KENSINGTON CAMPUS

BORE WATER SYSTEM
OPERATING AND MAINTENANCE MANUAL

PART 1
BORE WATER SYSTEM HISTORY, INFRASTRUCTURE & OVERVIEW

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1 INTRODUCTION

1.1 ABOUT THIS MANUAL

The UNSW Kensington Campus bore water manual (raw and treated bore water) has been arranged into two volumes as follows:

Bore Water Manual Part 1 - Bore Water System History, Infrastructure & Overview

Bore Water Manual Part 2 - Bore Water System Operation, Maintenance and Trouble Shooting

1.2 IMPORTANT DISCLAIMER

The manual (Part 1 & 2) is a compilation of information sourced to the best of the writer's knowledge of works that have been carried out to the bore water system since its inception.

The information contained within these documents is intended to provide a better understanding of technical matters associated with the bore water system as a whole and to assist with understanding the various separable installations which make up the system.

This publication should not be used in isolation and wherever possible repair, or replacement of mechanical parts should be referred to expert manufacturers' technicians for guidance.

While this is called an Operation and Maintenance Manual, it should be used to verify the logic of operation, rather than intrinsic tolerances required to repair, and maintain specific equipment.

Before working on any specific piece of mechanical plant, confirm the advice given in this document is relevant to that plant. Please refer to equipment suppliers or manufacturers for full instructions.

2 UNSW BORE WATER SYSTEM OVERVIEW

UNSW extracts raw bore water (under license from NSW Department of Industries –Water) from the underground aquifer for use on the Kensington campus.

UNSW uses three (3) extraction bores (Alpha, Bravo & Charlie Bores) to draw water from approximately 30m underground. The three bores are connected via a dedicated pipe network that discharges to the 300,000 litre underground raw bore water tank at Tyree Building (H6).

The raw bore water is drawn from the Tyree (H6) Raw Bore Water Reservoir and pressurised via a dedicated quad booster pump set, located within the Tyree (H6) basement plant room. The pumps have been set to maintain a reticulation pressure 600kPa at the outlet. Although the pumps can provide a much higher pressure, they are limited by the pressure capacity of the small amount of old asbestos cement (mostly along High Street, adjacent the Pool) and cast-iron mains. Possibly in the future with mains upgrading, pressures could be raised. Ground levels rise by 30m from Lower to Upper Campus, resulting in the bore water system for the upper campus having reduced raw bore system pressures compared to the lower campus.

The raw bore water pipe network extends throughout the lower campus to service buildings, irrigation and the Hilmer (E10) Building treated bore water plant (*currently in plant inhibit [sleep] mode*). Majority of the building on the lower campus are connected to the treated bore water system for toilet flushing, laboratory water & cooling towers. While the raw bore water is mainly used for irrigation on the lower campus, there are still a few buildings connected to the raw bore water for toilet flushing.

Raw bore water extends from the lower campus into the upper campus to service the Library Building (F21) treated bore water plant and small areas on landscaping (irrigation). Majority (due to the existing pipework configurations) of the irrigation on the upper campus is supplied from the treated bore water system.

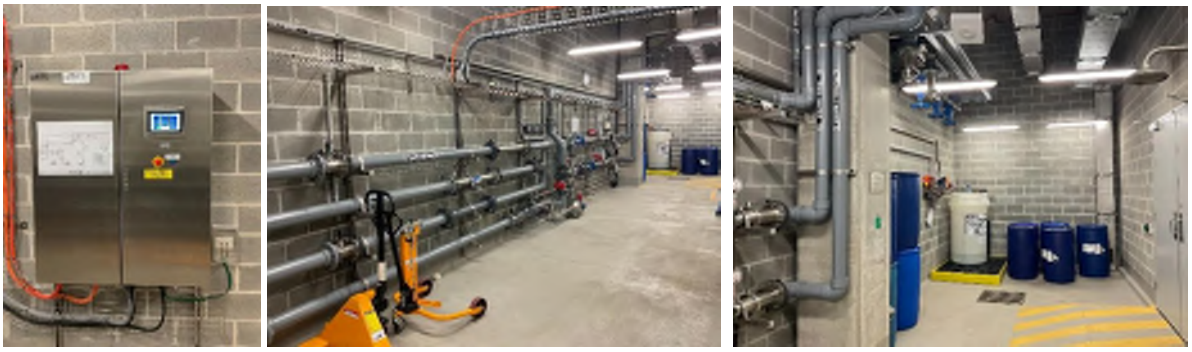
The first treated bore water plant on campus was constructed as part of the North Mall Development Zone (NMDZ) project and consisted of a dry Soda Ash plant and dosing system. The original system was plagued with problems including:

- Failure to Maintain a Constant pH
- pH Probe Maintenance
- Chemical Over-dosing
- Soda Ash Fouling of Automatic Valves and Instrumentation
- Soda Ash Hardening in Materials Handling Equipment
- High Total Dissolved Solids (TDS)
- Automatic Changeover to Potable Water



Original NMDZ bore water treatment plant (demolished)

The Hilmer (E10) Building treated bore water plant (BWTP) was constructed in 2015 with a liquid 50% Sodium Hydroxide dosing system. This plant has operated successfully for the majority of its life, however Estate Management found that the existing plant could not consistently maintain the pH range across the varying flows of the system. In addition, the upper campus treated bore water system was limited to the available pressure at the inlet to the raw bore water storage tanks within the Commerce Courtyard.



E10 BWTP (currently in Inhibit mode)

UNSW Estate Management decided that an Upper Campus bore water treatment plant and associated raw bore water storage would greatly benefit the Campus. In 2022, the Upper Campus Bore Water Treatment (UCBWTP) was constructed and commissioned within the basement of the Library Building (F21) and since its start-up, has supplied the entire Kensington Campus with treated bore water. Following the successful commissioning of the UCBWTP, UNSW Estate Management opted to retain the existing BWTP (E10) as a back-up system, with the existing BWTP being placed into plant inhibit [sleep] mode. If required, this system can be brought back into operation in less than a day.



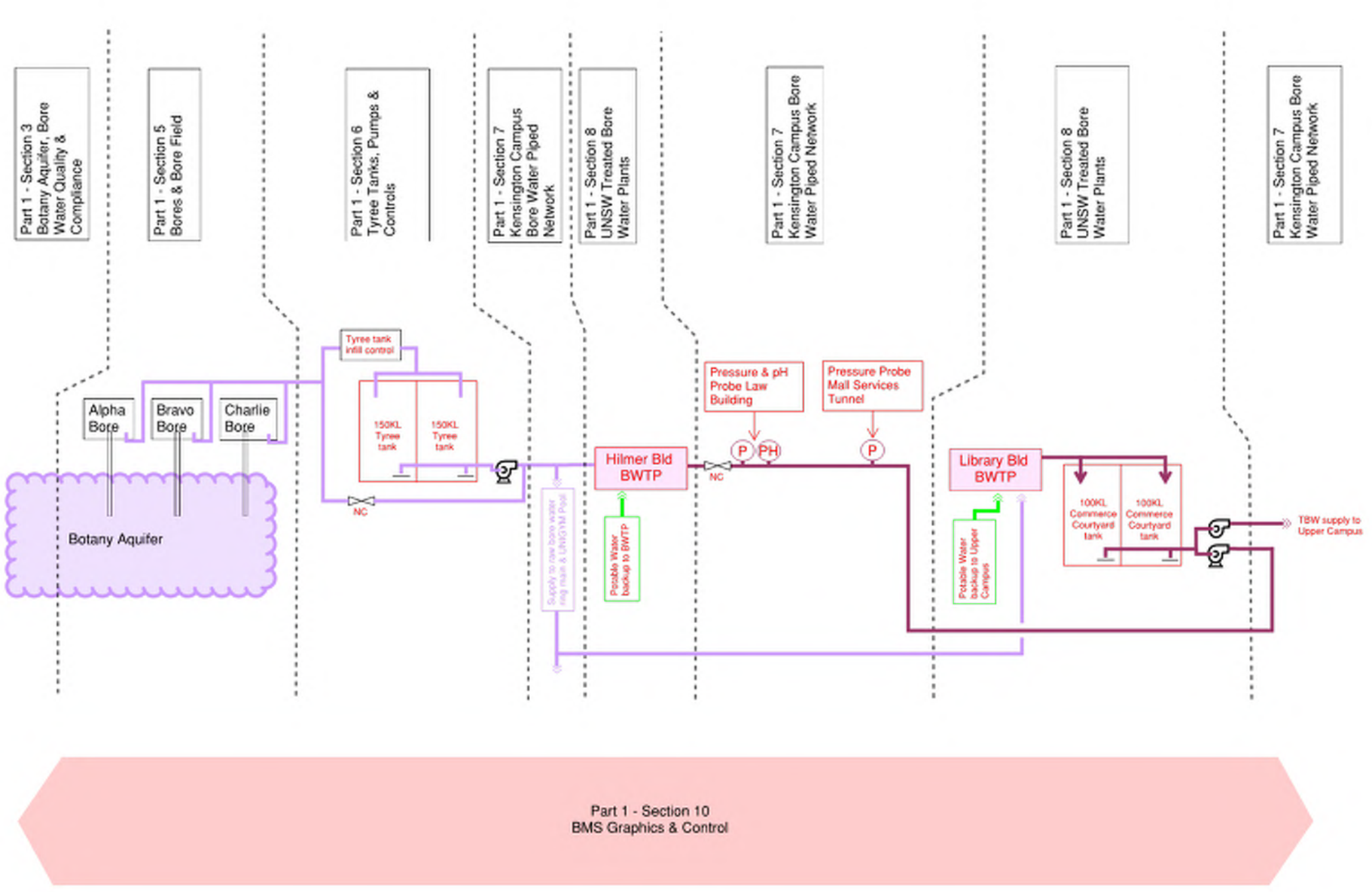
F21 UCBWTP

The UCBWTP pH corrects the raw bore water via an automatic inline dosing system. The treated bore water is then stored in dual 150KL tanks located inground under the Commerce Courtyard. The treated bore water is then drawn from the tanks and pressurised via dedicated pump for the upper and lower campus supplies.

The treated bore water system is used for toilet flushing, laboratory water & cooling towers. While the raw bore water is mainly used for irrigation on the lower campus, there are still a few buildings connected to the raw bore water for toilet flushing.

An overview of the Kensington Campus Bore Water system, broken into sections for the purpose of this manual is shown in Figure below.

Figure 1- Overview of the Kensington Campus Bore Water system



2.1 UNSW BORE WATER HISTORY

The bore water history at the UNSW Kensington campus is as follows:

- 1964 the first underground bore was sunk for the purpose of irrigating the playing field next to Anzac Pde, No.1 bore.
- In approximately 1977 the UNSW swimming pool was built and Bore No. 2 (now renamed to ALPHA Bore) was constructed to supply make-up water to the backwash tank and fill the pool.
- In 1995 Bore No. 3 was constructed along with the re-charge bore to provide air conditioning cooling to the Square House. Each of these bores initially operated independently and for their own specific purposes, although they also pumped into a common reticulation network.
- Also, in 1995, the Upper Campus water storage tanks and irrigation pumps were constructed under the Commerce Courtyard.
- In 1999 a cooling loop was constructed for the Instron Mechanical Test Unit in Materials Science, which took bore water from the ground level tank via the pressurized cooling loop and discharged it at 600kPa pressure back to the bore water main via a heat exchanger.
- In 2000, Bore No. 3 was separated from the Square House air conditioning and a dedicated circulation pump installed to draw water from the common reticulation and discharge back into the system. The Square house Bore water cooling system was deleted in 2015 & a dedicated cooling tower was installed for the mechanical systems.
- In 2009 UNSW commissioned the first bore water treatment plant (dry powder, soda ash system), designed to raise the pH of the raw bore water to be less acidic and able to be utilized in cooling towers and lab water applications. This system was decommissioned and replaced in early 2015 with the current BWTP (Sodium Hydroxide 50%), located in the basement of Hilmer Building (E10).
- In 2010, Bore 1 was decommissioned and the existing recharge bore serving the square house was converted to a production bore, Bore 4 (later re-named to CHARILE).
- 2010, also saw the completion of the Tyree Energy Technology Building, which incorporates a
- In late 2015, a failure of the bore screen (25m below ground) resulted in Bore 3 becoming in-operable. As a result, Bore 3 was decommissioned and a new bore, BRAVO Bore was constructed in late 2015-early 2016, to the west of International House.
- In 2016, an upgrade of the bore water pump controls was undertaken to allow the pumps to be controlled and monitored from central location.
- In 2022 the Library Building (F21) treated bore water plant (UCBWTP) was constructed and commissioned to supply treated bore water to the whole of the Kensington Campus. The Hilmer (E10) Building treated bore water plant (BWTP) was retained as a back-up system, with the existing BWTP being placed into plant inhibit [sleep] mode.

3 BOTANY AQUIFER, BORE WATER QUALITY & COMPLIANCE

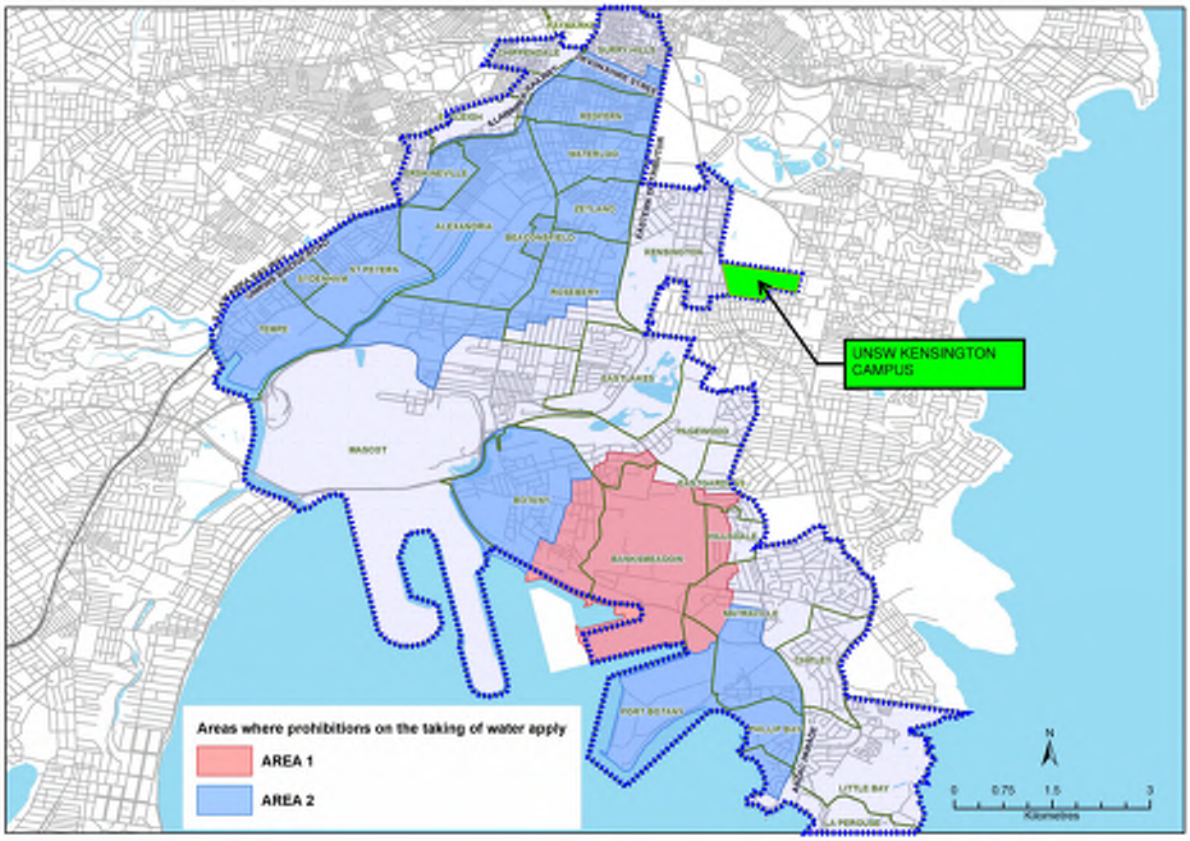
3.1 BOTANY SANDS AQUIFER

The Botany Sands Aquifer is a layer of sand containing a large volume of water surrounding Botany Bay south of Sydney, New South Wales. At a local scale, the aquifer runs from Centennial Park southeast of Sydney City to the Botany Wetlands and into Botany Bay. The Botany Sands Aquifer is layer of sand filled with water beneath the ground. It covers an area of approximately 141 square kilometres. The aquifer is recharged by rainwater percolating through sand and sandstone which act as natural filters to remove solid litter, silt and harmful nutrients.

A large portion of freshwater collects in and flows underground through the aquifer. Parts of the Botany Sands aquifer are polluted, and NSW Department of Industry - Water do not permit the use of ground water for any domestic purpose, such as drinking, cooking, watering household gardens, washing cars and clothes, filling swimming pools and providing drinking water for animals.

UNSW Kensington Campus lies within the uncontaminated part of the Botany Sands Aquifer. The red and blue Zones are restricted for domestic extraction purposes due to previous contamination.

UNSW has elected to undertake bi-annual water quality monitoring to ensure the groundwater is fit for purpose and to maintain a continuous register of bore water quality. It has been confirmed as part of this monitoring that the pH typically decreases (becomes mor acidic) during times of extended drought.



NSW Office of Water has provided a Report Card for the Botany Sands Groundwater Source which forms the basis of the Water Sharing Plan. It identifies two Management Zones:

Area 1 - The embargo area of August 2003 (Contaminated or potentially contaminated area not suitable for general groundwater extraction)

Area 2 - The remainder of the water source (UNSW Kensington and David Phillips Field are located in this area) which is considered to be usable water for non-potable uses.

The Report Card identified 51.7% of recharge for environmental flows and 48.3% for the Long-term Average Annual Extraction Limit. Therefore, available water for extraction will change as the annual weather pattern changes, the more rainfall, the higher the extraction limit. Conversely, the lower the annual rainfall, the lower the extraction limit and hence the less water available for each groundwater user. Initially, one Extraction Share is equal to one hundred megalitre per annum. However, this may vary as the average annual rainfall varies, and daily extraction rates may be reduced in critically dry periods, similar to other town water restrictions.

3.2 NSW OFFICE OF WATER

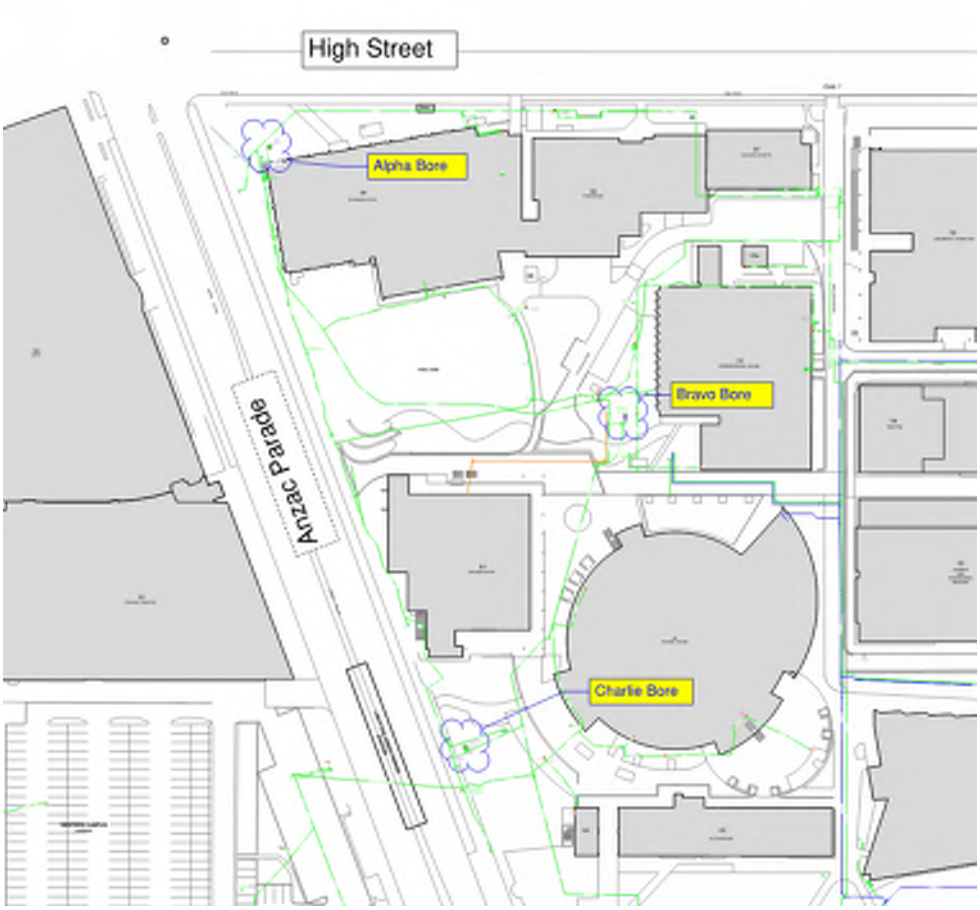
3.3 Department of Environment Climate Change and Water Conditions

Three bores production bores are registered with the New South Wales Department of Natural Resources (now DECCW Office of Water). These are:

Licence No 10BL156719 - Swimming Pool production Bore No. 2 (Alpha Bore)

Licence No 10BL156791 - Square House production Bore No. 3 (Charlie Bore)

Licence No 10BL156792 - Block House production Bore No.4 (Bravo Bore)



A submission to DNR in 2004 applied for an increase in the current allocation from 100mL to 400mL per annum. Although all requirements for information, testing and proving have been met, no formal approval has yet been given. Meanwhile better management of irrigation and the bore water system itself has resulted in lowering bore water use and it is likely the site will require around 300mL for known operations and building services. An additional 100mL per annum needs to be accounted for to cover unplanned temporary scientific uses, resulting in a total required allocation of 400mL per annum. Any additional allocation resulting from recharge credits could be utilised for short-term scientific hydraulic experiments should they be required in the future. Total bore pump rate of between 20 and 26L/sec. is expected to be allowed. To enable this extraction rate to be approved and maintained into the future, UNSW had to install and maintain groundwater draw-down level recording devices. Each bore is therefore fitted with water level sensors which are connected to the Facilities' BMS system which records a history of these levels. From these records, it is possible to determine deterioration in the condition of the bore, as well as aquifer standing water level fluctuations currently extracts bore water from the Botany Sands Aquifer under license from the NSW Office of Water. Our current extraction license for the UNSW Kensington Campus is100mL/year.

In recent years UNSW Kensington Campus has extracted:

- 310mL/year 2019
- 172mL/year 2020
- 105mL/year 2021
- 203mL/year 2022

3.4 BACKFLOW PROTECTION

Each bore discharges via a combined header into the inlet of the Lower Campus raw bore water storage tank located in the lower ground floor of Tyree ETB (H6) building. This tank has no potable backup and is only supplied with raw bore water. This disconnects the bore field from the general reticulation serving the campus.

By prior agreement with Sydney Water bore water system within buildings is afforded the same backflow protection as drinking water, with the exception that testable double check valves (DCVA) replace reduced pressure zone devices (RPZD). Where drinking water is provided as an emergency back-up to the bore water, the bore water is fitted with a DCVA and drinking water with an RPZD.

Irrigation supplied with bore water is not provided with protection as fertilizer-dosing is not practiced at this site.

3.5 COUNCIL DEVELOPMENT APPLICATIONS

Specifically, at UNSW Kensington, bore water has been accepted by Randwick City Council as a suitable second water supply in place of rainwater storage tanks. This means that all Development Applications require a statement that site bore water will be supplied to all toilet flushing, wet cooling towers, suitable industrial demands and garden irrigation as a substitute for rainwater tanks. Included with this statement should be the expected annual water savings in kilolitres due to bore water substitution in that specific development (this figure should be available from data prepared for the Greenstar rating for the development).

This does not preclude buildings being provided with rainwater harvesting where it provides economic benefits to the campus.

3.6 LIMITATIONS ON EXTRACTION RATES

Each of the three bores is limited in its yield by the soils from which the water is extracted. At the time that the bore was installed, the yield from each bore was confirmed via a 24-hour test of the extraction capacities and the results of these are as follows:

Alpha Bore 19L/sec (1995)
Bravo Bore 18L/sec (1995)
Charlie Bore 13L/sec (2006)

The bore extraction rates are regulated by Department of Climate Change, Energy, the Environment and Water (DECCW). The extraction rates are regulated to ensure that the draw from the aquifer is not exceeded, causing water levels to drop, thus impacting on neighbouring bore standing water levels.

Each of the three production bores is fitted with a water level sensor which is connected to the BMS via the Tyree bore water master controller. Historic information on groundwater levels and draw-down levels should be available from this system for periodic examination. From a trend graph of draw-down it could be determined whether the bore is becoming blocked. Should there be an obvious change in the trend graph gradient, the bore should be assessed for screen or aquifer blockage and measures taken to clean both the sand around the screen and the screen itself if required. Since the bore pump, which is about 20m below surface level, would need to be removed to carry out such an investigation, it would be far easier to periodically monitor the draw-down to establish when this operation should be undertaken.

To increase the life of the bore, it is essential not to over-pump. This means that the maximum flow rate of extraction should be substantially less than the original 24-hour test flow rate as detailed above. Rule-of-thumb ratio of pump rate to test rate is 70%. This allows for gradual natural reduction in aquifer inflow rate to the screen, and substantially reduces the tendency of iron to accumulate in the surrounding sand and the screen.

Hence bore pump discharge should be limited to the following flow rates:
Alpha Bore 13.3L/sec
Bravo Bore 12.6L/sec
Charlie Bore 10.5L/sec

To preserve the life of the screen and hence the bore, it is essential each production bore is maintained in use to prevent incrustation from mineral deposits and bio-fouling by the growth of microorganisms on the screen and subsequent potential blockage.

3.7 WATER QUALITY MONITORING AND REASONS FOR MONITORING

Untreated bore water must not be used for any potable purposes due to its uncontrolled bacteriological quality. Although tests to date indicate zero faecal coliform counts and minimal plate counts, there are no controls on these qualities. Quality of the bore water is assessed as excellent as a raw water feed for irrigation, swimming pool make up and toilet flushing where lower pH is not an issue. However, the pH varies considerably over time and geographically from about 4.5 to 6.8. Because of this variation, the use of raw bore water it is not considered acceptable for use for laboratory non potable water, and some industrial chemistry uses including concrete manufacture, without treatment.

With the variations in pH being low on occasions, no further extension of copper pipework should be undertaken for the raw bore water pipe network, unless for short, exposed distances where replacement can be easily affected, and deterioration surveyed. The most suitable materials are stainless steel and polyethylene for building services and PVC and polyethylene for in-ground works. Brass valves can be severely corroded and therefore this material should be avoided where in contact with the raw bore water. Cast iron is similarly affected and gate valves should be epoxy or powder coated internally and externally. Automatic valves have Grade 316 stainless steel internal components.

Regular periodical testing of bore water is carried out in compliance with the requirements of the Department of Health. Water quality from each bore should be monitored regularly to ensure the following:

- Contamination is not entering the bore from broken sewer services.
- Local or upstream pollution has not occurred due to sewage or contaminated stormwater entering the groundwater.
- Bores are not fouled with iron deposits.
- Treated bore water is not contaminated by chemical dosing.
- To track and record the changing pH in times of drought.

In addition to the above reasons, UNSW consider the supply of bore water to the following uses across campus is also grounds for water quality monitoring:

- Raw and treated bore water is fit to apply by spray irrigation around the Campus community.
- Raw bore water is fit for swimming pool top-up/balance tank filling.
- Raw and treated bore water is fit for toilet flushing and laboratory services.

The bore water sampled on a six (6) monthly basis by UNSW Estate management in accordance with the UNSW Sydney Campuses Water Quality Testing requirements updated every year by UNSW EM. (Appendix 1 – Bore Water Sampling Specification).

This document outlines the test locations, sampling parameters and testing frequency the UNSW Campuses. UNSW EM have records of the test results dating back to 2011.

Sampling is carried out to AS/NSZ 5667.1 1998.

Should additional sampling be required (on a one-off basis) please contact UNSW Estate Management, Hydraulic Engineers for our preferred sampling contractor and the suite of tests to be conducted.

Assessment of results of sampling and testing is best left to the water testing specialist for most parameters especially if results are either suspect or outside good public health practice.

When an adverse result is obtained, immediate advice should be given to UNSW EM Engineering with any additional relevant information associated with either the cause or the effect of the test failure. It should also include any advice from the water testing specialist upon which actions may be taken.

It is essential that test result information be kept private. Such information is not for the public distribution by anyone except the Director of UNSW Estate Management.

It must be understood that errors can and are made by either the person taking the samples, carrying out the tests or preparing the report. Often it will be necessary to re-sample and test to confirm any problems. Therefore, advice **should not be provided** to the users or anyone else but UNSW EM Engineering. This step must only be taken by UNSW EM Engineering after due diligence has confirmed any possible risks to campus personnel or the public.

3.8 UNSW AQUIFIER RECHARGE

The current UNSW Stormwater masterplan 2025 (accepted by Randwick City Council) allows for site stormwater drainage to be infiltrated back into the aquifer. There are numerous aquifer recharge systems located within the UNSW Kensington campus site, these include:

- Village green

- University Terraces
- Roundhouse
- The Kensington Colleges (TKC)
- Tyree Building

Majority of these systems capture gross pollutants before they are recharged into the aquifer and are maintained by UNSW EM on an annual basis.

As part of the 2022 Village Green redevelopment (and associated aquifer recharge/tank), UNSW Estate Management requested that inflow monitoring/metering be added to the incoming stormwater flows to the new 16,000m^3 (approx.) recharge chamber installed as part of the redevelopment works. The purpose of the metering is to determine that amount of water being recharged into the aquifer for a known catchment (Appendix 2 - 2022 Village Green redevelopment works and the installed flow monitoring system).

4 OVERVIEW OF BORE WATER USE ACROSS CAMPUS

4.1 Bore water Uses - Generally

Bore water is used in a multitude of ways across campus and even within buildings. Refer to section 4.7 for the current treated and untreated bore water uses within buildings on the Kensington Campus. Bore water (treated and untreated) uses are not detailed specifically within this section.

4.2 Cooling Towers

Raw and treated bore water is used across the Campus for cooling towers. The cooling tower make-up supply is predominately Treated Bore Water, however raw bore water supply is limited to some cooling towers on the lower campus.

Water consumption in a cooling tower is directly impacted by quality of feed water. Cooling towers utilising raw or treated bore water will use a greater quantity of water compared with typical potable water. More water consumption also results in increase chemical consumption and a more robust water treatment program.

Electrical Conductivity is very important for cooling tower water chemistry control, as high Electrical Conductivity water has a lower thermal transfer which increases the bleed frequency, so fluctuations are important to understand.
UNSW have recorded the following levels of Electrical Conductivity at their cooling towers:

- Sydney Water potable water is approximately 165 µS/m.
- Raw bore water is high in dissolved solids (TDS) with a conductivity count around 350 µS/m.
- Treated Bore Water, because of dosing with Sodium Hydroxide 50%, is higher again, and ranges between 510-525 µS/m.

4.3 Bore Water Reticulation and Backup

Dual water supplies are supplied to majority of buildings for toilet flushing, cooling towers and other uses in case the bore water fails. Bore water and potable (town) water either mix before direct injection to flush systems or are fed into storage tanks with the bore water being prioritised over the potable supply. Where mixing directly, the potable water is protected with a Reduced Pressure Zone backflow device (RPZD) and bore water is protected with a Double Check Valve Assembly (DCVA).

The potable water must be maintained in the off position to stop it preferentially supplying at night-time when its pressure can reach up to 810kPa, which is substantially above the bore water pressure.

4.4 Swimming Pool Supply

Makeup water to the swimming pool balance tank located under Building B4 is primarily from the raw bore water system although there is a second source of water from the town system. Approximate weekly inflow is some 70kL. Control of inflow to the balance tank is by probes and a solenoid valve. The manual make-up pipe has been reduced in size and capacity to prevent over-drawing the bore water system. Chemicals are added (by the pool operators) at the pool to raise the pH and disinfect the water.

An automatic potable water make-up is provided in case the bore water fails, operating on probes to open and close a solenoid valve above the balance tank.

4.5 System Drain Valves (Scours)

Upper and Lower campus systems are provided with their own dedicated drain valves. The Upper Campus system can be drained back into the Commerce Courtyard reservoirs using the 100mm butterfly valve in the

Library 1 Lower Plant Room. An additional scour is located between Phillip Baxter College (D18) and Morven Brown (C20) adjacent the lower level of the lift. The Lower Campus system can be drained into the stormwater system adjacent the bore water entry into the Tyree plant room. Additional scour valves are located adjacent each bore head.

4.6 Emergency Potable Supply

A manually operated 150mm emergency supply connection is located within the Morven Brown services tunnel. It is protected from backflow with an RPZD backflow preventer. This can supply both Lower and Upper campuses depending on which system valves are closed.

4.7 System Air Relief

The Lower Campus system is fitted with a Double Air Valve at its highest point inside the Library 1 plant room (above the stair leading to the Upper Campus system pumps). This valve allows air to escape during system filling and air to be sucked into the pipework when emptying. It is a 50mm Amiad Combination Air Valve type: D-040-50 Barak polyethylene valve and isolating ball valve tapped into the 100mm PVC main.

4.8 Bore water Uses – Specific to each Building.

Refer to Appendix 3 - UNSW Kensington Campus Bore water uses, for a full list on UNSW Kensington Campus buildings, bore water uses, installed bore water storage tanks, potable back-up systems and incoming supply location/reference photo.

4.9 Pressures

The below table identifies the likely system pressures at selected locations over the UNSW Kensington campus. Note, the locations are assumed to be at the main service tapping, ground level unless stated otherwise. Roof levels are indicative only. Those marked 'irrigation' are calculated assuming nighttime watering. This information should be used as an indicative guide only.

Location		Ground Level (mAHD)	Residual Pressure (m)	Hydraulic Grade Line (HGL mAHD)
Building	Site Grid			
AGSM (Irrigation)	G27	52.3	61.3	113.62
AGSM (Roof)	G27	78	30.3	108.3
Biological Sciences	D26	55.0	53.3	108.25
C25 Lowy Cancer Centre	C25	57.0	52.8	109.79
Central Lecture Block	E19	53.0	57.1	110.13
Chemical Sciences (Irrigation)	F10	29.5	56.5	86.03
Chemical Sciences (Roof)	F10	76	7	83.23
Civil Engineering (Irrigation)	H20	47.0	35.8	113.76
Civil Engineering (Roof tank)	H20	78	31.2	109.18
Computer Sciences (Irrigation)	K17	32.0	53.1	85.11
Computer Sciences (Roof tank)	K17	59	25.6	84.57
Electrical Engineering (Irrigation)	G17	44.0	41.0	85.06
Electrical Engineering (Roof tank)	G17	58	26.2	84.16
Goodsell (from Upper Campus)	F20	65.0	45.1	110.1
John Niland Scientia	G19	44.0	65.4	109.42
Law (Irrigation)	F8	28.6	57.4	86.03

Location		Ground Level (mAHD)	Residual Pressure (m)	Hydraulic Grade Line (HGL mAHD)
Building	Site Grid			
Law (Roof)	F8	49	34.1	83.08
Library lawn (Irrigation)	C21	55.0	57.8	112.82
Library Stage 2	F21	53.0	56.2	109.25
Library Stage 2 (Roof tank)	F21	105	3.4	108.41
Mathews (Irrigation)	F23	55.0	58.6	113.63
Mathews (Roof tank)	F23	102	6.2	108.15
Michael Birt Garden (Irrigation)	C25	57.0	55.0	112.0
Morven Brown	C20	67.0	43	110.01
Quadrangle Lawn (Irrigation)	D16	35.0	51.0	86.0
Red Centre	H13	26.0	58.9	84.89
Robert Webster	G14	29.4	55.4	84.83
Rupert Myers	M15	32.0	52.6	84.6
Samuels (Irrigation)	F25	53.2	60.4	113.61
Samuels (Roof tank)	F25	74	34.1	108.13

5 BORES & THE BORE FIELD

5.1 GENERAL

UNSW uses three (3) extraction bores (Alpha, Bravo & Charlie Bores) to draw the water from approximately 30m underground. The three bores are connected via a dedicated header pipe that discharges to the inlet fill valves associated with the 300,000 litre underground raw bore water tank at Tyree Building.

5.2 ALPHA BORE

5.2.1 Contractors and Suppliers

Bore Driller: Panorama Drilling
2016 Upgrade Southwell Group

5.2.2 Description

Location: Alpha Bore is located at the north west corner of the swimming pool and in a buried concrete pit with concrete-filled gatic cover.







GPS Co Ord: LAT -33.91512 LONG 151.22583
Drilled date: August 1995
Licence No: 10BL 156719
Drilling: Total depth 33m, 219mm OD ABS screwed and glued casing, 21m deep to top of screen.
Screen: 219mm OD x 0.7mm opening wire Stainless Steel, screwed and glued to casing. Screen depth 12m
Hydrology: Standing water level - 7.65m below surface, aquifer depth - 19.0m to 33.0m below surface, test flow rate: 19.0L/sec, yield: 19.0L/sec.
Pump Upgrade: The Bore Pump was replaced 29 Feb 2016 by Southwell Irrigation.

5.2.3 List of Critical Infrastructure

Pump	Grundfos SP Submersible pump (Model SP46-9), with MS6000 15kw motor (Model 15A21909P115500001)
Pump Column	Permaglass Fibre column 100mm
Bore Cap	100mm Stainless Steel
Rate of Flow Valve	ME Mack 50mm Rate of flow valve (P100 series valve, P40 pilot ACV Series) with orifice plate, stainless steel control tube and pilot. Set at 8.0lps
Water Meter	Elster 50mm H4000 water meter, with PR7 optical reader
Low level probe	3 x low level probes in 32mm conduit (Model 11SN1)
Level Transducer	Mercoid Level Transducer in 32mm Conduit (DWY MBLT-2SC-IVPM-60-66)
High / Low pressure	Condor Pressure Switch 1/4" (Model MDR3)
Control Panel	VSD DELTA VFD220E43B 22kW with sine wave filter
PLC/HMI	UNITRONICS V570

(Refer to Appendix 4 for technical information about Alpha Bore equipment)

5.3 BRAVO BORE

5.3.1 Contractors and Suppliers

Bore Driller: Highland Drilling
Bore Install Southwell Group

5.3.2 Description

Location: Bravo Bore is located at the western side of International House in a buried concrete pit with checker plate cover.






GPS Co Ord: LAT -33.91604 LONG 151.22646
Drilled date: 16 February 2016

Licence No: 10CA119351
Drilling: Total depth 30m, 214mm OD 316 stainless steel butt welded casing, 24m deep to top of screen.
Screen: 214mm OD x 1mm horizontal opening wedge wire Stainless Steel. Screen length 6m
Hydrology: Standing water level – 6.0m below surface, aquifer depth – 24.0m to 30.0m below surface, yield: 12.0L/sec.

5.3.3 List of Critical Infrastructure

Pump	Grundfos SP Submersible pump (Model SP46-9), with MS6000 15kw motor (Model 15A21909P115500001)
Pump Column	Permaglass Fibre column 100mm
Bore Cap	100mm Stainless Steel
Rate of Flow Valve	ME Mack 50mm Rate of flow valve (P100 series valve, P40 pilot ACV Series) with orifice plate, stainless steel control tube and pilot. Set at 8.0lps
Water Meter	Elster 50mm H4000 water meter, with PR7 optical reader
Low level probe	3 x low level probes in 32mm conduit (Model 11SN1)
Level Transducer	Mercoid Level Transducer in 32mm Conduit (DWY MBLT-2SC-IVPM-60-66)
High / Low pressure	Condor Pressure Switch 1/4" (Model MDR3)
Control Panel	VSD DELTA VFD220E43B 22kW with sine wave filter
PLC/HMI	UNITRONICS V570

(Refer to Appendix 5 for technical information about Bravo Bore equipment)

5.4 CHARLIE BORE

NOTE: Charlie Bore is the oldest active bore and control panel on campus. The current configuration of the light rail, landscaping, site access within UNSW and overhead trees would mean that the crane required to removal of the bore pump would be extremely difficult to position onsite. Considering the age of the bore, it is recommended that if this bore fails, then an alternate bore location be considered.

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5.4.1 Contractors and Suppliers
Bore Driller: Unknown
Bore Install Unknown

5.4.2 Description
Location: Charlie Bore is located at the southern side of Square House in a buried concrete pit with checker plate cover.





GPS Co Ord: LAT -33.91604 LONG 151.22646
Drilled date: 16 February 2016

Licence No:	10CA119351
Drilling:	Total depth 30m, 214mm OD 316 stainless steel butt welded casing, 24m deep to top of screen.
Screen:	214mm OD x 1mm horizontal opening wedge wire Stainless Steel. Screen length 6m
Hydrology:	Standing water level – 6.0m below surface, aquifer depth – 24.0m to 30.0m below surface, yield: 12.0L/sec.

5.4.3 List of Critical Infrastructure

Pump	Grundfos SP Submersible pump (Model SP46-9), with MS6000 15kw motor (Model 15A21909P115500001)
Pump Column	Permaglass Fibre column 100mm
Bore Cap	100mm Stainless Steel
Rate of Flow Valve	ME Mack 50mm Rate of flow valve (P100 series valve, P40 pilot ACV Series) with orifice plate, stainless steel control tube and pilot. Set at 8.0lps
Water Meter	Elster 50mm H4000 water meter, with PR7 optical reader
Low level probe	3 x low level probes in 32mm conduit (Model 11SN1)
Level Transducer	Mercoid Level Transducer in 32mm Conduit (DWY MBLT-2SC-IVPM-60-66)
High / Low pressure	Condor Pressure Switch 1/4" (Model MDR3)
Control Panel	VSD DELTA VFD220E43B 22kW with sine wave filter
PLC/HMI	UNITRONICS V570

(Refer to Appendix 6 for technical information about Charlie Bore equipment)

6 TYREE RAW BORE WATER RESERVOIR, PUMPS AND CONTROLS

6.1 Overview

The raw bore water is supplied to the Tyree basement plant room (LGQ27) from the common header supplied from the three bores. The raw bore water is then fed into the Tyree raw bore water reservoir (divided into two separate chambers to allow for cleaning), located inground on the western side of the Tyree Building.
(Refer to Appendix 7 technical information about Tyree Raw Bore Water equipment)

The Tyree raw bore water reservoir also serves as a heatsink for mechanical HVAC cooling plant within the Tyree building. The system draws water from the raw bore water tank, the water passes through a heat exchanger before being returned to the tank. During maintenance of the bore water tank, it is recommended that the mechanical system be isolated. Refer to mechanical O&M manuals for details of the system and its operation.

6.2 BORE WATER MASTER CONTROLLER

The bore water master controller is located within the lower ground floor plant room (LGQ27) Tyree Building (H6). The master controller is a single source of control, function, and data recording for the raw bore water infrastructure.

All of the three (Alpha, Bravo & Charlie) bores can be controlled via the individual bore panel; controlled via the remote access software; or from the master controller within Tyree Room LGQ27.

The master controller manages the following functions:

- The three bores are arranged as duty, standby & second standby. The order of which bore pump is duty, etc can be set at the master controller or at the individual bore pump.
- The pressure set point controls VSD speed on each of the bore pumps
- Signals alarms back to BMS
- Monitors all bores and reports to BMS
- Manages Tyree raw bore water tank level and inlet fill valve
- Monitors the incoming raw bore pressure & pH
- Tyree pump outlet pressure
- Provides fault reporting on the Tyree Raw Bore Water Reservoir quad booster pumps. The pumps can also be remotely reset from the master controller (via BMS)
- Stops Tyree pumps on low tank level



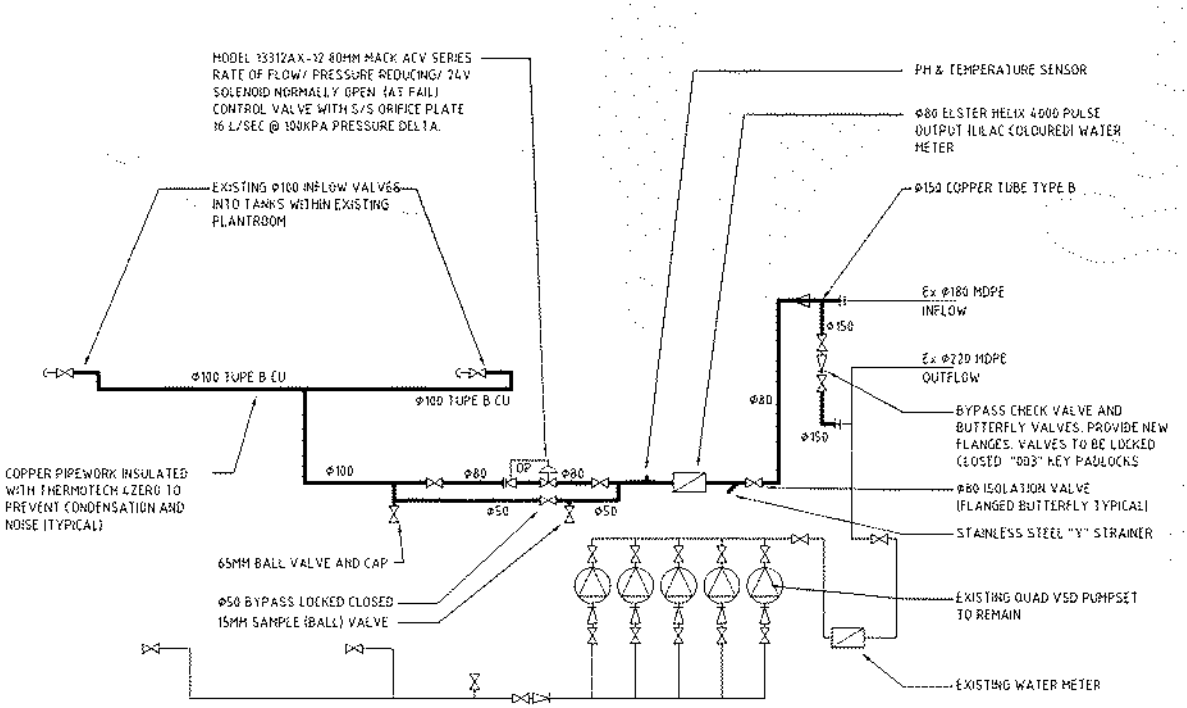
Tyree Bore water master controller HMI panel screens

6.3 Tank Inlet Valves and Controls

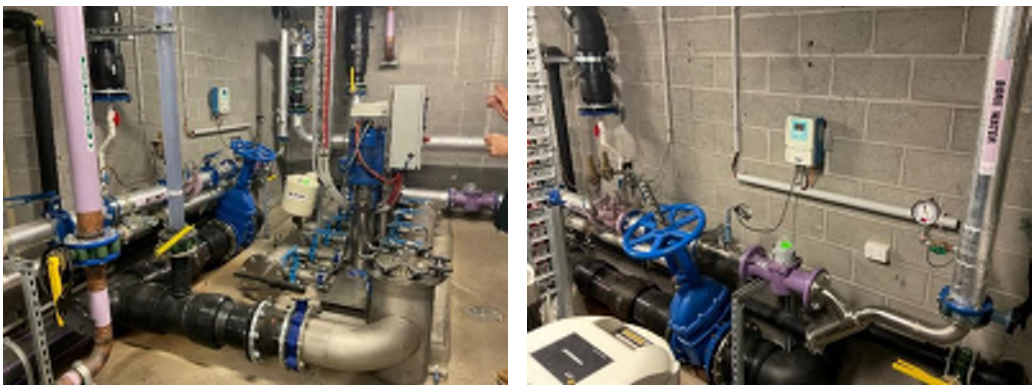
The raw bore water inlet to the Tyree Raw Bore Water Reservoir enters the plant room from the UNSW Mall inground pipework supplied from the bore pumps. The system has been arranged to allow flexibility in the event of pump failure or system maintenance.

1. The normal arrangement is configured to allow water to directly feed into the raw bore water tanks through the infill valve arrangement, strainer & meter.
2. There is a normally closed bypass (fitted with a check valve) that can divert the pumped discharge from the bore pumps back into the campus network (bypassing the Tyree bore water pressure pumps and the raw bore reservoir), however this is intended for emergency situations only as the bore pumps do not have enough head to adequately supply the whole campus.

Once past the bypass the water from the bores is feed through a strainer, water meter and is then measured for pH and temperature (for record purposes only).



Tyree Raw Bore Water Tank Infill Arrangements



Tyree raw bore water pumps and associated pipework

After the water meter the bore water fills into the two (2) tanks via a common infill valve (Model 13312AX-12 80mm Mack ACV Series Rate of flow/ Pressure Reducing/ solenoid control valve). The tank infill valve is set to provide a maximum inflow into the Tyree Raw Bore Water Reservoir of 17.5L/s. This flow rate has been determined in accordance with our extraction licence and so as not to overdraw any of the bores.

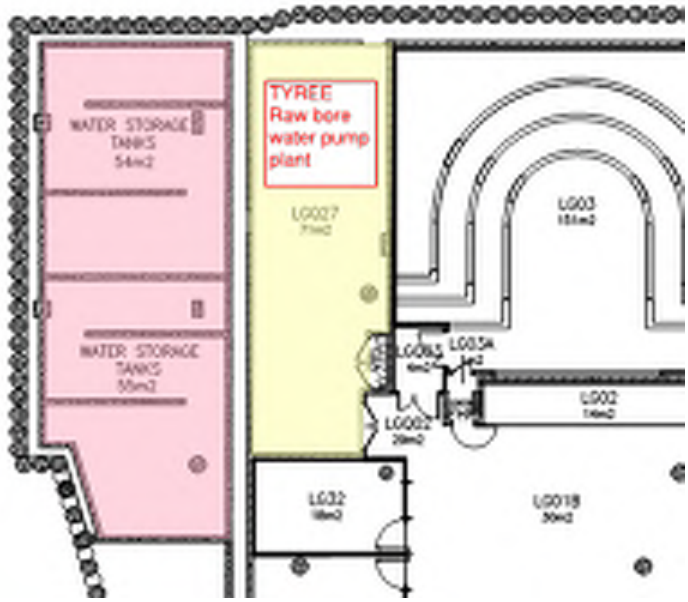
A hydrostatic level transducer within the northern portion of the two tanks controls the infill valve via the tank fill control panel. If the northern tank is shut down for maintenance or repair, then this level transducer would need to be moved into the southern tank to allow the tank to continue to refill. The tank fill control panel has no user adjustable settings, other than a test switch & level readout. The Panel was designed and installed by Enhanced Cabling Solutions (ECS) Pty Ltd to meet UNSW specifications.

6.4 Tyree Raw Bore Water Reservoir

The tank is a dual chamber concrete tank separated in two portions to allow for cleaning and maintenance. The tank was constructed with the base of the tank being approx. 500mm lower than the adjacent plant room (LGQ27) where the suction pumps are located. Vortex inhibitor plates were fitted on the suction lines within the tanks to maximise the usable volume of water within the tank.

The vortex plates were set set at 110mm from the finished floor level of the tank and were 500mm clear of walls and other obstructions around the plate.

The lowest water level within the tank was calculated to be 135mm above FFL, however the minimum tank water level was set at 150mm above the FFL.



Tyree Raw Bore Water Tank



Tyree Raw Bore Water Tank Pit Covers

Each tank has a minimum of two (2) 900x900 access covers for maintenance access. There are no ladders fitted within the tank and access needs to be obtained via a Confined Space Safety Rescue Tripod, after completing a confined spaces assessment.

The two reservoir tanks are fitted with a tell-tale overflow into the pump room (LGQ27). If the tanks overflows, water is discharged over a tundish in the plant room.

The underground tanks have experienced root penetration from the adjacent fig trees and need to be inspected (and cleaned if required) on a 2-yearly cycle.

6.5 Tyree raw bore water booster pumps

6.5.1 General

The quad VSD booster pumps are supplied off the Tyree Raw Bore Water Reservoir. A large inline strainer is installed on the inlet pipework to the pumps to reduce the risk of blockage or damage to the pumps. The pumps are arranged on a skid, complete with stainless steel pipework manifolds and spare capacity for an additional pump to be installed if required.

Each pump has a dedicated VSD controller and pressure transducer to provide for redundancy in the event of a pump failure. The pumps are also designed to cut out when the low level alarm is triggered from the Tyree Raw bore water reservoir.



Tyree Raw Bore Water Pumps

6.5.2 Equipment and Controls

Pumps: Lowara 22SV07F075T
Controller ITT Hydrovar (Master)
Pump Duty: 6.5L/sec@60m head
Pressure Vessel: Lowara 18Lt,
Pre-Ccharge pressure: 28 PSI.

6.6 Tyree Raw Bore Water Reservoir Operating Parameters

Tyree Raw Bore Water Tank Level information

Item	Height (meters) above base of tank	Volume (m3)	Percentage	Effective Volume	Total Volume
Overflow level	3.030	326.0	104%	90%	294
High Level alarm	3.000	322.8	103%		
Max water level	2.900	312.0	100%		
Low Level alarm	0.400	43.0	14%		
Tyree Pumps - off (level)	0.300	32.3	10%		
Minimum water level (0.165mm Absolute min)	0.200	21.5	7%		
Base of tank	0.000	0.0	0%		
Centre of Pumps above base of tank	0.700	75.3	24%		
Level sensor set approx 20mm above floor of tank The tanks suction outlets are filled with vortex plates (one per tank). The Vortex plate is set 110mm off FFL of tank and 500mm clear of walls.					

Usable Volume (cubic meters) **294**
Time to fill the tank - no outflow (hours) **4.64**

Maximum (tested) Bore Water Flow Rates

	Flow L/sec	Pressure kPa	Bore Setpoint kPa	Notes	m3/H
Tyree Raw Bore Water Tank Inlet Valve	17.6	180	600	All bores	63.36
Alpha Bore maximum flowrate (though bypass)	22.6	180	600	Alpha only	81.36
Bravo Bore maximum flowrate (though bypass)	23.2	180	600	Bravo only	83.52
Charlie Bore maximum flowrate (though bypass)	22.2	180	600	Charlie only	79.92

7 KENSINGTON CAMPUS BORE WATER PIPED NETWORK

7.1 General

The UNSW Kensington Campus has an extensive network of raw and treated bore water pipework throughout the lower and upper campus. (Refer to Appendix 8 for UNSW Kensington Campus Bore Water Pipework schematic and plan) The Treated Bore Water (TBW) and Raw Bore Water (BW) are differentiated on the plan to assist with identifying the different systems.

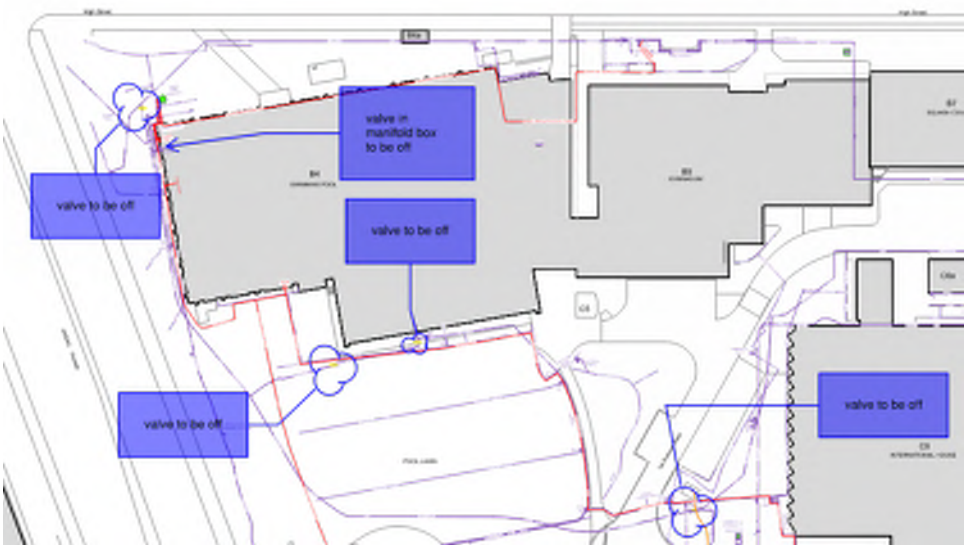
7.2 Lower Campus Raw Bore Water

Raw bore water extends throughout the lower campus via a mixture of pipe materials (MDPE, Cast Iron Blue Brute and Asbestos) and sizes to service Irrigation, toilet flushing, cooling tower make-up and swimming pool make-up water (Refer to Bore Water Manual Part 1 Section 4.8 for current raw bore water uses within the lower campus).

Prior to the redevelopment of the Village Green, the predominate use of the raw bore water was for irrigation, however since the conversion of the Village Green to synthetic turf, the irrigation demands have dropped considerably.

The UNIGYM Pool is currently supplied with Raw Bore water via an asbestos cement main. This section of main was installed when the building was originally constructed and is located under significant Fig trees along High Street. UNSW Estate Management recognise that there is a significant risk that this main will be damaged by the tree roots at some point in the future and may need to be replaced. Due to the Fig trees, replacing the main in its current location is near impossible. There was a concept proposal to extend the raw bore water from the pool lawn inground pipework over the roof of Swimming Pool (B4) and fixed to the existing wall on the northern side of the building until it connects to the existing pool plant.

The lower campus also incorporates a dedicated raw bore water pipe system that connects the three bore water pumps (Alpha, Bravo & Charlie) back to the Tyree Raw Bore Water tank. This pipe does interconnect with the Tyree pumped raw bore water system; however these interconnections are via normally closed valves (refer to image below).



7.3 Lower Campus Treated Bore Water

Treated bore water extends throughout the lower campus via a mixture of pipe materials (MDPE and Blue Brute) and sizes, to service laboratory uses, toilet flushing and cooling tower make-up (Refer to Bore Water Manual Part 1 Section 4.8 for current treated bore water uses within the lower campus).

7.4 Upper Campus Raw Bore Water

Raw bore water extends throughout limited parts of the upper campus via a mixture of pipe materials (MDPE, uPVC pressure pipe, Copper and Blue) and sizes to service (Refer to Bore Water Manual Part 1 Section 4.7 for current raw bore water uses within the upper campus).

7.5 Upper Campus Treated Bore Water

Treated bore water extends throughout the upper campus via mainly MDPE pipe and fittings, sized to service laboratory uses, toilet flushing and cooling tower make-up throughout the upper campus (Refer to Bore Water Manual Part 1 Section 4.8 for current treated bore water uses within the lower campus).

7.6 Mall Services Tunnel Reticulation

The raw (150mm blue brute main) and treated bore water (110mm MDPE main) extends through the UNSW mall Services tunnel.

The raw bore water main within the services tunnel forms part of the lower campus raw bore water ring main with significant valved branches extending off the main throughout the tunnel.

The treated bore water main extends through the tunnel from the tunnel branch from the western end of Robert Webster (G14) and extends all the way to the upper campus where it exits the tunnel at the western side of the Library (F21). A 50mm valve take-off is installed at the Electrical Engineering tunnel branch to supply treated bore water to the electrical Engineering Building.

8 UNSW TREATED BORE WATER PLANTS

8.1 General

UNSW provides primary chemical treatment to the raw bore water on campus due to the alkalinity of the bore water being low pH (generally ranging from 5.2 to 6.8 pH). The water can be aggressive with a negative Langelier Index of -4.2. Resultant Langelier Index after treatment of the raw bore water is -1.4 (similar to drinking water).

The Hilmer Building (E10) bore water treatment plant (E10 BWTP) was installed in 2015 to replace the North Mall bore water treatment plant, a water Soda Ash (powdered) treatment system, that was constructed in 2008 and is now demolished and removed from site.

In 2022 the Library Building (F21) upper campus bore water treatment plant (F21 UCBWTP) was constructed. At the successful commissioning of the F21 UCBWTP, UNSW Estate Management decided to retain the existing E10 BWTP as a back-up system, with the existing E10 BWTP being placed into plant inhibit [sleep] mode. If required, this system can be brought back into operation in less than a day.

Both the E10 BWTP and the new F21 UCBWTP pH correct the raw bore water via an automatic inline dosing system which raises the pH, by the addition of Sodium Hydroxide (50% w/w), automatically dosed (refer to Appendix 9 - Sodium Hydroxide – material safety data sheet).

The difference between the two systems is that the E10 BWTP was designed to dose the chemical and adjust the pH based on the variable flow rates of the treated bore water system. Whereas the F21 UCBWTP doses at a constant set flowrate with the fluctuations in system flow being buffered in the Commerce Courtyard tanks before the water is delivered to the upper or lower campus reticulation systems.

8.2 E10 BWTP - Hilmer Building

NOTE: E10 BWTP - HILMER BUILDING IS CURRENTLY IN PLANT INHIBIT (SLEEP) MODE. IN PLANT INHIBIT, THE PLANT IS NOT OPERATING AS A TREATMENT PLANT, ALL CHEMICAL HAS BEEN REMOVED FROM THE CAUSTIC STORAGE TANK AND THE PLANT IS IN SLEEP MODE. SHOULD UNSW ESTATE MANAGEMENT REQUIRE THE PLANT TO OPERATE FOR ANY REASION IT CAN BE RECOMMISSIONED WITHIN A FEW HOURS BY ADDING CAUSTIC AD TAKE THE PLANT BACK INTO NORMAL OPERATION. THIS WOULD ALSO REQUIRE ISOLATION OF THE LOWER CAMPUS PUMP LOCATED IN THE F21 UCBWTP AREA.

Raw bore water is fed into the E10 BWTP, pressurised from the Tyree Building raw bore water quad pumps. The raw bore water is metered, filtered (down to 200microns) and pH is measured.



E10 Bore water treatment plant



E10 BWTP control panel

When the system calls for treated bore water the raw bore water motorized valve opens, feeding raw bore water through the auto backwash filter and into the dosing loop.

The raw water is initially treated at the first dosing point, with liquid caustic supplied from Dosing Pump 1 via a flow paced measured chemical feed. The caustic and raw bore water is then mixed as it passes through an inline static mixer. The semi-treated water pH is then measured by a second pH probe, the pH must be above 6.9 (HMI adjustable), otherwise the system will alarm. The second dosing point adds additional liquid caustic into the system from Dosing Pump 2, which is PID controlled, based on the discharge pH. Again, the semi treated water and caustic is mixed as it passes through the second inline static mixer. The third dosing point is now redundant and not used.

If the final pH is within acceptable limits the treated bore water is then directly discharged out to the treated bore water network supplying the campus. If the treated water pH is outside acceptable limits, then the raw bore water inlet is isolated, and the potable water backup is opened automatically. The water within the treatment loop drains to waste until the water comes back into acceptable limits and the system resets itself automatically.

Additional pH monitoring is located within the adjacent Law Building, In the Mall Services Tunnel (Robert Webster tunnel entry) and at the inlet to the upper campus underground Reservoirs. These additional pH points provide a record of the systems operation.

The E10 BWTP does not have any pumps to pressurise the treated bore water system (the pipework was arranged to allow for the installation of an inline booster pump set, within the treated bore water plant room, if required at some stage in the future).

Refer to Appendix 10 - E10 BWTP O&M for additional information about the plant.

8.3 E10 BWTP - Chemical Delivery and Storage

The E10 BWTP receives deliveries of 200Lt drums of Sodium hydroxide (50%) delivered to site and manually unloaded/decantated into the onsite storage chemical tank. This process is labour intensive and has a degree of risk associated with chemical spills and or chemical burns. Transportation of the chemicals within the goods lift needs to be carried out in accordance with the “E10 Hilmer Building Hazardous Goods Service - 27.09.2017.PDF”, refer to Appendix 10 - E10 BWTP O&M

8.4 F21 UCBWTP - Library Building

The purpose of constructing the F21 UCBWTP was to allow the raw bore water to be treated and then stored within the Upper Campus Reservoirs (Commerce Courtyard) before being distributed to the upper and lower campus via dedicated booster pumps. This buffer treated bore water storage, created by the Upper Campus Reservoirs reduces the supply peaks in the treated bore water network throughout the campus and has resulted in a very stable pH after the treatment.



F21 UCBWTP



F21 UCBWTP

The F21 UCBWTP controls the flowrate into the Upper Campus Reservoirs maintaining the level in the tanks and controlling the pH to be equal to mains potable water.

The proposed new treatment plant is based on the existing bore water treatment plant control technique. Raw bore water is fed into the F21 UCBWTP, pressurised from the Tyree Building raw bore water quad pumps. The raw bore water is metered, filtered (down to 200microns) and pH is measured. The water is treated via a two-dosing control function, dosing into a single channel pipe system. The pipework has a length of 30 metres of 100mm CPVC tube, two dosing points, and five pH sampling points.

The first dosing system is flow paced and doses the untreated water with 50% sodium hydroxide at rate that is calculated on the combined calculation of the incoming water pH and flowrate. The second dosing control system is in the middle of the serpentine pipework and uses a PID function calculated on the discharge pH to control to a discharge setpoint.

The plant consists of field instruments collecting the operational data, with dosing pumps, actuated, and modulating valves carrying out plant operation, and a programable logic controller (PLC) that assesses the operational data, and then actions plant operation on programmed parameters. To interface with the PLC, a touchscreen (HMI) is used to indicate plant operation and allow access to setpoints. The PLC collects data for use by the UNSW BMS system.

The plant has three operating modes:

Reservoir Bypass Mode

When in Reservoir Bypass mode, the F21 UCBWTP and the Upper Campus Reservoirs are shut down as well as the Upper and Lower Campus Treated Bore Water Booster Pumps. Potable water is diverted into the Upper Campus reticulation system.

UCBWTP Bypass Mode

When in F21 UCBWTP Bypass mode, the UCBWTP shuts down and the Upper Campus Reservoirs maintains tank level using the potable water line to fill the tank. This mode can be used for maintenance,

serviceability of the Bore Water Treatment Segment of the plant, or if the UCBWTP 'Auto Operation' is inhibited.

Auto Operation Mode

When the plant is not in 'UCBWTP Bypass' or 'Reservoir Bypass' it is in 'Automatic Operation' (Auto). The Raw Bore Water Actuated Valve opens as required to allow Raw Bore Water into the plant. The chemical dosing pumps are enabled, if all plant conditions are met, the Treated Bore Water Outlet valve is opened and the Potable Water Actuated Valve, is closed. Tank level is maintained automatically.

Refer to Appendix 11 – F21 UCBWTP Library Building O&M for additional information about the plant.

Several of the valves associated with the UCBWTP are air operated. A dedicated air compressor is located within the UCBWTP room to supply air to these air operated valves.



F21 UCBWTP - Air compressor

8.5 Upper Campus Reservoirs (Commerce Courtyard)

These two reservoirs are located under the Commerce courtyard and next to the Library. Their access hatches are small 600 square openings in the brick paving. They are a confined space and access is therefore restricted.

The 150mm PVC overflow from the first reservoir drains to the adjacent grated stormwater pit near the Library Plantroom access door. The combined capacity of the two reservoirs is 130,000 litres, although they have a nominal capacity of 200,000 litres.



Upper Campus Reservoir (northern hatch)



Upper Campus Reservoir (level cables)



Upper Campus Reservoir (inside roof of tank)

Water levels are monitored by a hydrostatic pressure transducer located in the northern tank and controlled via the F21 UCBWTP.

Refer to Appendix 12 - Upper Campus Reservoirs (Commerce Courtyard) for details of existing tanks.

The treated water is drawn from the Upper Campus Reservoirs via dedicated pump sets for both the upper and lower campus.

8.6 F21 UCBWTP - Upper Campus Booster Pumps

The booster pumps were installed in approximately 2014 as part of an earlier plant room upgrade. The pumps were then reconfigured, and the controls changed onto the new F21 UCBWTP control panel as part of the 2022 works.

The original pumps comprise four [4] Lowara model 15SVR-10 vertical multistage (Pump duty: 6.5 l/s each pump @ 80 metres head), fitted with 11 KW Hydrovar units, two [2]15 litre 16bar pressure tanks, pressure transducers, 65mm non-hammer mission duo and butterfly valves on each pump discharge, main 150mm isolating butterfly valve on common stainless discharge, tank isolating valves, common mild steel fabricated base including suction and discharge neoprene eliminators.



F21 UCBWTP - Upper Campus Booster Pumps



F21 UCBWTP - Lower Campus Booster Pumps

8.7 F21 UCBWTP - Lower Campus Booster Pumps

New booster pumps were fitted to the lower campus treated bore water pipework supplying the lower campus as part of the 2022 F21 UCBWTP construction works.

The installed pumps comprise three [3] Lowara model 10SV05 vertical multistage (Pump duty: 3.5 l/s each pump @ 35 metres head), fitted with 3 KW Hydrovar units, two [2] 15 litre 16bar pressure tanks, pressure transducers, 50mm non-hammer mission duo and butterfly valves on each pump discharge, main 100mm isolating butterfly valve on common stainless discharge, tank isolating valves, common mild steel fabricated base including suction and discharge neoprene eliminators.

8.8 F21 UCBWTP - Chemical Delivery and Storage

The F21 UCBWTP uses liquid Sodium hydroxide (50%) for the treatment chemical, in keeping with the existing E10 BWTP.

The chemical storage requirements for Sodium Hydroxide (50%) were confirmed at the time of design with Steve Sylvester, Riskcon Engineering, with the advice provided that in accordance with Schedule 11 of the WHS regulation, and if storage volumes are maintained to be less than 2,500L of Sodium Hydroxide (50%), a Skin Corrosion Category 1B Corrosive (PGII), then the storage is classified as "Placard Quantity". Any greater volume stored would be classified as “Manifest Quantity” and would require additional approval and certification requirements.

The F21 UCBWTP chemical storage tanks were configured with three (3) 1,180Lt chemical storage tanks (filled up to a 2,499 Lt maximum fill level to avoid the requirements of a ‘Manifest Quantity’).

This chemical storage volume allows for bulk deliveries extending the delivery times and reduce delivery costs. The Chemical tanks are filled via a remote fill point to enable the chemical tank to be filled off the back of a delivery truck. The chemical is remotely decantated into the fixed on-site chemical tank via a dual skin pipe reducing the risks of spills.

The decanting fill point includes:

- Automated safety controls that will prevent the on-site tank being filled more than 2,499Lt in total.
- Remote fill point Control Panel located in the Library Loading dock, adjacent the Commerce’s Courtyard.
- 3 phase 415V power outlet
- Camlock fittings for connection to the remote chemical fill line
- Safety shower and eye wash
- Washdown hose tap

The decanting area and surrounding pavement have been designed to allow for decanting is done off the rear of a truck. The existing pavement (where the truck will be unloading) falls a stormwater grated drain. The outlet of the grated drain has been diverted to a 1,100Lt holding pit and isolation valve within the pit, to capture and hold the waste in the event of a spill.

The Sodium hydroxide (50%) are currently supplied under contract with Redox Chemicals with the following agreed safe decanting procedure in place.

On the day of chemical delivery, to achieve compliance:

1 Chemical delivery can only occur in dry weather conditions.
2 During delivery the valve on the outlet of the spill capture pit will be closed.
3 Once decanting has been complete and a visual check confirms that no spills occurred, then the valve can be reopened.

4 In the event of a spill the spill will be contained to the 1000Lt IBC only, with appropriate clean-up procedures being undertaken. Once the spill is neutralised and cleaned up, then the valve can be re-opened, and the stormwater drainage can operate as normal until the next chemical filling operation.

We note that this method of chemical spill protection is utilised in numerous other locations on campus.



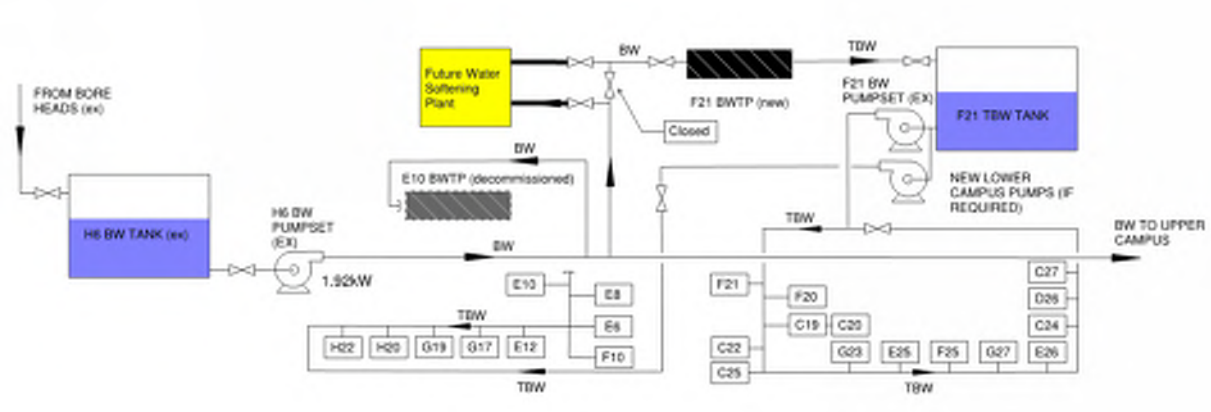
Decanting fill point



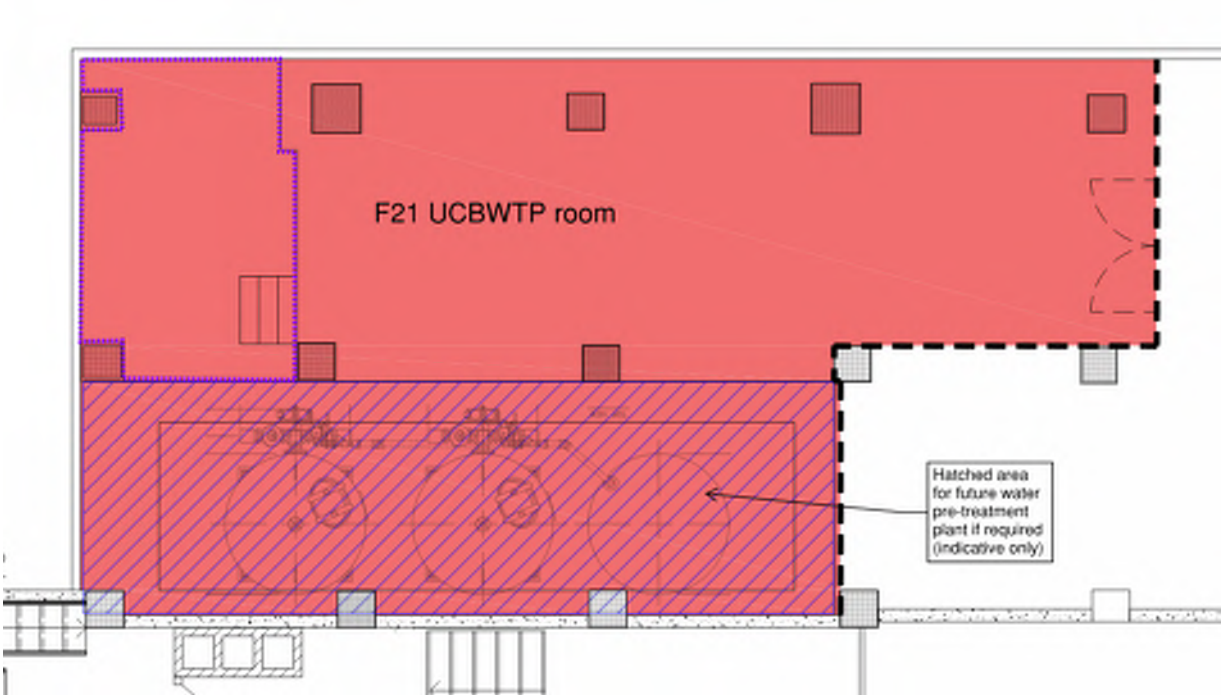
F21 UCBWTP chemical tanks

8.9 F21 UCBWTP - Provision for Future Water Softening Plant

The F21 UCBWTP was designed to allow for the installation of a future water softening pre-treatment system of the incoming raw bore water, if required. UNSW Estate Management are monitoring the new F21 UCBWTP operation and water quality results to confirm if the proposed additional plant is required. We have reviewed in conjunction with UNSW EM a water softening plant option for the Stage 3 pre-treatment purely to make space allowances. Details of the proposed water softening plant that was considered for spatial allowances is attached in Appendix 13.



Schematic showing future water softening plant



Proposed future water softening plant space allocation

9 BORE WATER SYSTEM POWER SUPPLIES

The following is a list of key critical electrical infrastructure that effects the operation of the UNSW Kensington Campus Bore Water System.

ITEM	SUPPLIED FROM	BUILDING
Alpha Bore	DB-3 CB 57	POOL
Bravo Bore		E4 SQUARE HOUSE
Charlie Bore	MSB-E4 CB N20	E4 SQUARE HOUSE
Tyree (H6) Raw Bore Pumps & Controls	MSB2 C61	H6 TYREE LGQ027
LCBWTP	E10-DB-HYDRAULIC-B CB20	E10 HILMER HBQ02
UCBWTP	DB-BORE WATER PUMPS CB9	F21 LIBRARY LGQ01
Law Building (F8) Pressure and pH Probe	GPO	F8 LAW BQ03
Mall Services Tunnel Pressure Transducer	GPO	MALL SERVICES TUNNEL ENTRANCE

Refer to **UNSW Bore water manual 2023 Part 2** for trouble shooting and fault finding associated with loss or power to any of the above.

10 REMOTE MONITORING, ACCESS, AND PASSWORDS

10.1 Remote Monitoring of Bore Water System

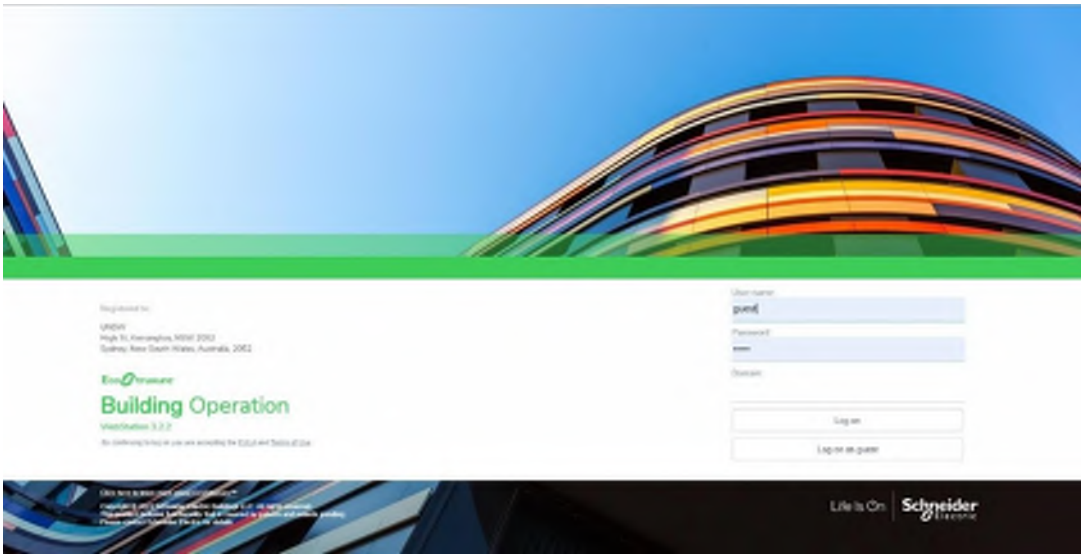
Log into UNSW via CISCO ANY CONNECT
Connect to VPN.UNSW.EDU.AU/EDFO
Add: your UNSW ZID
Add: your Password

Log into Building Monitoring WebStation
WebStation; 149.171.164.13
Login: **guest**
Password: **guest**

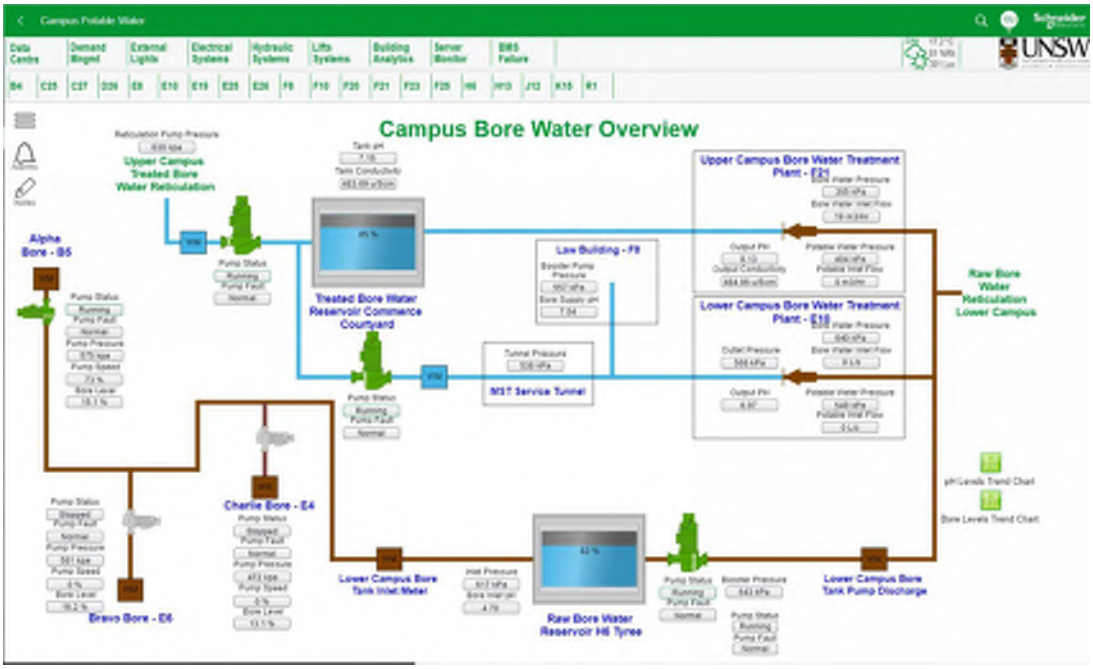
Once logged in go to

- NAVAGATION MENU
- Hydraulic system
- Bore Water Treatment

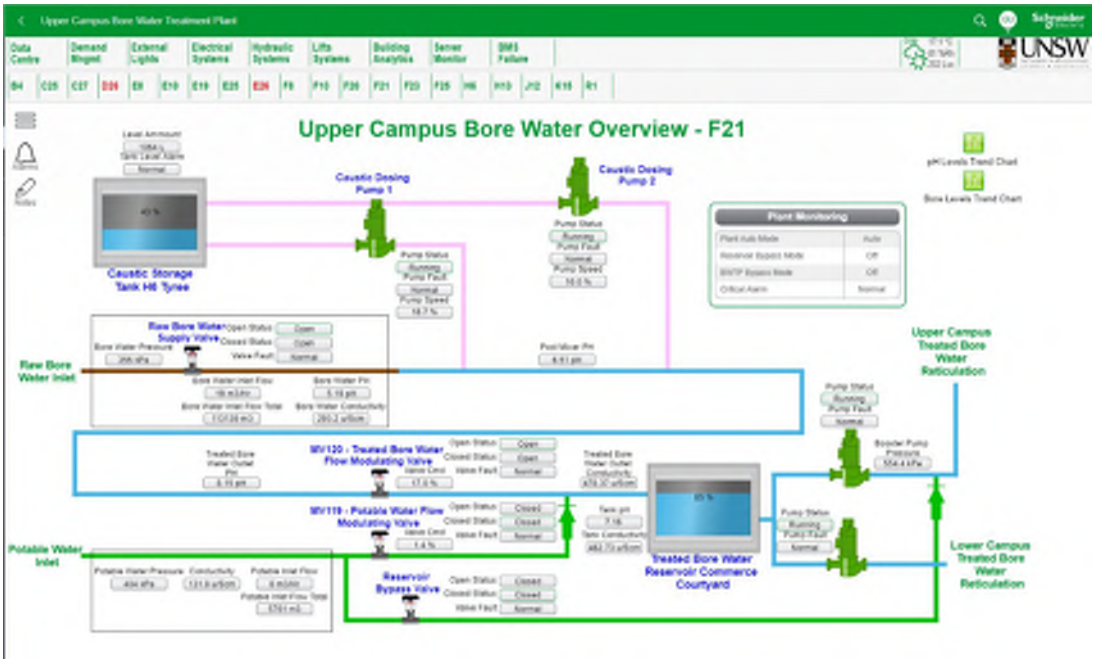
Once logged in the system shows an overview of the bore water system, including pressures, flows, conductivity, pH, pump operation, bore and tank levels can be found via the UNSW BMS Graphics Interface. For access contact UNSW Estate Management.



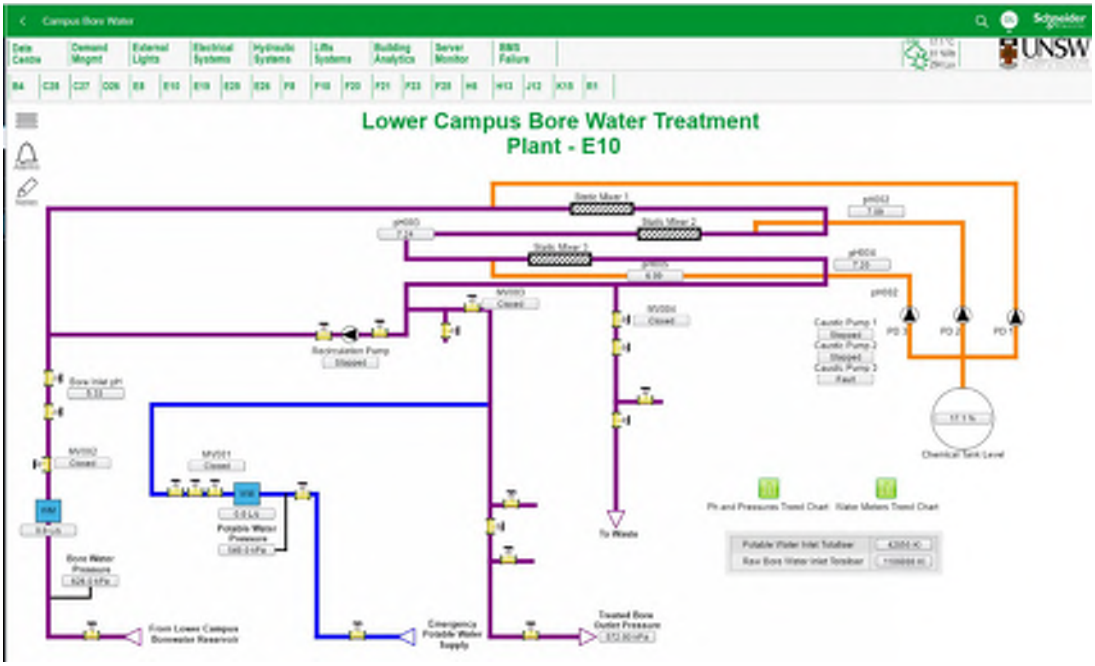
Graphics Interface Main Page - WebStation 149.171.164.13



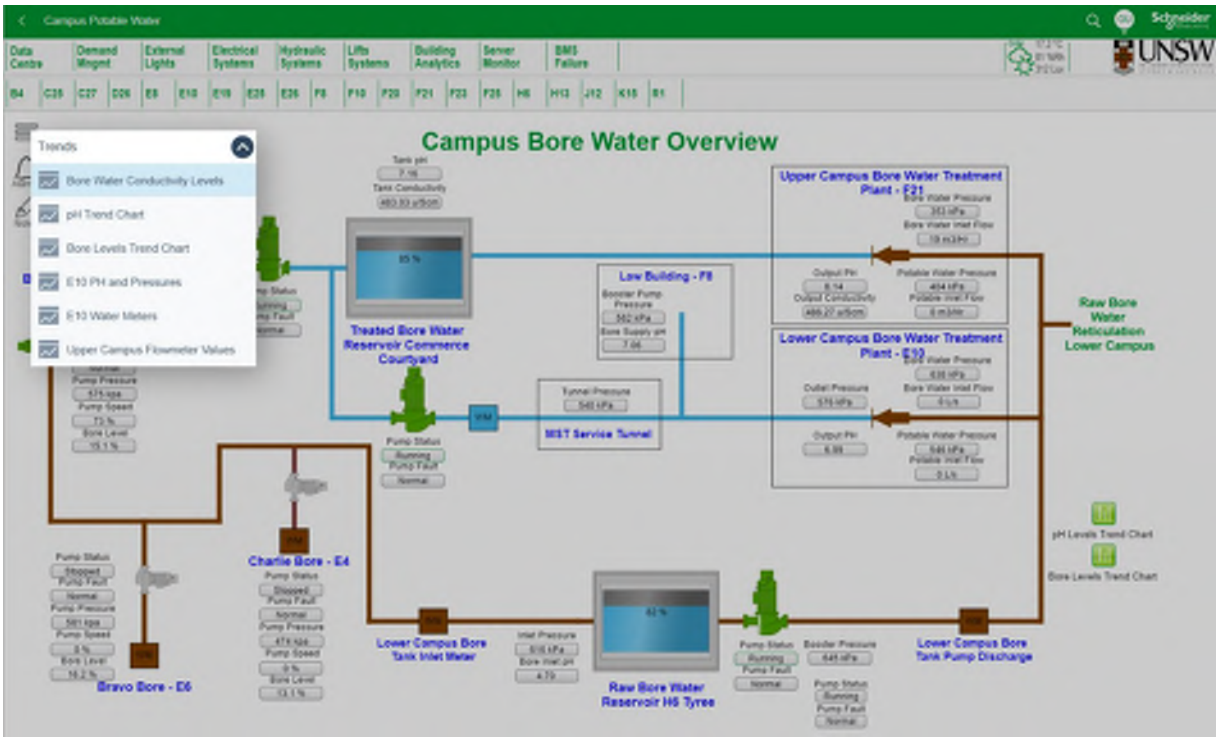
Graphics Interface Main Page – All of campus



Graphics Interface Main Page – F21 UCBWTP



Graphics Interface Main Page – E10 BWTP



Graphics Interface Main Page – Trend Pop-ups

11 TREATED & RAW BORE WATER pH MEASUREMENT.

The pH of the bore water is monitored across campus via data collection points. The data is being collected from four additional areas and include bore water pH, bore supply pressure, bore water supply pressure (post booster pumps), treated bore water pH and pressure as well as pump-set fault and running information.

This information is recorded as part of the bore water remote monitoring system, refer to Section 10 of this manual.

The collection points and information collected are as follows:

Tyree Building (H6)
Information collected:

- Bore Water pH
- Bore Pumps Supply Pressure
- Lower Campus Bore Water Booster Pumps Pressure
- Bore Water Storage Tank Level
- Bore Water Booster Pumps Status

Law Building F8
Information collected:

- Treated Bore Water pH, post the Bore Water Treatment Plant
- Bore Water Booster Pumps Pressure

Upper Campus UCBWTP
Information collected:

- Treated Bore Water pH, post the Bore Water Treatment Plant
- Bore Water Booster Pumps Pressure
- Upper Campus Booster Pumps Pressure
- Upper Campus Water Storage Tank Level
- Upper Campus Booster Pumps Status

Mall Services Tunnel
Information collected:

- Treated Bore Water pH, post the Bore Water Treatment Plant
- Bore Water Booster Pumps Pressure

Refer to Appendix 14 TREATED & RAW BORE WATER pH MEASUREMENT O&M for system set points, system description and variables.

12 BUILDING AND BORE WATER MASTER PLANNING FOR THE FUTURE

12.1 ADDITIONAL RAW BORE WATER STORAGE LOWER CAMPUS

Future master planning of any buildings within the lower campus needs to consider the suitability of providing additional raw bore water storage (as additional capacity to the Tyree raw bore water tanks) as part of the development proposal. UNSW Estate Management Engineering should be consulted to ensure the suitability of any future storage site in relation to the existing infrastructure.

12.2 INCREASING LICENSE EXTRACTION RATES

The increasing of licence extraction rates, while an option to increase the overall bore water supply for the site, needs to be carefully considered to ensure compliance with NSW Department of Industries –Water and not to overdraw the aquifer. A detailed bore water study and discussions with NSW Department of Industries –Water would be recommended before proceeding with this option.

12.3 NEW BORES & FACTORS AFFECTING BORE LOCATIONS

12.3.1 Proximity to Other Bores

Due to the aquifer being sand, when a bore pump is producing at its full flow rate, the groundwater level drops substantially at the bore site. The effects of the ground water drawdown decreases as you move away from the bore from the bore until the effect is gone. This plays an important role in determining how close the bores can be located to each other. ALPHA Bore is currently 127m away from BRAVO Bore and BRAVO Bore is 105m away from CHARLIE Bore. These distances ensure that all bore pumps can operate at full capacity without any noticeable effect on each other. No other private production bores located outside UNSW site are affected due to their separation being further than100m.

12.3.2 Bore Maintenance

Bore construction and maintenance is a heavy engineering activity requiring long heavy vehicles, space for water and sludge tanks, temporary water disposal trenches, working space and site access completely clear of pedestrian and vehicular traffic. To accommodate these activities, a space of some 250m2 outside tree canopies and overhead power is required and includes truck manoeuvring space of at least 18m x 10m. All bore locations satisfy this requirement at present.

12.3.3 Site Development

The existing production bores are located along Anzac Pde boundary. As UNSW increases its student population and subject diversity, additional buildings and facilities are being constructed to accommodate them. Any future relocation of existing bores or construction of new bores need to be carefully planned, especially in regard to proximity to existing other bores, maintenance access, access to existing network infrastructure and current bore water licenses approvals.

12.3.4 Required Bore Site Planning Restriction

UNSW presently do not have any masterplan for of excising important infrastructure sites from future development. If bore water is to be a future source of up to 90% of campus water supply, it is imperative that current and future bore sites be identified and reserved, including the 250m^2 and 18m radius for truck manoeuvring buffer for maintaining the bore.

13 BORE WATER SYSTEM PASSWORDS

13.1 Alpha, Bravo & Charlie Bores - HMI

The existing bores, Alpha, Bravo & Charlie HMI panels are password protected.
Password: **2052**

13.2 Remote Access to Bore Water System Master Controller

This includes remote (full functional) access to the 3 Bores and master controller.

Log into UNSW via CISCO ANY CONNECT
Connect to VPN.UNSW.EDU.AU/EDFO
Add: your UNSW ZID
Add: your UNSW ZID password

To access you require UNITRONICS Software "**Remote Operator**" and Application name "**UNSW Bore System.UR2**"

13.3 Remote Access to Access to E10 BWTP & F21 UCBWTP HMI

This includes remote (full functional) access to the E10 BWTP & F21 UCBWTP HMI's.

Log into UNSW via CISCO ANY CONNECT
Connect to VPN.UNSW.EDU.AU/EDFO
Add: your UNSW ZID
Add: your UNSW ZID password

Run application software "RealVNC Viewer" (software that allows remote access to HMI's)
Lower Campus (E10 BWTP)
Web Address: 149.171.165.7
Login
Password f1!bpNK

Upper Campus (F21 UCBWTP)
Web Address: 149.171.165.17
Login
Password NkyWfhR

13.4 Programming Code.

All of the bore water plant control equipment has been programmed Allen Bradley software, "Controllogix". This is the back end of the programming software and if any changes are required to the programming code, a copy of this code can be obtained from the following link.
https://enhancecabling.sharepoint.com/UNSW

14 KEY CRITICAL CONTACTS

The following is a list of key critical contacts who been involved in the installation, repair, maintenance or have general knowledge about the UNSW Kensington Campus Bore Water system.

Item	Company
Bore pumps and level transducers	Enhance Cabling Systems Southwell Irrigation
Bore Pump Controls	Enhance Cabling Systems
Bores and drilling	Southwell Irrigation Highland Drilling
Tyree Raw Bore Water Pumps	Enhance Cabling Systems
Cleaning of Tyree Tank (Confined Spaces Access)	Australian Facilities Plumbing Madjic Plumbing
Chemical supply/delivery	Enhance Cabling Systems
Tyree tank infill pipework	Enhance Cabling Systems Madjic Plumbing
E10 & F21 Bore Water Treatment plants - pipework	Madjic Plumbing
E10 & F21 Bore Water Treatment plants – Controls	Enhance Cabling Systems
F21 Bore Water Treatment plant - Pumps	Enhance Cabling Systems Madjic Plumbing
General Kensington Campus Bore system knowledge	Earlmap

The contact details for each of the above companies are as follows:

Company	Primary Contact	Alternate Contact
Australian Facilities Plumbing 1300 782 387 www.ausfg.com	Adrian Menon Key Account Manager 0415 104 144 amenon@ausfp.com.au	
Earlmap PO Box 6129 UNSW Sydney NSW 1466	Trevor Stocker 0419 466 399 trevor@earlmap.com.au	
Enhance Cabling Systems 21/22-30 Northumberland Rd, Caringbah NSW 2229	Martial Lawson 0414 248 869 martial@enhancecabling.com.au	Dylan Lamour 0422 990 056 dylan@enhancecabling.com.au Andrew Box 0430 341 380 andrew@enhancecabling.com.au
Highland Drilling P.O. Box 7091 Berrima, NSW, 2577 Office : 02 4877 2118	Brett Delamont 0411 592 739	

Company	Primary Contact	Alternate Contact
Madjic Plumbing Office 02 8544-0402	Gary Hughes 0481-333-156/ gary@madjic.com.au	
Southwell Irrigation Unit 10B Sherwood Village Kirkham Road BOWRAL NSW 2576 Ph • 02 4861 6911 bowralsales@southwells.com.au	Hugh Southwell 0412 409 216 Hugh@southwells.com.au	

Appendix 1

UNSW Kensington Campus - Bore Water Sampling Specification

THE UNIVERSITY OF
NEW SOUTH WALES

UNSW SYDNEY CAMPUSES
WATER QUALITY TESTING January 2021
Project Specification
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Schedule A – Lump Sum Tender Schedule
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1 GENERAL

1.1 General

UNSW are the owners of the water supply infrastructure within campus boundaries and are therefore responsible for any change in water quality from the source to the consumer. As part of our Duty of Care, water quality monitoring is on-going, and it is proposed the following sampling and testing regime will be carried out in the 2021 calendar year. Water supplies include potable, borewater and recycled stormwater depending on the campus.

1.2 UNSW Site Induction Requirements

Prior to any person attending site for the purpose of carrying out any work within this Contract, that person shall be site inducted. This process provides instruction and guidance on personal responsibilities and behavior whilst on UNSW property. Time for Induction needs to be allowed and shall be done on-line off-site, with paperwork handed to the UNSW project Supervisor prior to commencement of work. Exclusion from site could be the result of failing to operate according to site induction instruction.

1.3 Additional Mandatory Site Requirements

1. Risk assessment/work method statements.
2. Pre-arrange site visits to obtain keys from UNSW Hydraulic Works Supervisor (must be returned COB same day)

1.4 Associated Documents

- Project Specification (this document)
- UNSW Water Testing Spreadsheet (available from UNSW upon request)
- Schedule A – Lump Sum Tender Schedule
- Schedule B – Schedule of Rates for Sampling and Testing
- Sampling Locations Sketches

2 GENERAL SCOPE OF WORK

Water quality monitoring shall be conducted on three UNSW Campuses – Kensington, Randwick and David Phillips Field. It shall consist of the following activities:

1. Supply of appropriate sample containers,
2. Sampling at a total of 24 locations,
3. Transporting samples at appropriate temperatures and within required time parameters to a laboratory,
4. Testing and analysis for many different parameters, including microbiological organisms, chemicals, metals, nutrients, pesticides and organics, depending on location, water use and origin,
5. Obtaining and delivering to UNSW the laboratory test results for each test on every nominated sample.

3 SAMPLING LOCATIONS

3.1 Kensington Campus

The following water supplies at Kensington Campus shall be sampled once or twice per annum as set out in the accompanying Excel Spreadsheet (Refer to Sampling Location Plans FME 0030H & 0031H).

3.1.1 Potable Water

Sydney Water supplies potable water to the boundary meters in High St and Botany St via a common 750mm main. Samples shall be taken from several locations on campus as follows:

- Test Location 1. Immediately after the Botany St. meter-set installation.
- Test Location 2. Upper Campus at inlet to Mathews Building domestic supply pump suction (in basement).
- Test Location 3. Mathews domestic water tank
- Test Location 4. Water supply to Mathews Arcade food outlets drinking fountain.
- Test Location 5. Water supply to Round House kitchen

3.1.2 Raw Borewater

Borewater is extracted from the ground by three (3) only production bores along Anzac Pde boundary. Samples shall be taken from the following locations:

- Test Location 6. From the sampling valve on Alpha Bore discharge head located below the swimming pool,
- Test Location 7. From the sampling valve on Bravo Bore discharge head located west of the Square House,
- Test Location 8. From the sampling valve on Charlie Bore discharge head located west of Round House,
- Test Location 9. Borewater tap outside entrance to Morven Brown tunnel.
- Test Location 9A Tyree ETB Building – Off the manifold of the Bore Water pumps

3.1.3 Treated Borewater

Borewater is treated with liquid caustic to raise the naturally low pH to reduce its corrosivity for use in cooling towers, toilets and industrial applications around campus. Samples shall be taken from the following locations:

- Test Location 10. At the inlet to the Commerce Courtyard treated borewater storage tanks,
- Test Location 11. Borewater tap located within the Samuels Building plant room

3.1.4 Percolated Stormwater

Stormwater is captured in the Village Green percolation chamber from where it soaks into the ground to recharge the aquifer. Due to the potential for this water to transport contaminants to the aquifer, the NSW Department of Energy Climate Change and Water requires groundwater to be tested upstream and downstream of the chamber. Samples shall be taken from the following monitoring bores:

- Test Location 12. Site 2 The Manly Vale Hydraulics Lab Access Point located adjacent to stormwater gross pollutant trap.
- Test Location 13. Site 3 located adjacent to the score board on the south west corner of the Village Green atop the embankment.

3.1.5 Groundwater

To provide a comparison with groundwater unaffected by the percolation chamber, an old monitoring bore uphill is to be sampled and is located as follows:

Test Location 14. Site 1 (old monitoring Bore No3) in Science Rd and southern edge of University Mall shown on attached plan as Site 1 (this is the comparison or Control Sample site)

3.2 David Phillips Field

The following water supplies at David Phillips Field Campus shall be sampled once or twice per annum as set out in the Table of Water Sampling Locations:

3.2.1 Borewater

Borewater is extracted from the ground by 2 production bores. Samples shall be taken from the following locations:

Test Location 15. From the sampling valve on the Northern Bore discharge head located adjacent to the main entrance from Gwea Avenue,

Test Location 16. From the sampling valve on the Southern Bore discharge head located adjacent to the cricket practice nets.

3.2.2 Potable Water

Potable water is supplied to both amenities' buildings from the Sydney Water main in Gwea Ave. Samples shall be taken from each of the two amenities buildings

Test Location 17. From the hockey field (Central) amenities kitchen sink,

Test Location 18. From the cricket ground (Western) amenities kitchen sink.

3.3 Randwick Campus

The following waters at Randwick Campus shall be sampled once or twice per annum as set out in the Table of Water Sampling Locations:

3.3.1 Potable Water

Sydney Water supplies potable water to the boundary meters in King St and Govett St. Samples shall be taken from several locations on campus as follows:

Test Location 19. King St. meter-set installation.

Test Location 20. At the tea sink in Building R9 Room G13,

Test Location 21. At the tea sink in Building R1 Level 1.

3.3.2 Borewater

Borewater is extracted from the ground by one production bore located adjacent to the borewater storage tank (THIS SYSTEM IS NOW REDUNDANT). Samples shall be taken from the following locations:

Test Location 22. NO LONGER REQUIRED TO BE TESTED

Test Location 23. NO LONGER REQUIRED TO BE TESTED.

4 WATER QUALITY MONITORING

4.1 Sampling Methods and Standards

Sampling should not be undertaken by unqualified personnel. This is a specialist field and failure to observe the strictest of hygiene or failure to use the correct sample container will void the sample and result in an erroneous report.

Sampling should be carried out to AS/NSZ 5667.1 1998.

4.2 Applicable Standards and Guidelines

UNSW shall and with the assistance of a third party, be making the final assessment of water quality with regard to the following documents:

- Australian Drinking Water Guidelines (ADWG) 2011, (subject to rolling revision)
- Australian Water Quality Guidelines for Fresh and Marine Water (2018, Australian and New Zealand Environment and Conservation Council)
- Guidelines for Managing Risks in Recreational Water (2008, National Health and Medical Research Council)

Of secondary importance are the guidelines by The Environment Protection and Heritage Council, the Natural Resource Management Ministerial Council and the National Health and Medical Research Council who have developed guidelines for the safe use of recycled water. The guidelines include:

- Australian Guidelines for Water Recycling: Managing Health and Environmental Risks
- Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2): Augmentation of Drinking Water Supplies
- Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2): Stormwater Harvesting and Reuse
- Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2): Managed Aquifer Recharge

All test reporting shall make reference to the most appropriate one or more of the above documents.

4.3 Sampling Parameters

The following tables list parameters for which samples shall be tested depending on water type and location. Sampling and testing for normal conditions is listed below.

4.3.1 Test Type A - Micro-biological Organisms

Parameter Tested	Unit	Level of Resolution	Historical Typical Results
Total Coliforms	cfu/100ml	1	<1000
Faecal Coliforms	cfu/100ml	1	<2
Faecal Streptococci	cfu/100ml	1	<2

Parameter Tested	Unit	Level of Resolution	Historical Typical Results
Excherichia coli	cfu/100ml	1	<2
Heterotrophic Plate Count	cfu/100ml	1	<100

4.3.2 Test Type B - Chemical

Parameter Tested	Unit	Level of Resolution	Historical Typical Results
Alkalinity - Hydroxide as $CaCO_3$	mg/L	1	<1
Alkalinity - Carbonate as $CaCO_3$	mg/L	1	<1
Alkalinity - Bicarbonate as $CaCO_3$	mg/L	1	80
Alkalinity - Total as $CaCO_3$	mg/L	1	60-120
Electrical Conductivity @ 25^0C	us/cm	1	300-500
pH Value	pH unit	0.01	6.5-7.5
Redox Potential	mV	0.1	50-200
Total Dissolved Solids	mg/L	1	220-350
Total Hardness as $CaCO_3$	mg/L	1	100-1590
MAJOR ANIONS			
Sulphate as SO_4	mg/L	1	N/A
Chloride	mg/L	1.0	200 - 300
MAJOR CATIONS			
Calcium	mg/L	1	35-50
Magnesium	mg/L	1	5-7
Sodium	mg/L	1	15-20
Potassium	mg/L	1	8-15

4.3.3 Test Type C - Metals

Parameter Tested	Unit	Level of Resolution	Historical Typical Results
Aluminium	mg/L	0.01	6
Antimony	mg/L	0.001	0.02
Arsenic	mg/L	0.001	<0.001
Barium	mg/L	0.001	0.15
Beryllium	mg/L	0.001	<0.001
Boron	mg/L	0.05	0.05
Cadmium	mg/L	0.0001	<0.0001
Chromium	mg/L	0.001	<0.001
Cobalt	mg/L	0.001	<0.001
Copper	mg/L	0.001	0.004
Iron (total)	mg/L	0.05	0.3 - 1.5
Lead	mg/L	0.001	0.001
Lithium	mg/L	0.001	0.001

Parameter Tested	Unit	Level of Resolution	Historical Typical Results
Manganese (total)	mg/L	0.001	0.03
Mercury	mg/L	0.0001	<0.0001
Molybdenum	mg/L	0.001	<0.001
Nickel	mg/L	0.001	0.001
Selenium	mg/L	0.01	0.01
Silver	mg/L	0.001	0.001
Zinc	mg/L	0.005	0.2

4.3.4 Test Type D - Nutrients

Parameter Tested	Unit	Level of Resolution	Historical Typical Results
Ammonia as N	mg/L	0.01	<0.6
Nitrate as N	mg/L	0.01	6
Nitrite as N	mg/L	0.01	N/A
Total Nitrogen as N	mg/L	0.01	7
Total Kjeldahl nitrogen as N	mg/L	0.1	N/A
Total Phosphorous as P	mg/L	0.01	0.1

4.3.5 Test Type E – Pesticides

Parameter Tested	Unit	Level of Resolution	Historical Typical Results
ORGANOCHLORINE PESTICIDES (OCP)			
alpha-BHC	ug/L	0.5	<0.05
Hexachlorobenzene (HCB)	ug/L	0.5	<0.05
beta-BHC & gamma-BHC	ug/L	0.5	<0.05
delta-BHC	ug/L	0.5	<0.05
Heptachlor	ug/L	0.5	<0.05
Aldrin	ug/L	0.5	<0.05
Heptachlor epoxide	ug/L	0.5	<0.05
Chlordane - trans	ug/L	0.5	<0.05
Endosulfan 1	ug/L	0.5	<0.05
Chlordane - cis	ug/L	0.5	<0.05
Dieldrin	ug/L	0.5	<0.05
4,4'-DDE	ug/L	0.5	<0.05
Endrin	ug/L	0.5	<0.05
Endosulfan 2	ug/L	0.5	<0.05
4,4'-DDD	ug/L	0.5	<0.05
Endrin aldehyde	ug/L	0.5	<0.05
Endosulfan sulfate	ug/L	0.5	<0.05
4,4'-DDT	ug/L	2	<2

Parameter Tested	Unit	Level of Resolution	Historical Typical Results
Endrin ketone	ug/L	0.5	<0.05
Methoxychlor	ug/L	2	<2
Endosulfsan (sum)	ug/L	0.5	<0.05
Total Chlordane (sum)	ug/L	0.5	<0.05
ORGANOPHOSPHORUS PESTICIDES			
Dichlorvos	ug/L	0.5	<0.05
Demeton-S-methyl	ug/L	0.5	<0.05
Monocroptophos	ug/L	2	<2
Dimethoate	ug/L	0.5	<0.05
Diazinon	ug/L	0.5	<0.05
Chlorpyrifos-methyl	ug/L	0.5	<0.05
Parathion-methyl	ug/L	2	<2
Malathion	ug/L	0.5	<0.05
Fenthion	ug/L	0.5	<0.05
Chlorpyrifos	ug/L	0.5	<0.05
Parathion	ug/L	2	<2
Pirimiphos-ethyl	ug/L	0.5	<0.05
Chlorfenvinphos E	ug/L	0.5	<0.05
Chlorfenvinphos Z	ug/L	0.5	<0.05
Bromophos-ethyl	ug/L	0.5	<0.05
Fenamiphos	ug/L	0.5	<0.05
Prothiofos	ug/L	0.5	<0.05
Ethion	ug/L	0.5	<0.05
Carbophenothion	ug/L	0.5	<0.05
Azinphos-methyl	ug/L	0.5	<0.05
FUMIGANTS			
2,2-Dichloropropane	ug/L	5	<5
1,2-Dichloropropane	ug/L	5	<5
cis-1,3-Dichloropropylene	ug/L	5	<5
trans-1,3-Dichloropropylene	ug/L	5	<5
1,2-Dibromoethane (EDB)	ug/L	5	<5

4.3.6 Test Type F – Organics

Parameter Tested	Unit	Level of Resolution	Historical Typical Results
PHENOLS			
Phenol	ug/L	1	<1.0
2-Chlorophenol	ug/L	1	<1.0
2-Methylphenol	ug/L	1	<1.0
3- & 4-Methylphenol	ug/L	2	<1.0
2-Nitrophenol	ug/L	1	<1.0
4-Nitrophenol	ug/L	1	<1.0
2.4-Dimethylphenol	ug/L	1	<1.0
2.4-Dichlorophenol	ug/L	1	<1.0

Parameter Tested	Unit	Level of Resolution	Historical Typical Results
2.6-Dichlorophenol	ug/L	1	<1.0
4-Chloro-3-methylphenol	ug/L	1	<1.0
2.4.6-Trichlorophenol	ug/L	1	<1.0
2.4.5-Trichlorophenol	ug/L	1	<1.0
Pentachlorophenol	ug/L	2	<2.0
TOTAL PETROLEUM HYDROCARBONS			
C6-C9 Fraction	ug/L	20	<20
C10-C14 Fraction	ug/L	50	<50
C15-C28 Fraction	ug/L	100	<100
C29-C36 Fraction	ug/L	50	<50
BTEX			
Benzene	ug/L	1	<1
Toluene	ug/L	2	<2
Ethylbenzene	ug/L	2	<2
meta- & para- Xylene	ug/L	2	<2
ortho-Xylene	ug/L	2	<2
HALOGENATED ALIPHATIC HYDROCARBONS (VOL)			
Dichlorodifluoromethane	ug/L	0.5	<0.5
Chloromethane	ug/L	50	<50
Vinyl chloride	ug/L	0.3	<0.3
Bromomethane	ug/L	0.5	<0.5
Chloroethane	ug/L	0.5	<0.5
Trichlorofluoromethane	ug/L	0.5	<0.5
1.1-Dichloroethene	ug/L	0.1	<0.1
Iodomethane	ug/L	5	<5
trans-1.2-Dichloroethene	ug/L	0.1	<0.1
1.1-Dichloroethane	ug/L	0.1	<0.1
cis-1.2-Dichloroethene	ug/L	0.1	<0.1
1.1.1-Trichloroethane	ug/L	0.1	<0.1
1.1-Dichloropropylene	ug/L	5	<5
Carbon tetrachloride	ug/L	0.05	<0.05
1.2-Dichloroethane	ug/L	0.1	<0.1
Trichloroethene	ug/L	0.05	<0.05
Dibromomethane	ug/L	5	<5
1.1.2-Trichloroethane	ug/L	5	<5
1.3-Dichloropropane	ug/L	5	<5
Tetrachloroethene	ug/L	0.05	<0.05
1.1.1.2-Tetrachloroethane	ug/L	5	<5
trans-1.4-Dichloro-2-butene	ug/L	5	<5
cis-1.4-Dichloro-2-butene	ug/L	5	<5
1.1.2.2-Tetrachloroethane	ug/L	5	<5
1.2.3-Trichloropropane	ug/L	5	<5
Pentachloroethane	ug/L	5	<5
1.2-Dibromo-3-chloropropane	ug/L	5	<5
Hexachlorobutadiene	ug/L	0.04	<0.04
POLYCHLORINATED BIPHENYLS			
Total Polychlorinated biphenyls	ug/L	1	<1

Parameter Tested	Unit	Level of Resolution	Historical Typical Results
HALOGENATED AROMATIC COMPOUNDS			
Chlorobenzene	ug/L	5	<5
Bromobenzene	ug/L	5	<5
2-Chlorotoluene	ug/L	5	<5
4-Chlorotoluene	ug/L	5	<5
1.3-Dichlorobenzene	ug/L	5	<5
1.4-Dichlorobenzene	ug/L	5	<5
1.2-Dichlorobenzene	ug/L	5	<5
1.2.4-Trichlorobenzene	ug/L	5	<5
1.2.3-Trichlorobenzene	ug/L	5	<5

TRIHALOMETHANES			
Chloroform	ug/L	5	<5
Bromodichloromethane	ug/L	5	<5
Dibromochloromethane	ug/L	5	<5
Bromoform	ug/L	5	<5
POLYNUCLEAR AROMATIC HYDROCARBONS			
Naphthalene	ug/L	1	<1.0
Acenaphthylene	ug/L	1	<1.0
Acenaphthene	ug/L	1	<1.0
Fluorene	ug/L	1	<1.0
Phenanthrene	ug/L	1	<1.0
Anthracene	ug/L	1	<1.0
Fluoranthene	ug/L	1	<1.0
Pyrene	ug/L	1	<1.0
Benz(a)anthracene	ug/L	1	<1.0
Chrysene	ug/L	1	<1.0
Benzo(b)fluoroanthene	ug/L	1	<1.0
Benzo(k)fluoranthene	ug/L	1	<1.0
Benzo(a)pyrene	ug/L	0.5	<0.5
Indeno(1.2.3-cd)pyrene	ug/L	1	<1.0
Dibenz(a.h)anthracene	ug/L	1	<1.0
Benzo(g.h.i)perylene	ug/L	1	<1.0
CHLORINATED HYDROCARBONS			
1.3-Dichlorobenzene	ug/L	2	<2
1.4-Dichlorobenzene	ug/L	2	<2
1.2-Dichlorobenzene	ug/L	2	<2
Hexachloroethane	ug/L	2	<2
1.2.4-Trichlorobenzene	ug/L	2	<2
Hexachloropropylene	ug/L	2	<2
Hexachlorobutadiene	ug/L	2	<2
Hexachlorocyclopentadiene	ug/L	10	<10
Pentachlorobenzene	ug/L	2	<2
Hexachlorobenzene	ug/L	4	<4

4.3.7 Test Type G – Synthetic Compounds

PFAS Testing at David Phillips Field ONLY			
Perfluorobutane sulfonic acid (PFBS)	ug/L	0.01	NA
Perfluoropentane sulfonic acid (PFPeS)	ug/L	0.01	NA
Perfluorohexane sulfonic acid (short suite) (PFHxS)	ug/L	0.01	NA
Perfluoroheptane sulfonic acid (PFHpS)	ug/L	0.01	NA
Perfluorooctane sulfonic acid (short suite) (PFOS)	ug/L	0.01	NA
Perfluorodecane sulfonic acid (PFDS)	ug/L	0.02	NA
Perfluorobutanoic acid (PFBA)	ug/L	0.02	NA
Perfluoropentanoic acid (PFPeA)	ug/L	0.02	NA
Perfluorohexanoic acid (PFHxA)	ug/L	0.01	NA
Perfluoroheptanoic acid (PFHpA)	ug/L	0.01	NA

AnthracenePerfluorooctanoic acid (short suite) (PFOA)	ug/L	0.01	NA
Perfluorononanoic acid (PFNA)	ug/L	0.01	NA
Perfluorodecanoic acid (PFDA)	ug/L	0.02	NA
Perfluoroundecanoic acid (PFUnDA)	ug/L	0.02	NA
Perfluorododecanoic acid (PFDoDA)	ug/L	0.05	NA
Perfluorotridecanoic acid (PFTrDA)	ug/L	0.1	NA
Perfluorotetradecanoic acid (PFTeDA)	ug/L	0.5	NA
4:2 Fluorotelomer sulfonic acid (4:2 FTS 0.01)	ug/L	0.01	NA
6:2 Fluorotelomer sulfonic acid (short suite) (6:2 FTS)	ug/L	0.01	NA
8:2 Fluorotelomer sulfonic acid (short suite) (8:2 FTS)	ug/L	0.02	NA
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	ug/L	0.02	NA
Perfluorooctane sulfonamide (FOSA)	ug/L	0.1	NA
N-Methyl perfluorooctane sulfonamide (MeFOSA)	ug/L	0.05	NA
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	ug/L	0.1	NA
N-methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	ug/L	0.02	NA
N-ethyl perfluorooctane sulfonamidoacetic acid (EtFOSSA)	ug/L	0.02	NA
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	ug/L	0.05	NA
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	ug/L	0.5	NA

Note: NA = Not Available

4.4 Assessing Results

The results of each test shall be initially assessed and commented upon by the testing laboratory manager, indicating whether the results represent a risk to human health and shall use the terms of "NO LIKELY RISK", "POSSIBLE RISK", "LIKELY RISK" and "HIGH RISK". Any results which give rise to the use of "POSSIBLE RISK", "LIKELY RISK" and "HIGH RISK" shall immediately, and within 24 hours they are known or suspected, be reported to UNSW Estate Management – Hydraulic Engineers.

5 REPORTING

Transfer each and every test result from the laboratory manager's signed results sheet to the Excel spreadsheet (as provided by UNSW with the Tender) and submit this completed excel file to UNSW for assessment and reporting by the third party.

6 SAMPLING AND RE-SAMPLING

6.1 Methods of Sample Collection and Transportation

Sampling shall be undertaken by a technician with at least 12 months' relevant experience in the field of actually taking and transporting samples, displaying the following knowledge:

1. Appropriate containers to suit the parameters being tested,
2. Methods of sampling to prevent contamination of bacteria samples caused by the sampling process. This is especially in relation to dip sampling of water

tanks, disinfecting taps prior to sampling, running taps for at least 10 seconds after disinfection and prior to taking sample.
3. Methods of storage of samples for transportation. This especially includes: returning samples to the laboratory within the maximum desirable time frame and maintain sample temperatures at refrigerated conditions.

6.2 Re-Sampling

Re-sampling shall be undertaken at the discretion of UNSW in the following circumstances:

1. Results are in conflict with those expected and may give rise to substantial investigation costs.
2. Results are outside statutory requirements.
3. Results appear to be erroneous possibly due to suspect sampling, handling or testing method.

Re-sampling costs will only be met by UNSW where it can be shown there was no failure in sampling, handling or testing procedure and at the reasonable discretion of UNSW.

7 DELIVERABLES

The Contractor shall provide the following completed documents:

1. Completed Excel Spreadsheet.
2. Soft copy of each and every test result with Lab. Manager's comments.
3. Report on each and every re-test required, with Lab. Manager's comments on the result in addition to a statement on whether the retest was warranted.

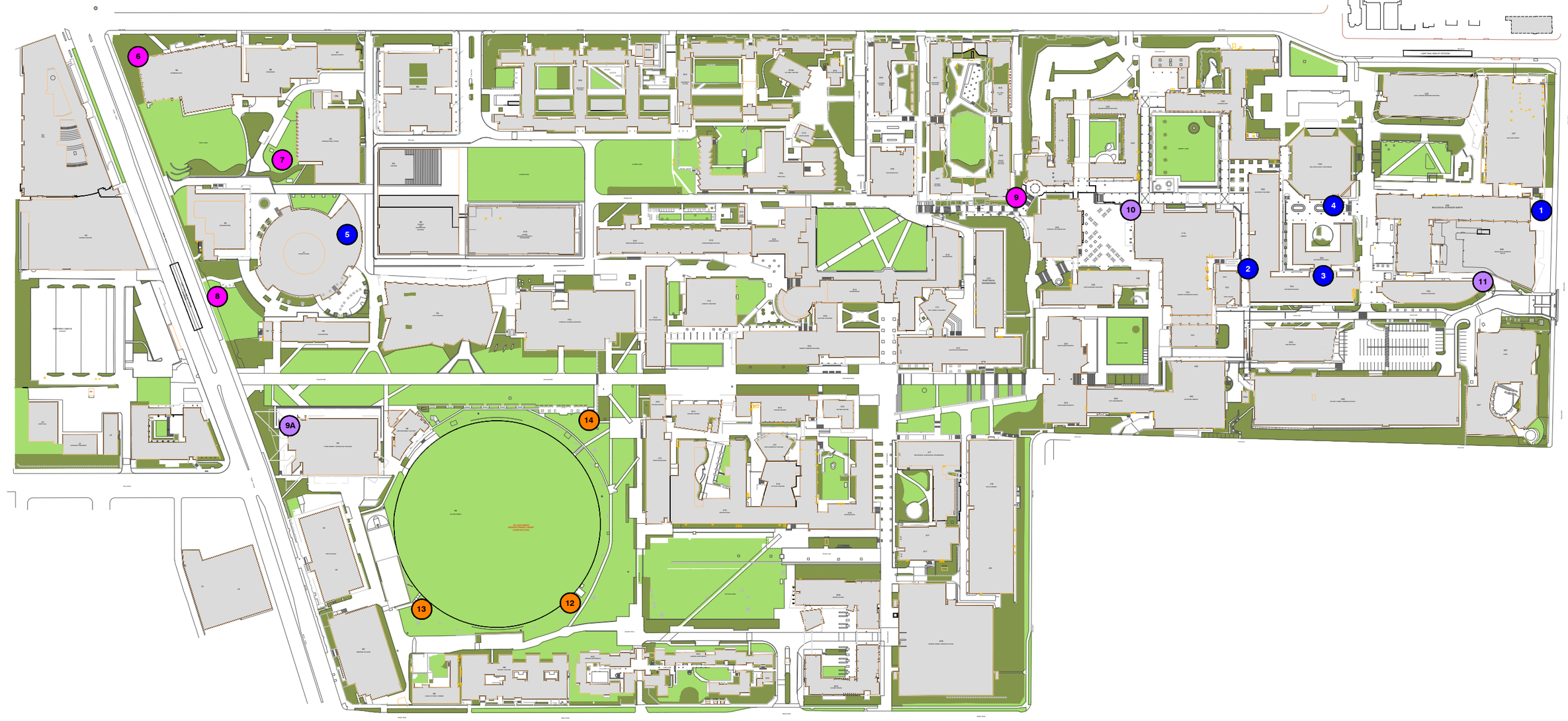
8 TABLE OF REQUIRED SAMPLING / TESTING

The Table "A" below identifies each sampling location, type / purpose of water being sampled, and type of testing required at each location depending on whether it is a full annual test or an intermediate 6-monthly test.

TABLE "A" – Schedule of Tests

Location Number	Location Description	Water Type	Test Types
1	Botany St. main water meter discharge	Potable	A,B,C,D
2	Mathews Building domestic water tank inlet	Potable	A
3	Mathews Building domestic water tank contents	Potable	A,B,C,D
4	Mathews Arcade food outlet	Potable	A,C
5	Round House kitchen sink	Potable	A
6	Alpha Bore (Old Bore 2) discharge tap under (outside pool Western end in stainless steel box) swimming pool	Raw Borewater	A,B
7	Bore 3 discharge head tap in locked SS cover Bravo Bore located to the western side of International house. Discharge tap in stainless steel box	Raw Borewater	A,B
8	Charlie Bore (old Bore 4) discharge head tap in locked pit in ground	Raw Borewater	A,B
9	Borewater special tap outside Morven Brown tunnel	Raw Borewater	A
9A	Tyree ETB Building – Off the manifold of the Bore Water pumps	Raw Borewater	A
10	Inlet to Commerce Courtyard storage tank in Lower Library Plant Room West. Sampling tap.	Treated Borewater	A,B
11	Bulk borewater standpipe in Samuels Lane	Treated Borewater	A,B
12	Sampling bore (Site 2 on plan) The Manly Vale Hydraulics Lab Access Point located adjacent to stormwater gross pollutant trap.	Groundwater Recharge	C,E,F
13	Sampling bore (Site 3 on plan) adjacent to scoreboard, SW corner Village Green	Groundwater Recharge	C,E,F
14	Monitoring Bore No3 in Science Rd (Site 1 on plan)	Groundwater	C,E,F
15	David Phillips Field North Bore borehead in locked pit	Groundwater	A,B,C,D,E, F
16	David Phillips Field South Bore borehead in locked pit	Groundwater	A,B,C,D,E, F

Location Number	Location Description	Water Type	Test Types
17	David Phillips Field hockey (Central) amenities	Potable	A,B,C,D
18	David Phillips Field cricket (Western) amenities	Potable	A,B,C,D
19	Randwick Campus King St meter discharge.	Potable	A,B,C,D
20	Randwick Building R9 tea sink	Potable	A
21	Randwick Building R1 tea sink	Potable	A,B
22	Randwick Inlet to storage tank inlet	Borewater	NOT REQUIRED
23	Randwick Bore Water Storage tank outlet, before discharge pump.	Borewater	NOT REQUIRED



POTABLE WATER

1. IMMEDIATELY AFTER BOTANY ST. WATER METER SET
2. INLET TO MATHEWS BUILDING DOMESTIC SUPPLY PUMP SUCTION (IN BASEMENT)
3. MATHEWS DOMESTIC WATER TANK (LEVEL 18 ROOM 1802)
4. MATHEWS ARCADE FOOD OUTLETS DRINKING FOUNTAIN
5. WATER SUPPLY ROUND HOUSE KITCHEN SINK

BORE WATER (RAW)

6. SAMPLING VALVE ON ALPHA BORE DISCHARGE HEAD LOCATED BELOW SWIMMING POOL
7. SAMPLING VALVE ON BRAVO BORE DISCHARGE HEAD LOCATED UNDER S.S COVER SOUTH WEST OF INTERNATIONAL HOUSE
8. SAMPLING VALVE ON CHARLIE BORE DISCHARGE HEAD LOCATED UNDER S.S COVER IN GRASS
9. BOREWATER TAP LOCATED OUTSIDE ENTRANCE TO MORVEN BROWN TUNNEL

TREATED BORE WATER

9A. INLET TO COMMERCE COURTYARD TBW STORAGE TANKS (LOWER PLANT ROOM)

10. INLET TO COMMERCE COURTYARD TBW STORAGE TANKS (LOWER PLANT ROOM)
11. TBW STANDPIPE ON NORTH WALL OF SAMUELS BUILDING IN SAMUELS LANE

TESTING BORES

12. SITE 2 LOCATED ADJACENT TO STORMWATER GPT & UPHILL WEST OF PATHWAY
13. SITE 3 LOCATED ADJACENT TO SCORE BOARD ON S.E. CORNER OF VILLAGE GREEN ATOP EMBANKMENT
14. SITE 1 (OLD MONITORING BORE 3) IN SCIENCE RD & SOUTHERN EDGE OF UNIVERSITY MALL

NOTES:

1. PRIOR TO USING THIS PLAN THE FACILITIES INFORMATION SERVICES MANAGER SHOULD BE CONTACTED FOR THE MOST RECENT REVISION.
2. SERVICES SHOWN OUTSIDE UNSW BOUNDARIES SHOULD BE VERIFIED BY "DIAL BEFORE YOU DIG" OR OTHER SERVICE SUPPLIERS.
3. ALL SERVICES SHOWN ARE TO BE FIELD VERIFIED PRIOR TO EXCAVATION.
4. DATUM FOR LEVELS: AUSTRALIAN HEIGHT DATUM

PRELIMINARY
INFORMATION ONLY
CONTINUOUSLY UPDATED

UNSW SYDNEY

Created 25.02.2021	Updated 25.02.2021
Drawn/Design RD	Approved CP
Discipline ENG	Scale N.T.S@A3
CAD Reference	

Section: ESTATE MANAGEMENT

Building Name: KENSINGTON CAMPUS — Building No: –

Project: – — Sheet No: 1 OF1

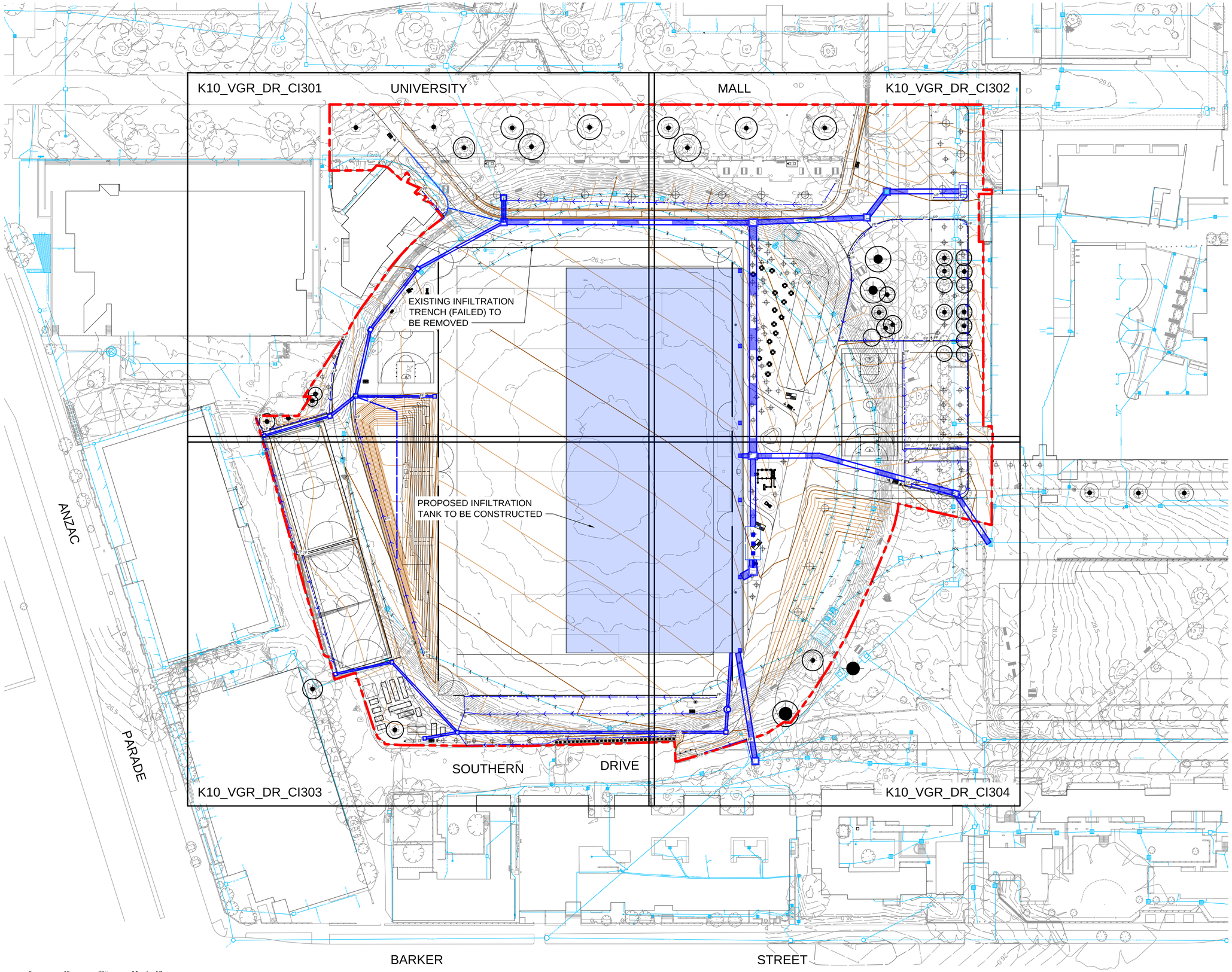
Title: WATER QUALITY TESTING LOCATION PLAN

Drawing No: EME–K–2021–H001 — Revision A

I:\EDFO\FM\Asset Management\Drawing Office\06 Output Drawings

Appendix 2

2022 Village Green redevelopment works and the installed flow monitoring system



NOTES

1. FOR GENERAL NOTES REFER TO DRG No. K10_VGR_DR_CI010 AND K10_VGR_DR_CI011.
2. FOR LEGEND REFER TO DRG No. K10_VGR_DR_CI020.
3. FOR FIELDS OF PLAY DRAINAGE, REFER TO SPORT CONSULTANTS DOCUMENTATION.
4. ALL RETAINED EXISTING PITS TO BE RAISED / LOWERED TO MATCH PROPOSED SURFACE LEVELS.
5. ALL RETAINED EXISTING PIT COVERS TO BE UPGRADED TO INFILL LIDS. ALL RETAINED EXISTING PIT GRATES TO BE UPGRADED TO HEEL SAFE GRATES.
6. FOR CONNECTIONS TO FIELDS OF PLAY DRAINAGE SYSTEMS REER TO SPORTING FIELDS CONSULTANT DOCUMENTATION.
7. FOR ADDITIONAL TRENCH DRAIN LOCATIONS, REFER TO FIELDS OF PLAY CONSULTANTS DOCUMENTATION.
8. ALL PIPEWORK INSTALLATION TO BE IN ACCORDANCE WITH UNSW SPECIFICATION SECTION D - EXTERNAL WORKS.
9. ALL PIPES TO BE REINFORCED CONCRETE CLASS 4, SUBJECT TO DESIGN FINALISATION.
10. ALL PIPES TO BE RUBBER RING JOINTED. ALL PITS TO BE PRECAST CONCRETE.
11. ALL PIT COVERS AND GRATES TO BE MINIMUM CLASS D, UNLESS NOTED OTHERWISE.
12. ALL TRENCH GRATE COVERS TO BE MINIMUM CLASS D AND ANTI-SLIP, HEEL SAFE AND BIKE SAFE.
13. SUBSOIL DRAINAGE TO BE INSTALLED IN ACCORDANCE WITH UNSW HYDRAULIC SERVICES STANDARD SECTION E.1.7.9.

Rev	Date	Revision Details	By	Chk	App
2	06/09/19	FOR TENDER	JE	MR	DC
1	21/08/19	75% DESIGN DEVELOPMENT	JE	MR	DC
-	18/07/19	50% DESIGN DEVELOPMENT	DJ	MR	DC

STAGE 1 - VILLAGE GREEN REDEVELOPMENT PROJECT (UNSW VGA)

UNSW KENSINGTON CAMPUS, SYDNEY, NSW

File #: CI300

Landscape Architect: T.C.L

Engineers: ARUP

Field of Play Consultant: SPORTENG

Architect: COX

Project Manager: ROOT PARTNERSHIPS

Client: UNSW SYDNEY

Designed by	Drawn by	Checked by	Approved by
ARUP	JE	MR	DC

Status:

FINAL ISSUE

DESIGN DOCUMENTATION

FOR TENDER

Drawing: DRAINAGE KEY PLAN

Sheet:

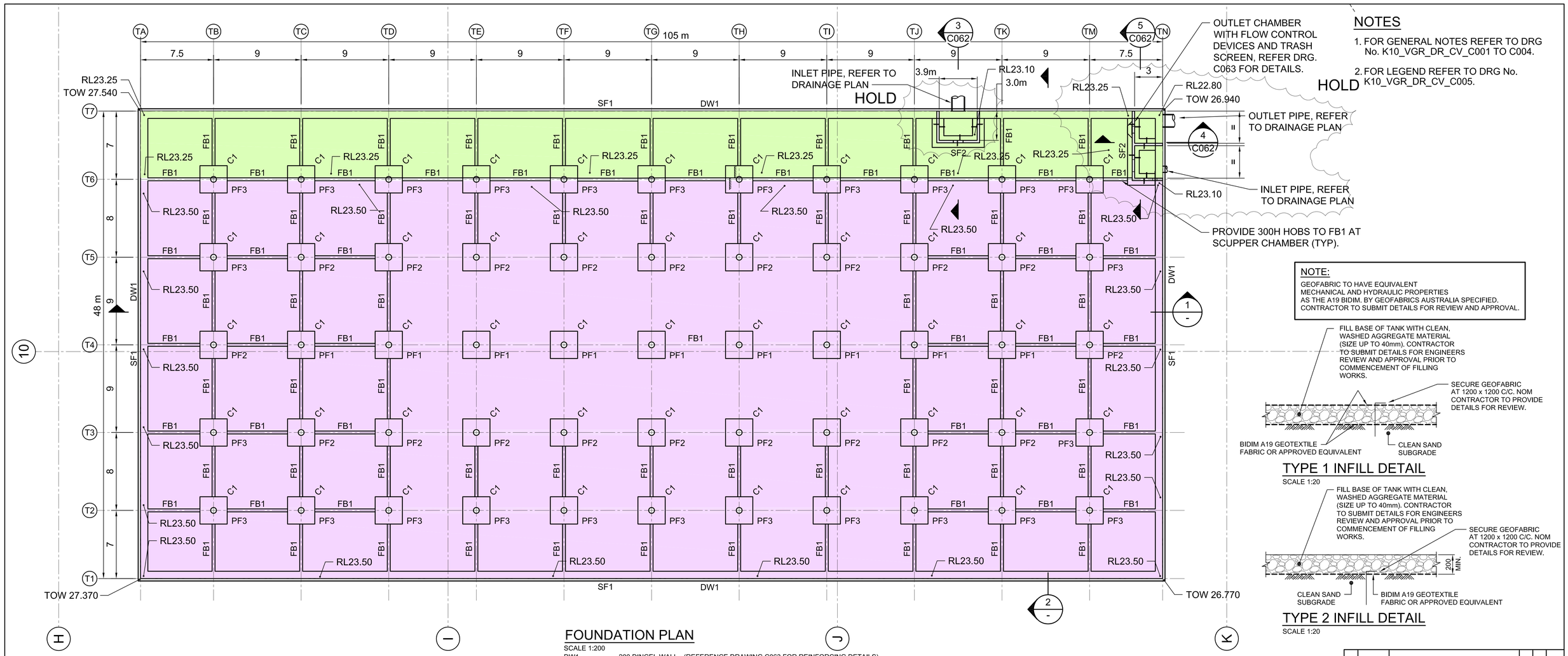
Purpose:

Date: 21.08.19

Scale: 1:500m

Drawing No. CI300

Rev. 2



FOUNDATION PLAN

SCALE 1:200

DW1.....200 DINCEL WALL - (REFERENCE DRAWING C063 FOR REINFORCING DETAILS)

TANK BASE INFILL:

TYPE 1 - SCUPPER CHAMBER - REFER DETAILS

TYPE 2 - GENERAL CASE - REFER DETAILS

NOTES

1. FOR GENERAL NOTES REFER TO DRG No. K10_VGR_DR_CV_C001 TO C004.
2. FOR LEGEND REFER TO DRG No. K10_VGR_DR_CV_C005.

HOLD

NOTE:

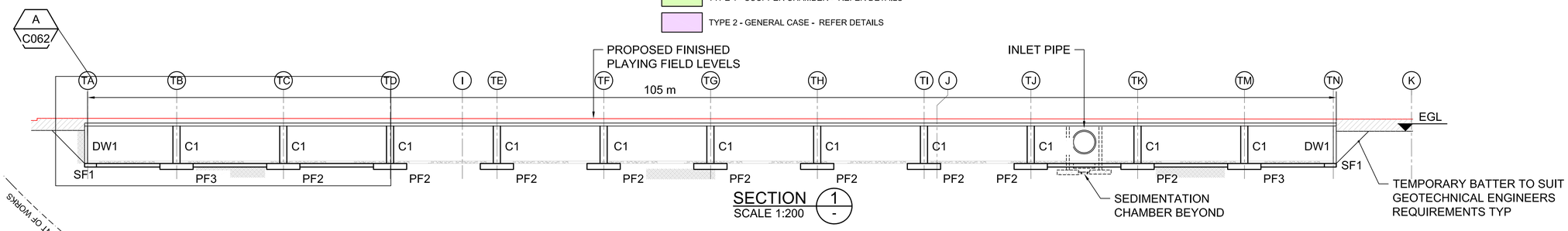
GEOFABRIC TO HAVE EQUIVALENT MECHANICAL AND HYDRAULIC PROPERTIES AS THE A19 BIDIM. BY GEOFABRICS AUSTRALIA SPECIFIED. CONTRACTOR TO SUBMIT DETAILS FOR REVIEW AND APPROVAL.

TYPE 1 INFILL DETAIL

SCALE 1:20

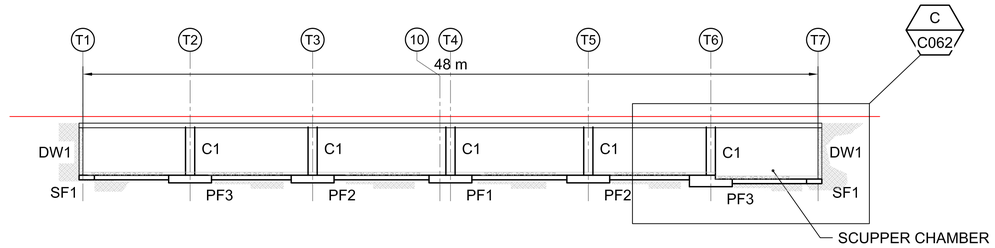
TYPE 2 INFILL DETAIL

SCALE 1:20



SECTION 1

SCALE 1:200



SECTION 2

SCALE 1:200

DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

ISSUED FOR CONSTRUCTION

Rev	Date	Revision Details	By	Chk	App
C	08-10-21	GRIDS ADDED	BM	NN	SM
B	17-09-21	RE-ISSUED FOR CONSTRUCTION	BM	NN	SM
A	10-09-21	ISSUED FOR CONSTRUCTION	BM	NN	SM
2	04-06-21	ISSUED FOR APPROVAL	BM	AP	AP
1	16-03-20	ISSUED FOR APPROVAL	BM	AP	AP

STAGE 1 - VILLAGE GREEN REDEVELOPMENT PROJECT (UNSW VGR)

UNSW KENSINGTON CAMPUS, SYDNEY, NSW

PROJECT: _5223

Landscape Architect: T.C.L TAYLOR CULLITY LETHLEAN

Engineers: M+G Consulting M & G CONSULTING ENGINEERS PTY LTD ABN 83 004 094 550 L3, 33 Berry Street, North Sydney NSW 2060 (PO Box 1656, NSW 2059) Tel: + 61 2 9956 7988

Field of Play Consultant: SPORTENG

Architect: COX

Head Contractor: AW EDWARDS

Client: UNSW SYDNEY

Designed by	Drawn by	Checked by	Approved by
AP	BM	SM	SM

Status: CONSTRUCTION DESIGN DOCUMENTATION

Drawing: INFILTRATION TANK FOUNDATION PLAN & SECTIONS

Sheet:

Date:

Scale: 1:200

North

Project & Discipline: K10_VGR_DR_CV

Drawing No.: C060

Rev.: C

A1 Sheet

A1

University Mall

New connection to potable cold water complete with isolation valve to serve taps adjacent to barbeques

New potable cold water connection to tap

New Ø180 MDPE PN12.5 Natural gas connection point with 150Ø isolation valve. Allow to insert isolation valves system shutdown

Capped Ø250 MDPE PN16 treated bore water with 200Ø isolation valve for future stage connection. Complete pipework is to be charged and live

Connect to existing bore water

Ø25 PCW MDPE PN 16

Confirmation is required from UNSW EM if BW(I) is to be made reduntant and if so location at which it is to be capped.

Water tap to be provided with isolating ball valve on riser and hose tap shall be Lock-shield type fitted with a permanently installed vacuum breaker. Tap connection to be 650mm above FGL

Potable water tap to discharge over landscape

Ø25 BW MDPE PN 16

Ø25 PCW MDPE PN 16

Treated bore water is proposed as enabling works for future stages. This pipework to be installed in Stage 1 works

Capped gas, sewer drainage and PCW for connection to F&B retail outlet. Sewer vent to be entered on installation

Capped connection for future

IL 27.10

IL 26.83

100Ø Future Grease Waste IL:27.95

100Ø Future Chamber Vent IL:27.95

100Ø Future Drainage Vent IL:27.95

Ø100 TW @ 1.65%
Ø100 CV @ 1.25%
Ø100 VP @ 1.25%
Ø100 S @ 1.65%

IL:26.64

Ø180 NG MDPE PN16
Ø250 BW MDPE PN16
Ø40PCW MDPE PN16
Ø100 S @ 1.65%

New Ø180 MDPE PN16 Natural gas inground (For future stage)
New Ø250 MDPE PN16 Treated bore water inground (For future stage)
New Ø40 MDPE PN16 Potable cold water inground
NewØ100 UPVC DWV Sewer drainage inground

Drinking fountain to drain to stormwater drainage

Ø100 STW @ 1.0%

Grate with bend with tap over provide isolating ball valve on riser and hose tap shall be Lock-shield type fitted with a permanently installed vacuum breaker.

Tap connection to be 650mm above FGL

IL 26.23

Connect to existing bore water

Trench to be hand dug to protect the tree roots

Hose tap to be 20mm lilac coloured lockshield with reverse thread outlet.

IL:27.39 TW

IL:27.62 CV

Provisional space allocation for 1500L grease arrestor to serve F&B retail outlet. Location as nominated by UNSW EM.

IL:27.24

Existing sprinkler and hydrant booster height will be adjusted (if required) subject to final FGL.
Sprinkler and hydrant booster supply to be disconnected and connected to new pipework. Refer HYS324

Provide 1.5m clearance in front of booster assemblies

PIT P06-1
PIT P06-2
PIT P06-3
PIT P06-4
PIT P06-5
12000Ø RCP CLASS 2
1350Ø RCP CLASS 2

For Continuation Refer to SD - HYS321

For Continuation Refer to SD - HYS324

0 2 4 6 8 10 m

Construction Managers: AW EDWARDS

Workshop Drawing Engineers: map

Hydraulic Contractor: JONES & JONES MASTER PLUMBERS PTY LTD

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THIS DOCUMENT HAS BEEN PREPARED IN ACCORDANCE WITH THE RELEVANT PROVISION'S OF THE CURRENTLY GAZETTED NCC 2019 AND THE FOLLOWING AUSTRALIAN STANDARDS:
AS 3500 - 2018 - PARTS 0-4 INCLUSIVE
AS 2419.1 - 2005. (Subject to FES provsions or departures)
AS 2441- 2005. (Subject to FES provsions or departures)
AS 5601 - 2013.

AND IN COMPLIANCE WITH THE SECTION E UNSW DESIGN &CONSTRUCTION REQUIREMENTS 2018 REVISION 5.9 DOCUMENT

Existing services - Legend

Existing services

SAM CRACKNELL PAVILION
GRAND STAND
PROPOSED BAR

Key Plan

Rev	Date	Revision Details	By	Chk	App
F	02.06.22	WT Revision	RM	JQ	JQ
E	02.05.22	GA Level Revision	RM	JQ	JQ
D	21.04.22	Gas Connection Revised to Site Condition	RM	JQ	JQ
C	12.04.22	Future GA Position Revised	RM	JQ	JQ
B	10.02.22	IL's Revised	RM	JQ	JQ
A	19.01.22	For Construction	RM	JQ	JQ
1	21.12.21	For Approval	RM	JQ	JQ

K10 UNSW VILLAGE GREEN REDEVELOPMENT PROJECT (UNSW VGR)

UNSW KENSINGTON CAMPUS, SYDNEY, NSW

File #: M1910

Landscape Architect: T.C.L
Engineers: ARUP
Field of Play Consultant: SPORTENG
Architect: COX
Project Manager: BOSS PARTNERSHIPS
Client: UNSW SYDNEY

Designed by	Drawn by	Checked by	Approved by
RM	RM	RM	RM

Status: FOR CONSTRUCTION
HYDRAULIC SERVICES WORKSHOP DRAWING

Drawing: Hydraulic & Fire Services In-Ground Services
Sheet: Sheet 2 of 4
Drawing is colour coded: PRINT IN COLOUR
Date: 21.12.21
Scale: 1:200
Drawing No.: K10_VGR_DR_HYS322
Rev.: F

Do not scale

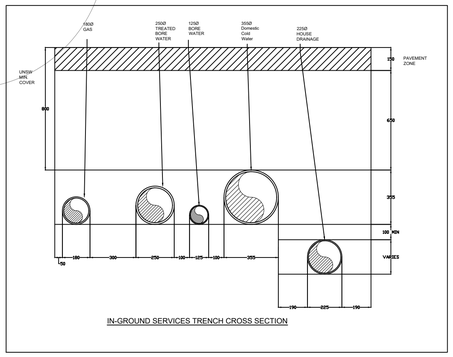
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A1

For Continuation Refer to SD - HYS322

For Continuation Refer to SD - HYS323



IN-GROUND SERVICES TRENCH CROSS SECTION

Stormwater drainage to be compacted to specified certification to provide adequate support of hydraulic services above to eliminate any future subsidence

Install a sewer access chamber at FGL on sewer line connection. Internal diameter = 1050mm

Refer to detail for service trench coordination, spacing and cover

Connect new Ø125 bore water to existing Ø100 bore water

New Ø355 PCW to connect to existing Ø300 PCW

Existing sprinkler and hydrant booster height will be adjusted (if required) subject to final FGL

Provide 1.5m clearance in front of booster assemblies

Cap existing bore water

Ø100 STW @1.0% IL 26.00

IL 25.97

New SAC IL 25.39

Ø225 S @0.77%

Ø125 BW Ø180 NG Ø250 TBW

Cap Ø100 bore water

Connect Ø150 FS to new Ø355 PCW

New SAC IL:25.72

Ø225 S @0.88%

Connect diverted PCW to existing PCW service. Existing PCW service invert level is IL:25.64.

Proposed twin 750Ø Stormwater drainage Obvert is OBV:25.435. Stormwater to tunnel under existing water main.

Connect to existing sewer manhole make good replace if required.

Capped treated bore water and gas complete with isolation valve for connection at a future stage

New Ø180 Natural gas inground (For future stage)
New Ø250 Treated bore water inground (For future stage)
New Ø125 Bore Water inground
New Ø355 Potable cold water inground
NewØ225 Sewer drainage inground

Ø250 TBW Ø180 NG Ø125 BW Ø355 PCW Ø225 S

Hose tap to be 20mm lilac coloured lockshield with reverse thread outlet.

Ø100 STW @1.0% IL:26.10

Drinking fountain to drain to stormwater drainage.

Stormwater drainage to be compacted to specified certification to provide adequate support of hydraulic services above to eliminate any future subsidence

Connect existing bore water to new bore water to provide bore water to west of site

Ø25 PCW MDPE PN 16

Assess condition of existing bore water pipework and replace if required

Temporarily connect Ø15 BW to Ø250 TBW so that pipework is charged and live. Provide isolation valve on Ø15 supply branch.

Capped Ø180 gas & Ø250 treated bore water with isolation valve for extension in a future stage. Align Valves

New Ø355 PCW connection into existing Ø150 main

Ø225 S @0.65%

Borewater Monitoring Well

Borewater monitoring well to remain. Adiust level of existing bore shaft to suit new FGL

New Ø180 Natural gas inground (For future stage)
New Ø250 Treated bore water inground (For future stage)
New Ø125 Bore Water inground
New Ø355 Potable cold water inground
NewØ225 Sewer drainage inground

C.O

225Ø Clear-out to surface

IL: 25.03

New SAC IL:24.98

Pass Over 1050 STW to be reduced to 600 refer civil documentation

Pass Under 375 STW

Pass Over 375 STW

Ø125 bore water connection to existing Ø100 bore water

IL: 24.770

Connect into existing SAC. Allow to replace and make good the sewer pipeline pit to allow connection. IL:24.70 to be confirmed on site

Install a sewer access chamber at FGL on sewer line connection. Internal diameter = 1050mm

Scientia Road

Southern Drive

0 2 4 6 8 10 m

Construction Managers:
AW EDWARDS

Workshop Drawing Engineers:
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fire & hydraulic engineers
Suite18/2955-271 pennant hills rd
po box 136 thornleigh nsw 2120
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f +61 2 9484 8387
e. mail@maps.com.au
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Hydraulic Contractor:
JONES & JONES MASTER PLUMBERS PTY LTD
19-21 Clarg Street, Artarmon NSW 2064
Postal Address: PO Box 276, Artarmon NSW 1570
TEL 02 9439 6500 • FAX 02 9906 7930
ABN 47 605 416 971 • Contractor Authority No. 1300120

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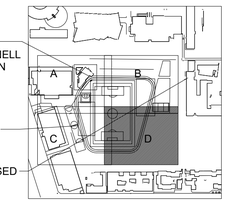
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NOTE: HOUSE DRAINAGE GRADE HAS BEEN REDUCED TO 0.65% DUE SITE CONSTRAINTS AND EXISTING INVERT LEVELS THIS WILL ALLOW A MAXIMUM FIXTURE UNIT RATING OF 3250

Existing services - Legend

Existing services



Key Plan

Rev	Date	Revision Details	By	Chk	App
G	02.06.22	Site Progress Amendments	RM	JQ	JQ
F	14.04.22	Site Progress Amendments	RM	JQ	JQ
E	12.04.22	Site Progress Amendments	RM	JQ	JQ
D	18.02.22	J&J comments	RM	JQ	JQ
C	18.02.22	House drainage route amended	RM	JQ	JQ
B	02.02.22	DF to STW	RM	JQ	JQ
A	19.01.22	For Construction	RM	JQ	JQ
1	21.12.21	For Approval	RM	JQ	JQ

K10 UNSW VILLAGE GREEN REDEVELOPMENT PROJECT (UNSW VGR)

UNSW KENSINGTON CAMPUS, SYDNEY, NSW

File #: M1910

Landscape Architect: T.C.L

Engineers: ARUP

Field of Play Consultant: SPORTENG

Architect: COX

Project Manager: ACOR PARTNERSHIPS

Client: UNSW SYDNEY

Designed by	Drawn by	Checked by	Approved by
RM	RM	RM	RM

Status:
FOR CONSTRUCTION
HYDRAULIC SERVICES
WORKSHOP DRAWING

Drawing: Hydraulic & Fire Services In-Ground Services

Sheet: Sheet 4 of 4

Drawing is colour coded: PRINT IN COLOUR

Date: 21.12.21

Scale: 1:200

Drawing No. K10_VGR_SD_HYS324

Rev. G

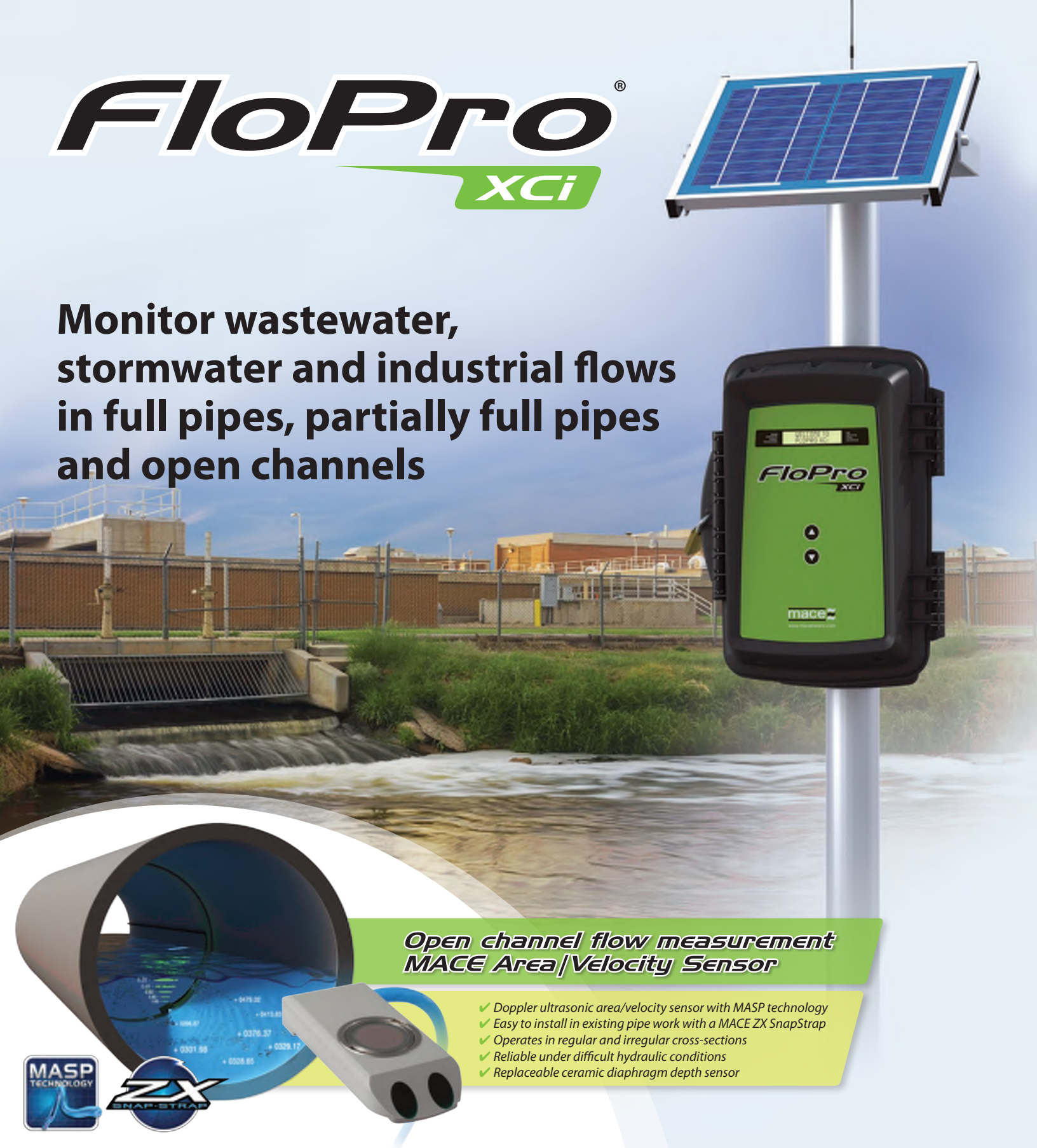
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FloPro® XCi

Monitor wastewater, stormwater and industrial flows in full pipes, partially full pipes and open channels



Open channel flow measurement
MACE Area/Velocity Sensor

- ✔ *Doppler ultrasonic area/velocity sensor with MASP technology*
- ✔ *Easy to install in existing pipe work with a MACE ZX SnapStrap*
- ✔ *Operates in regular and irregular cross-sections*
- ✔ *Reliable under difficult hydraulic conditions*
- ✔ *Replaceable ceramic diaphragm depth sensor*

www.macemeters.com

mace

An *In-Situ* Company

FloPro XCi

The FloPro XCi can be used to monitor just about any water quantity and quality sensor together with vital mining, municipal and industrial equipment and assets. Whether you need to measure flow as well as conductivity, pH and rainfall or utilize a downward looking ultrasonic depth sensor to measure pond levels the FloPro is fully expandable to your needs. Furthermore, FloPro is easily interfaced to SCADA/telemetry systems.

FloPro XCi is easy to install, easy to use and virtually maintenance free. Utilizing state of the art MACE Doppler ultrasonic velocity sensors, FloPro has no moving parts and provides minimal obstruction to the flow. MACE Doppler ultrasonic velocity sensors produce superior results under a wide range of hydraulic operating conditions such as those encountered in wastewater and stormwater flows. Even when the pipe slope is unknown, in surcharge, or flowing in reverse, the FloPro produces accurate repeatable data every time.

True average velocity measurement

MACE velocity sensors use continuous wave Doppler ultrasound to measure the speed of dirt, bubbles and other particles in the stream flow. ***MACE Doppler ultrasonic sensors "see" particles in water just like turning on a flashlight in fog.***

In a full pipe, electromagnetic or mechanical insertion devices "see" a golf ball sized velocity profile and then use complex algorithms to calculate velocity. By contrast, MACE Doppler ultrasonic velocity sensors utilizing MACE Advanced Signal Processing (MASP) technology ***"see"*** across the entire stream profile to give a true average velocity.

Ready-to-Go straight out of the box

The MACE FloPro XCi includes a data logger, LCD display, solar regulator, battery, multiple cards (application dependent) all in one ruggedized weatherproof enclosure. No more hunting around for bits and pieces. In most cases you can be up and monitoring in just a couple of hours.

Easily connect In-Situ sensors

- Plug 'n' play In-Situ sensors with an SDI-12 card
  - Aqua TROLL 600 multiparameter sonde
  - Aqua TROLL (depth/EC/temp.) sensors
  - Level TROLL (depth/temp.) sensors
- Support up to 10 sensors per SDI-12 card
- Powerful SDI-12 setup utility

Remote configuration, diagnostics and data retrieval with MACE WebComm

- The MACE WebComm card provides FloPro XCi the ability to be remotely configured and diagnosed
- Internal logged data is automatically uploaded to MACE or HydroVu data servers
- SMS/Email alert subscription service available
- Upload to 3rd party data servers



Multiple cards for multiple sensor applications

The FloPro XCi (multiple card interface) allows the user to efficiently monitor a vast array of water quantity and quality sensors plus vital mining, municipal and industrial equipment and assets. It's a smart packaged monitoring solution that provides remote data access with alerts and alarms. It's also telemetry-ready for effective low cost control and rapid response. Users can install any combination of the MACE cards shown, in the five available card slots.

Choose the right card/s for your application to tailor the FloPro to your exact monitoring requirements now and in the future.

Doppler Card

This card supports one MACE Doppler ultrasonic sensor.

I/O Card

This card supports seven sensor inputs and four control outputs including 4-20mA, voltage and digital.

The card also supplies 12V to power your add-on sensors.

Pulse I/O Card

This card powers (+5VDC or + 12VDC) a single pulsing flow sensor and provides a pulse output.

This allows FloPro XCi the ability to sense pulses from non-MACE flow sensors.

SDI-12 Master Card

This card provides FloPro XCi with the ability to control/log In-Situ and 3rd party SDI-12 compliant sensors.

SCADA

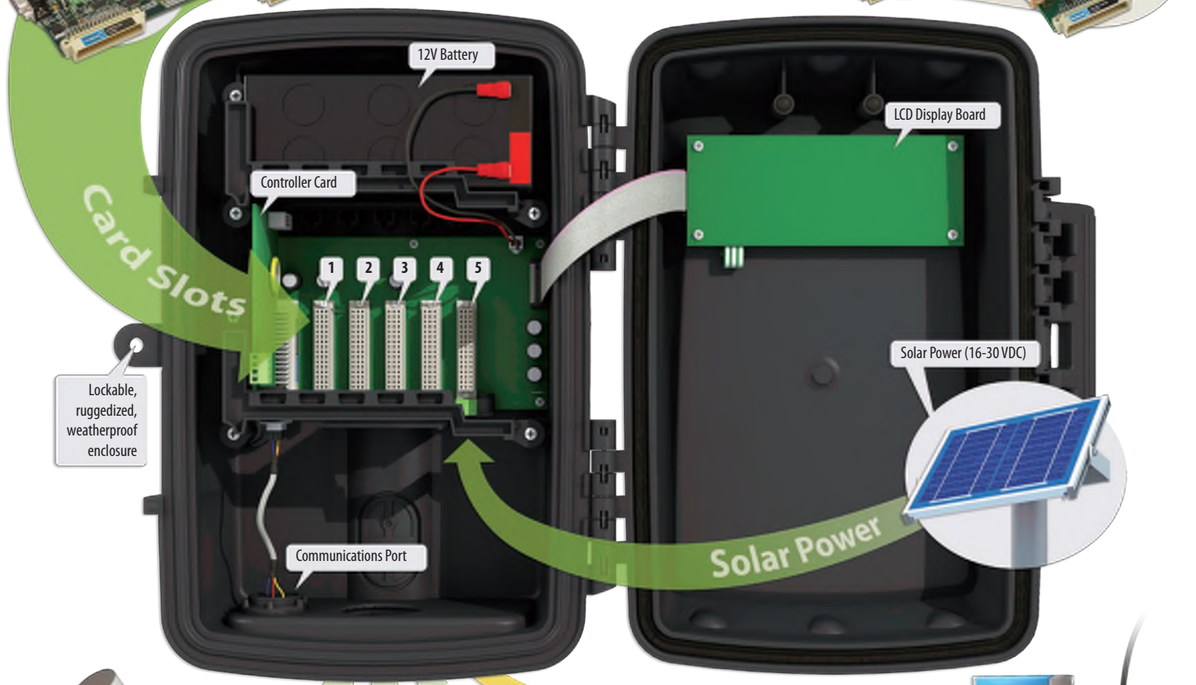
FloSI Card

This card provides an SDI-12 or ModBus output to interface FloPro XCi to SCADA systems.

Remote Access

WebComm Card

Provides FloPro XCi the ability to remotely configure the device and run diagnostics as well as upload internal logged data to a web-based data server via GSM/3G cell networks.



Doppler Ultrasonic Insert Velocity Sensor

For use in full pipes or partially full pipes (when used in conjunction with an EchoFlo depth sensor).

Doppler Ultrasonic Velocity Sensor

ZX SnapStrap mounted, velocity sensor for use in full pipes or open channels (when used in conjunction with a depth sensor).

Doppler Ultrasonic Area/Velocity Sensor

ZX SnapStrap mounted, combined velocity and depth sensor for use in partially full pipes or open channels.

Add-on Sensors

FloPro XCi can be configured to monitor a diverse range of water quantity and quality sensors and devices.

For example:

- In-Situ Aqua TROLL 600 multiparameter sonde
- In-Situ Level TROLL (depth/temp.) sensors
- Water sampler
- Pond/dam/tank level measurement
- Pumps/engines (RPM, pressure, temperature)

Solutions using FloPro XCi

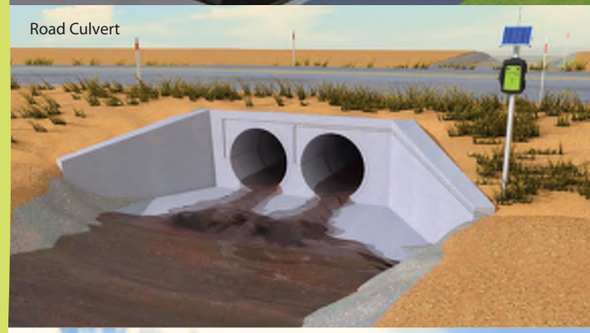
Stormwater Monitoring



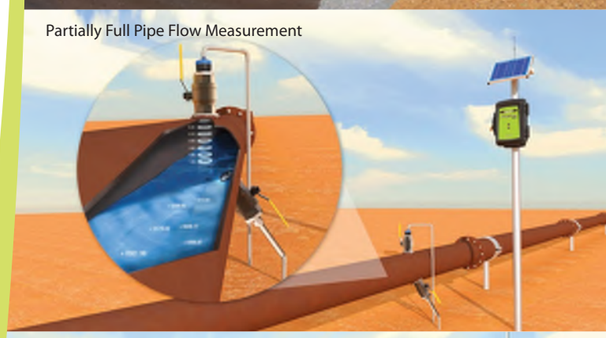
Sewer Monitoring



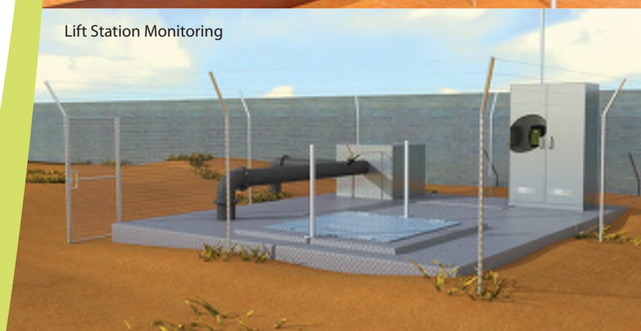
Road Culvert



Partially Full Pipe Flow Measurement



Lift Station Monitoring



FloPro XCi Specifications



GENERAL

Weight	Approx. 5 kg (11 lbs)
Dimensions	365 mm (H) x 260 mm (W) x 170 mm (D) 14.4 in. (H) x 10.2 in. (W) x 6.7 in. (D)
Enclosure rating	IP66
Enclosure material	UV stabilized polycarbonate
Operating temperature (with internal battery installed)	-15 to +50° C (5 to 122° F)
Operating temperature (with internal battery removed and external power used)	-20 to +65° C (-4 to 150° F)
Backlit display	16 character x 2 line alphanumeric LCD
Program memory	2 Mb flash (sufficient for 600,000 discrete readings)
Power	Internal 12Volt 7.2Ah battery with external solar panel or mains charger
Units of measure	User definable (metric/US)
Application software	FloCom+ PC software for system configuration, data downloading and velocity profile testing. Minimum system requirements - Windows® XP
Factory backup	24 months - parts and labour guarantee

DEPTH MEASUREMENT

Method	Ceramic pressure transducer with large flat sensing diaphragm which allows straight, undeflected flow over the sensing area to reduce drawdown effects at high stream velocities and provides for self cleaning with an impervious Alumina ceramic surface.
Full scale range	4 m (13 ft.) above the transducer face
Accuracy	0.2% of full scale at constant temperature in a static stream. 1% of full scale over a stream 5 to 55° C (41 to 130° F)
Resolution	1 mm (0.04 in.)
Overrange	60 m (200 ft.) without damage
Min. operating depth	20 mm (0.79 in.)

VELOCITY MEASUREMENT

Method	Submerged Ultrasonic Doppler
Range	±0.025 to ± 8.0 m/s (±0.08 to ± 26 ft/s)
Resolution	1 mm at 1.0 m/s (0.04 in. at 3.3 ft/s)
Accuracy	±1% up to 3.0 m/s (±1% up to 10 ft/s)
Urethane sensor cable	9 mm (D) up to 50 m (L) (0.35 in. (D) up to 164 ft. (L))
Min. operating depth	40 mm (1.57 in.)
Max. operating temperature	60° C (140° F)



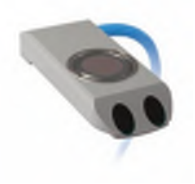
DOPPLER INSERT VELOCITY SENSOR

For use in full pipes or partially full pipes (when used in conjunction with an EchoFlo depth sensor)

Pipe size	0.1 to 2.54 m (4 in. to 100 in.) diameter
Process fitting	2″ BSP or 2″ NPT
Max. process fitting pressure[1]	1034 kPa (150psi)
Max. operating pressure[2]	253kPa (37psi)
Shaft dimensions	330 mm (L) x 20 mm (D) 13 in. (L) x 0.8 in. (D)
Head dimensions	45 mm (D) x 25 mm (H) 1.8 in. (D) x 1 in. (H)
Wetted materials	Nickel plated brass and epoxy
Pipe intrusion area	11.25 cm^2 (1.74 in^2)

*1 The pipe **must be de-pressurized** prior to insertion or removal*

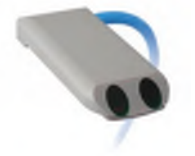
*2 The stream flow may be suitable for Doppler ultrasonic flow measurement in pressures >253kPa (37psi) if it contains **at least** 100 parts per million of suspended solids that are >75 microns in size.*



DOPPLER AREA/VELOCITY SENSOR

ZX SnapStrap mounted, combined velocity and depth sensor for use in partially full pipes or open channels

Pipe size	0.15 to 2.54 m (6 in. to 100 in.) diameter
Max. channel width *	3 m (10 ft.)
Dimensions	125 mm (L) x 50 mm (W) x 20 mm (H) 5 in. (L) x 2 in. (W) x 0.79 in. (H)
Wetted materials	PVC, Alumina ceramic and epoxy
Pipe intrusion area	8.6 cm^2 (1.33 in^2)



DOPPLER VELOCITY SENSOR

ZX SnapStrap mounted, velocity sensor for use in full pipes or open channels (when used in conjunction with a depth sensor)

Pipe size	0.15 to 2.54 m (6 in. to 100 in.) diameter
Max. channel width *	3 m (10 ft.)
Dimensions	125 mm (L) x 50 mm (W) x 17 mm (H) 5 in. (L) x 2 in. (W) x 0.67 in. (H)
Wetted materials	PVC and epoxy
Pipe intrusion area	8 cm^2 (1.24 in^2)

** MACE Doppler ultrasonic sensors **will** operate in wider channels, but a reliable stream gauging **must** be performed for best system accuracy.*

Note to end users: These specifications are subject to change at any time without notice. MACE takes no responsibility for the use of these figures. Please consult MACE for the latest specifications before using them in contract submittals or third party quotes etc. MACE reserves the right to change specifications without prior warning. All quoted figures are based on test conditions and are subject to variation due to site conditions.

DISTRIBUTOR:

Part No. 825-311 Rev. 3.5

www.macemeters.com

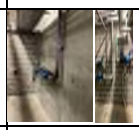
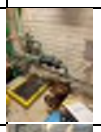
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Email: sales@macemeters.com

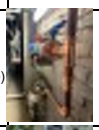
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Appendix 3

UNSW Kensington Campus Bore water uses.

UNSW KENSINGTON CAMPUS - Bore water Uses – Specific to each Building.															Jul-23	Revision 1
Building Code	***Building Name***	Incoming supply location	Photo Reference	Bore water tanks Installed	Potable RPZD backup	Bore water pumps	TBW Toilets	TBW Lab water	TBW cooling towers	TBW to RO Units	TBW makeup to trade waste plant	Raw Bore Water Toilets	Raw bore water to cooling tower	Raw Bore Water Pool	Notes
001	PIMS Multiple Buildings														
B10	UNSW Village														
B10B	Campus Village Cafe														
B12B	Substation 22														
B12A	Building B12A														
B14D	Fig Tree Theatre														
B15	Old Tote														
B16	Colombo House	Room LGQ03 (Fire booster pump room)		x	✔	x	✔								
B17	Goldstein College	Supplied from Fig Tree Hall (B18)		x	✔	x	✔								
B18	Fig Tree Hall	Room LGQ13		x	✔	x	✔								
B21	Repository														
B4	Fitness and Aquatic Centre	Room P10 (Bore water fill to balance tank)		x	✔	x								✔	
		External in Outdoor plant space (High Street)		x	✔	x						✔			
B8	University Terraces											✔			

Building Code	Building Name	Incoming supply location	Photo Reference	Bore water tanks Installed	Potable RPZD backup	Bore water pumps	TBW Toilets	TBW Lab water	TBW cooling towers	TBW to RO Units	TBW makeup to trade waste plant	Raw Bore Water Toilets	Raw bore water to cooling tower	Raw Bore Water Pool	Notes
C15	White House														
C19	Garbage Disposal Unit C19														
C20	Morven Brown (eastern side of Building)	LG26A (services duct eastern side)		x	x	✔	✔								
C20	Morven Brown (western side of Building)	External on esteren wall		x	x	✔	✔								
C21	East side														
C22	Chancellery														
C24	Clancy Auditorium														
C25	Lowy Cancer Research Centre	Room LGQ24		✔	x	✔	✔		✔	✔					Bore water to lab water tanks turned off
C27	Wallace Wurth	Room LGQ27		✔	x	✔	✔		✔						Bore water to lab water tanks turned off
C6	International House	Room G92		x	✔	x						✔			
D9	IO Myers Studio														
D10	Building D10														
D16	Goldstein Hall	Lower ground eastern side in locked lightwell		x	x	x						✔			
D17	Basser College	Supplied from Fig Tree Hall (B18)		x	✔	x	✔								
D18	Philip Baxter College	Supplied from Fig Tree Hall (B18)		x	✔	x	✔								

Building Code	Building Name	Incoming supply location	Photo Reference	Bore water tanks Installed	Potable RPZD backup	Bore water pumps	TBW Toilets	TBW Lab water	TBW cooling towers	TBW to RO Units	TBW makeup to trade waste plant	Raw Bore Water Toilets	Raw bore water to cooling tower	Raw Bore Water Pool	Notes
D2	NIDA														
D23	Mathews Theatres														
D26	Biological Sciences - North	Room LG05		✔	x	✔	✔	✔	✔	✔					
E8	Science & Engineering (SEB) and Science & Engineering (SEB) Theatre	Room HBQ01		✔	x	✔	✔	✔	✔	✔	✔				
E10	Hilmer Building	Room HBQ01		✔	x	✔	✔	✔	✔		✔				
E26	Biological Sciences - South	Room MLG003		✔	x	✔	✔	✔	✔	✔					
E12	UNSW Business School	Building E14		x	✔	✔	✔								
E15	Quadrangle	Room LG001A		x	✔	x							✔		
E19	Central Lecture Block	In hydraulic riser adjacent G07 (Accessible toilet		x	✔	x	✔								
E2	NIDA Parade Theatre														
E24	The Pavilions														
E24A	Mathews Arcade	Room 150		x	✔	x	✔								
E4	Squarehouse														
E6	Roundhouse	External plantroom north western side of building		x	x	x	✔								
F10	Chemical Sciences	Room LGQ4	 	x	x	✔	✔								

Building Code	*Building Name*	Incoming supply location	Photo Reference	Bore water tanks Installed	Potable RPZD backup	Bore water pumps	TBW Toilets	TBW Lab water	TBW cooling towers	TBW to RO Units	TBW makeup to trade waste plant	Raw Bore Water Toilets	Raw bore water to cooling tower	Raw Bore Water Pool	Notes
F12	Dalton														
F13	Science Theatre	External area LG1A		x	✔	x						✔			
F20	Goodsell	Externally within Commerce Courtyard		x	x	x	✔								
F21	Library	Room 130A		x	x	✔	✔		✔						
F22	Bank														
F23	Mathews	Room 1Q25		✔	✔	✔	✔		✔						
F25	Samuels	Room LG21		x	✔	x			✔	✔					
F8	Law Building	Room BQ3		x	✔	x	✔		✔						
G14	Robert Webster	In external cupboard Western end	 	x	✔	x						✔			
G15	Robert Webster Theatres														
G17	Electrical Engineering	External plant room eastern side of building		✔	x	x	✔		✔						
G19	John Niland Scientia	Plant room LG11		x	✔	x	✔								
G23	Solar Industrial Research Facility (SIRF)			x	✔	x	✔								
G27	AGSM			x	✔	x			✔						
G6	Blockhouse														

Building Code	Building Name	Incoming supply location	Photo Reference	Bore water tanks Installed	Potable RPZD backup	Bore water pumps	TBW Toilets	TBW Lab water	TBW cooling towers	TBW to RO Units	TBW makeup to trade waste plant	Raw Bore Water Toilets	Raw bore water to cooling tower	Raw Bore Water Pool	Notes
H1	UNSW Regiment														
H13	The Red Centre	Isolation valve in Mall Services tunnel		x	x	x	✓		✓						
H20	Civil Engineering	Isolation valve in Mall Services tunnel, under Scientia		x	✓	✓	✓								
H22	Vallentine Annexe														
H22A	Garbage Disposal Unit H22A														
H25	Botany Street Parking Station														
H3	New College Postgraduate Village														
H6	Tyree Energy Technologies Building (TETB)	Room LGQ27		x	x	x	✓			✓	✓				
H8	Sam Cracknell Pavilion														
J12	Newton	Supply (uPVC Pressure) from plantroom above SWRP Old Main Building		x	x	x							✓		
J14	Keith Burrows Theatre														
J17	Ainsworth Building	In external enclosure on Engineering Rd		x	x	✓						✓	✓		
J18	Willis Annexe	H01Q01 Pump Room		x	✓	x									
J2	UNSW Regiment 2														
K14	Physics Theatre	Room LG17		x	✓	x						✓			

Building Code	***Building Name***	Incoming supply location	Photo Reference	Bore water tanks Installed	Potable RPZD backup	Bore water pumps	TBW Toilets	TBW Lab water	TBW cooling towers	TBW to RO Units	TBW makeup to trade waste plant	Raw Bore Water Toilets	Raw bore water to cooling tower	Raw Bore Water Pool	Notes
K15	Old Main	External Southern side of building		x	x	x		✔							Provides backup cooling water to LG floor lab
		External Southern side of building		x	x	x		✔							Provides backup cooling water to LG floor lab
K17	Building K17 Computer Sciences	B06 Plant room		x	x	x						✔			
L5	Building L5														
L6	New College														
M15	Rupert Myers	Room 1105		x	✔	x						✔			
M7	Warrane College														
N13	Barker Apartments														
N18	Barker Street Parking Station														
N8	House At Pooh Corner														
N9	Shalom College														

Appendix 4

Alpha Bore Technical Information

Group Pty Ltd

"Providing Irrigation & Pumping Solutions"

UNSW - Kensington

ALPHA Bore Pump
29-02-2016
Lic no. 10BL156719

GPS co ord: Lat -33.91512 Long 151.22583



Prepared by: Southwell Group Pty Ltd 29-02-2016
hugh@southwells.com.au
Ph 02 46557004

SOUTHWELL

Irrigation

UNSW - Sydney

List of Critical Infrastructure
ALPHA Bore

	Description	Model
Pump	Grundfos SP Submersible pump	SP46-9
	with MS6000 15kw motor	15A21909P115500001
Pump Column	Permaglass Fibre column	100mm
Bore Cap	100mm Stainless Steel	
Rate of Flow Valve	ME Mack 50mm Rate of flow valve	P40 pilot ACV Series
	with orifice plate, stainless steel	P100 series valve
	control tube and pilot. Set at 8.0lps	
Water Meter	Elster 50mm H4000 water meter	H4000 50mm
	with PR7 optical reader	
Low level probe	3 x low level probes 11SN1	11SN1
	in 32mm conduit	
Level Transducer	Mercoid Level Transducer	DWY MBLT-2SC-IVPM-60-66
	in 32mm Conduit	
High / Low pressure switch	Condor Pressure Switch 1/4"	MDR3
Control Panel	Inca control VSD with Sine wave filter	Drawing no.
		11004

UNSW Commission Test
ALPHA Bore

SOUTHWELL Irrigation

38 Edward St Camden

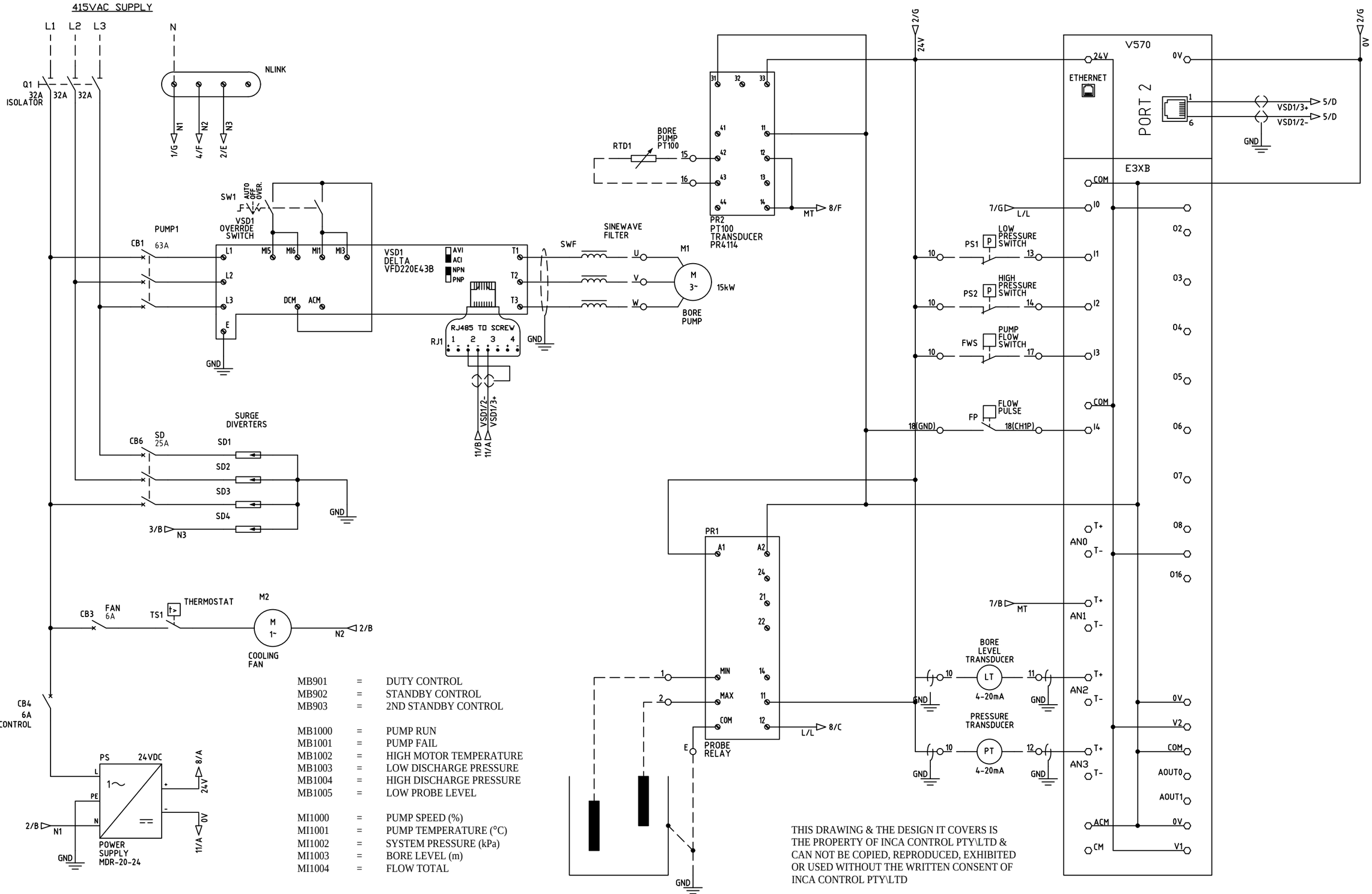
Date: 17-09-2015

Client Name: University of New South Wales

Project Name: Commission tests for ALPHA Bore

Present: Brenton Nicholson, Matt Shalala, Peter Lea

Item no.		Operation	Comment	Target	Checked
1		Pressure test Mainline for 24 hr		1600 Kpa	√
2		Pump Start Duty	Controlled from downstream tapping transducer	570 Kpa	√
3		Pump Set Pressure	Controlled from downstream tapping transducer	600 Kpa	√
4		Pump Stop Duty	Controlled from downstream tapping transducer	600Kpa	√
5		Pump run on time to stop (all duties)	Hold 600 Kpa for 30 Seconds	60 seconds	√
6		System High Press Pump Stop & Alarm	Controlled from downstream tapping transducer	700 Kpa	√
7		High Press Stop and Alarm	Controlled from up stream tapping pressure switch	750 Kpa	√
8		Low Press Stop and Alarm	Controlled from up stream tapping pressure switch	400 Kpa	√
9		Low aquifer Level	Pump will NOT Start and Alarm	RL 18.5 mt	√
10		Aquifer reset level	via level transducer	RL 13.5 mt	√
11		Check operation of cooling fans	Visual	Yes	√
12		Check maximum flow rate of bore	via water meter	8 lt/sec	√



MB901 = DUTY CONTROL
MB902 = STANDBY CONTROL
MB903 = 2ND STANDBY CONTROL

MB1000 = PUMP RUN
MB1001 = PUMP FAIL
MB1002 = HIGH MOTOR TEMPERATURE
MB1003 = LOW DISCHARGE PRESSURE
MB1004 = HIGH DISCHARGE PRESSURE
MB1005 = LOW PROBE LEVEL

MI1000 = PUMP SPEED (%)
MI1001 = PUMP TEMPERATURE (°C)
MI1002 = SYSTEM PRESSURE (kPa)
MI1003 = BORE LEVEL (m)
MI1004 = FLOW TOTAL

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No:	Revision	Date	By

INCA CONTROL PTY LTD
UNIT14/02 OWEN ST
GLENDENNING NSW 2761
Phone: (02) 9675 3815
Web: www.incacontrol.com.au

SCALE 1:1

	DATE	NAME
Edit	07/07/2015	F.E.
Chec.		

FILENAME 20164

Single VSD Pressure System Pump Controls

SWIMMING POOL

11003

SHEETS 1

H4000 Woltmann Helix
Helical Vane Cold Water Meters

Product specification



The H4000 is a high capacity in-line Woltmann helical vane type meter with a precision injection moulded measurement mechanism eminently suitable for high and sustained flows associated with bulk metering. Low pressure loss characteristics are due to minimum restriction and no change in flow direction as water flows through the meter. For maintenance purposes the complete measuring mechanism may be quickly replaced with a pre-calibrated measuring mechanism, or alternatively a blank cover may be fitted, making a by-pass unnecessary in most cases. The Helix H4000 meter range complies with the Metrological and Technical Requirements of NMI R 49-1 (Water Meters Intended for the Metering of Cold Potable Water and Hot Water) in horizontal, vertical and inclined pipelines.

Measurement mechanism

The measurement mechanism incorporates state of the art features to give optimum long term accuracy, extended wear life and reduced maintenance. The balanced rotor has a specific gravity of 1.0 to minimise bearing loads and reduce friction. This ensures that even the slightest movement of water will be translated to the rotor, giving improved flow sensitivity at low flows. The measurement mechanism has been specially designed to give the rotor a "thrust relief" effect as water passes through the meter. This, together with the use of jeweled rotor bearings plus tungsten carbide thrust pads and stub shafts result in greater linear accuracy and longer wear life.

Register

The Helix H4000 has a hermetically sealed register with kilolitres shown in a bold straight reading drum and pointers indicating litres. An e^{sens} patented inductive resonant pulse target is also incorporated into the register optimising the overall sensing capability. The "copper can" outer barrier and mineral glass lens, together with a small drain hole in the lid preventing stagnant water pooling in the lid if left open, ensures moisture is kept out to give clear, condensation free readings over the life of the meter, even in the most severe environments. The register is protected by a robust housing and lid. The resonant target is not affected by a static magnet placed directly above the target pointer.

Reliable connectivity

The H4000 uses an e^{sens} inductive register to deliver enhanced communications performance and tamper proof security offering protection against fraud. The H4000 is compatible with the Emeris PR7 inductive pulse transmitter fully compatible with Elster's Emeris range of intelligent meter reading systems and is fully compatible with other common ancillary devices including data loggers and AMR systems. The H4000 can provide even more vital management information to assist with effective distribution management, reduce water losses from leakage and improve customer service. When combined with ancillary monitoring equipment, a range of intelligent features including leakage alarms, data logging and tariffs enables a complete metering system that addresses the efficiency objectives for water providers.

Key features

- Generous length integral flow straightening vanes to negate the effect of non-ideal upstream flow conditions.
- e^{sens} Inductive register for improved output performance and security. The register can be rotated 359°.
- Accurate in both forward and reverse flow for network management.
- Flanges drilled to Australian Standard AS 4087 Table D. (Other drill patterns available on request).
- Maximum working pressure 1600 kPa.
- Maximum limiting temperature 50°C.
- Longer wear life for optimum accuracy.





Optional features

- Emeris PR7 inductive pulse transmitters for use with data loggers, remote counters, rate of flow and process control equipment.
- Remote battery operated totalising counter with LCD display (ScanCounter).
- Inline strainer.
- Alternative flange drilling provided on request.

Materials

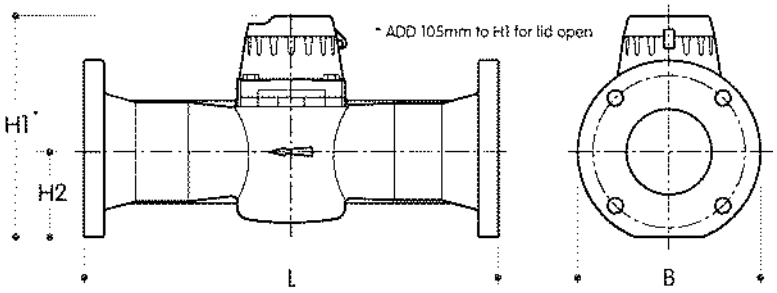
All Helix H4000 meters are manufactured from the highest quality materials, ensuring maximum resistance to wear and corrosion. The meter body is powder coated for protection in all environments.

All materials in contact with potable water comply with the Australian Standard AS 4020.

Flow performance to NMI R49-1 / Class 2

Nominal diameter (DN mm)	Units	40	50	65	80	100	150	200	250	300
Minimum flowrate - $Q_1 \pm 5\%$	kL/h	0.50	0.50	1.00	1.28	1.28	2.00	3.94	6.25	12.80
Transitional flowrate - $Q_2 \pm 2\%$	kL/h	0.81	0.81	1.60	2.05	2.05	3.20	6.30	10.0	20.48
Permanent flowrate - $Q_3 \pm 2\%$	kL/h	63.0	63.0	63.0	160	160	400	630	1000	1600
Overload flowrate - $Q_4 \pm 2\%$	kL/h	79.0	79.0	79.0	200	200	500	787.5	1250	2000
Q_3/Q_1 ratio		125	125	63	125	125	200	160	160	125
Minimum registration flowrate	kL/h	0.15	0.16	0.17	0.22	0.25	0.9	1.2	1.8	1.8
Pressure loss @ Q3	kPa	39	24	19	18	18	15	12	15	37
Maximum working pressure	kPa	1600	1600	1600	1600	1600	1600	1600	1600	1600
Maximum limiting temperature	°C	50	50	50	50	50	50	50	50	50
1st pointer registration (per revolution)	L	1	1	1	1	1	10	10	10	10
Maximum counter registration	kL	999999	999999	999999	999999	999999	9999999	9999999	9999999	9999999
PR7 Pulse Unit	L/pulse	1, 10, 100 or 1000					10, 100, 1000 or 10000			
		Please consult an Elster sales office for details								
Dimensions										
Overall meter length (L)	mm	311	311	200	413	483	500	520	450	500
Meter height - Lid closed (H1)	mm	220	220	228	247	259	335	387	438	465
Centreline height (H2)	mm	78	78	86	94	106	135	165	198	225
Flange width (B)	mm	151	166	186	201	228	286	341	409	461
Approx. meter weight (std. packed)	kg	13	14	15.5	22	26	47	64	95	120

Meter dimensions



Register details



esens patented pulse target technology

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Vital Connections

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SML011 15/03

PR6 and PR7

Wiring Elster's Inductive Output Pulsers.



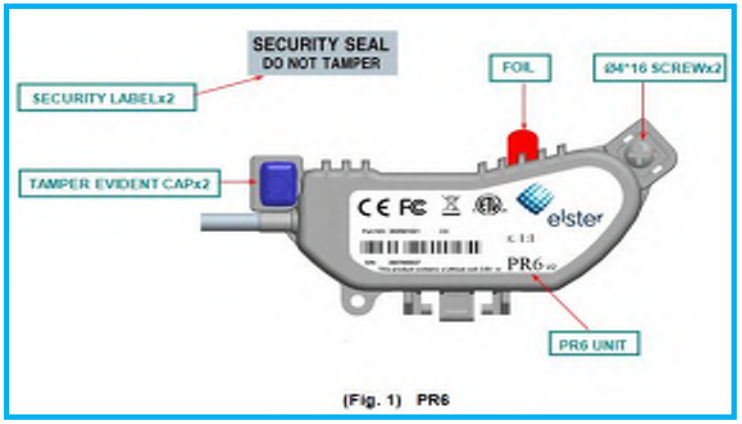


elster

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WIRING PR6 AND PR7

What PR6 and PR7 are used for



(Fig. 1) PR6

1. Elster PR6 inductive pulse unit.

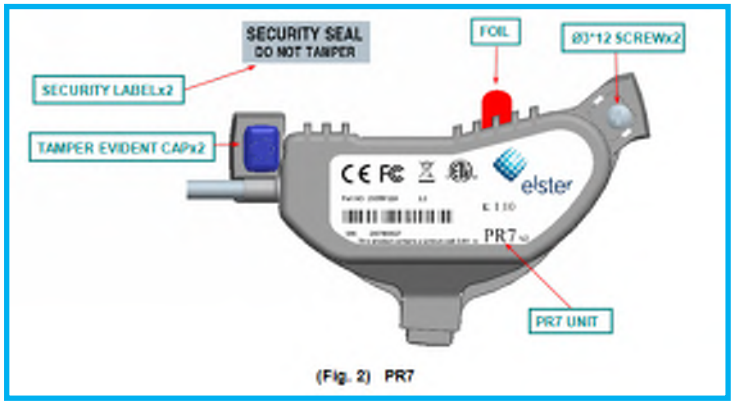
Its fitted to the **V200/V210/V220**



and the **H4000P** series of meters



Remember to remove the foil tab before fitting the pulse unit to the meter!



(Fig. 2) PR7

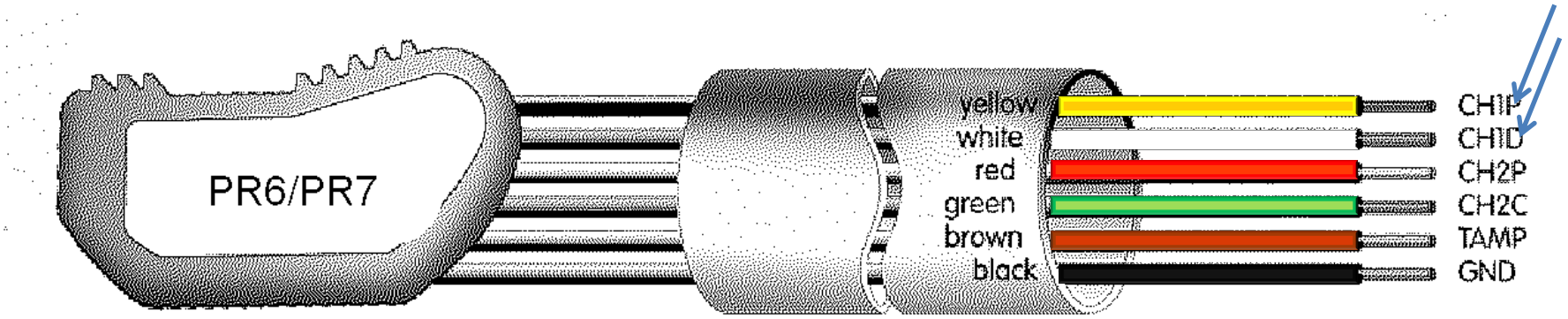
2. Elster PR7 inductive pulse unit.

Its fitted to the **H4000,C4000 and S2000** series of inductive output meters

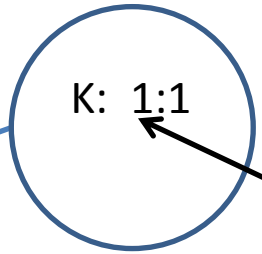


WIRING PR6 AND PR7

What each wire does







The **yellow** wire is the primary pulse output and labelled Channel 1 Pulse (CH1P)

The K factor of this pulse output is the <u>first</u> number after the 'K' on the PR6/PR7 label
(see page 7 for pulse value calculation)
CH1P outputs all pulses regardless of direction, whether the meter is running backwards or forwards.

The **white** wire labelled Channel 1 Direction (CH1D) gives the direction of the pulses on CH1P. The signal is High for Forward Flow and Low for Reverse Flow

WIRING PR6 AND PR7

What each wire does





The **red** wire is the secondary pulse output and labelled Channel 2 Pulse (CH2P)

The K factor of this output is the second number after the 'K' on the PR6/PR7 label (see page 7 for pulse value calculation)

CH2P outputs pulses that are compensated for backwards flow. The PR6/7 counts the backwards flow and stops outputting until the same forward flow has occurred.

The **green** wire labelled Channel 2 Compensation (CH2C) indicates when compensation is occurring by going to Low state during backflow compensation.

WIRING PR6 AND PR7

What each wire does



The **brown** wire is the alarm output and labelled Tamper (TAMP)
It activates to High state when the PR6/7 is removed from the meter.
It also activates to High state if the PR6/7 battery is low.

The **black** wire is the common or 0v wire and labelled Ground (GND)

WIRING PR6 AND PR7

Pulse outputs – Primary or Secondary

The PR6/7 is suitable for use with most data loggers, radio end points and counters.

- Use the Secondary (**Red**) CH2P compensated output for general data logging, remote displays, or AMR equipment.

- Use the Primary (**Yellow**) CH1P output where reverse flow monitoring is required. Most data loggers support bidirectional monitoring. However it's best to check with the data logger supplier before buying.

For applications such as SCADA, BMS, PLC, the outputs may be connected via pull-up resistor to up to 30V. Maximum sink current is 30mA.

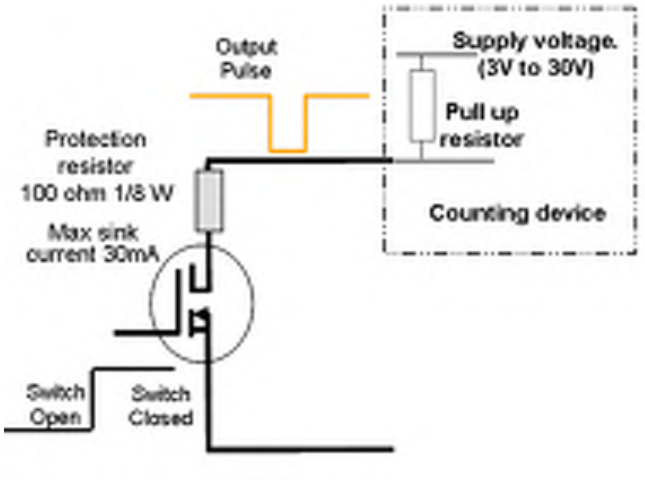


Fig1. PR6/7 Pulse output schematic

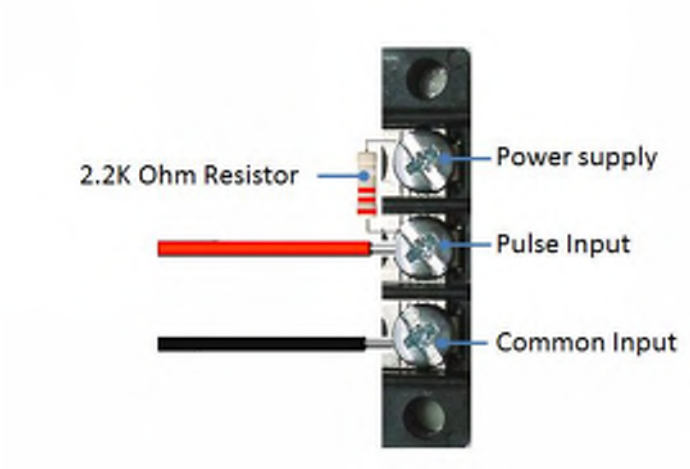
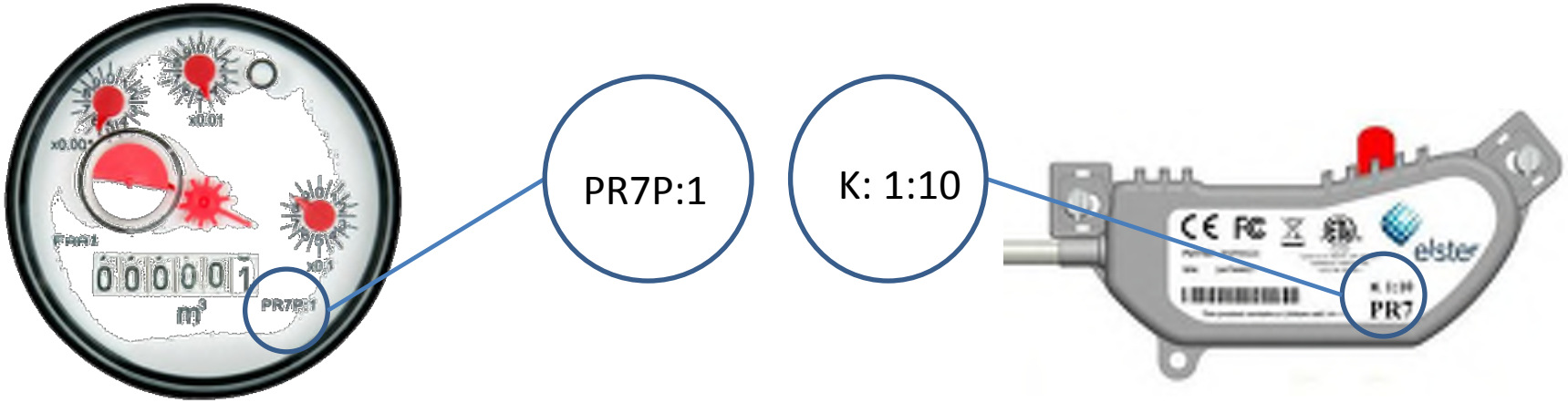


Fig 2. Wiring layout showing CH2P connected to PLC

WIRING PR6 AND PR7

K Factor – Calculating the pulse value



The pulse value (weight) is calculated by multiplying the Pulse Value P from the meter dial face by the K Value from the PR6/7 pulser label.

In the example above;-
For the Primary Pulse Output **Yellow** CH1P the pulse weight = 1x1 = 1 litre per pulse
For the Secondary Pulse Output **Red** CHP2 the pulse weight = 1x10 = 10 litres per pulse.

WIRING PR6 AND PR7

Pulser types, K Factors and example pulse values

Type	K Factor	Elster Part Number	Register Type	Primary Pulse Value	Secondary Pulse Value
PR6	1:1	2925M1221	PR6P:1	1litre/pulse	1litre/pulse
PR6	1:10	2925M1265	PR6P:1	1 litre/pulse	10litres/pulse
PR6	1:100	2925M1261	PR6P:1	1 litre/pulse	100 litres/pulse
PR6	1:1000	2925M1262	PR6P:1	1 litre/pulse	1000 litres/pulse
PR7	10:10	2925M1222	PR7P:1	10 litres/pulse	10 litres/pulse
PR7	10:100	2925M1280	PR7P:10	100 litres/pulse	1000 litres/pulse
PR7	1:-	2925M1223	PR7P:10	10 litres/pulse	n/a
PR7	1:10	2925M1224	PR7P:10	10 litres/pulse	100 litres/pulse
PR7	1:100	2925M1263	PR7P:10	10 litres/pulse	1000 litres/pulse
PR7	1:1000	2925M1264	PR7P:1	1 litre/pulse	1000 litres/pulse

Pulse widths (milliseconds) PR6 K:1 = 80, PR7 K:1 = 10, all other PR6/7 = 100.

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Standard Product Warranty

Scope of Warranty

This warranty applies exclusively to all Water Meters (the "Water Meter") and Associated Products (the "Associated Product") listed within appendix A and supplied by Elster Metering Pty Ltd ("Elster"). The warranties given in respect of the Water Meter or its Associated Product will apply when it is installed, operated, maintained and used in accordance with Elster's guidelines which include, but are not limited to, information contained in Elster's Terms and Conditions for Sale of Products and/or Services, Specifications and Installation Instructions, User and Maintenance Manuals (the "Guidelines").

This warranty applies exclusively to the original purchaser (the "Purchaser") that purchases the Water Meter or its Associated Product directly from Elster and may be extended also by an Elster authorised distributor (the "Distributor") to its purchasers.

Materials and Workmanship

If installed, operated, used and maintained in accordance with Elster's Guidelines, Elster warrants the Water Meters and its Associated Product (with the exception of software listed within Appendix A ("Software Products") to be free from defects in design, materials and workmanship for a period of twelve (12) months (the "Warranty Period") after date of shipment by Elster or its Distributor.

Elster warrants that Software Products will substantially conform with Elster's Guidelines (but does not warrant Software Products to be error free or without interruptions) and are warranted for a period of ninety (90) days after date of shipment by Elster or its distributor.

Water Meter Accuracy

If installed, operated, used and maintained in accordance with Elster's Guidelines, Elster warrants that its Water Meters will perform within the following in service maximum permissible errors as set out in their relevant Specification for the duration of the Warranty Period:

(a) The maximum permissible error, positive or negative, on volumes delivered at flowrates between the minimum flowrate (Q1) (included) and the transitional flowrate (Q2) (excluded) is 10% for water having any temperature; and

(b) The maximum permissible error, positive or negative, on volumes delivered at flowrates between the transitional flowrate (Q2) (included) and the overload flowrate (Q4) (included) is 4% for water having a temperature ≤30°C or 6% for water having a temperature >30°C.

Water Meter accuracy must be ascertained by a method and facility approved by Elster.

Electronic Devices Used to Store and Communicate Data

Where the Water Meter or Associated Product incorporates an electronic device used to store and communicate data by radio or a communicating wire and has been installed, operated, used and maintained in accordance with Elster's Guidelines, Elster warrants that the Water Meter or Associated Product will function in accordance with the Guidelines for the Warranty Period, provided it is not subjected to electromagnetic phenomena such as, but not limited to, un-natural magnetic field, radiation, electro-magnetic pulse or any mechanical intervention leading to the degradation of the ingress protection of the Water Meter or Associated Product.

The Water Meter or Associated Product may offer a number of Purchaser configurable data features, that are factory programmed by Elster during production of the Water Meter or Associated Product, such as data logging, date stamp marking, leak, burst and tamper alarms. Whilst Elster will use all reasonable efforts to ensure that these features comply with the Purchaser's requirements on dispatch from the factory, their performance is not warranted. Likewise, radio transmission ranges can vary depending on environmental conditions and installation sites and are not warranted.

Battery Powered Products

Where the Water Meter or Associated Product incorporates a battery and has been installed, operated, used and maintained in accordance with Elster's Guidelines, Elster warrants that the battery will operate in accordance with the Guidelines for twelve (12) months from the date of manufacture of the Water Meter or Associated Product, as evidenced by the serial number or otherwise marked on the Water Meter or Associated Product, provided the frequency of communication events does not exceed one (1) communication of a normal data set event per day.

ABN 98 004 088 680

If a failure in the materials and workmanship of the Water Meter or Associated Product during the Warranty Period, when installed, operated, used and maintained in accordance with Elster's Guidelines, causes premature discharge of battery power, then this failure will be covered under the specific materials and workmanship warranty specified above.

Evidence of tampering or removal of the battery at any time during the life of the Water Meter or Associated Product will invalidate this warranty.

Limits of Warranty

The warranties set forth in this document shall not apply: (a) to consumable parts, such as protective coatings that are designed to diminish over time, unless failure has occurred due to a defect in materials or workmanship; (b) to cosmetic damage, including but not limited to scratches, dents and broken plastic on ports; (c) to any failure, non-conformity or defect of the Water Meter or Associated Product or component thereof caused by aggressive water or environmental conditions (including submersion in contaminated ground water or foreign matter in the environment; (d) to damage caused by use with another product; (e) to damage caused by accident, abuse, vandalism, deliberate tampering, theft, mishandling, misapplication, misuse, fire, earthquake or other external cause; (f) to improper installation and/or damage caused by operating the Water Meter or Associated Product outside Elster's Guidelines; (g) to damage caused by services (including but limited to upgrades, maintenance, repairs and expansions) performed by anyone who is not a representative of Elster or authorised by Elster to undertake such work; (h) to a Water Meter or Associated Product that has been modified to alter functionality or capability without the written permission of Elster; (i) to defects caused by normal wear and tear or otherwise due to the normal aging of the Water Meter or Associated Product, (j) to negligent acts or omissions or malfeasance of the Purchaser or any third party; (k) to damage to the Water Meter or Associated Product caused by the Purchaser or any third party or other conditions beyond the control of Elster; or (l) if any serial number or security seals have been removed or defaced from the Water Meter or Associated Product.

ABN 98 004 088 680

Appendix A

Water Meters

Cold Water Meters (water temperature ≤30°C):

V100	Marly 3	S100P	H2000	C3000
V110	M100	S110	H3000	C3100
V130	M110	EH	H3010	C3200
V150	M120	S120	H3200	C4000
V200	M130	S150	H3500	C4200
V200P	M140	S150P	H4000	R1000
V200H	M160	S220	H4000P	R2000
V210	MOF	S220P	H4010	SM250
V210P	MOH	Y250	H4100	SM700
V210H	M170	Y250M	H4200	SM800
V230	M200	Y290	H4300	Q200
V300	M210	Y290M	H4400	Q700
Marly 2	S100	S2000	H5000	

Warm Water Meters (water temperature ≤90°C):

Marly 2	MOF	M190	S110
M130	MOH	S100	EH

Associated Products

Automatic Meter Reading (AMR) Products:

LRP	PR7	ScanCoder	Wavesense	Wavegate
LRT	TPR6	eLog	Wavetherm	Wavehub
LRB	TPR7	Beltbox	Wavelog	Waveport
BPG20	SR50	Wavecard	Wavetag	Wavelook
TRC600	PSR140	Wavefront	Wavetalk	
PR6	ScanCounter	Waveflow	Wavecell	

Software Products:

ERMII	ECM	iNet

Boundary Box Products:

Ajusta Box

Rigid Box

Contaminated Land Box

Corrugated Guard Tube

SMF01A 14/10

ABN 98 004 088 680

Montageanweisung
Operating Instructions
Instrucciones de Montaje
Instructions de Montage
Instruzioni d'impiego

MDR 3

Max. zul. Motorleistung / Max. Motor Performance / Max. Potencia Admisible del motor
Puissance max. du moteur / Pot. max. ammissibile dei motori

Ue (50 / 60 Hz)	3 (AC-3)	1 (AC-3)
120 V	3,0 kW	1,1 kW
230 V	5,5 kW	2,2 kW
400 V	7,5 kW (11 kW)*	-
500 V	7,5 kW (11 kW)*	-
690 V	7,5 kW (15 kW)*	-

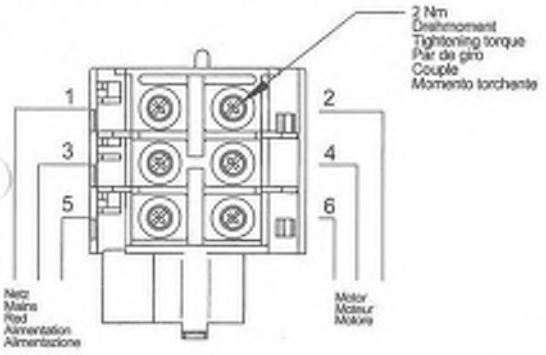
* = mit SK 3 H, SK-R3 H - with SK 3 H, SK-R3 H - con SK 3 H, SK-R3 H avec SK 3 H, SK-R3 H - con SK 3 H, SK-R3 H

Zul. Verschmutzungsgrad	3
Permissible Degree of Pollution	3
Grado polución permisible	3
Degré de pollution permissive	3
Grado di inquinamento amesso	3

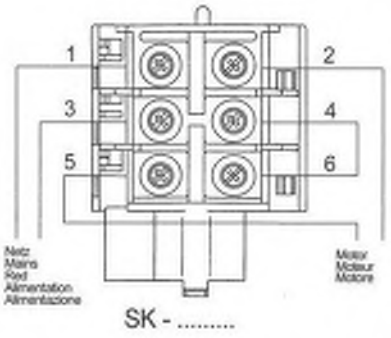


SCHALTBILD / WIRING DIAGRAM / ESQUEMA DE CONEXION / SCHEMA DE RACCORDEMENT / SCHEMA ELETTRICO

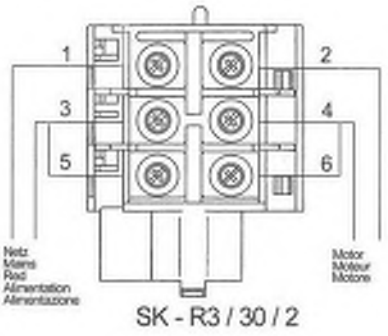
3-PHASIG / 3-PHASE / TRIFASICO / TRIPHASE / TRIFASE



1-PHASIG / 1-PHASE / MONOFASICO / MONOPHASE / MONOFASE



SK - .....



SK - R3 / 30 / 2

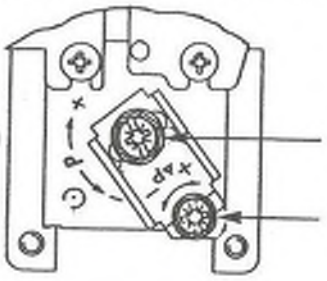
ACHTUNG: Vor der Druckeinstellung ist der Druckschalter freizuschalten. Die Druckeinstellung ist nur am montiertem Druckschalter bei unter Druck stehendem Gerät möglich.

ATTENTION: Adjustments are to be carried out only when the switch is mounted, under pressure and voltage-free.

ATENCION: Cambios de presión deberán ser efectuados solo con el presóstato montado, bajo presión y libre de tensión.

ATTENTION: Le réglage de pression ne peut se faire que lorsque l´appareil est monté, sous pression et libre de tension.

ATTENZIONE: La regolazione va effettuata solo col pressostato montato, sotto pressione e disinserito.



Druckeinstellung / Pressure setting / Ajuste de presión / Réglage de la pression / Regolazione della pressione

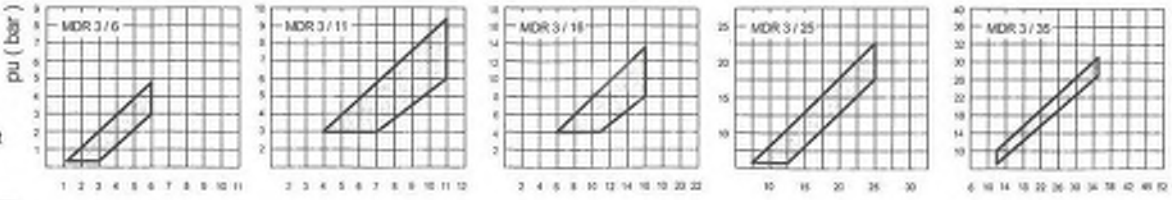
Oberer Druckwert / Upper Pressure Setting / Presion de Disparo Superior / Pression Supérieure / Pression di Distacco

Druckdifferenz / Pressure Differential / Diferencial de Presión / Différentiel de Pression / Differenziale di Pressione

Einbau und Anschluß nur durch Fachkraft; nach Anbringung von Zubehör Funktionsüberprüfung durch Elektrofachkraft erforderlich.
Installation and assembly of electrical equipment shall be carried out by qualified personnel only.
Instalación y asemblaje de equipos eléctricos deberán ser efectuados solamente por personal cualificado.
L'installation et raccordement des appareils doit être effectué par du personnel qualifié.
L'installazione e l'assemblaggio delle parti elettriche vanno eseguite esclusivamente da personale qualificato.

DRUCKDIAGRAMME / PRESSURE DIAGRAMS / DIAGRAMAS DE REGULACION / DIAGRAMMES DE REGLAGE / DIAGRAMMI TARATURE

Einschaltdruck *
Cut-in pressure
Presión de disparo inferior
Pression de d'enclenchement
Pressione di attacco

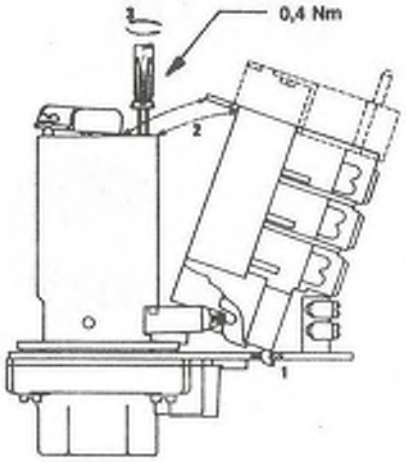


po (bar)

* MDR 3 EA in Position / I Auto
MDR 3 EA in position / I Auto
MDR 3 EA en posición / I Auto
MDR 3 EA dans position / I Auto
MDR 3 EA in posizione / I Auto

Ausschaltdruck
Cut-out pressure
Presión de disparo superior
Pression déclenchement
Pressione di distacco

ANBAU DER MODULE / MOUNTING ADD-ON MODULES / MONTAJE DE LOS MODULES / MONTAGE DES MODULES / MONTAGIO DEI MODULI



ANBAU DER MODULE / MOUNTING ADD-ON MODULES / MONTAJE DE LOS MODULES / MONTAGE DES MODULES / MONTAGIO DEI MODULI

1. - Nase wie im Piktogramm schräg einsetzen
2. - Modul nach hinten kippen
3. - Befestigungsschrauben festdrehen

Wechsel bereits montierter Module:
in umgekehrter Reihenfolge verfahren

1. - Insert catch as shown
2. - Push the module backwards
3. - Tighten screws

Changing mounted modules: proceed in reverse

1. - Insertar el tetón como en la pictografía
2. - Presionar hacia atras
3. - Apretar tornillos

Cambiar módulos ya montados: proceder al inverso

1. - Insérer le teton en oblique
2. - Pousser le module vers l'arrière
3. - Serrer les vis de fixation

Pour remplacer un module: fait l'opération inverse

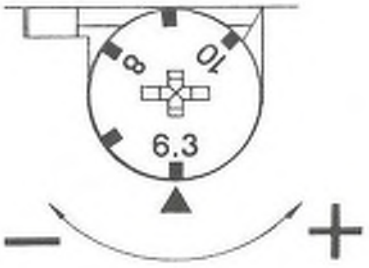
1. - Inserire obliquamente il beccuccio come da schema illustrativo
2. - Raddrizzare il modulo
3. - Serrare le viti di fissagio

Sostituzione moduli: procedere in senso inverso

Haubenbefestigung / Cover fastening / Fijación de la tapa / Fixation par coiffe / Fissaggio coperchio: 1Nm
Anbau der Module / Add-on Modules / Módules Montables / Modules complementaires / I Moduli:
s.Katalog / see catalogue / ver cátalogo / voyez notre catalogue / vedere catalogo

Kurzschlußschutzeinrichtung für MDR 3 / Protection against short-circuit for MDR 3 / Protección contra corto circuito para MDR 3
Protection contre court-circuit pour MDR 3 / Protezione contro corto circuito per MDR 3 Iq ≤ 50kA

Type / Tipo	Koordination "1" Co-ordination "1" Coordinación "1" Coordination "1" Coordinamento "1"		Koordination "2" Co-ordination "2" Coordinación "2" Coordination "2" Coordinamento "2"	
Überstromrelais Overload relais Relé térmico Relais disjoncteur Relé termico	max. Sich. gL max. Fuse (slow) max. Fusible (retardado) max. Fusible (retardé) max. Fusible (ritardato)	oder or o ou o	LS-Schalter (400 V) MCB (400 V) Automático (400 V) Disjoncteur Automatiques (400 V) Interruptore modulare (400 V)	
	400 V	690 V	400 V	690 V
SK-R3/1,0	80 A	63 A	6 A	4 A
SK-R3/1,6	80 A	63 A	10 A	6 A
SK-R3/2,5	80 A	63 A	20 A	10 A
SK-R3/4,0	80 A	63 A	35 A	20 A
SK-R3 (H)/6,3 ... 24	80 A	63 A	35 A	35 A
SK-R3 (H) / SK-R3 (H-S)	80 A	63 A	35 A	35 A



Motornennstrom am Excenter des SK-R3 Überstromrelais wie abgebildet einstellen.

Use dial to adjust the overload relay SK-R3 to the rated motor current as shown

Usar la excéntrica para ajustar el relé térmico SK-R3 a la corriente nominal del motor como en la pictografía

Déplacé l'excentrique du thermique SK-R3 a la valeur du courant nominal du moteur comme indiqué

Tarare la corrente nominale del motore sul relais termico SK-R3 agendo sull'eccentrico come indicato

Horsepower Ratings und Short Circuit Protection acc. to UL 508										
Contact Block	110 - 120 V		220 - 240 V		440 - 480 V		550 - 600 V		Short Circuit Protection	
Type	1-ph	3-ph	1-ph	3-ph	1-ph	3-ph	1-ph	3-ph	max. V	max. Fuse
SK-R3/1	-	-	-	-	-	½	-	½	600	15 A
SK-R3/1,6	-	-	1/10	⅓	-	¾	-	1	600	15 A
SK-R3/2,5	-	-	⅛	½	½	1	½	1½	600	15 A
SK-R3/4	⅛	½	⅓	1	1	2	1½	3	600	15 A
SK-R3/6,3	¼	¾	½	1½	2	3	2	5	600	25 A
SK-R3/10	½	1	1½	3	3	5	3	7½	600	40 A
SK-R3/16	1	2	2	5	5	10	7½	10	600	60 A
SK-R3/20	1½	3	3	-	-	-	10	-	600	80 A
SK-R3/24	2	-	-	7½	7½	-	10	-	600	100 A
SK-R3H/16	1	2	2	5	5	10	7½	10	600	60 A
SK-R3H/20	1½	3	3	-	-	-	10	15	600	80 A
SK-R3H/24	2	-	-	7½	7½	15	10	20	600	100 A
SK-R3/30/2	2	-	5	-	-	-	-	-	240	110 A

1. Suitable for use on a circuit capable of delivering not more than 5 kA rms symmetrical Amperes, 600 Volts maximum (240 Volts for SK-R3/30/2) when protected by nontime delay fuses as noted in the table above.
2. Suitable for group fusing of 5 kA rms symmetrical Amperes 600 V, 3-ph maximum (SK-R3/30/2 240V, 1-ph max.) when protected by time delay fuses rated max. 100 A.
3. Use 75° copper wire AWG 10 - AWG 14
4. AC Motor Load
5. Break all lines
6. Trip current is 125% of dial setting

Max. Operating pressure*	
MDR 3 / 6	90 psi / 600 kPa
MDR 3 / 11	160 psi / 1100 kPa
MDR 3 / 16	230 psi / 1600 kPa
MDR 3 / 25	360 psi / 2500 kPa
MDR 3 / 35	510 psi / 3500 kPa

* see pressure diagrams

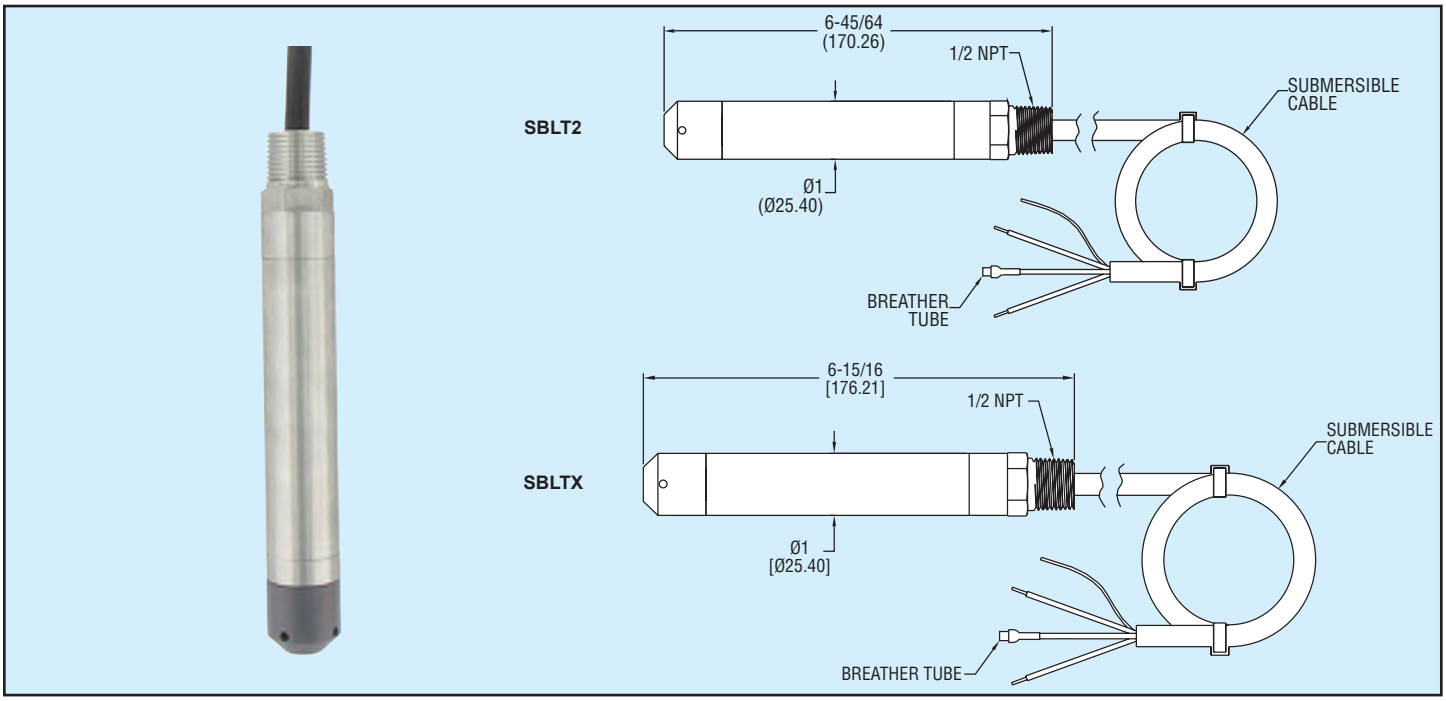
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Gebr. Frede GmbH & Co. KG
Warendorfer Straße 47-51
D-59320 Ennigerloh
vertrieb@condor-werke.com
Telefon (0 25 87) 89-0
Telefax (0 25 87) 89 140
www.condor-werke.com

30.310.93.001 04/04

Series SBLT2 & SBLTX

Submersible Level Transmitters

Perfect for Ground Water and Wells, Lightning Protected or Intrinsically Safe



SBLT2 and SBLTX Submersible Level Transmitters are manufactured for years of trouble free service in the harshest applications. Both measure the height of liquid above the position in the tank referenced to atmospheric pressure. The transmitters consist of a piezoresistive sensing element, encased in a 316 SS housing. Bullet nose design protects the diaphragm from damage.

The SBLT2 incorporates lightning and surge protection utilizing dual arrestor technology, grounded to case, eliminating both power supply surges and lightning ground strike transients (surge protection is not guaranteed and is not covered by warranty). The SBLTX is UL approved intrinsically safe for use in hazardous locations when used with proper barrier.

Units come equipped with a 270-pound tensile strength shielded and vented cable. Ventilation tube in the cable automatically compensates for changes in atmospheric pressure above the tank. The vent is protected with a maintenance free filter eliminating particulate or water droplets from entering the transducers.

- Excellent chemical compatibility
- Lightning and surge protection on SBLT2 models
- Maintenance free vent filter
- UL approved intrinsically safe on SBLTX models
- Slim design for tight applications

APPLICATIONS

Well monitoring; Ground water monitoring; Environmental remediation; Surface water monitoring; Down hole; Water tanks.

Model	Range psi (ft w.c.) [m w.c.]	Cable Length ft (m)	Cable Type
SBLT2-5-40-ETFE	5 (11.54) [3.52]	40 (12.2)	ETFE
SBLT2-10-40-ETFE	10 (23.09) [7.04]	40 (12.2)	ETFE
SBLT2-15-60-ETFE	15 (34.63) [10.56]	60 (18.3)	ETFE
SBLT2-20-60-ETFE	20 (46.18) [14.08]	60 (18.3)	ETFE
SBLT2-5-40	5 (11.54) [3.52]	40 (12.2)	Polyurethane
SBLT2-10-40	10 (23.09) [7.04]	40 (12.2)	Polyurethane
SBLT2-15-60	15 (34.63) [10.56]	60 (18.3)	Polyurethane
SBLT2-20-60	20 (46.18) [14.08]	60 (18.3)	Polyurethane
SBLT2-3.5M-5M	4.97 (11.48) [3.5]	16.40 (5)	Polyurethane
SBLT2-5M-10M	14.21 (32.81) [10]	32.81 (10)	Polyurethane
SBLT2-10M-18M	25.58 (59.06) [18]	59.06 (18)	Polyurethane

OPTIONS

Intrinsically Safe Approval- Change model number from SBLT2 to SBLTX

Custom ranges or Cable Lengths- Contact the factory

SPECIFICATIONS

Service: Compatible liquids.
Wetted Materials: 316 SS, 316L SS, epoxy; Cable: Polyurethane or ETFE; Bullet nose: PVC.
Accuracy: ±0.25% of full-scale.
Temperature Limit: SBLT2: 0 to 150°F (-18 to 66°C); SBLTX: 0 to 176°F (-18 to 80°C).
Compensated Temperature Range: SBLT2: 0 to 140°F (-18 to 60°C); SBLTX: 0 to 176°F (-18 to 80°C).
Thermal Effect: ±0.02% full-scale/°F.
Pressure Limit: 2X full-scale.
Power Requirement: SBLT2: 13 to 30 VDC; SBLTX: 10 to 28 VDC.
Output Signal: 4 to 20 mA DC, 2-wire.
Response Time: 50 ms.
Max. Loop Resistance: 900 Ω at 30 VDC.
Electrical Connections: Wire pigtail.
Mounting Orientation: Suspended in tank below level being measured.
Weight: 2.2 lb (1.0 kg).
Electrical Protection: SBLT2: Lightning and surge protection; SBLTX: None.
Agency Approvals: SBLT2: None; SBLTX: CE, cUL intrinsically safe for Class I, Div. 1, Groups A, B, C, D; Class II, Div. 1, Groups E, F, G; Class III Div. 1. (According to control drawing 01-700797-00).

ACCESSORIES

MTL5041, intrinsically safe galvanic isolator
MTL7706, intrinsically safe zener barrier



A-297, Dessicant Filter for vent tube. Removes humidity for protection of the sensor. Changes color to show saturation



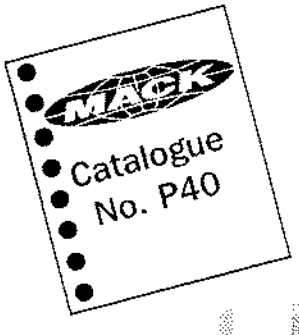
A-625, 316 SS Cable Hanger use with NPT option for attaching chain for easy pulling out of application

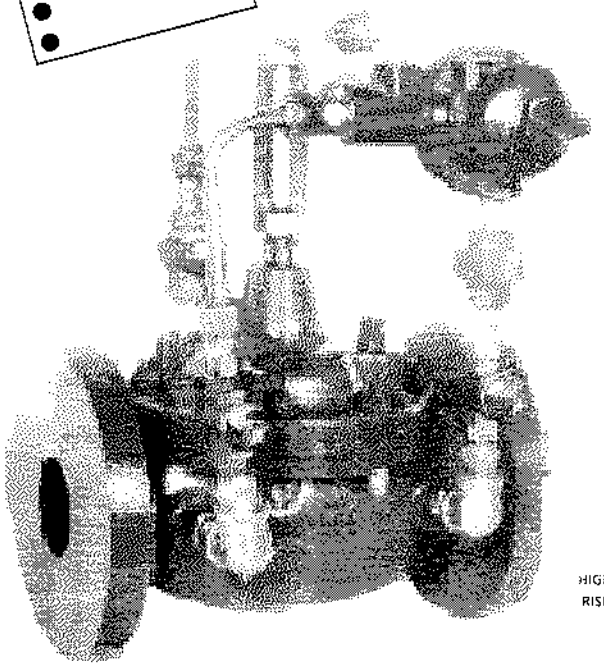
INSTALLATION AND MAINTENANCE MANUAL

Cat. No. P40 Mack ACV Series Rate of Flow Control Valve

CONTENTS

1. Installation
2. Operation
3. Adjustment Procedures
4. Maintenance Procedure
5. Spare Parts
6. Troubleshooting

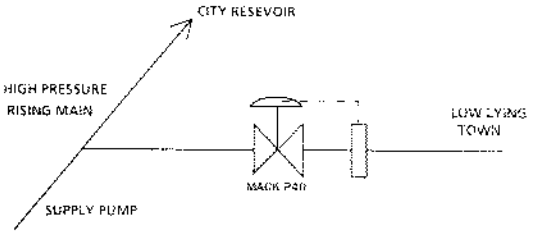




P40

TYPICAL FUNCTION & APPLICATION

- Hydraulically operated.
- Actuated by the differential pressure.
- Accurate control.
- Rate of flow adjustment by varying a spring loading on pilot valve control.
- Prevents lowering of supply pressure.
- Easily set to maintain maximum allowable flow rate.
- Limits primary water supply to a pre-set flow.



DIMENSIONS & FLOW CHART

VALVE SIZE (mm)		40F	50F	80F	80YG	100F	100YG	150F	150YG	200F	250F	300F	350F	400Y
Dimensions in mm	A	220	245	349	335	403	403	533	533	671	791	914	1000	1092
	B	143	168	235	225	292	292	405	405	508	604	707	831	940
	C	115	135	180	180	227	337	306	573	350	446	800	608	940
Dimensions in inches	A	8.66	9.63	13.75	13.00	15.88	15.88	21.00	21.00	26.41	31.13	36.00	39.38	43.00
	B	5.60	6.60	9.30	8.88	11.50	11.50	16.00	16.00	20.00	23.80	27.90	32.70	37.00
	C	4.50	5.30	7.10	7.10	8.90	13.30	12.10	22.60	13.80	17.60	31.50	24.00	37.00
Minimum Flow	l/s	0.8	0.9	1.9	2.5	3.2	4.2	7.3	9.4	12.9	18.9	25.0	31.8	60.00
	GPM	10	12	25	33	42	55	96	124	170	250	330	420	800.00
Maximum Continuous Flow	l/s	7.9	13.1	29.2	37.9	50.4	65.5	113.7	147.8	195.5	309.1	439.5	536.5	960
	GPM	104	173	385	500	665	864	1500	1950	2580	4080	5800	7080	12660
Maximum Intermittent Flow	l/s	10.6	16.7	36.0	46.8	63.6	82.7	159.1	206.9	246.3	378.9	541.8	663.0	1235
	GPM	140	220	475	618	840	1092	2100	2730	3250	5000	7150	8750	16350

Y = Angle seated pattern with flanged end connection. YG = Angle seated pattern with rolled groove end connection.
When size only quoted standard end connection shown is (F) flanged

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Email: enquiries@mackvalves.com.au Web Site. http://www.mackvalves.com.au

INSTALLATION

Before valve is installed flush pipelines of all foreign matter. Failure to do so may result in failure of the valve to operate correctly or damage to the valve not covered by warranty.

1. It is recommended that gate valves be installed at either end of the valve to facilitate maintenance that may periodically be required.

2. Install valve in the line with flow in the direction as indicated on the inlet plate or flow arrows.

3. Pressure gauges should be installed to indicate both inlet and outlet pressures along with a flow meter to facilitate the adjustment and setting of valve.

4. Orifice plate assembly should be installed downstream of main valve with5 pipe diameters of straight pipe either side.

5. Allow sufficient room around the valve to allow for adjustment and disassembly when required or as required by the local authority for safe working environment.

6. Mack ACV's operate with maximum efficiency when installed in horizontal pipelines with the cover up. However other orientations are acceptable. Due to the weight of the cover and internal components Mack Valves recommend valves of 150mm or larger are installed with the cover up so that maintenance can be carried out effectively.

7. If a pilot system is installed on the valve care must be taken to prevent damage, if necessary remove all components and fittings from the valve. Ensure they are kept clean and refitted exactly as they were.

8. After installation and when valve is first pressurised any air trapped in the cover or control tubing must be vented. Ensure all ball valves are in the fully open position and loosen fitting at high points till no more air is left in the valve.

9. If the pipeline is to be pressure tested after the valve is installed ensure that the valves rated test pressure is not exceeded.

Operation

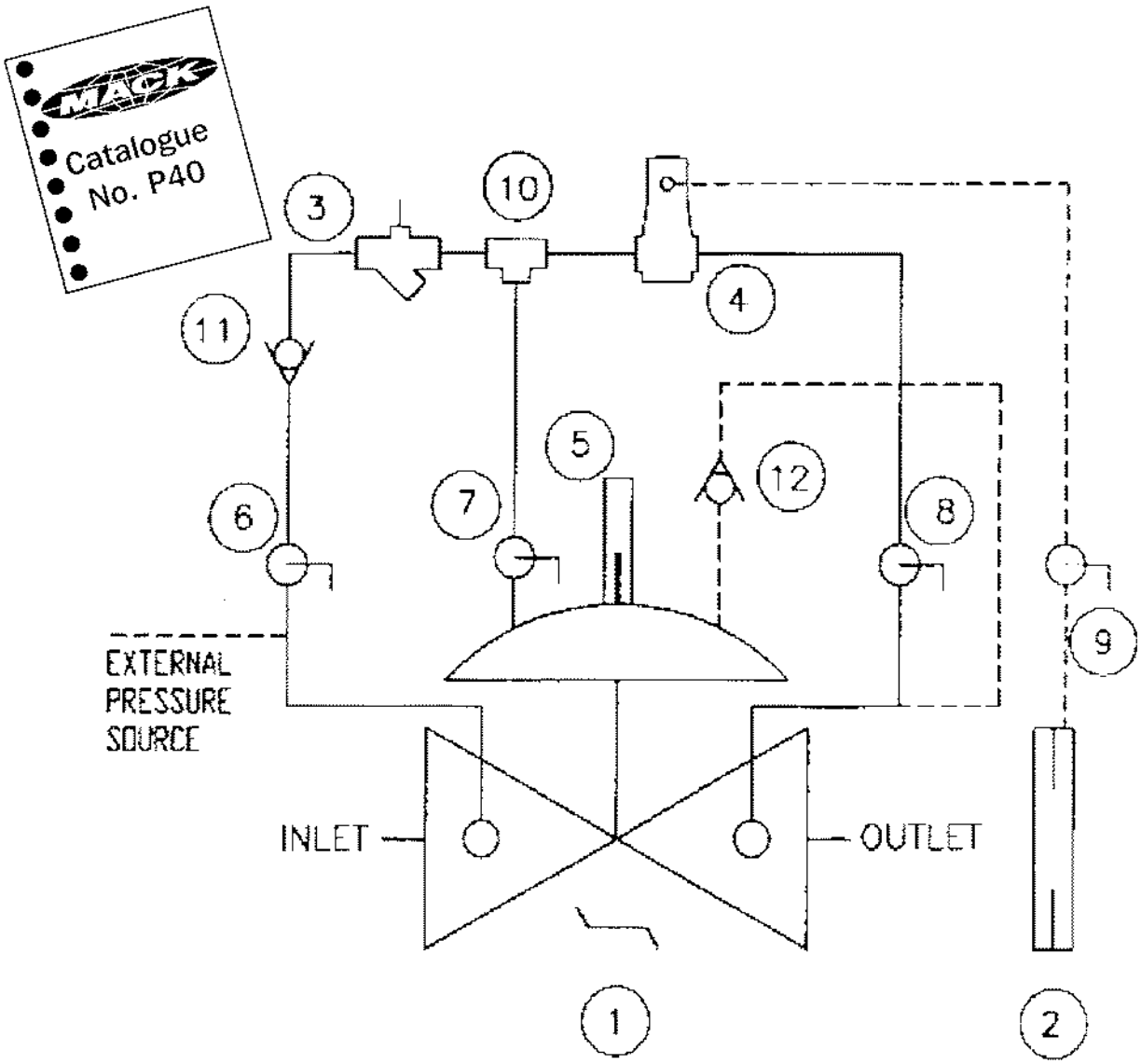
- Pilot control (4) is a normally open differential control and reacts to changes in differential pressure across calibrated orifice plate (2)

- Flow through orifice plate (2) above set point increases differential pressure causing pilot control (4) to throttle towards closed position causing more flow to top cover of main valve (1) thus throttling this valve shut.

- A decrease in flow through the orifice plate (2) decreases differential pressure causing pilot valve (4) to throttle further open allowing more flow to come of the cover of main valve (1) allowing it to open further with the ejector (10) assisting in removing pressure from cover.

- Item (3) needle valve strainer assembly keeps the pilot system clear of debris and grit and is adjusted to control the closing rate of the valve.

- Check valves items (11 & 12) are an optional extra to shut the main valve (1) in case of a flow reversal.



ITEM	TITLE
1	MAIN VALVE
2	ORIFICE PLATE ASSEMBLY
3	STRAINER / NEEDLE VALVE
4	DIFFERENTIAL CONTROL VALVE
5	POSITION INDICATOR (OPTIONAL)
6 - 8 inclusive	BALL VALVE FITTED TO 80 MM VALVES & LARGER
9	BALL VALVE SUPPLIED WITH ALL ORIFICE PLATE ASSEMBLIES
10	EJECTOR
11 & 12	CHECK VALVE (OPTIONAL)

Adjustment Procedure

To adjust the flow rate of the P40 have the downstream valves opened so that flow is going through the main valve.

Remove the cap from the CDHS18 pilot control. Wind adjusting screw clockwise to increase flow and wind anti-clockwise to decrease flow. After final setting tighten lockscrew.

The CDHS18 is sensitive to small changes in differential pressure so it is advisable to use small adjustments.

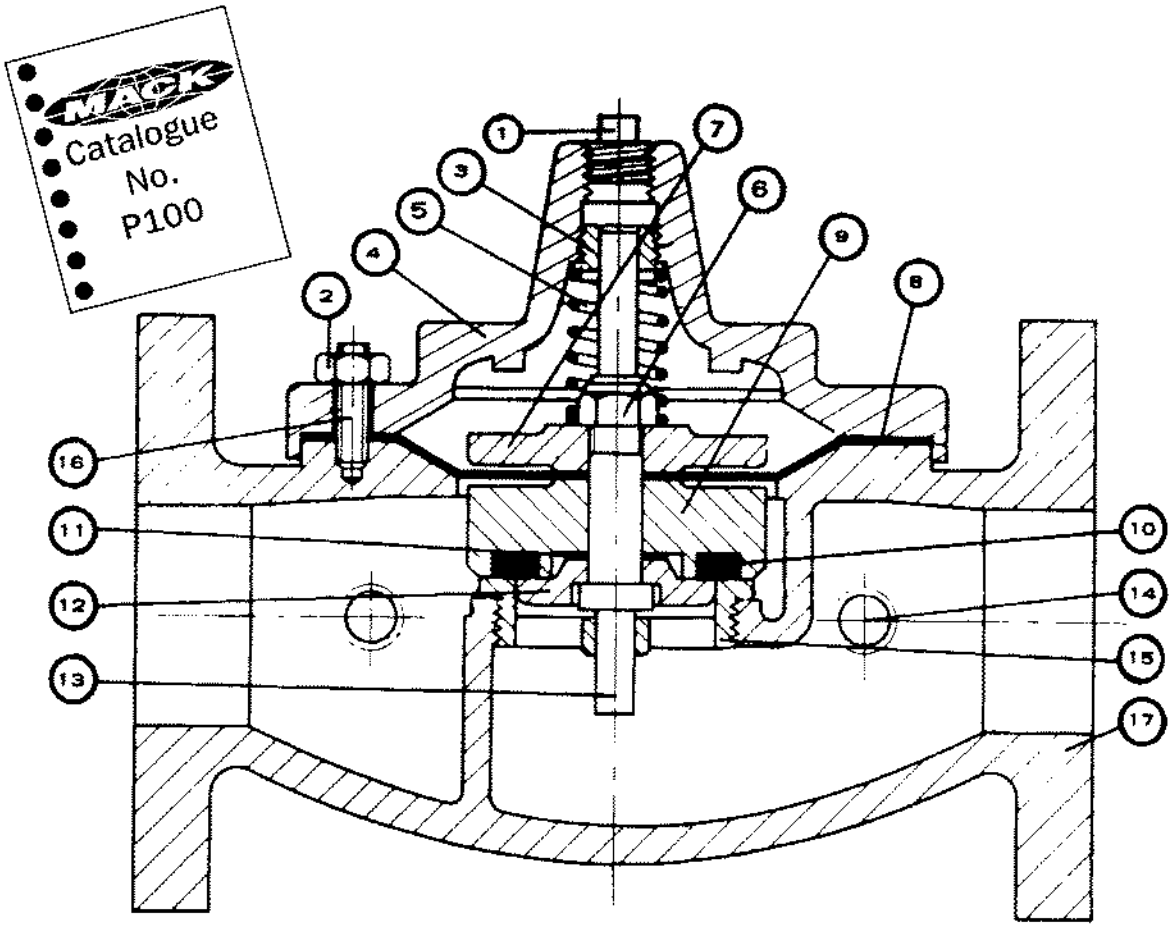
The inlet needle valve adjusts the sensitivity of the valve and the rate at which it shuts.

The valve is despatched from the factory with this set in approximately the correct position which is a small opening of 1 – 2 turns off its seat.

If the opening is too large it may cause water hammer.

If the opening is too small it may cause hunting and surging.

To adjust loosen locknut and screw adjuster clockwise to restrict opening and anti-clockwise to increase opening.



Sizes:

25mm, 40mm, 50mm, 80mm, 100mm, 150mm, 200mm, 250mm, 300mm, 350mm, 400mm

1" 1¼" 2" 3" 4" 6" 8" 10" 12" 14" 16"

ITEM	TITLE	MATERIALS	
		STANDARD	OPTIONAL
1	COVER PLUG	Galvanised steel AS1074	S/S 316 AS1444
2	COVER NUT	Plated steel	S/S 316 AS1444
3	COVER BEARING	Bronze AS2728.3/1984/C92410	
4	COVER	Cast Iron AS1830	Steel AS2074 C3 Austenitic C.1. AS1833 or Bronze AS2738 3/1984/C92410 up to 80mm
5	SPRING	S/S 304 AS1444	
6	STEM NUT	Bronze AS2728.3/1984/C92410	S/S 316 AS1444
7	DIAPHRAGM WASHER	Cast Iron AS1830	Steel AS2074 C3 Austenitic C.1. AS1833 or Bronze AS2738.3/1984/C92410 up to 80mm
8	DIAPHRAGM	Nitrile ASTM D-2000	Viton ASTM D-2000
9	DISC RETAINER	Cast Iron AS1830	Steel AS2074 C3 Austenitic C.1. AS1833 or Bronze AS2738 3/1984/C92410 up to 80mm
10	DISC	Nitrile ASTM D-2000	Viton ASTM D 2000
11	SPACER WASHER	Fibre	
12	DISC GUIDE	Bronze AS2728.3/1984/C92410	S/S 316 AS1444
13	STEM	S/S 316 AS1444	
14	BODY PLUG	Galvanised steel AS1074	S/S 316 AS1444
15	SEAT	Bronze AS2728.3/1984/C92410	S/S 316 AS1444
16	BODY STUD	Plated steel	S/S 316 AS 1444
17	BODY	Cast Iron AS1830	Steel AS2074 Austenitic C.1. AS1833 or Bronze AS2738.3/1984/C92410 up to 80mm

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MAINTENANCE PROCEDURE MAIN VALVE P100

1. Mack Valves recommends that all maintenance is carried out by a qualified technician.

2. Prior to any maintenance being carried out the pressure in the line should be isolated from the valve. Make sure also to relieve any pressure trapped in the body or cover chambers.

3. Disconnect pilot lines at fittings.

4. Unscrew cover nuts (2) and remove cover (4) on 150mm diameter and larger size valves jacking or lifting holes are provided for this purpose.

5. Remove spring (5) and diaphragm assembly (8,9 & 11)

6. Metal seat should only be removed if it needs replacing due to damage to the seating surface.

7. Examine diaphragm assembly by checking diaphragm and disc for rupture, wear or surface damage.

8. If diaphragm assembly needs to be disassembled to replace parts follow following procedure

   8.1. Hold bottom of stem (13) in vice using soft jaws so as not to damage precision machined surface

   8.2. Remove stem nut (6), diaphragm washer (7), diaphragm (8), disc retainer (9), disc guide (12) and spacer washers (11)

   8.3. All worn and damaged parts should be replaced

9. To reassemble diaphragm assembly follow the reverse procedure of disassembly the area where the disc guide (12) and disc retainer (9) sit on the stem should be smeared with a sealing silastic.

   9.1. Ensure there is enough pressure exerted on the disc (10) by the disc guide (12) when the stem nut is tight by using sufficient numbers of spacer washers (11).

10. Lightly grease top and bottom of stem (13).

11. Fit diaphragm assembly back into valve body, position spring (5) and refit cover (4) into the position it was removed from

12. Tighten cover nuts in an equal and opposite manner.

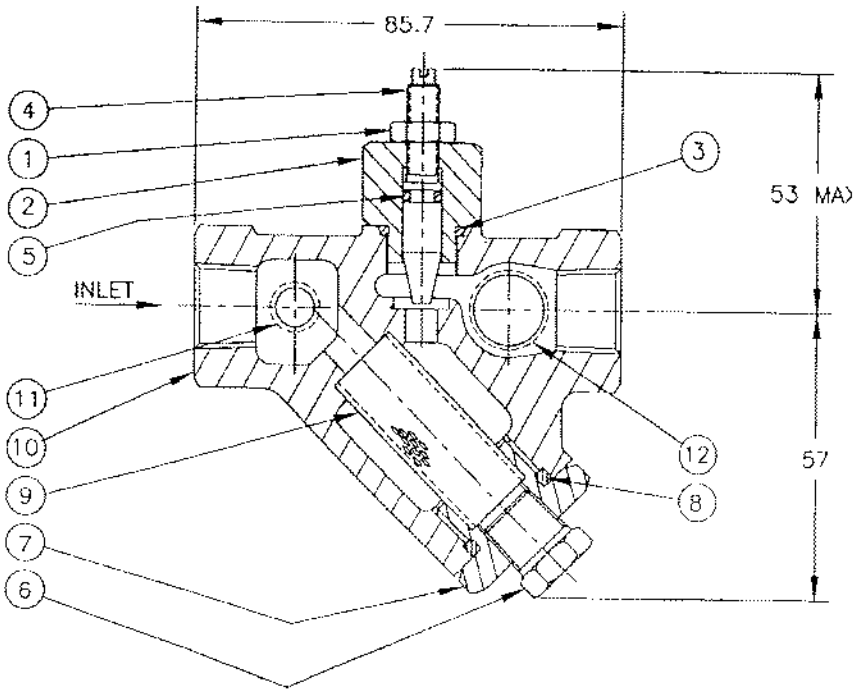
13. Refit pilot system.

Procedure to Determine if Diaphragm is Ruptured.

This procedure can be used to determine if there is damage to the diaphragm without removing cover (4) from the valve. Apply pressure to the valve inlet by ensuring the upstream gate valve is opened. Close all control line isolating ball valves. Remove a fitting from the cover if there is continuous flow the diaphragm is ruptured or the diaphragm assembly on the stem is loose.

X42N STRAINER AND NEEDLE VALVE ASSEMBLY

The Mack Valves Model X42N is a "Y" Type in-line strainer in combination with an adjustable needle valve. It's duty is to filer water before it enters ACV pilot controls and to create a predictable pressure differential at specific flows.

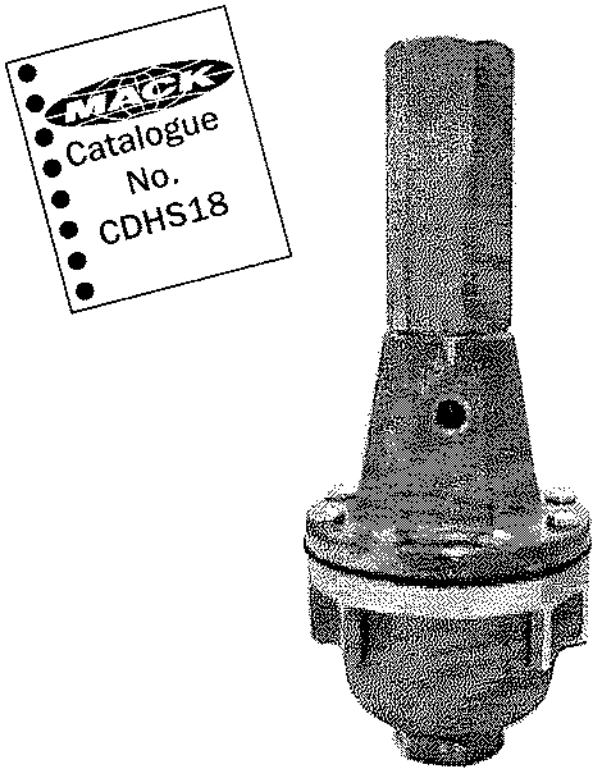


Item Number	Description
1	Hex Locknut
2	Bonnet
3	'O' Ring
4	Stem stainless steel
5	'O' Ring
6	Plug
7	Cap
8	'O' Ring
9	Screen
10	Body gun metal
11	Hex Plug
12	Hex Head Plug

MAINTENANCE PROCEDURE FOR STRAINER NEEDLE VALVE ASSEMBLY X42N-1

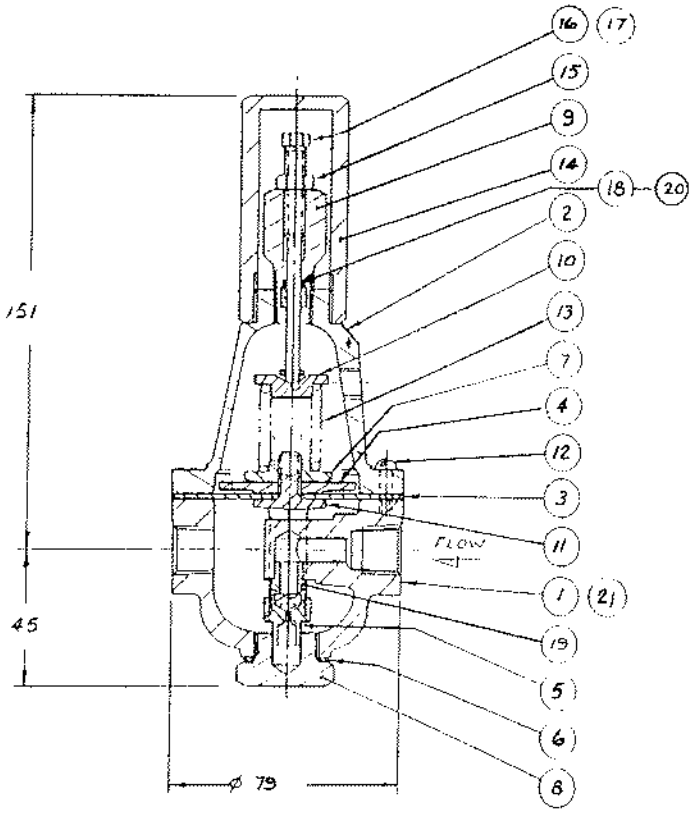
Remove strainer (9) element and remove foreign material from strainer needle valve model X42N. This procedure should be carried out every 12 months in the case of pollution this should be carried out every 3 months. No other adjustments should be made to the setting.

MACK DIFFERENTIAL CONTROL



- The **MACK** CDHS18 Differential Control closes when controlling pressure exceeds the predetermined setting.
- The **MACK** CDHS18 Differential Control is designed for use in conjunction with a **MACK** Model P40 rate of flow valve and Model P49 combination Pressure Reducing and rate of flow valve and operates within very tight pressure limits.
- The **MACK** CDHS18 Differential Control is actuated by the differential produced across an orifice plate in the main line. Accurate control is assured as very small changes in the controlling differential produce immediate corrective action of the main valve.

  Rate of flow is adjustable by varying the spring load on the control



ITEM	TITLE
1	Body
2	Cover
3	Diaphragm
4	Diaphragm Washer
5	Disc Retainer Assembly
6	Gasket
7	Diaphragm Nut
8	Plug
9	Stem Guide
10	Spring Pad
11	Stirrup Gun Metal
12	Round Head Screw
13	Spring
14	Cap
15	Hex Locknut
16	Adjusting Screw
17	Spring Pin
18	Bush
19	Seat
20	"O" Ring
21	Hex Head Plug

MAINTENANCE PROCEDURE CDHS18
DIFFERENTIAL CONTROL

1. Remove cap (14) and release all tension on spring via adjuster (16)

2. Remove screws (12) and spring cover (2).

3. Undo plug (8), the disc retainer assembly (5) can now be screwed out take care not to damage.

4. Diaphragm assembly (3,4,7 & 11) can now be removed.

5. Inspect and replace all damaged and worn parts.

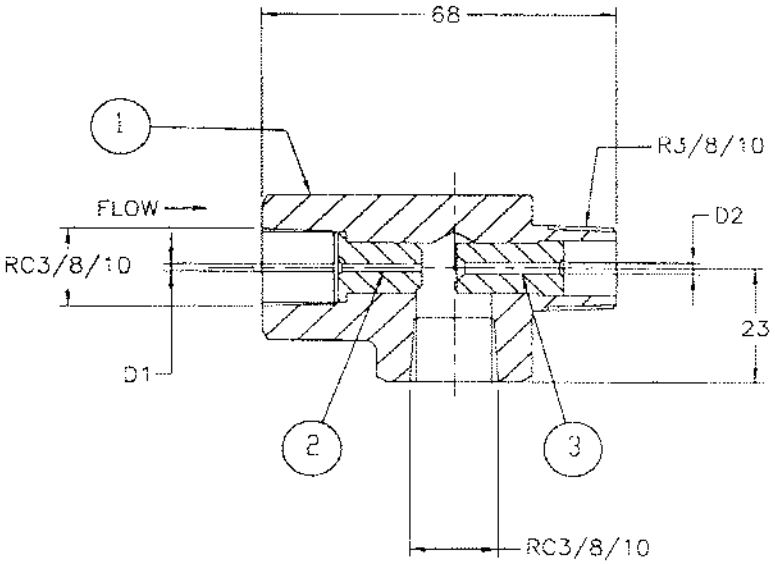
6. Reassembly is the reverse of disassembly

7. Ensure stirrup (11) does not drag on inlet nozzle.

X47 Ejector

The Mack Valves X47 ejector is a precision manufactured Tee fitting manufactured with a primary and secondary nozzle. Flow from the primary nozzle to the secondary nozzle creates a low pressure zone at the third port.

It's main use is in Mack ACV pilot systems to create a suction to assist in venting of the main cover and opening of the valve.



Item No.	Description
1	Body
2	Primary Nozzle
3	Secondary Nozzle

The X47 has no serviceable parts, should it's performance deteriorate, inspect and ensure ports are clean if there is any evidence of damage to the orifice replace entire ejector.

SPARE PARTS

Spare parts can be obtained from your nearest Mack Valves office or distributor.

When ordering spares parts provide the following information.

Valve model and size.
Date of original purchase or serial number off name plate.
Media the valve is being used on.
Inlet and outlet pressures
Any special material requirements.

SYMPTOM	POSSIBLE CAUSE	TEST PROCEDURE	REMEDY
Valve won't open.	Low pressure sensing shut-off valve in closed position	Visual check of this valve. It should be open.	Open valve
	Adjustment below desired set point.	Turn adjusting screwed "IN" and watch for the main valve to open.	Re-adjust the valve to the desired set point.
	Sensing lines reversed.	Visually check location of sensing lines. Downstream tapping on orifice flange should go to the spring chamber of the differential pilot control valve.	Connect the lines properly.
	Pilot Valve stuck closed.	Turn the adjusting screw "IN" until the spring compresses solid. You can tell this by the sudden increase in resistance to turning. Turn the adjusting screw about ¼ to ½ turn more in an effort to free the control.	Disassemble the pilot control valve, clean all parts, replace any worn ones, and reassemble. If cause of the sticking was a heavy mineral deposit, you should set up more frequent maintenance for this control.
	Main Valve stuck closed.	Close inlet control system shutoff cock. Remove plug from main valve cover. Valve should open if there is any pressure at inlet. NB:- Valve will not open with no pressure at inlet.	Disassemble main valve and clean all parts thoroughly. Pay particular attention to stem and bearing surfaces. Also make sure the disc guide is not dragging in the seat.
Valve won't close.	Flow rate is below set point.	If possible, increase the flow rate to the set point. Further attempts to increase flow rates should result in the valve throttling. If it is not possible to increase the flow rate to the set point, you can check this possibility by turning the adjusting screw "OUT". Keep track of the turns so you can return the control to its original setting.	Re-adjust the flow rate setting of the control.

SYMPTOM	POSSIBLE CAUSE	TEST PROCEDURE	REMEDY
Valve won't close.	Pilot Control valve diaphragm worn or loose diaphragm nut.	Disconnect low-pressure sense line. Apply pressure to the high-pressure sense line. Flow should appear at the open low-pressure connection of the pilot control valve.	Replace the diaphragm or tighten the diaphragm nut.
	Clogged primary jet in ejector.	Disconnect low-pressure sense line and apply pressure to high-pressure sense line. Main valve cover pressure should equal inlet pressure.	Remove ejector and clean jet. Make sure you do not enlarge the jet diameter as you clean it. This is a good time to check the strainer too.
	Worm main valve diaphragm.	Close inlet control system shutoff cock. Remove plug from main valve cover. Apply pressure at valve inlet. Continuous flow form the open port indicates damage diaphragm.	Disassemble and replace main valve diaphragm. Try to determine the immediate cause of failure and remedy this condition if possible.
	Main Valve stuck open.	Slowly close block valve "B" and observe main valve position indicator. Main valve should slowly close.	Disassemble and clean all parts of the main valve. Particular attention should be given to the stem and bearing surfaces. If this condition is chronic and is due to excessive scale build-up, you should open up the clearances to 0.4mm on the diameter, or install delrin sleeved stem.
	Pilot Valve stuck open.	Turn adjusting screw "IN" until the spring compresses solid. You can tell this by the sudden increase in resistance to turning. Turn the adjusting screw about ¼ to ½ turn more in an effort to free the control.	Pilot valve must be disassembled and cleaned. Replace any worn parts, reassemble, and test. If cause of the sticking is excessive build-up of mineral deposits, you should set up more frequent maintenance checks.
	Plugged or partly plugged orifice sensing ports.	Disconnect sense lines. Open shut-off cocks. Large stream of water under high pressure should be present.	With a suitable size rod, for out sensing ports in orifice holder. Make sure you get all the way into the middle of the pipe.

ADVANCED PUMP TECHNOLOGIES PTY LTD

PERMAGLASS TECHNICAL MANUAL
-PUMP COLUMN-



First Edition SEP 2014

Foreword

Welcome to the First Edition of the Permaglass® Technical Manual. Permaglass has enjoyed a long and successful history in Australia for the manufacture and supply of premium FRP piping systems for Bore Pump Column & Bore Casing applications. The products have been utilized in some of the harshest applications imaginable in Australia. It is widely considered that Australia can, and does produce some of the most challenging expectations from product manufacturers in terms of the installation environment and the poor water quality the products are subjected to. In this manual, we cover detailed requirements and identify application considerations when designing systems utilizing premium, Permaglass® FRP products.

Permaglass is a registered product with intellectual property owned by Advanced Pump Technologies and is manufactured under a licensed joint-venture by RPC Technologies.

Disclaimer

All reasonable care has been taken to ensure the accuracy of the contents, however Advanced Pump Technologies shall not be liable for any loss whether direct, indirect, incidental or consequential arising out of the use of, or reliance upon any of the content of this publication.

This publication is designed to provide technical data and information gathered from various sources. The data and information is presented with the express understanding that Advanced Pump Technologies and RPC Technologies are not engaging in the design of complete water infrastructure systems.

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2 INTRODUCTION – WHAT IS FRP?

Fibreglass Reinforced Plastic (FRP/GRP) or GRE are all material names for “Fibreglass” Pipe.

Permaglass® FRP PUMP COLUMN is high quality Fibreglass Pipe which has been used in Australian and International pump installations for over 25 years. Permaglass® is manufactured to Australian Standards and also incorporates Testing and Post Curing to ensure the highest quality and mechanical strength is achieved.

FRP is constructed with a Filament Wound Glass Reinforced Polyester Resin with material content as follows:

- Corrosion Resistant Isophthalic Polyester Resin – Dion 61386
- ‘E’ Glass reinforcement in chopped and continuous strands. Minimum glass content 50%.
- High Performance internal Isophthalic C veil reinforced resin applied to the internal mould surface.
- High performance externally applied Isophthalic NPG Flowcoat for external finish.

3 PRODUCT DESCRIPTION, FEATURES & BENEFITS

Permaglass® FRP PUMP COLUMN is a lightweight, rigid rising main, specifically designed for submersible borepump installations. It will not corrode like steel or twist and stretch like flexible hose, and is very quick and easy to install.

Permaglass® FRP PUMP COLUMN is suitable for nominal pump settings up to 200mts for Standard Duty, and 350mts for Heavy Duty. Deeper applications can be accommodated in some instances. Please contact your supplier to verify maximum tensile loads for applications outside the tables shown in section 5.1.

FEATURES:	BENEFITS:
• KWIK-LOK Joints (very quick and easy to assemble). • Anti-Torque Non-Rotating Joints. • Corrosion Resistant • Lightweight Column • Various Lengths • High Tensile Loads for deeper bores.	• Fast Installation and Removal (by a team of 2) • Long Service Life- Reuse Over Many Years • Easy to Add or Remove Sections for specific and varying depths. • Rigid design. Does not stretch, expand or twist causing potential failure of electrical drop cables and motors. • Standard Lifting Practises are employed to reduce OH&S hazards. • Deeper bore applications due to high tensile load capability.

4 APPROVALS

Permaglass® manufacturing facilities are fully certified to AS/NZS ISO 9001:2008.


BUREAU VERITAS
Certification

Certification

RPC TECHNOLOGIES PTY LTD

AS/NZS ISO 9001:2008

5 PERFORMANCE DATA

When selecting Permaglass® Column, take careful consideration of critical factors such as:

- The OD at the coupling joints. Ensuring there is sufficient available area between the borecasing ID and column annulus to allow for drop cable to fit.
- Total weight of the entire installation does not exceed the Maximum Equivalent Tensile Load (see Performance Table below).
- Water quality. If water is corrosive, consider using alternative PEEK locking cords and duplex End-Connectors. See section 8.4 for further details.
- Total system pressure does not exceed the Maximum Allowable Internal Pressure.

5.1 DIMENSIONS & PERFORMANCE TABLE

- SD Suffix = Standard Duty Column
- HD Suffix = Heavy Duty Column

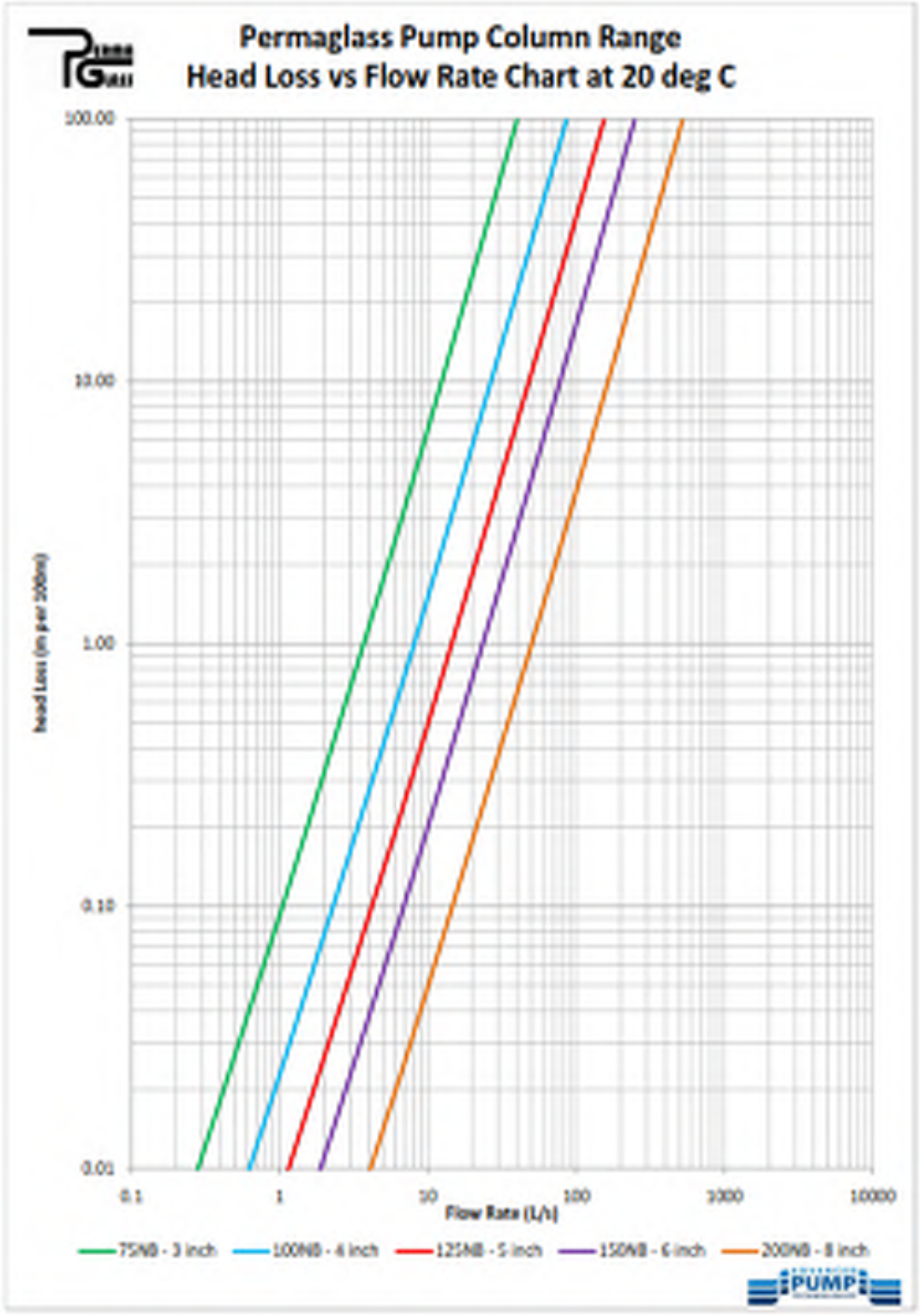
Size	Internal Diameter	OD at Coupling	Standard Wall Thickness	Locking Cord Diameter	Weight	Maximum Equivalent Tensile Load*	Maximum Allowable Torque	Maximum Allowable Internal Pressure
	mm(in.)	mm	mm	mm	kg/m	kg	kg.m	kPa
75SD	76(3)	112	5	6	2.1	3580	40	6430
75HD	76(3)	112	6.5	6	2.7	4630	56	8420
100SD	101.7(4)	143	5	6	2.8	6390	71	4875
100HD	101.7(4)	143	8	6	4.5	8070	125	7905
125SD	127.1(5)	169	6.5	6	4.6	8110	151	5190
125HD	127.1(5)	169	9.5	6	6.7	9850	235	7610
150SD	152.5(6)	202	6.5	8	5.5	11340	215	4355
150HD	152.5(6)	202	9.5	8	8	14250	334	6415
200SD	203(8)	267	8	10	8.9	14840	479	4100
200HD	203(8)	267	11	10	12.3	18920	688	5660

- *Tensile load = axial stress due to the combination of internal pressure, weight of pump & motor, electrical cable, shutoff head, FRP column and the water in the column.
- Refer to supplier if uncertain of load calculation or should load exceed maximum load.
- Effective lengths available - 5m (standard), 3m, 2m, 1m.
- Handles 80C. Up to 100C (refer to supplier for over 80C).
- Suitable for potable water.
- Locking wires in 316 stainless steel (standard) special composite PEEK cord for highly corrosive water.

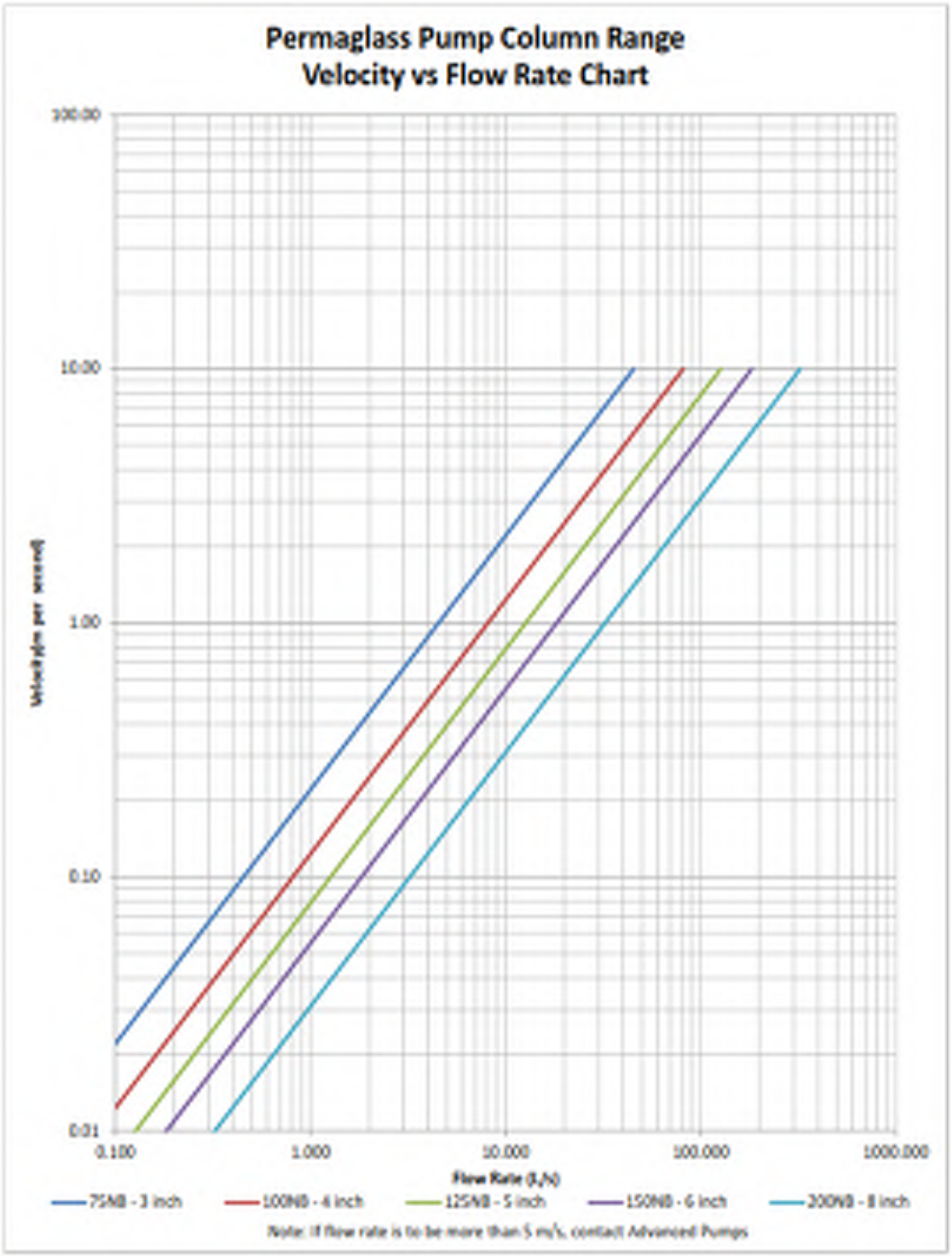
5.2 FRICTION LOSS - CHART

The friction loss table below is applicable for both Standard Duty and Heavy Duty Permaglass®. Heavy Duty Permaglass® has a larger OD. The ID remains the same for both Standard Duty and Heavy Duty.

Note: Joint OD remains the same for both Standard & Heavy Duty Permaglass®.



5.3 VELOCITY CHART



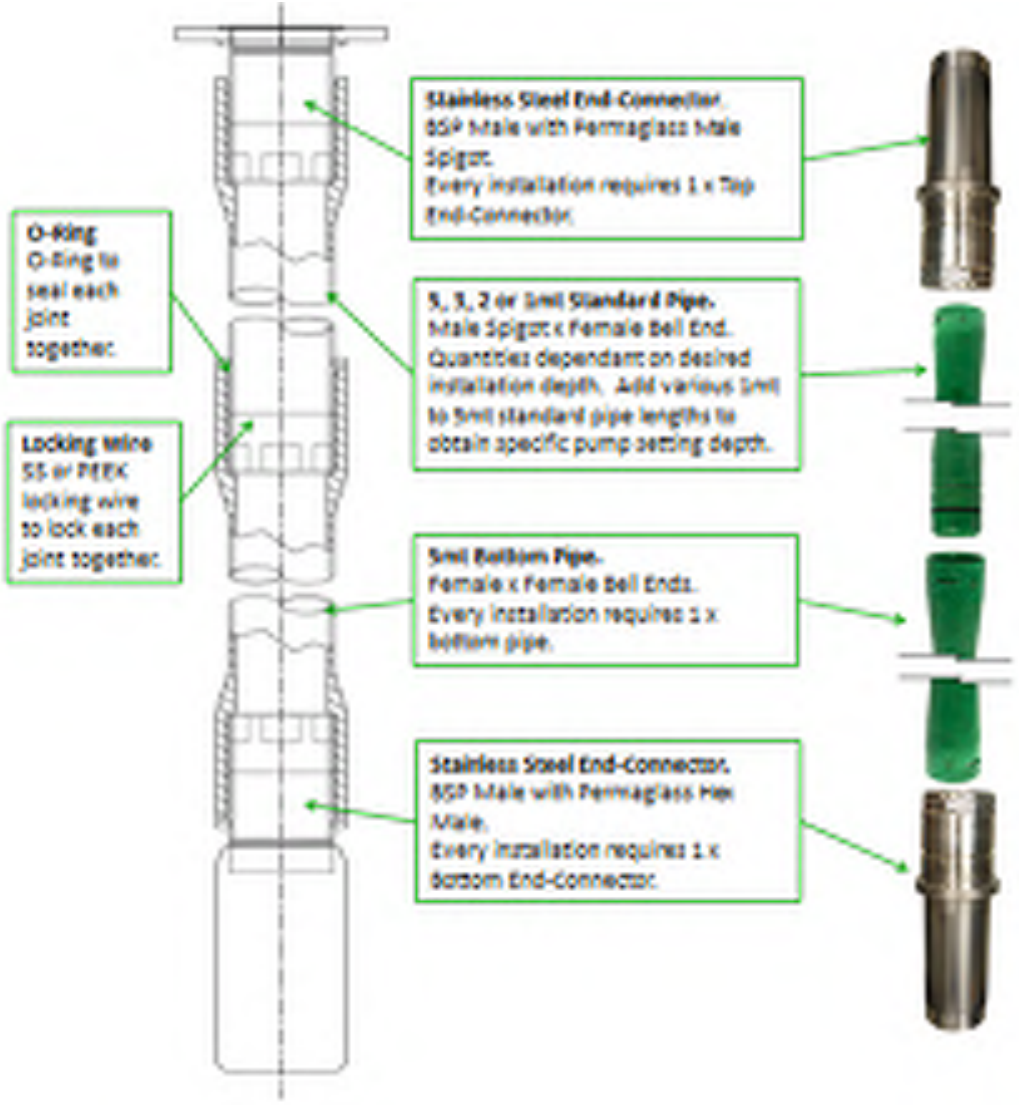
6 SYSTEM COMPONENTS

This section describes each of the components required for one complete bore installation.

The following sections describe each component in further detail.

6.1 GENERAL ARRANGEMENT

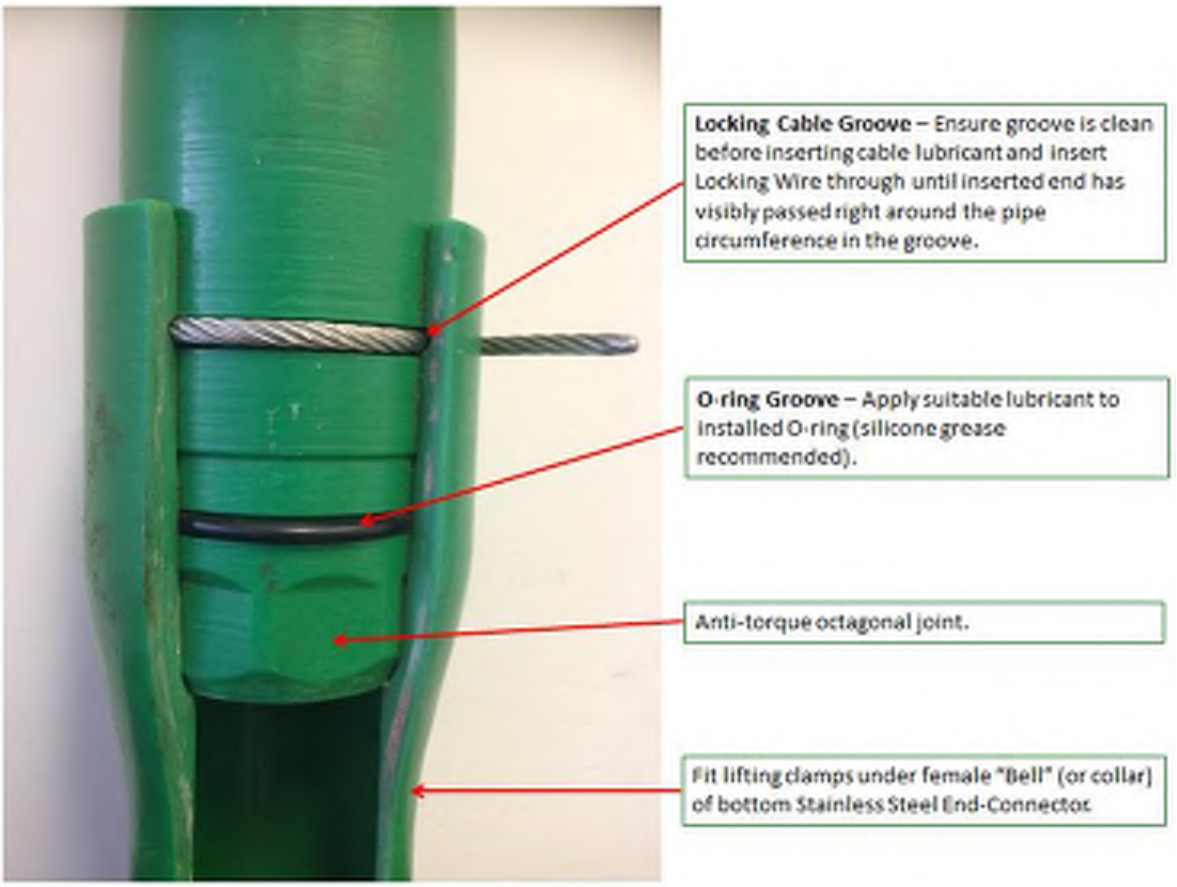
Below is a basic arrangement diagram of a typical installation. Please observe the following sections to learn about each component in further detail.



6.2 JOINTS

Permaglass FRP Pump Column is coupled using the Kwik-Lok joint which consists of an O-ring for pressure sealing and a 316 stainless steel Locking Wire.

Permaglass FRP Pump Column has an Anti-Torque Octagonal male spigot end to stop rotation of the pipe joint with pump thrust. The 316ss End-Connectors are threaded one end for pump and headworks connection, and the other end is a machined Permaglass male spigot for connecting into the double-ended female (bottom pipe) and standard female bell (top).



It is recommended to wrap PermaTape around each bell end connection to prevent dirt ingress in the joint. This will assist to separate the joints at a later stage if needed, as well as preventing the Locking Wire being caught on installation/removal.

6.3 LOCKING WIRES & CORDS

Locking Wires are used to secure each joint together. Standard Locking Wires are made of 316ss materials which are suitable for most raw water applications.

A standard 316ss Locking Wire is supplied with each standard length of Permaglass®.

For aggressive water applications, an optional locking cord made of "PEEK" (Polyether Ether Ketone) is available. See section 8.4 for further details for aggressive water applications.



CODE	SIZE (to suit column)	Description
PER3-LOCKWIRE	80mm	80mm Stainless Steel Locking Wire
PER4-LOCKWIRE	100mm	100mm Stainless Steel Locking Wire
PER5-LOCKWIRE	125mm	125mm Stainless Steel Locking Wire
PER6-LOCKWIRE	150mm	150mm Stainless Steel Locking Wire
PER8-LOCKWIRE	200mm	200mm Stainless Steel Locking Wire
PEEK3- LOCKCORD	80mm	80mm PEEK1000 Locking Cord
PEEK4- LOCKCORD	100mm	100mm PEEK1000 Locking Cord
PEEK5- LOCKCORD	125mm	125mm PEEK1000 Locking Cord
PEEK6- LOCKCORD	150mm	150mm PEEK1000 Locking Cord
PEEK8- LOCKCORD	200mm	200mm PEEK1000 Locking Cord

The Locking Wires supplied are suitable for both the Standard-Duty and Heavy-Duty pump column.

6.4 O-RINGS

O-Rings are used to seal the joints. O-Rings are made of EPDM elastomers.



O-Rings are not required to be ordered separately. O-Rings and Standard Locking Wires are supplied with each standard pipe length.

However, replacement O-Rings are available if required.

CODE	SIZE (to suit column)	Description
PER3-O-RING	80mm	80mm O-Ring
PER3-O-RING	100mm	100mm O-Ring
PER3-O-RING	125mm	125mm O-Ring
PER3-O-RING	150mm	150mm O-Ring
PER3-O-RING	200mm	200mm O-Ring

The O-Rings supplied are suitable for both the Standard-Duty and Heavy-Duty pump column.

6.5 END-CONNECTORS

Each complete Permaglass installation requires two (2x) End-Connectors.

One is to connect to the pump discharge head, referred to as the "Bottom End-Connector". The second is to connect to the discharge headworks at the surface, referred to as the "Top End-Connector".

The Bottom End-Connector is available with, or without a break-off pin fitted. See section 6.6 for further information regarding the use of break-off pin.

All End-Connectors are 316ss materials and have BSP Tapered Male connections.

For aggressive water applications, Duplex End-Connectors are available as an option. See section 8.4 for further details for aggressive water applications.





If an exact pump-setting depth target is desired, please note that each End Connector will add a short length to the overall column dimensions. The table below illustrates the additional "effective length" added by the End-Connectors to the overall column length.

END CONNECTOR DIA	EFFECTIVE LENGTH per END-CONNECTOR
80mm	200mm
100mm	250mm
125mm	260mm
150mm	310mm
200mm	350mm

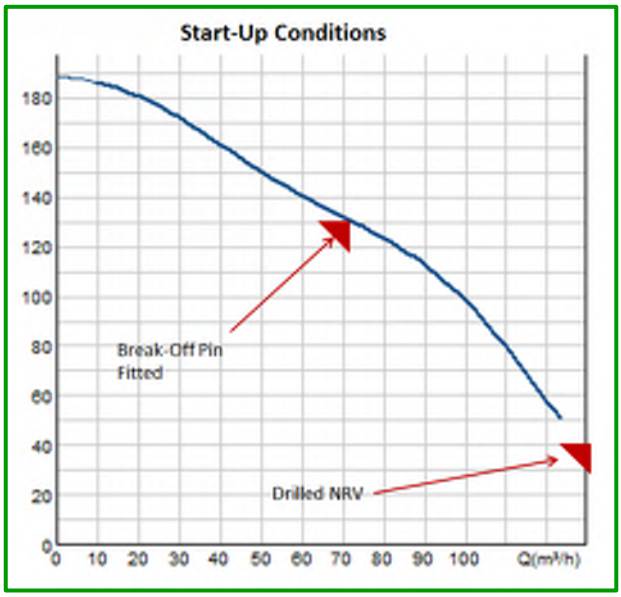
6.6 BREAK-OFF PINS

Break–off Pins are the preferred alternative to drilling a hole in the pump's non-return valve (NRV). In the past, drilling a hole in the NRV has evolved as a widely accepted practice for borehole applications. This was attributed to the limitations of flexible hose columns, as this was the only viable option to enable the retrieval of a flexible hose column. The full column of water needed to be drained in order to lift the flexible hose.

As Permaglass® is installed in maximum 5mt sections; the water is able to be drained when each section is disconnected. However, using this technique resulted in a wet work area which presents undesirable OH&S outcomes in the current day work environment.

Drilling NRV's was a result of the above two scenarios and had become the only solution (albeit a remedial effort), until the development of the Break-Off Pin.

Moreover, pump manufacturers do not endorse drilling NRV's as "good practice". When a pump is in standby mode, the water level in the column drains to the well's natural standing water level. When the pump is called to start, the pump is now starting under no load and the performance duty is now running off-the-curve (see illustration to the right). The result can be:



- Upthrust of the pump shaft & impellers
- Cavitation

Both of these conditions will cause premature pump failure.

In addition to this, it is quite common that the pump may be contributing to a pressurised pipeline network. In this circumstance, on pump start-up, the column will eventually fill up and meet a pressurised main which is held by the non-return valve fitted to the bore headworks at the surface. The result is a fast moving column of water meets a stationary column of water at a rapid rate. The result can be:

- Increased water hammer
- Damaged motor thrust bearings
- Breaking Pump Shafts
- Stress on all mechanical components

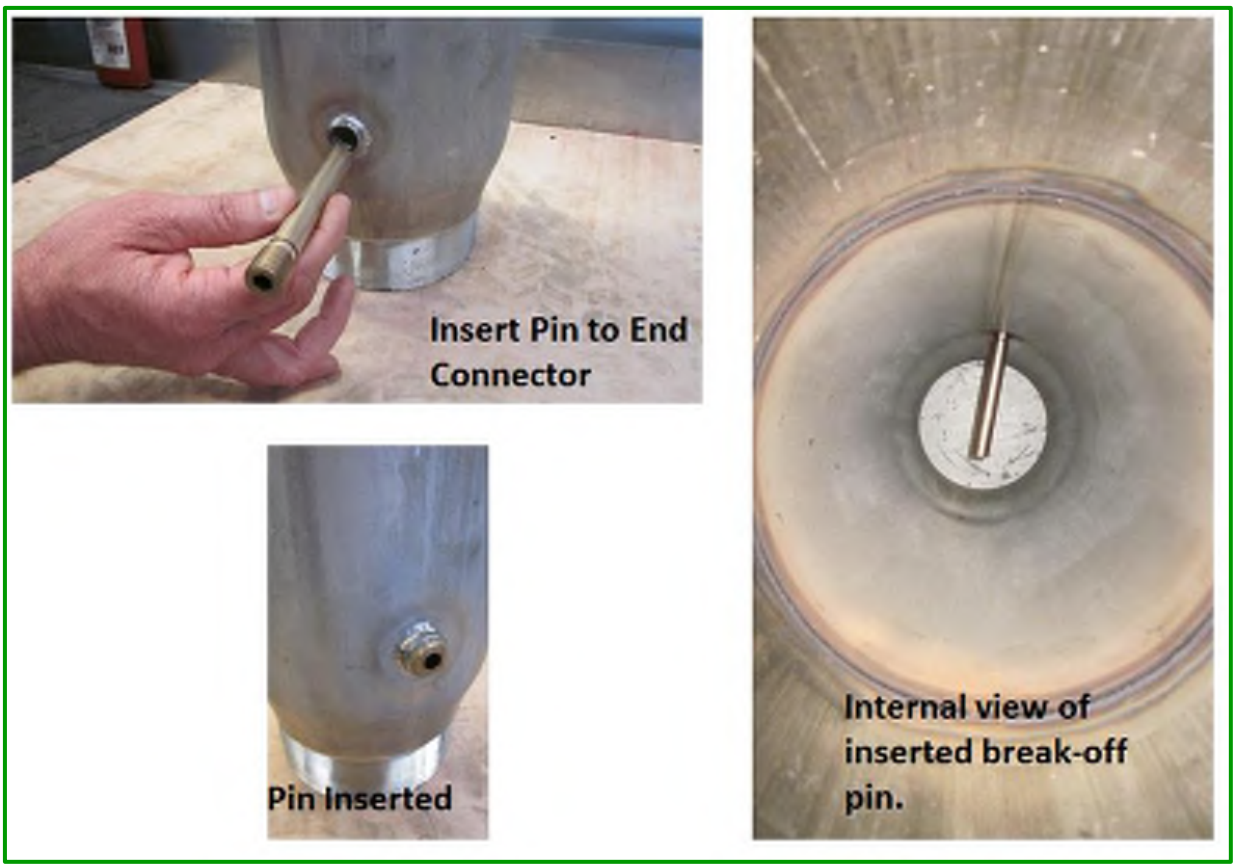
All causing premature failure of pumps & motors.

To address these issues, Permaglass developed a break-off pin.

The Break-Off Pin is inserted into the Bottom End-Connector. When the pump needs to be retrieved, a heavy, narrow weight (TORPEDO) is gently lowered down the centre of the column until it comes to rest (bottoms-out) on the "bar" of the break-off pin. The weight is then lifted a few centimeters and

then left to “drop” onto the pin, thus breaking the pin and allowing water to evacuate the column out into the borecasing.

Before re-installing the column, replace with a new break-off pin.



6.7 CABLE SUPPORT OPTIONS

For small cable diameters, PermaTape can be used to secure the drop cable to the pump column. Larger (heavier) cable diameters require PermaStrap.

The following table details the recommended quantity of cable supports required.

As Permaglass® is a rigid column; there is no need to allow for additional slack in the drop cable to allow for column "stretch".

POWER CABLE WEIGHT (P/MTR)	Minimum Qty of cable supports	
	PermaTape	PermaStrap
Less than 1.7kg/m	Every 2 mtr	Not required
1.8kg/m to 2.5kg/m	not suitable	Every 3mt
2.6kg/m to 4.0kg/m	not suitable	Every 2mt
4.1kg/m to 5.0kg/m	not suitable	Every 1mt
Over 5kg/m	Consult Permaglass	



PermaTape Cable Support

PermaTape is a heavy duty PVC pipe protection tape coated with an anti-corrosive and aggressive adhesive. It is designed for above ground and underground applications making it suitable for use in bore holes.

PermaTape is user-friendly in its installation and is designed to provide ease and flexibility in fastening cables to Permaglass® Pump Column.

The recommended installation is for PermaTape to be wrapped around the bell ends to prevent silt build up in the joint. PermaTape should also be wrapped around the stainless steel locking wire to prevent damage to the cable and bore casing.

Advantages of the Perma-Tape System Include:

- 5 years of proven bore service.
- No sharp edges.
- High tensile strength after fastening.

Specifications . . . . . .

- Dimensions: 72mm wide x 0.25mm thick
- Roll length: 33m
- Breaking load: 44N/cm
- Elongation: 220%
- Continuous Use Temperature: -5 C to 80 C
- Colour: Black



PermaStrap Cable Support



The PermaStrap Cable Strap System is a user-friendly product designed to provide ease and flexibility in fastening heavier cables to Permaglass® Pump Column.

This system includes weather-resistant acetyl cable straps and marine grade locking devices.

Advantages of the PermaStrap System Include:

- 10 years + proven bore service.
- No sharp edges.
- High tensile strength after fastening.

Specifications . . . . . .

- Minimum Tensile Strength: 1,211N minimum.
- Outdoor Life: Designed to last a minimum of 20 years.
- Continuous Load: 9.07 kg
- Continuous Use Temperature: -65 C to 90 C
- Colour: Black.
- Strap and Body: Weatherable acetyl; offers superior resistance to sunlight, moisture, and salt environments.
- Locking Device: Marine-grade corrosion-resistant silicon copper alloy.

6.8 LIFTING CLAMPS

To ensure the safe handling and installation of Permaglass® FRP Pump Column, a pair (x2) of certified lifting clamps is required.



Both the Standard Duty and Heavy Duty Permaglass® use the same lifting clamp.

The clamps can be re-used many times, and should be considered a necessary tool for every installation. Installer should regularly check the condition of the clamps to ensure they are in good working order and the lifting wings have not been damaged. If wings are damaged, the clamps may need to be re-tested for SWL certification.

Genuine Permaglass Lifting Clamps are certified tested with SWL stamped on each clamp. Certification documents are provided with each clamp.

CODE	SIZE (to suit column)	Description	SWL (Tonne)
PER3-LC	80mm	80mm Lifting Clamp – Certified (per unit)	3T
PER4-LC	100mm	100mm Lifting Clamp – Certified (per unit)	5T
PER5-LC	125mm	125mm Lifting Clamp – Certified (per unit)	7T
PER6-LC	150mm	150mm Lifting Clamp – Certified (per unit)	11T
PER8-LC	200mm	200mm Lifting Clamp – Certified (per unit)	20T

7 SYSTEM CHECK LIST

A check list has been provided to ensure all items are accounted for when making a materials take off list for a bore installation.

CHECK LIST – ESSENTIAL ITEMS				
Description	**STD Duty/ Heavy Duty**	**Nominal Bore**	**QTY**	**CHECK**
Stainless Steel End Connector – Top				
Stainless Steel End Connector – Bottom. Fitted with break off pin/dewatering plug.				
Bottom Pipe – 5mt				
Standard Pipe – 5mt				
Standard Pipe – 3mt				
Standard Pipe – 2mt				
Standard Pipe – 1mt				
PermaTape (30mt Roll)				
PermaStrap Cable Support Strapping (330mt Roll)				
PermaStrap Cable Support Toggles (Box 500)				

CHECK LIST – OPTIONAL ACCESSORIES				
Description		**Nominal Bore**	**QTY**	**CHECK**
Lifting Clamps (2 required for installation)				
Torpedo Weight				
PEEK Locking Cords (for aggressive water)				

Note: there is no need to order O-Rings and Locking Wires separately. Standard S/S Locking Wires and O-Rings are supplied with every length of Permaglass® ordered. Additional spare O-Rings and Locking Wires are available as spares. See section 6 for part numbers.

For aggressive water applications, non-corrosive PEEK Locking Cords are available as an option and must be ordered separately.

8 APPLICATION CONSIDERATIONS

8.1 SAFETY CABLE

The Permaglass® column is manufactured to withstand very high tensile loads, and as such, safety cable is not required. However, if desired, safety cable can be used without causing any damage to the column.

8.2 BOREHOLE DIMENSIONS

Ensure there is adequate room in the annulus between the Permaglass® OD and the bore casing ID for all ancillary equipment to fit.

Items to consider would be:

- Electrical drop cable – Power (for the motor).
- Electrical drop cable - Control or Monitoring (i.e. PT100 temperature sensor, level sensors etc.).
- Level sensor probes.
- Dip tubes
- Centralisers

Take note of the Permaglass® dimensions table as shown in section 5.1. Note that the joint is wider than the nominal pipe diameter. Ensure there is enough room to hang the column in a central position within the bore, and adequate room is available to accommodate all the other items being installed.

8.3 MAXIMUM PERMISSIBLE LOADS

Ensure the maximum tensile load of the installation does not exceed the maximum permissible loads as specified in section 5.1.



Maximum load of the installation will consist of:

- Mass of the pump and motor assembly;
- Mass of the electrical drop cables;
- Mass of safety cable (if used);
- Mass of any other ancillary cables/sensors/items supported by the column;
- Pump shut-off head;
- Maximum pump torque;
- Water SG (Specific Gravity);

- Mass of the column; and
- Mass of column full of water.

If unsure of how to calculate the maximum tensile load, contact Advanced Pump Technologies for further advice.

8.4 AGRESSIVE WATER CONDITIONS

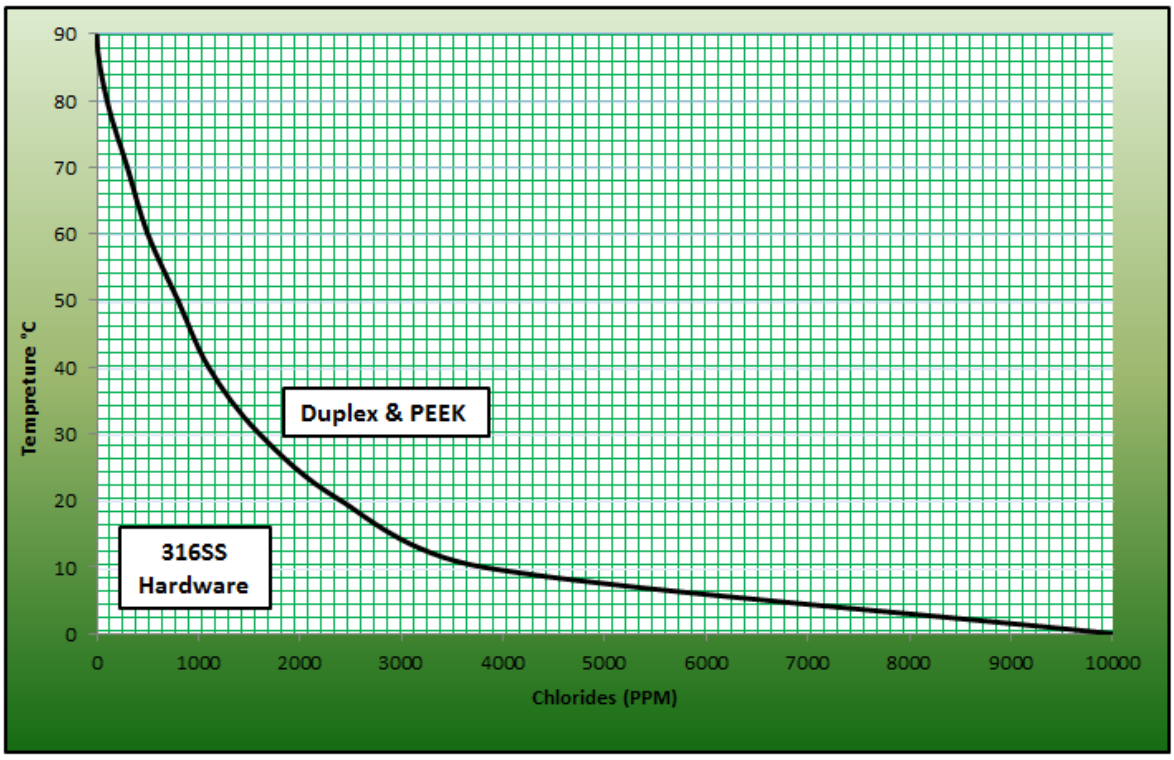
Water wells that produce poor quality raw water can cause premature corrosion of mechanical components installed in the well.

For these applications, alternative materials are available for consideration.

PEEK locking cords provide a non-corrosive solution to the standard 316ss locking wires delivered with each length of Permaglass®.

End Connectors made from Duplex steel should be used for water with high chloride contents.

Refer to the chart below for the recommended component selection in aggressive operating conditions. Please use this chart as a guide only. Accurate duration of life cycle cannot be guaranteed due to many operating factors of the installation that would not be known by the manufacturer.



- Below the line, use 316SS End-Connectors and 316ss Locking Wires.
- Above the line, use Duplex End-Connectors and PEEK Locking Cords.

Based on pH levels between 5 to 8.

9 INSTALLATION

PERMAGLASS® PUMP COLUMN Installation Guide

The following is a guide for the installation of Permaglass® Pump Column. It is a guide only and may depend upon the type of equipment used or circumstances at the time of installation.

A risk management process should be undertaken prior to installation and it is recommended that the four step process be followed. Starting with the identification of hazards in the working environment. Then determine the nature of the harm that could be caused by the hazard, how serious it could be and the likelihood of it happening. Once this has been identified, implement the most effective control measures that is reasonable practicable, then review the control measures to ensure they are working as planned.

Good safety practices should always be maintained during the installation process and consideration should be given to the most suitable type of Personal Protective Equipment (PPE) that is required to safely undertake the work.

Installers should satisfy themselves that their equipment is correctly sized and fit for purpose.

Lifting of 2 or more joined lengths of Permaglass® from the horizontal plain will result in distortion and permanent damage to joints; therefore this practice is not approved and will void warranty.



9.1 CONVENTIONAL CRANE METHOD

This method employs the standard lifting practices using a mobile crane. Planning is the first step in ensuring that lifting of a load is done safely. The following steps are recommended:

- Development of an initial work scope of works;
- Selection and acquisition of the crane;
- Planning, programming, scheduling and organising the work; and
- Managing the work.

Hazards can be introduced if crane characteristics do not match the work requirements or work environment.

The person operating the crane and the persons working with the crane, for example a dogger or rigger must hold an appropriate high risk work (HRW) licence.

STEP 1 - Lubrication

a) Lubricate locking wire groove in female end with a suitable silicone grease (suitable for potable water applications if required) for ease of insertion of locking wire;
b) Lubricate all O-rings for smooth insertion of male spigot into the female end to avoid damaging the O-ring, and to prevent the O-ring from “rolling”;

STEP 2 - Install bottom SS316 end connector.

Method employing a pair of lifting clamps or elevators

a) Thread the Permaglass® 316 stainless steel BSP End Connector into the female threaded connection of the submersible pump;
b) Install O-ring on the protruding Permaglass® male spigot;
c) Place lifting clamp under the collar of the End Connector;
d) Connect clamp to crane with a rated chain or rated sling(s) and carefully lift assembly into the bore.
e) Hold with the clamp supported on a suitable seating device such as a“C-plate or similar arrangement mounted over the bore.



STEP 3 - Install Permaglass® bottom pipe

a) Disconnect the sling from the lifting clamp fitted under the collar of the stainless steel end-connector and attach to a second lifting clamp;
b) Fit the second clamp under the top bell of the double-ended female bottom pipe;
c) Lift pipe into position over the male spigot of the end-connector;
d) Lower into position and install locking wire;
e) Wrap PermaTape several times around the end of the locking wire
f) Use PermaTape or PermaStrap to secure the electrical drop cable to the column and finish by wrapping PermaTape around the joint;
g) Take up tension on the sling to allow the removal of the first clamp;
h) Lower the pump and bottom pipe into the bore until the second lifting clamp under the top bell of the bottom pipe rests on the C-plate (as for the first lifting clamp). Be sure to secure

the electrical drop cable at regular intervals with PermaTape or PermaStrap according to relevant requirements as detailed in Section 6.7 “Cable Support Systems”.

STEP 4 - Install remaining Permaglass pipe

a) Insert the first lifting clamp under the female bell of the next length of Permaglass;
b) Attach the slings removed from the second lifting clamp and lift a pipe until vertical over the bottom pipe which is now secured in the bore;
c) Lower until the male spigot is above the female, install a lubricated O-ring then insert into the female bell until locking wire grooves are aligned;
d) Insert the locking wire.

Repeat **STEP 4** until all pipe is installed. Be sure to secure the electrical drop cable at regular intervals with PermaTape or PermaStrap according to relevant requirements as detailed in Section 6.7 “Cable Support Systems”.

STEP 5 – Install Top SS316 End-Connector

a) Fit a lubricated O-Ring to the second male end connector and install into the top female;
b) Secure with a locking wire.

The assembly is now ready to accept head works



If using a hydraulic or pneumatic clamping device, care must be taken not to exceed 70% of the external collapse pressure of the Permaglass® (as stated in the manufacturer’s specifications).

Lifting clamps should be positioned evenly under the bell and closed with a pin.

9.2 PERMASAFE INSTALLATION METHOD

In some installation environments such as major mine sites, working under suspended loads using a crane is undesirable.

After many months of market research, development and construction, the Permaglass design team has set a new standard in innovation and safety with the introduction of the industry's first bore pump and Permaglass® Pump Column installation and retrieval rig.

PermaSafe® is a custom-built rig specifically designed for the installation, testing and removal of bore pumps in a safe and efficient manner, reducing the risks associated with working under and in the line of fire of a suspended load.

Responsibly built and tested in consultation with leading mining industry water management experts, the PermaSafe® Rig delivers the highest level of safety for installers of Permaglass®. It is designed as a fully integrated unit built to safely install bore pumps, Permaglass® and power cable to depths of more than 200 metres. The depth is only limited by the maximum Kg load which is 13Tonne.

For further details on the PermaSafe Rig, please contact Advanced Pump Technologies.





10 REMOVAL

To remove Permaglass, simply reverse the steps in section 9.

If a “Break-Off Pin” is fitted, a Torpedo weight should be lowered down inside the pump column as described in section 6.6. The water level inside the column should start to slowly drop. If the water level does not change, the pin has not been successfully broken off. The Torpedo weight should then be slightly lifted and dropped onto the pin again until the water level starts to drop.

11 STORAGE AND HANDLING

Permaglass® FRP Pump Column and Bore Casing is a rigid pipe with high tensile strength properties.

However the pipe must be handled and stored with some care to ensure the sealing faces are protected and the pipe surface is not damaged. The user should also ensure that no heavy items are dropped on the pipe or the pipe itself is not dropped.

The chemical composition of Permaglass® allows for short term storage in direct sunlight as well as high humidity without causing any damage to the surface or structural properties of the pipe, provided it remains strapped in the bundles. However incorrect storage can cause the pipe to bend under certain conditions. Extended direct exposure to UV radiation from the sun will cause some

degradation of the surface over time and should be avoided. A simple tarpaulin or black plastic sheeting to cover the bundles is recommended.

11.1 TRANSPORT INSTRUCTION

- It is preferable that Permaglass® is transported in the packs supplied by the Manufacturer.
- Plastic strapping should be used to hold the packs together, however if metal straps are used, they should not be in direct contact with the pipe surface. Some form of protective material (eg tape or matting strip) should be used to insulate the two surfaces.
- Complete packs should be supported in a minimum of 4 places along the length of pipe to ensure the rigidity of the pack.
- During transport the packs should be securely fastened with proper ratchet straps to ensure the pack does not move or tip over.

11.2 SHORT TERM STORAGE INSTRUCTION

- For short term storage Permaglass® can be kept in full sun conditions for periods less than 4 weeks, provided that the pipe remains in the manufacturer's packs.
- The male and female ends should be protected from damage. Damage to the O-ring groove in either the male or female end may cause sealing issues with the pipe.
- Pipes stored in direct sunlight can bow due to the temperature differential between the exposed side and the shaded side of the pipe. This is a temporary phenomenon and is fully reversible. If this creates installation issues the bow can be rectified by storing the pipe in shade for several hours prior to installation.

11.3 LONG TERM STORAGE

- For longer term (4 weeks+) outdoor storage it is recommended that the Permaglass® pipe is stored under a tarpaulin type cover as a minimum or preferably out of direct sunlight.
- As is the case with short term storage, the recommendation is to store in packs similar to those supplied by manufacturer. If these are not available then the pipe should be stored off the ground with minimum 40mm x 40mm gluts equally spaced in at least 4 points along the length of the pipe with a maximum of 400mm overhanging the outer most gluts. Between each row of pipe horizontal and vertical gluts of the same dimensions needs to be used to keep the pack rigid.
- Loose pipes should be stored flat and covered to stop the potential bowing of the pipe.
- The male and female ends should be protected from damage. Damage to the O-ring groove in either the male or female end may cause sealing issues with the pipe.

12 WARRANTY

CONSUMER WARRANTY

ADVANCED PUMP TECHNOLOGIES PTY LTD.

This Warranty only applies to PERMAGLASS goods distributed by Advanced Pump Technologies Pty Ltd (***Seller***) where the Buyer acquires the goods for his/her own use and not for the purpose of re-supply. This warranty is additional to any rights and remedies that Buyer may have under the Australian Consumer Law and other laws.

If this Warranty applies, Seller warrants that its goods will be free from defects in material and workmanship for a period of one (1) year from the date of installation or eighteen (18) months from the date of purchase, whichever shall occur first. Seller shall, at its option and at no cost to Buyer, either repair or replace any product which fails to conform with the foregoing warranty; provided, however, that under either option, Seller shall not be obligated
to remove the defective product or install the replaced or repaired product and the Buyer shall be responsible for all other costs, including, but not limited to, service costs, shipping fees and expenses. Seller shall have complete discretion as to the method or means of repair or replacement. Buyer's failure to comply with Seller's repair or replacement directions shall constitute a waiver of its rights and render this Warranty void. Any parts repaired or replaced under this limited Warranty are warranted only for the balance of the warranty period on the parts that were repaired or replaced. Seller's warranty is conditioned on Buyer giving written notice to Seller of any defects in material or workmanship of warranted goods within ten (10) days of the date when any defects are first manifest.

This Warranty does not apply to any parts of products that: (a) have been subject to misuse, misapplication, neglect, alteration, accident, or physical damage; (b) have been used in a manner contrary to Seller's instructions for installation, operation and maintenance; (c) have been damaged from ordinary wear and tear, corrosion, or chemical attack; (d) have been damaged due to abnormal conditions; or (e) have been damaged resulting from the use of accessory equipment not sold by Seller or not approved by Seller in connection with products supplied by Seller. This Warranty does not apply to products not manufactured by Seller; however, Seller will extend to Buyer any warranty received from Seller's supplier of such products.

Should the Buyer require an alleged defect to be investigated by the Seller and that investigation results in a defect not being discovered, or a defect is discovered which is not covered by this Warranty, then all costs and expenses incurred by the Seller in carrying out that investigation shall be to the Buyers account.

Statutory rights
Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

To the extent our goods are not of a kind ordinarily acquired for personal, domestic or household use or consumption, then we limit our liability to repair or replacement of goods or the payment of the cost of repairing or replacing goods, or supplying services again or payment for the cost of supplying services again, in accordance with section 64A of the Australian Consumer Law.

Limitation of liability
SUBJECT TO THE BUYER'S STATUTORY RIGHTS AS SET OUT ABOVE AND OTHERWISE *TO THE EXTENT PERMITTED BY LAW*, BUYER'S EXCLUSIVE REMEDY AND SELLER'S AGGREGATE LIABILITY FOR BREACH OF THIS WARRANTY ARE LIMITED TO REPAIRING OR REPLACING THE PRODUCT AND SHALL IN ALL CASES BE LIMITED TO THE AMOUNT PAID BY THE BUYER HEREUNDER AND IN NO EVENT IS SELLER LIABLE FOR ANY OTHER FORM OF DAMAGES, WHETHER DIRECT, INDIRECT, LIQUIDATED, INCIDENTAL, CONSEQUENTIAL, PUNITIVE, EXEMPLARY OR SPECIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF PROFIT, LOSS OF ANTICIPATED

SAVINGS OR REVENUE, LOSS OF INCOME, LOSS OF BUSINESS, LOSS OF PRODUCTION, LOSS OF OPPORTUNITY OR LOSS OF REPUTATION.

The terms of this warranty policy may be inconsistent with the warranty statement in the product owner's manual. To the extent of any inconsistency other than warranty duration, the terms of this warranty shall prevail.

Claims process: To make a warranty claim, check first with the dealer from whom you purchased the product or call the following number for the name and location of the nearest dealer providing warranty service +618 61431000 .Alternatively, you can make a claim under this warranty by writing to:
Advanced Pump Technologies Pty Ltd, 72 May Holman Dr, Bassendean, Western Australia, 6054, AUSTRALIA.

Distributed by:
Advanced Pump Technologies Pty Ltd
Tel. +618 6143 1000
www.advancedpumps.com.au

SP

Installation and operating instructions



EC declaration of conformity

We, Grundfos, declare under our sole responsibility that the products SP, to which this declaration relates, are in conformity with these Council directives on the approximation of the laws of the EC member states:

— Machinery Directive (2006/42/EC).
Standard used: EN 809:1998 + A1:2009.

— Low Voltage Directive (2006/95/EC). Applicable when the rated power is lower than 1.5 kW.
Standards used: 60335-2-41:2003 + A1:2004 + A2:2010, except sections 25.1 and 25.8.

— Ecodesign Directive (2009/125/EC).
Water pumps:
Commission Regulation No 547/2012.
Applies only to water pumps marked with the minimum efficiency index MEI. See the pump nameplate.

Bare shaft pump

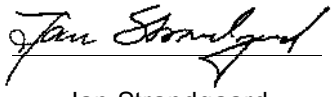
We, Grundfos, declare under our sole responsibility that the products SP, to which this declaration relates, are in conformity with these Council directives on the approximation of the laws of the EC member states:

— Machinery Directive (2006/42/EC).
Standard used: EN 809:1998 + A1:2009.

— Ecodesign Directive (2009/125/EC).
Water pumps:
Commission Regulation No 547/2012.
Applies only to water pumps marked with the minimum efficiency index MEI. See the pump nameplate.

Before the pump is taken into operation, the complete machinery into which the pump is to be incorporated must be declared in accordance with all relevant regulations.

Bjerringbro, 15th September 2012



Jan Strandgaard
Technical Director
Grundfos Holding A/S
Poul Due Jensens Vej 7
8850 Bjerringbro, Denmark

Person authorised to compile technical file and
empowered to sign the EC declaration of conformity.

Original installation and operating instructions.

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Warning

Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

1. Symbols used in this document

Warning

If these safety instructions are not observed, it may result in personal injury.

Warning

If these instructions are not observed, it may lead to electric shock with consequent risk of serious personal injury or death.

Caution ***If these safety instructions are not observed, it may result in malfunction or damage to the equipment.***

Note ***Notes or instructions that make the job easier and ensure safe operation.***

2. Introduction

These instructions apply to Grundfos submersible pumps, type SP, with submersible motors, types Grundfos MS/MMS or Franklin 4"-8".

If the pump is fitted with a motor of another motor make than Grundfos MS or MMS, note that the motor data may differ from the data stated in these instructions.

Note ***The USB stick supplied with the product contains installation and operating instructions in various languages.***

3. Delivery and storage

3.1 Delivery

Caution ***The pump should remain in the packing until it is placed in vertical position during installation. Handle the pump with care.***

When the pump part and motor are supplied as separate units (long pumps), fit the motor to the pump as described in section *7.1 Fitting the motor to the pump*.

Note ***The extra nameplate supplied with the pump should be fixed at the installation site.***

The pump should not be exposed to unnecessary impact and shocks.

3.2 Storage

Storage temperature

Pump: -20 °C to +60 °C.
Motor: -20 °C to +70 °C.

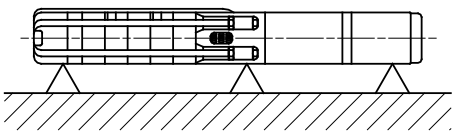
The motors must be stored in a closed, dry and well ventilated room.

Caution ***If MMS motors are stored, the shaft must be turned by hand at least once a month. If a motor has been stored for more than one year before installation, the rotating parts of the motor must be dismantled and checked before use.***

The pump should not be exposed to direct sunlight.

If the pump has been unpacked, it should be stored horizontally, adequately supported, or vertically to prevent misalignment of the pump. Make sure that the pump cannot roll or fall over.

During storage, the pump can be supported as shown in fig. 1.



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Fig. 1 Pump position during storage

3.2.1 Frost protection

If the pump has to be stored after use, it must be stored on a frost-free location, or the motor liquid must be frost-proof.

4. Applications

Grundfos SP submersible pumps are designed for a wide range of water supply and liquid transfer applications, such as the supply of fresh water to private homes or waterworks, water supply in horticulture and agriculture, drawdown of groundwater and pressure boosting, and various industrial jobs.

The pump must be installed so that the suction interconnector is completely submerged in the liquid. The pump can be installed horizontally or vertically. See section *5.2 Positional requirements*.

4.1 Pumped liquids

Clean, thin, non-explosive liquids without solid particles or fibres.

The maximum sand content of the water must not exceed 50 g/m^3. A larger sand content will reduce the life of the pump and increase the risk of blocking.

Caution ***When pumping liquids with a density higher than that of water, motors with correspondingly higher outputs must be used.***

If liquids with a viscosity higher than that of water are to be pumped, contact Grundfos.

The pump versions SP A N, SP A R, SP N, SP R and SPE are designed for liquids with higher aggressiveness than drinking water.

The maximum liquid temperature appears from section *5.4 Liquid temperatures/cooling*.

4.2 Sound pressure level

The sound pressure level has been measured in accordance with the rules laid down in the EC machinery directive 2006/42/EC.

Sound pressure level of pumps

The values apply to pumps submerged in water, without external regulating valve.

Pump type	$\overline{L}_{pA}$ [dB(A)]
SP 1A	< 70
SP 2A	< 70
SP 3A	< 70
SP 5A	< 70
SP 8A	< 70
SP 14A	< 70
SP 17	< 70
SP 30	< 70
SP 46	< 70
SP 60	< 70
SP 77	< 70
SP 95	< 70
SP 125	79
SP 160	79
SP 215	82

Sound pressure level of motors

The sound pressure level of Grundfos MS and MMS motors is lower than 70 dB(A).

Other motor makes: See installation and operating instructions for these motors.

5. Preparations before installation

Warning

Before starting work on the product, switch off the power supply. Make sure that the power supply cannot be accidentally switched on.

5.1 Checking the motor liquid

The motors are factory-filled with a special non-poisonous liquid which is frost-proof down to -20 °C.

Note ***Check the level of motor liquid and refill if required. Use clean water.***

Caution ***If frost protection is required, special Grundfos liquid must be used to refill the motor. Otherwise clean water may be used for refilling (however, never use distilled water).***

Refill liquid as described below.

5.1.1 Grundfos MS 4000 and MS 402 motors

The filling hole for motor liquid is placed in the following positions:

- MS 4000: in the top of the motor.
- MS 402: in the bottom of the motor.

1. Position the submersible pump as shown in fig. 2. The filling screw must be at the highest point of the motor.
2. Remove the screw from the filling hole.
3. Inject liquid into the motor with the filling syringe, see fig. 2, until the liquid runs back out of the filling hole.
4. Replace the screw in the filling hole and tighten securely before changing the position of the pump.

Torques

- MS 4000: 3.0 Nm.
- MS 402: 2.0 Nm.

The submersible pump is now ready for installation.

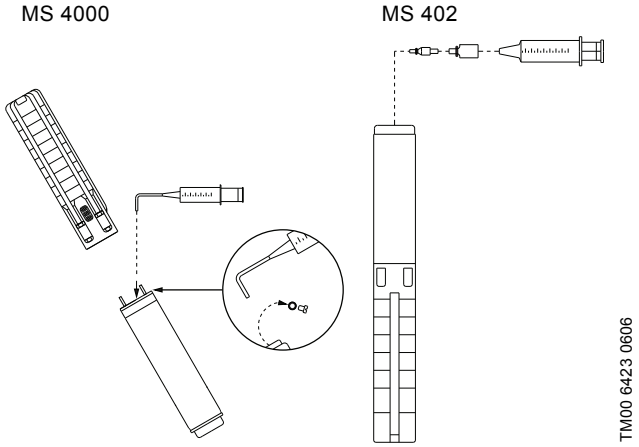


Fig. 2 Motor position during filling - MS 4000 and MS 402

5.1.2 Grundfos MS6 and MS 6000 motors

- If the motor is delivered from stock, check the level of motor liquid before fitting the motor to the pump. See fig. 3.
- When pumps are delivered direct from Grundfos, the level has already been checked.
- Check the level in connection with service. See fig. 3.

The filling hole for motor liquid is placed at the top of the motor.

1. Position the submersible pump as shown in fig. 3. The filling screw must be at the highest point of the motor.
2. Remove the screw from the filling hole.
3. Inject liquid into the motor with the filling syringe, see fig. 3, until the liquid runs back out of the filling hole.
4. Replace the screw in the filling hole and tighten securely before changing the position of the pump.

Torque: 3.0 Nm.

The submersible pump is now ready for installation.

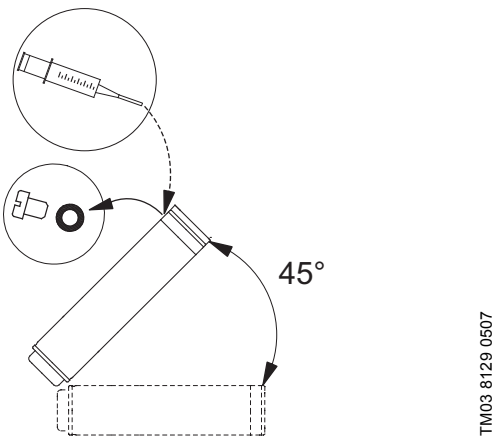


Fig. 3 Motor position during filling - MS6 and MS 6000

5.1.3 Grundfos MMS 6000, MMS 8000, MMS 10000 and MMS 12000 motors

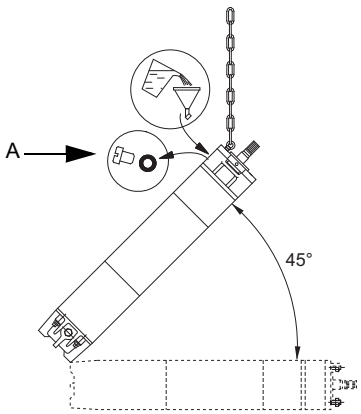
1. Place the motor at a 45 ° angle with the top of the motor upwards. See fig. 4.
2. Unscrew the plug A and place a funnel in the hole.
3. Pour tap water into the motor until the motor liquid inside the motor starts running out at A.

Caution ***Do not use motor liquid as it contains oil.***

4. Remove the funnel and refit the plug A.

Caution ***Before fitting the motor to a pump after a long period of storage, lubricate the shaft seal by adding a few drops of water and turning the shaft.***

The submersible pump is now ready for installation.



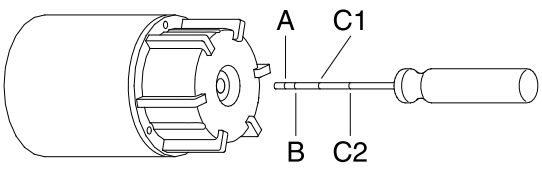
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Fig. 4 Motor position during filling - MMS

5.1.4 Franklin motors from 3 kW and up

Check the level of motor liquid in Franklin 4" and 6" motors by measuring the distance from the bottom plate to the built-in rubber diaphragm. The distance can be measured by inserting a rule or a small rod through the hole until it touches the diaphragm. See fig. 5.

Caution ***Take care not to damage the diaphragm.***

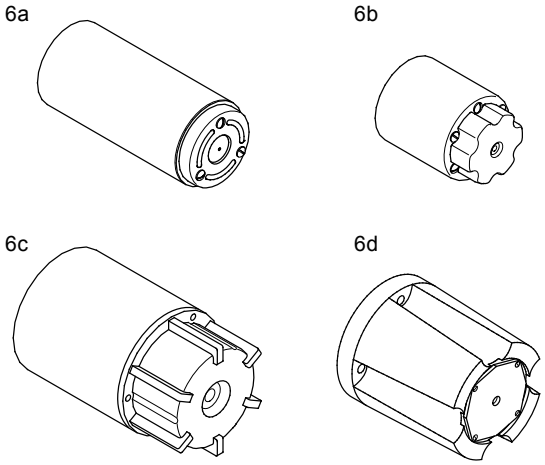


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Fig. 5 Measuring the distance from bottom plate to diaphragm

The table below shows the correct distance from the outside of the bottom plate to the diaphragm:

Motor	Dimension	Distance
Franklin 4", 0.25 - 3 kW (fig. 6a)	A	8 mm
Franklin 4", 3 - 7.5 kW (fig. 6b)	B	16 mm
Franklin 6", 4 - 45 kW (fig. 6c)	C1	35 mm
Franklin 6", 4 - 22 kW (fig. 6d)	C2	59 mm



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Fig. 6 Franklin motors

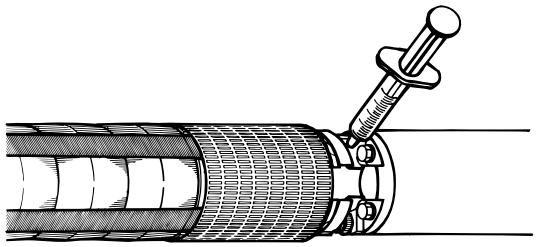
If the distance is not correct, carry out an adjustment as described in section *5.1.5 Franklin motors*.

5.1.5 Franklin motors

Check the level of motor liquid in Franklin 8" motors as follows:

1. Prise out the filter in front of the valve at the top of the motor using a screwdriver. If the filter is slotted, unscrew. Figure 7 shows the position of the filling valve.
2. Press the filling syringe against the valve and inject the liquid. See fig. 7. If the valve cone is depressed too far, it may be damaged thus causing the valve to leak.
3. Remove any air in the motor by pressing the point of the filling syringe lightly against the valve.
4. Repeat the process of injecting liquid and releasing air until the liquid starts running out or the diaphragm is in its correct position (Franklin 4" and 6").
5. Refit the filter.

The submersible pump is now ready for installation.



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Fig. 7 Position of filling valve

5.2 Positional requirements

Warning

If the pump is to be installed in a position where it is accessible, the coupling must be suitably isolated from human touch. The pump can for instance be built into a flow sleeve.

Depending on motor type, the pump can be installed either vertically or horizontally. A complete list of motor types suitable for horizontal installation is shown in section *5.2.1*.

If the pump is installed horizontally, the discharge port should never fall below the horizontal plane. See fig. 8.

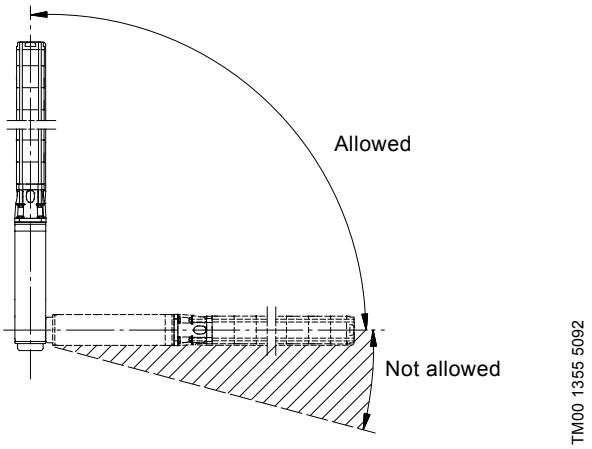


Fig. 8 Positional requirements

If the pump is installed horizontally, e.g. in a tank, we recommend to fit it in a flow sleeve.

5.2.1 Motors suitable for horizontal installation

Motor	Output power 50 Hz	Output power 60 Hz
	[kW]	[kW]
MS	All	All
MMS 6000	3.7 - 30	3.7 - 30
MMS 8000	22 - 92	22 - 92
MMS 10000	75 - 170	75 - 170
MMS 12000	147 - 220	-

When Franklin 4" motors up to and including 2.2 kW are started more than 10 times a day, we recommend to incline the motor at least 15 ° above the horizontal plane in order to minimise wearing of the upthrust disc.

Caution ***During operation, the suction interconnector of the pump must always be completely submerged in the liquid.***

Warning

If the pump is used for pumping hot liquids (40 to 60 °C), make sure that persons cannot come into contact with the pump and the installation, e.g. by installing a guard.

5.3 Pump/motor diameter

We recommend to check the borehole with an inside calliper to ensure unobstructed passage.

5.4 Liquid temperatures/cooling

The maximum liquid temperature and the minimum flow velocity past the motor appear from the table below.

We recommend to install the motor above the well screen in order to achieve proper motor cooling.

Caution ***In cases where the stated flow velocity cannot be achieved, a flow sleeve must be installed.***

If there is a risk of sediment build-up, such as sand, around the motor, use a flow sleeve in order to ensure proper cooling of the motor.

5.4.1 Maximum liquid temperature

Out of consideration for the rubber parts in pump and motor, the liquid temperature must not exceed 40 °C (~105 °F). See also the table below.

The pump can operate at liquid temperatures between 40 °C and 60 °C (~105 °F and 140 °F) provided that all rubber parts are replaced every third year.

Motor	Installation		
	Flow past the motor	Vertical	Horizontal
Grundfos MS 402 MS 4000 MS 6000	**0.15 m/s**	40 °C (~ 105 °F)	40 °C (~ 105 °F)
Grundfos MS 4000I* MS 6000I*	**0.15 m/s**	60 °C (~ 140 °F) Flow sleeve recommended	60 °C (~ 140 °F) Flow sleeve recommended
Grundfos MS6T30	**0.15 m/s**	30 °C (~ 86 °F)	30 °C (~ 86 °F)
Grundfos MS6T60	**1.0 m/s**	60 °C (~ 140 °F)	60 °C (~ 140 °F)
Grundfos MMS	**0.15 m/s**	25 °C (~ 77 °F)	25 °C (~ 77 °F)
	0.50 m/s	30 °C (~ 86 °F)	30 °C (~ 86 °F)
Franklin 4"	**0.08 m/s**	30 °C (~85 °F)	30 °C (~85 °F)
Franklin 6" and 8"	**0.16 m/s**	30 °C (~85 °F)	30 °C (~85 °F)

* At an ambient pressure of minimum 1 bar (1 MPa).

Note ***37 kW MMS 6000, 110 kW MMS 8000 and 170 kW MMS 10000:***
The maximum liquid temperature is 5 °C lower than the values stated in the above table.
190 kW MMS 10000:
The temperature is 10 °C lower.

5.5 Pipe connection

If noise may be transmitted to the building through the pipework, we recommend to use plastic pipes.

Note ***We recommend plastic pipes for 4" pumps only.***

When plastic pipes are used, the pump should be secured by an unloaded straining wire.

Warning

Make sure that the plastic pipes are suitable for the actual liquid temperature and the pump pressure.

When connecting plastic pipes, a compression coupling should be used between the pump and the first pipe section.

6. Electrical connection

Warning

During electrical installation, make sure that the power supply cannot be accidentally switched on.

Warning

The electrical installation should be carried out by an authorised person in accordance with local regulations.

The supply voltage, rated maximum current and cos φ appear from the loose data plate which must be fitted close to the installation site.

The required voltage quality for MS and MMS motors, measured at the motor terminals, is - 10 %/+ 6 % of the nominal voltage during continuous operation (including variation in the supply voltage and losses in cables).

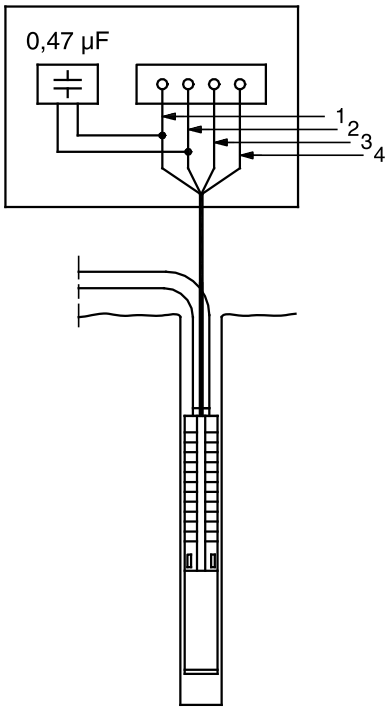
Check also that there is voltage symmetry in the power supply lines, i.e. same difference of voltage between the individual phases. See section *11. Checking motor and cable*, item 2.

Warning

The pump must be earthed.

The pump must be connected to an external mains switch with a minimum contact gap of 3 mm in all poles.

If MS motors with a built-in temperature transmitter (Tempcon) are not installed together with a MP 204 or similar Grundfos motor protection, they must be connected to a 0.47 µF capacitor approved for phase-phase operation (IEC 384-14) to meet the EC EMC directive (2004/108/EC). The capacitor must be connected to the two phases to which the temperature transmitter is connected. See fig. 9.



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Fig. 9 Connection of capacitor

Colours of the leads		
Lead	**Flat cable**	**Single leads**
1 = L1	Brown	Black
2 = L2	Black	Yellow
3 = L3	Grey	Red
4 = PE	Yellow/green	Green

The motors are wound for direct-on-line starting or star-delta starting, and the starting current is between four and six times the rated current of the motor.

The run-up time of the pump is only about 0.1 second. Direct-on-line starting is therefore normally approved by the power supply company.

6.1 Frequency converter operation

6.1.1 Grundfos motors

Three-phase Grundfos motors can be connected to a frequency converter.

Caution

If an MS motor with temperature transmitter is connected to a frequency converter, a fuse incorporated in the transmitter will melt and the transmitter will be inactive. The transmitter cannot be reactivated. This means that the motor will operate like a motor without a temperature transmitter.

If a temperature transmitter is required, Grundfos offers a Pt100 sensor for the submersible motor.

Caution

The motor should not run at a frequency higher than the rated frequency (50 or 60 Hz) during frequency converter operation. In connection with pump operation, never reduce the frequency (and consequently the speed) to such a level that the necessary flow of cooling liquid past the motor is no longer ensured.

To avoid damage to the pump part, the motor must stop when the pump flow falls below 0.1 x nominal flow.

Depending on the frequency converter type, it may expose the motor to detrimental voltage peaks.



Warning

MS 402 motors for supply voltages up to and including 440 V (see motor nameplate) must be protected against voltage peaks higher than 650 V (peak value) between the supply terminals.

We recommend to protect other motors against voltage peaks higher than 850 V.

The above disturbance can be abated by installing an RC filter between the frequency converter and the motor.

Possible increased acoustic noise from the motor can be abated by installing an LC filter which will also eliminate voltage peaks from the frequency converter.

We recommend to install an LC filter when using a frequency converter. See section *6.7.6 Frequency converter operation*.

For further details, contact your frequency converter supplier or Grundfos.

6.1.2 Other motor makes than Grundfos

Contact Grundfos or the motor manufacturer.

6.2 Motor protection

6.2.1 Single-phase motors

Single-phase MS 402 motors incorporate a thermal switch and require no additional motor protection.



Warning

When the motor has been thermally switched off, the motor terminals are still live.
When the motor has cooled sufficiently, it will restart automatically.

Single-phase MS 4000 motors must be protected. A protective device can either be incorporated in a control box or be separate.

Franklin 4" PSC motors must be connected to a motor-protective circuit breaker.

6.2.2 Three-phase motors

MS motors are available with or without a built-in temperature transmitter.

The following motors must be protected by a motor-protective circuit breaker with thermal relay, or an MP 204 and contactor(s):

- motors with a built-in and intact temperature transmitter
- motors without or with a defective temperature transmitter
- motors with or without a Pt100 sensor.

MMS motors have no built-in temperature transmitter. The Pt100 sensor is available as an accessory.

6.2.3 Required settings of motor-protective circuit breaker

For cold motors, the tripping time of the motor-protective circuit breaker must be less than 10 seconds at 5 times the rated maximum current of the motor. During normal operating conditions the motor must be running at full speed in less than 3 seconds.

Caution

If this requirement is not met, the motor warranty will be invalidated.

In order to ensure optimum motor protection, the motor-protective circuit breaker should be set as follows:

1. Set the motor-protective circuit breaker to the rated maximum current of the motor.
2. Start the pump and let it run for half an hour at normal performance.
3. Slowly grade down the scale indicator until the motor trip point is reached.
4. Increase the setting by 5 %.

The highest permissible setting is the rated maximum current of the motor.

For motors wound for star-delta starting, the motor-protective circuit breaker should be set as above, but the maximum setting should be rated maximum current x 0.58.

The highest permissible start-up time for star-delta starting or autotransformer starting is 2 seconds.

6.3 Lightning protection

The installation can be fitted with a special overvoltage protective device to protect the motor from voltage surges in the power supply lines when lightning strikes somewhere in the area.
See fig. 10.

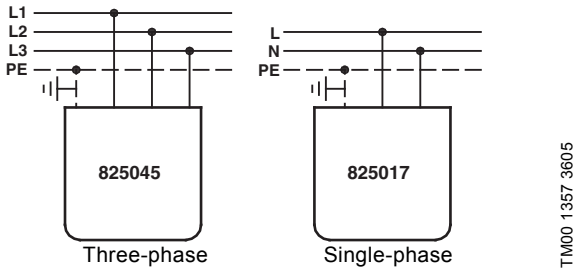


Fig. 10 Fitting an overvoltage protective device

The overvoltage protective device will not, however, protect the motor against a direct stroke of lightning.

The overvoltage protective device should be connected to the installation as close as possible to the motor and always in accordance with local regulations.
Ask Grundfos for lightning protective devices.

MS 402 motors, however, require no further lightning protection as they are highly insulated.

A special cable termination kit with a built-in overvoltage protective device is available for Grundfos 4" motors (product No 799911 or 799912).

6.4 Cable sizing

Make sure that the submersible drop cable can withstand permanent submersion in the actual liquid and at the actual temperature.

Grundfos can supply submersible drop cables for a wide range of installations.

The cross-section (q) of the cable should meet the following requirements:

1. The submersible drop cable should be sized to the rated maximum current (I) of the motor. *
2. The cross-section should be sufficient to make a voltage drop over the cable acceptable.

Use the largest of the cross-sections found under items 1 and 2.

* The table below specifies the current value of Grundfos submersible drop cables (i.e. the maximum current tolerated by the drop cable) at an ambient temperature of maximum 30 °C. Contact Grundfos if the ambient temperature lies above 30 °C.

When sizing the submersible drop cable, make sure that the rated maximum current does not exceed the current value (I_s).

For star-delta starting, however, size the cables so that 0.58 x the rated maximum current of the motor does not exceed the current value (I_s) of the cables.

q [mm²]	I_s [A]	q [mm²]	I_s [A]
1.5	23	50	202
2.5	30	70	250
4	41	95	301
6	53	120	352
10	74	150	404
16	99	185	461
25	131	240	547
35	162	300	633

If Grundfos submersible drop cables are not used, the cross-section should be selected on the basis of the current values of the actual cables.

6.5 Control of single-phase MS 402 motors

Warning

The single-phase MS 402 motor incorporates motor protection which cuts out the motor in case of excessive winding temperatures while the motor is still supplied with voltage. Allow for this, when the motor forms part of a control system.

If a compressor is included in a control system together with an ochre filter, the compressor will run continuously once the motor protection has cut out the motor, unless other special precautions have been taken.

6.6 Connection of single-phase motors

6.6.1 2-wire motors

MS 402 2-wire motors incorporate motor protection and a starter device and can therefore be connected direct to the mains.
See fig. 11.

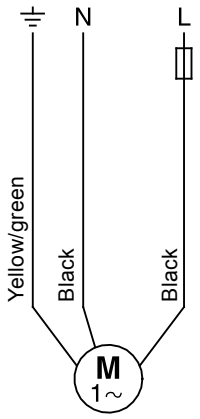


Fig. 11 2-wire motors

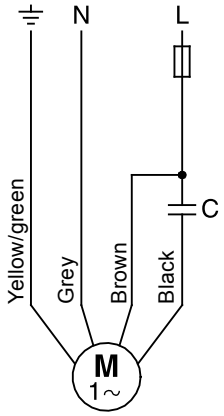
6.6.2 PSC motors

The PSC motors are connected to the mains via an operating capacitor which should be sized for continuous operation.

Select the correct capacitor size from the table below:

Motor [kW]	Capacitor [µF] 400 V, 50 Hz
0.25	12.5
0.37	16
0.55	20
0.75	30
1.10	40
1.50	50
2.20	75

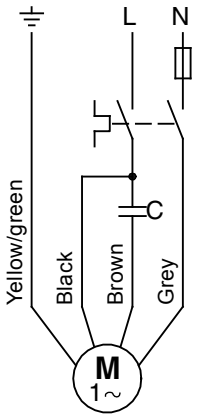
MS 402 PSC motors incorporate motor protection and should be connected to the mains as shown in fig. 12.



TM00 1359 5092

Fig. 12 PSC motors

See www.franklin-electric.com and fig. 13.



TM00 1361 1200

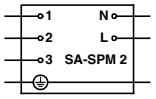
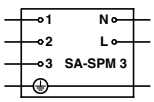
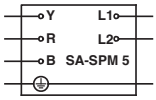
Fig. 13 Franklin motors

6.6.3 3-wire motors

MS 4000 3-wire motors should be connected to the mains via a Grundfos control box SA-SPM 2, 3 or 5 incorporating motor protection.

MS 402 3-wire motors incorporate motor protection and should be connected to the mains via a Grundfos control box SA-SPM 2, 3 or 5 without motor protection.

The connection of MS 402 and MS 4000 motors appears from the table below:

Motor	Cable	Control box	Mains
Up to 0.75 kW 50 Hz	Grey Brown Black Yellow/green		N L PE
From 1.10 kW 50 Hz	Grey Brown Black Yellow/green		N L PE
1.1 - 3.7 kW (~ 1.5 - 5.0 hp) 60 Hz	Yellow Red Black Yellow/green		L1 L2 PE

6.7 Connection of three-phase motors

Three-phase motors must be protected.
See section *6.2.2 Three-phase motors*.

For electrical connection via the MP 204, see the separate installation and operating instructions for this unit.

When a conventional motor-protective circuit breaker is being used, the electrical connection should be carried out as described below.

6.7.1 Checking the direction of rotation

Caution ***The pump must not be started until the suction interconnector has been completely submerged in the liquid.***

When the pump has been connected to the power supply, check the direction of rotation:

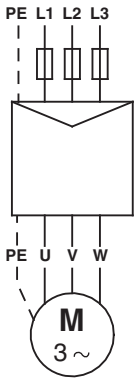
1. Start the pump and measure quantity of water and head.
2. Stop the pump and interchange two phases.
3. Start the pump and measure quantity of water and head.
4. Stop the pump.
5. Compare the two results. The connection giving the larger quantity of water and the higher head is the correct one.

6.7.2 Grundfos motors - direct-on-line starting

The connection of Grundfos motors wound for direct-on-line starting appears from the table below and fig. 14.

Mains	Cable/connection
	Grundfos 4" and 6" motors
PE	PE (yellow/green)
L1	U (brown)
L2	V (black)
L3	W (grey)

Check the direction of rotation as described in section *6.7.1 Checking the direction of rotation*.



TM03 2099 3705

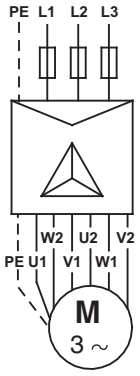
Fig. 14 Grundfos motors - direct-on-line starting

6.7.3 Grundfos motors - star-delta starting

The connection of Grundfos motors wound for star-delta starting appears from the table below and fig. 15.

Connection	Grundfos 6" motors
PE	Yellow/green
U1	Brown
V1	Black
W1	Grey
W2	Brown
U2	Black
V2	Grey

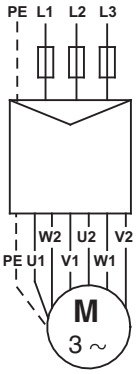
Check the direction of rotation as described in section *6.7.1 Checking the direction of rotation*.



TM03 2100 3705

Fig. 15 Grundfos motors wound for star-delta starting

If direct-on-line starting is required, the motors should be connected as shown in fig. 16.



TM03 2101 3705

Fig. 16 Grundfos motors wound for star-delta starting - direct-on-line starting

6.7.4 Connection in the case of unidentified cable marking/connection (Franklin motors)

If it is unknown where the individual leads are to be connected to the mains in order to ensure the correct direction of rotation, proceed as follows:

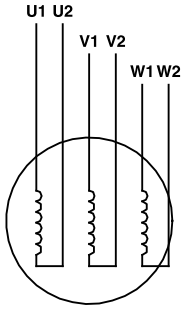
Motors wound for direct-on-line starting

Connect the pump to the mains as is expected to be right.

Then check the direction of rotation as described in section *6.7.1 Checking the direction of rotation*.

Motors wound for star-delta starting

Determine the windings of the motor by means of an ohmmeter and name the lead sets for the individual windings accordingly: U1-U2, V1-V2, W1-W2. See fig. 17.



TM00 1367 5092

Fig. 17 Unidentified cable marking/connection - motors wound for star-delta starting

If star-delta starting is required, connect the leads as shown in fig. 15.

If direct-on-line starting is required, connect the leads as shown in fig. 16.

Then check the direction of rotation as described in section *6.7.1 Checking the direction of rotation*.

6.7.5 Soft starter

We only recommend the use of soft starters which control the voltage on all three phases and which are provided with a bypass switch.

Ramp times: Maximum 3 seconds.

For further details, contact your soft starter supplier or Grundfos.

6.7.6 Frequency converter operation

Three-phase MS motors can be connected to a frequency converter.

Note ***To enable the monitoring of the motor temperature, we recommend to install a Pt100 sensor together with a PR 5714 relay.***

Permissible frequency ranges: 30-50 Hz and 30-60 Hz.

Ramp times: Maximum 3 seconds for start and stop.

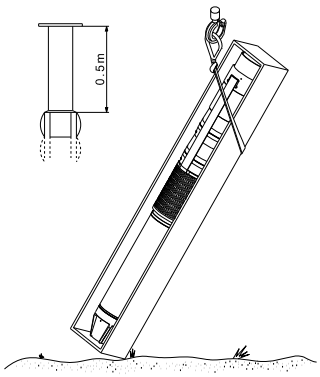
Depending on the type, the frequency converter may cause increased acoustic noise from the motor. Furthermore, it may expose the motor to detrimental voltage peaks. This can be abated by installing an LC filter between the frequency converter and the motor.

For further details, contact your frequency converter supplier or Grundfos.

7. Installation

We recommend that you first fit a 50 cm long pipe to the pump to facilitate handling of the pump during installation.

Caution ***Lift the pump to vertical position before removing it from the wooden box.***



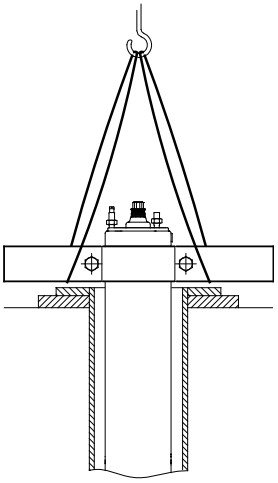
TM05 1617 3311

Fig. 18 Lifting the pump into vertical position

7.1 Fitting the motor to the pump

When the pump part and the motor are supplied as separate units (long pumps), fit the motor to the pump as follows:

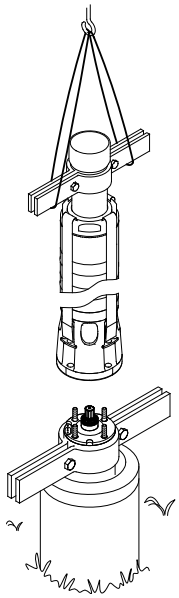
1. Use pipe clamps when handling the motor.
2. Place the motor in vertical position at the borehole seal. See fig. 19.



TM00 5259 2402

Fig. 19 Motor in vertical position

3. Lift the pump part by means of pipe clamps fitted to the extension pipe. See fig. 20.



TM02 5263 2502

Fig. 20 Lifting the pump into position

4. Place the pump part on top of the motor.
5. Fit and tighten the nuts. See table below.

Caution ***Make sure that the coupling between the pump and motor engages properly.***

The bolts and nuts securing the straps to the pump must be cross-tightened to the following torques:

Bolt/nut	Torque [Nm]
M8	18
M10	35
M12	45
M16	120
SP 215, 50 Hz, with more than 8 stages SP 215, 60 Hz, with more than 5 stages	150

When fitting the motor to the pump part, cross-tighten the nuts to the following torques:

Staybolt diameter	Torque [Nm]
3/8 UNF	18
1/2 UNF	50
M8	18
M12	70
M16	150
M20	280

Caution ***Make sure that the pump chambers are aligned when assembly has been completed.***

7.2 Removing and fitting the cable guard

If the cable guard is screwed on to the pump, it should be removed and fitted by means of screws.

Caution ***Make sure that the pump chambers are aligned when the cable guard has been fitted.***

7.3 Connecting the submersible drop cable

7.3.1 Grundfos motors

Before connecting the submersible drop cable to the motor, make sure that the cable socket is clean and dry.

To facilitate the connection of the cable, lubricate the rubber parts of the cable plug with non-conducting silicone paste.

Tighten the screws holding the cable to these torques [Nm]:

MS 402: 2.0.
MS 4000: 3.0.
MS6: 6.0.
MS 6000: 4.5.
MMS 6000: 10.
MMS 8000: 18.
MMS 10000: 18.
MMS 12000: 15.

7.4 Riser pipe

If a tool, e.g. a chain pipe wrench, is used when the riser pipe is fitted to the pump, the pump must only be gripped by the pump discharge chamber.

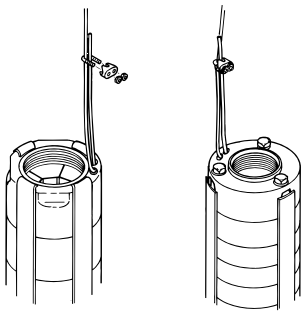
The threaded joints on the riser pipe must all be well cut and fit together to ensure that they do not work loose when subjected to torque reaction caused by the starting and stopping of the pump.

The thread on the first section of the riser pipe which is to be screwed into the pump should not be longer than the threads in the pump.

If noise may be transmitted to the building through the pipework, we recommend to use plastic pipes.

Note ***We recommend plastic pipes for 4" pumps only.***

When plastic pipes are used, secure the pump by an unloaded straining wire to be fastened to the discharge chamber of the pump. See fig. 21.



TM00 1368 2298

Fig. 21 Fixing the straining wire

When connecting plastic pipes, use a compression coupling between the pump and the first pipe section.

Where flanged pipes are used, the flanges should be slotted to take the submersible drop cable and a water indicator hose, if fitted.

7.5 Maximum installation depth below water level [m]

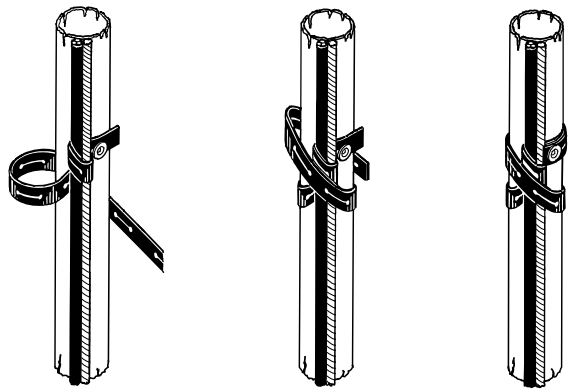
Grundfos MS 402: 150.
Grundfos MS 4000: 600.
Grundfos MS6: 600.
Grundfos MS 6000: 600.
Grundfos MMS: 600.
Franklin motors: 350.

7.6 Cable clips

Fit cable clips every 3 metres to fix the submersible drop cable and the straining wire, if fitted, to the riser pipe of the pump.

Grundfos supplies cable clip sets on request.

1. Cut off the rubber band so that the piece with no slit becomes as long as possible.
2. Insert a button in the first slit.
3. Position the wire alongside the submersible drop cable as shown in fig. 22.



TM00 1369 5092

Fig. 22 Fitting the cable clips

4. Wind the band once around the wire and the cable. Then wind it tightly at least twice around the pipe, wire and the cable.
5. Push the slit over the button and cut off the band.

Where large cable cross-sections are used, it will be necessary to wind the band several times.

Where plastic pipes are used, some slackness must be left between each cable clip as plastic pipes expand when loaded.

When flanged pipes are used, the cable clips should be fitted above and below each joint.

7.7 Lowering the pump

We recommend to check the borehole by means of an inside calliper before lowering the pump to ensure unobstructed passage.

Lower the pump carefully into the borehole, taking care not to damage the motor cable and the submersible drop cable.

Caution ***Do not lower or lift the pump by means of the motor cable.***

7.8 Installation depth

The dynamic water level should always be above the suction interconnector of the pump. See section *5.2 Positional requirements* and fig. 23.

Minimum inlet pressure is indicated in the NPSH curve for the pump. The minimum safety margin should be 1 metre head.

We recommend to install the pump so that the motor part is above the well screen in order to ensure optimum cooling.
See section *5.4 Liquid temperatures/cooling*.

When the pump has been installed to the required depth, the installation should be finished by means of a borehole seal.

Slacken the straining wire so that it becomes unloaded and lock it to the borehole seal by means of wire locks.

Note ***For pumps fitted with plastic pipes, the expansion of the pipes when loaded should be taken into consideration, when deciding on the installation depth of the pump.***

8. Start-up and operation

8.1 Start-up

When the pump has been connected correctly and it is submerged in the liquid to be pumped, it should be started with the discharge valve closed off to approx. 1/3 of its maximum volume of water.

Check the direction of rotation as described in section *6.7.1 Checking the direction of rotation*.

If there are impurities in the water, the valve should be opened gradually as the water becomes clearer. The pump should not be stopped until the water is completely clean, as otherwise the pump parts and the non-return valve may become blocked.

As the valve is being opened, the drawdown of the water level should be checked to ensure that the pump always remains submerged.

The dynamic water level should always be above the suction interconnector of the pump. See section *5.2 Positional requirements* and fig. 23.

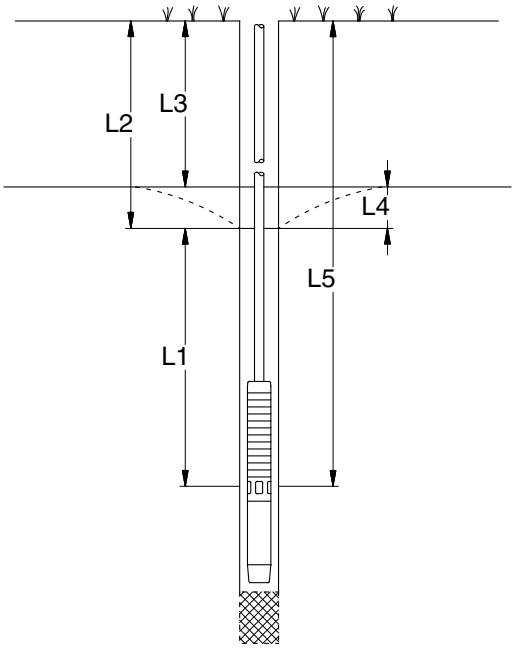


Fig. 23 Comparison of various water levels

L1: Minimum installation depth below dynamic water level. We recommend minimum 1 metre.

L2: Depth to dynamic water level.

L3: Depth to static water level.

L4: Drawdown. This is the difference between the dynamic and the static water levels.

L5: Installation depth.

If the pump can pump more than yielded by the well, we recommend to install the Grundfos MP 204 motor protector or some other type of dry-running protection.

If no water level electrodes or level switches are installed, the water level may be drawn down to the suction interconnector of the pump and the pump will then draw in air.

Caution ***Long time of operation with water containing air may damage the pump and cause insufficient cooling of the motor.***

8.2 Operation

8.2.1 Minimum flow rate

To ensure the necessary cooling of the motor, the pump flow rate should never be set so low that the cooling requirements in section *5.4 Liquid temperatures/cooling* cannot be met.

8.2.2 Frequency of starts and stops

Motor type	Number of starts
MS 402	Minimum 1 per year is recommended. Maximum 100 per hour. Maximum 300 per day.
MS 4000	Minimum 1 per year is recommended. Maximum 100 per hour. Maximum 300 per day.
MS6	Minimum 1 per year is recommended. Maximum 30 per hour. Maximum 300 per day.
MS 6000	Minimum 1 per year is recommended. Maximum 30 per hour. Maximum 300 per day.
MMS 6000	Minimum 1 per year is recommended. Maximum 15 per hour. Maximum 360 per day.
MMS 8000	Minimum 1 per year is recommended. Maximum 10 per hour. Maximum 240 per day.
MMS 10000	Minimum 1 per year is recommended. Maximum 8 per hour. Maximum 190 per day.
MMS 12000	Minimum 1 per year is recommended. Maximum 5 per hour. Maximum 120 per day.
Franklin	Minimum 1 per year is recommended. Maximum 100 per day.

9. Maintenance and service

All pumps are easy to service.

Service kits and service tools are available from Grundfos.

The pumps can be serviced at a Grundfos service centre.

Warning

If a pump has been used for a liquid which is injurious to health or toxic, the pump will be classified as contaminated.

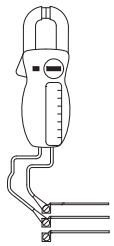
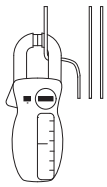
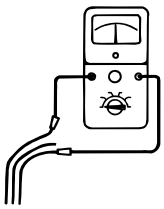
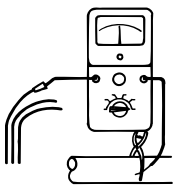
If Grundfos is requested to service the pump, Grundfos must be contacted with details about the pumped liquid, etc. before the pump is returned for service. Otherwise Grundfos can refuse to accept the pump for service.

Possible costs of returning the pump are paid by the customer.

10. Fault finding

Fault	Cause	Remedy
1. The pump does not run.	a) The fuses are blown.	Replace the blown fuses. If the new ones blow too, the electric installation and the submersible drop cable should be checked.
	b) The ELCB or the voltage-operated ELCB has tripped.	Cut in the circuit breaker.
	c) No power supply.	Contact the power supply company.
	d) The motor-protective circuit breaker has tripped.	Reset the motor-protective circuit breaker (automatically or possibly manually). Check the voltage if it trips again. If the voltage is okay, see items 1e to 1h.
	e) The motor-protective circuit breaker/contactor is defective.	Replace the motor-protective circuit breaker/contactor.
	f) Starter device is defective.	Repair or replace the starter device.
	g) The control circuit has been interrupted or is defective.	Check the electric installation.
	h) The dry-running protection has cut off the power supply to the pump due to low water level.	Check the water level. If it is okay, check the water level electrodes/level switch.
	i) The pump/submersible drop cable is defective.	Repair or replace the pump/cable.
2. The pump runs but gives no water.	a) The discharge valve is closed.	Open the valve.
	b) No water or too low water level in borehole.	See item 3a.
	c) The non-return valve is stuck in closed position.	Pull out the pump and clean or replace the valve.
	d) The suction strainer is blocked.	Pull out the pump and clean the strainer.
	e) The pump is defective.	Repair or replace the pump.
3. The pump runs at reduced capacity.	a) The drawdown is larger than anticipated.	Increase the installation depth of the pump, throttle the pump or install a pump with a smaller capacity.
	b) Wrong direction of rotation.	See section *6.7.1 Checking the direction of rotation*.
	c) The valves in the discharge pipe are partly closed/blocked.	Clean or replace the valves.
	d) The discharge pipe is partly blocked by impurities (ochre).	Clean or replace the pipe.
	e) The non-return valve of the pump is partly blocked.	Pull out the pump and clean or replace the valve.
	f) The pump and the riser pipe are partly blocked by impurities (ochre).	Pull out the pump and clean or replace it. Clean the pipes.
	g) The pump is defective.	Repair or replace the pump.
	h) Leakage in the pipework.	Check and repair the pipework.
	i) The riser pipe is defective.	Replace the pipe.
4. Frequent starts and stops.	a) The differential of the pressure switch between the start and stop pressures is too small.	Increase the differential. The stop pressure must not exceed the operating pressure of the pressure tank, and the start pressure should be high enough to ensure sufficient water supply.
	b) The water level electrodes or level switches in the reservoir have not been installed correctly.	Adjust the intervals of the electrodes/level switches to ensure suitable time between the cutting-in and cutting-out of the pump. See installation and operating instructions for the electrodes/level switches. If the intervals between stop/start cannot be changed via the automatics, the pump capacity may be reduced by throttling the discharge valve.
	c) The non-return valve is leaking or stuck half-open.	Pull out the pump and clean or replace the valve.
	d) The tank precharge pressure is too small.	Adjust the tank precharge pressure in accordance with its installation and operating instructions.
	e) The tank is too small.	Increase the capacity of the by replacing or supplementing with another tank.
	f) The diaphragm of the tank is defective.	Check the diaphragm tank.

11. Checking motor and cable

1. Supply voltage  TM00 1371 5092	Measure the voltage between the phases by means of a voltmeter. On single-phase motors, measure between phase and neutral or between two phases, depending on the type of supply. Connect the voltmeter to the terminals in the motor-protective circuit breaker.	The voltage should, when the motor is loaded, be within the range specified in section *6. Electrical connection*. The motor may burn if there are larger variations in voltage. Large variations in voltage indicate poor power supply, and the pump should be stopped until the defect has been remedied.
2. Current consumption  TM00 1372 5092	Measure the amps of each phase while the pump is operating at a constant discharge head (if possible, at the capacity where the motor is most heavily loaded). For maximum operating current, see nameplate.	On three-phase motors, the difference between the current in the phase with the highest consumption and the current in the phase with the lowest consumption should not exceed 5 %. If so, or if the current exceeds the rated current, there are the following possible faults: • The contacts of the motor-protective circuit breaker are burnt. Replace the contacts or the control box for single-phase operation. • Poor connection in leads, possibly in the cable joint. See item 3. • Too high or too low supply voltage. See item 1. • The motor windings are short-circuited or partly disjointed. See item 3. • Damaged pump is causing the motor to be overloaded. Pull out the pump for overhaul. • The resistance value of the motor windings deviates too much (three-phase). Move the phases in phase order to a more uniform load. If this does not help, see item 3.
Items 3 and 4: Measurement is not necessary when the supply voltage and the current consumption are normal.		
3. Winding resistance  TM00 1373 5092	Disconnect the submersible drop cable from the motor-protective circuit breaker. Measure the winding resistance between the leads of the drop cable.	For three-phase motors, the deviation between the highest and the lowest value should not exceed 10 %. If the deviation is higher, pull out the pump. Measure motor, motor cable and drop cable separately, and repair or replace defective parts. **Note:** The operating winding of single-phase 3-wire motors will assume the lowest resistance value.
4. Insulation resistance  TM00 1374 5092	Disconnect the submersible drop cable from the motor-protective circuit breaker. Measure the insulation resistance from each phase to earth (frame). Make sure that the earth connection was made carefully.	If the insulation resistance is less than 0.5 MΩ, the pump should be pulled out for motor or cable repair. Local regulations may specify other values for the insulation resistance.

12. Disposal

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

Subject to alterations.

SP A

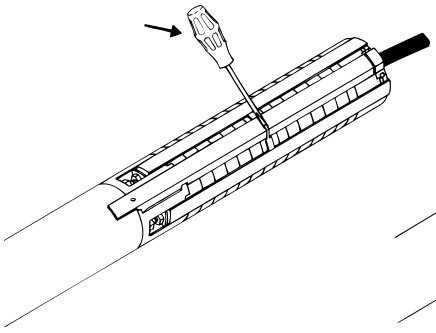


Fig. 1

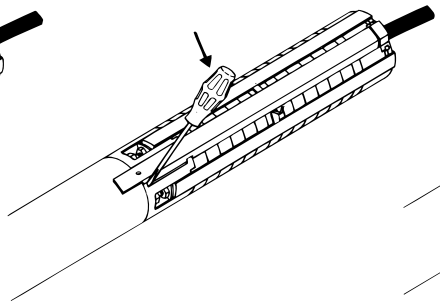


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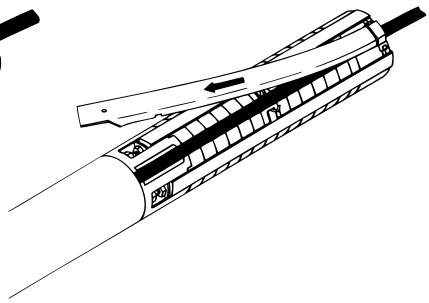


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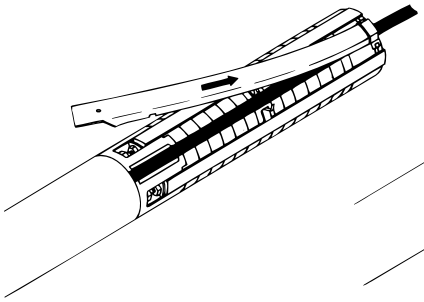


Fig. 1

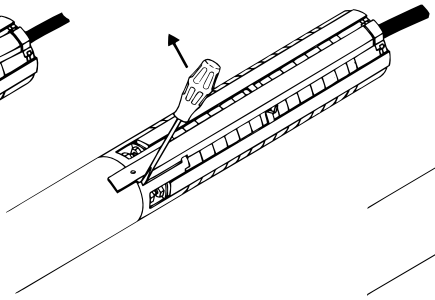


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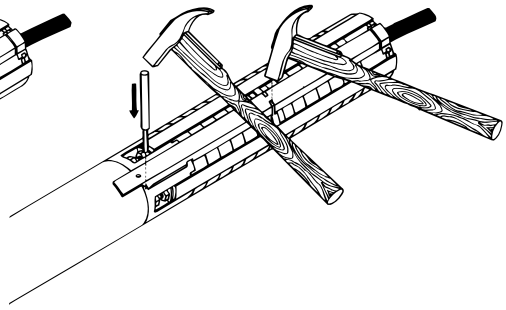


Fig. 3

TM00 1323 5092

SP A

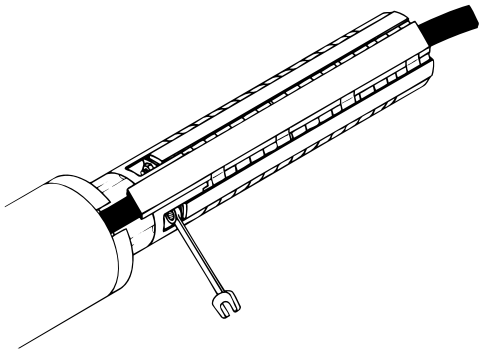


Fig. 1

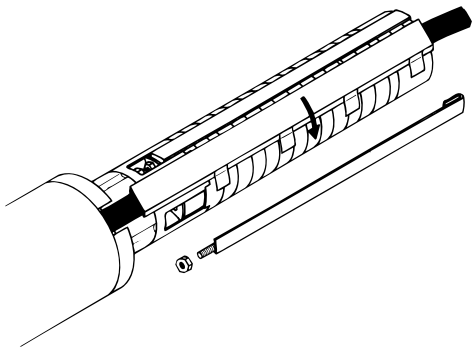


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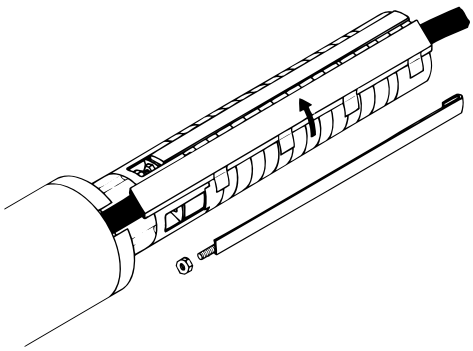


Fig. 1

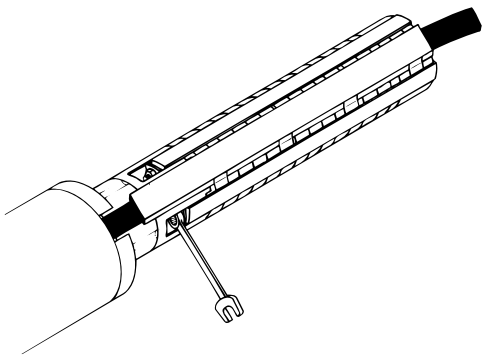


Fig. 2

TM00 1324 5092

SP 17 - SP 30 - SP 46 - SP 60

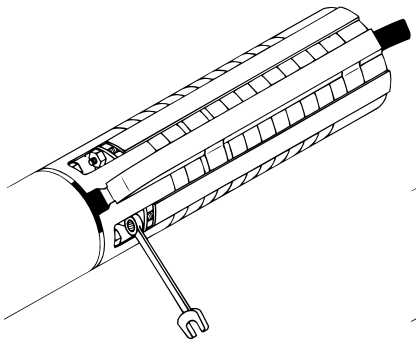


Fig. 1

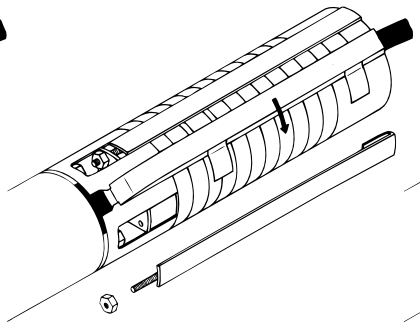


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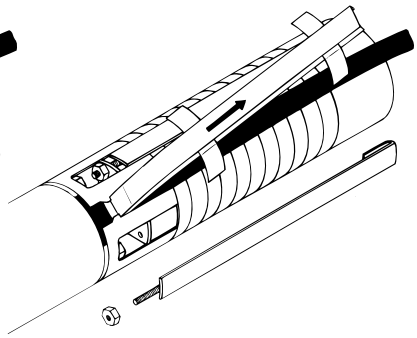


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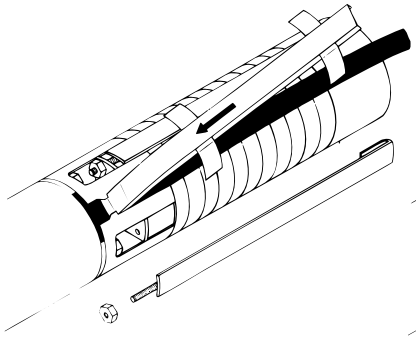


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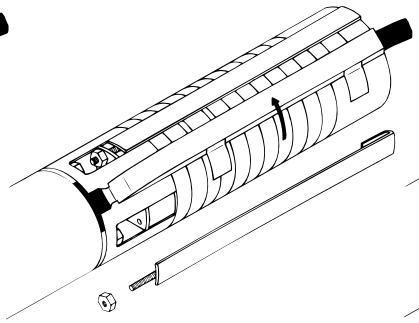


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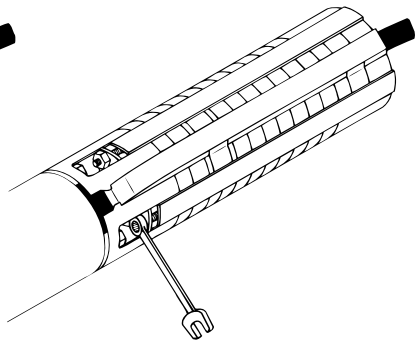


Fig. 3

TM00 1325 5092

SP 77 - SP 95 - SP 125 - SP 160 - SP 215

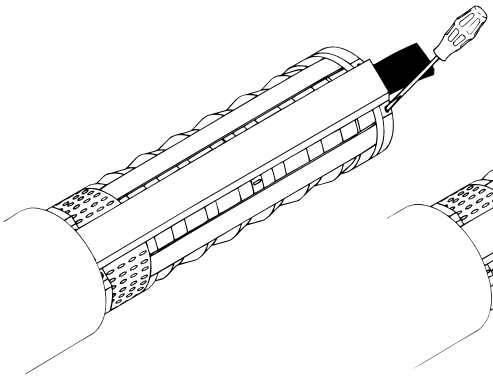


Fig. 1

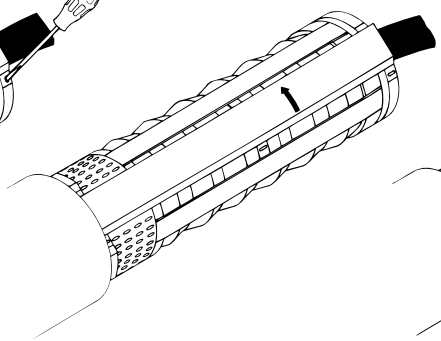


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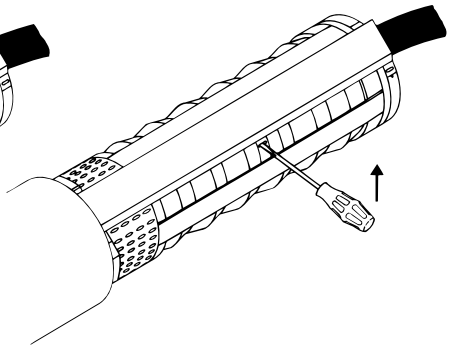


Fig. 3

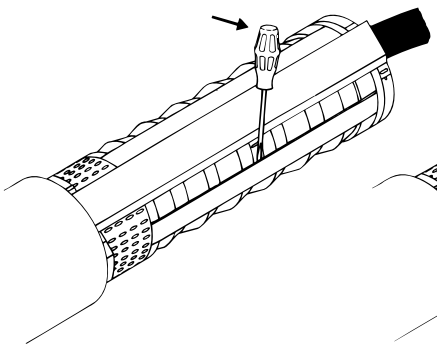


Fig. 1

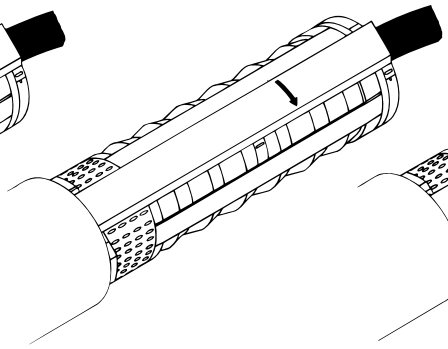


Fig. 2

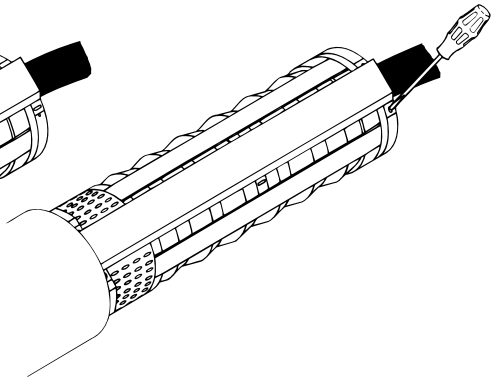


Fig. 3

TM00 1326 5092

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Revised 27.04.2012

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ECM: 1075639

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SP

Safety instructions



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GRUNDFOS

Declaration of conformity

GB: EC declaration of conformity

We, Grundfos, declare under our sole responsibility that the product SP, to which this declaration relates, is in conformity with these Council directives on the approximation of the laws of the EC member states:

— Machinery Directive (2006/42/EC).
Standard used: EN 809:1998 + A1:2009.

— Low Voltage Directive (2006/95/EC). Applicable when the rated power is lower than 1.5 kW.
Standards used: 60335-2-41:2003 + A1:2004 + A2:2010, except sections 25.1 and 25.8.

— Ecodesign Directive (2009/125/EC).
Water pumps:
Commission Regulation No 547/2012.
Applies only to water pumps marked with the minimum efficiency index MEI. See the pump nameplate.

Bare shaft pump

We, Grundfos, declare under our sole responsibility that the products SP, to which this declaration relates, are in conformity with these Council directives on the approximation of the laws of the EC member states:

— Machinery Directive (2006/42/EC).
Standard used: EN 809:1998 + A1:2009.

— Ecodesign Directive (2009/125/EC).
Water pumps:
Commission Regulation No 547/2012.
Applies only to water pumps marked with the minimum efficiency index MEI. See the pump nameplate.

Before the pump is taken into operation, the complete machinery into which the pump is to be incorporated must be declared in accordance with all relevant regulations.

BG: ЕС декларация за съответствие

Ние, фирма Grundfos, заявяваме с пълна отговорност, че продукта SP, за който се отнася настоящата декларация, отговаря на следните указания на Съвета за уеднаквяване на правните разпоредби на държавите членки на ЕС:

— Директива за машините (2006/42/EC).
Приложен стандарт: EN 809:1998 + A1:2009.

— Директива за нисковолтови системи (2006/95/EC). Приложим за помпи с номинална мощност по-нсика от 1,5 kW.
Приложени стандарти: 60335-2-41:2003 + A1:2004 + A2:2010, с изключение на раздели 25.1 и 25.8.

— Директива за екодизайн (2009/125/EC).
Водни помпи:
Наредба No 547/2012 на Европейската комисия.
Отнася се само за водни помпи, маркирани с минималният индекс за ефективност MEI. Вижте табелата с данни на помпата.

Помпа със свободен вал

Ние, фирма Grundfos, заявяваме с пълна отговорност, че продуктите SP, за които се отнася настоящата декларация, отговарят на следните указания на Съвета за уеднаквяване на правните разпоредби на държавите членки на ЕС:

— Директива за машините (2006/42/EC).
Приложен стандарт: EN 809:1998 + A1:2009.

— Директива за екодизайн (2009/125/EC).
Водни помпи:
Наредба No 547/2012 на Европейската комисия.
Отнася се само за водни помпи, маркирани с минималният индекс за ефективност MEI. Вижте табелата с данни на помпата.

Преди да се въведе в експлоатация помпата, трябва да се декларира съответствието на цялото съоръжение, в което се вгражда тази помпа, към съответните актуални наредби и стандарти.

CZ: ES prohlášení o shodě

My firma Grundfos prohlašujeme na svou plnou odpovědnost, že výrobek SP, na nějž se toto prohlášení vztahuje, je v souladu s ustanoveními směrnice Rady pro sblížení právních předpisů členských států Evropského společenství v oblastech:

— Směrnice pro strojní zařízení (2006/42/ES).
Použitá norma: EN 809:1998 + A1:2009.

— Směrnice pro nízkonapěťové aplikace (2006/95/ES). Je možno použít, pokud jmenovitý výkon je menší než 1,5 kW.
Použité normy: 60335-2-41:2003 + A1:2004 + A2:2010, mimo části 25.1 a 25.8.

— Směrnice o ekodesignu (2009/125/ES).
Vodní čerpadla:
Nařízení Komise č. 547/2012.
Vztahuje se pouze na vodní čerpadla označená minimální účinností index MEI. Viz typový štítek čerpadla.

?erpadlo s voln?m koncem h? í dele

My firma Grundfos prohlašujeme na svou plnou odpovědnost, že výrobky SP, na něž se toto prohlášení vztahuje, jsou v souladu s ustanoveními směrnice Rady pro sblížení právních předpisů členských států Evropského společenství v oblastech:

— Směrnice pro strojní zařízení (2006/42/ES).
Použitá norma: EN 809:1998 + A1:2009.

— Směrnice o ekodesignu (2009/125/ES).
Vodní čerpadla:
Nařízení Komise č. 547/2012.
Vztahuje se pouze na vodní čerpadla označená minimální účinností index MEI. Viz typový štítek čerpadla.

Před uvedením čerpadla do provozu, musí být kompletní strojní zařízení, jehož součástí čerpadlo je, deklarováno ve shodě se všemi příslušnými předpisy.

DK: EF-overensstemmelseserklæring

Vi, Grundfos, erklærer under ansvar at produktet SP som denne erklæring omhandler, er i overensstemmelse med disse af Rådets direktiver om indbyrdes tilnærmelse til EF-medlemsstaternes lovgivning:

— Maskindirektivet (2006/42/EF).
Anvendt standard: EN 809:1998 + A1:2009.

— Lavspændingsdirektivet (2006/95/EF). Gælder når mærkeeffekten er lavere end 1,5 kW.
Anvendte standarder: 60335-2-41:2003 + A1:2004 + A2:2010, undtagen afsnit 25.1 og 25.8.

— Ecodesigndirektivet (2009/125/EF).
Vandpumper:
Kommissionens forordning nr. 547/2012.
Gælder kun vandpumper der er mærket med mindsteeffektivitetsindekset MEI. Se pumpens typeskilt.

Pumpe uden kobling og motor

Vi, Grundfos, erklærer under ansvar at produkterne SP som denne erklæring omhandler, er i overensstemmelse med disse af Rådets direktiver om indbyrdes tilnærmelse til EF-medlemsstaternes lovgivning:

— Maskindirektivet (2006/42/EF).
Anvendt standard: EN 809:1998 + A1:2009.

— Ecodesigndirektivet (2009/125/EF).
Vandpumper:
Kommissionens forordning nr. 547/2012.
Gælder kun vandpumper der er mærket med mindsteeffektivitetsindekset MEI. Se pumpens typeskilt.

Før pumpen tages i brug, skal det komplette maskinanlæg hvori den skal inkorporeres, erklæres i overensstemmelse med alle relevante bestemmelser.

DE: EG-Konformitätserklärung

Wir, Grundfos, erklären in alleiniger Verantwortung, dass das Produkt SP, auf das sich diese Erklärung bezieht, mit den folgenden Richtlinien des Rates zur Angleichung der Rechtsvorschriften der EU-Mitgliedsstaaten übereinstimmt:

— Maschinenrichtlinie (2006/42/EG).
Norm, die verwendet wurde: EN 809:1998 + A1:2009.

— Niederspannungsrichtlinie (2006/95/EG). Nur anwendbar für Nennleistungen kleiner 1,5 kW.
Normen, die verwendet wurden: 60335-2-41:2003 + A1:2004 + A2:2010, ausgenommen Abschnitt 25.1 und 25.8.

— ErP-Richtlinie (2009/125/EG).
Wasserpumpen:
Verordnung der Europäischen Kommission Nr. 547/2012.
Gilt nur für Pumpen, für die der Mindesteffizienzindex (MEI) anzugeben ist. Siehe das Typenschild der Pumpe.

Pumpe mit freiem Wellenende

Wir, Grundfos, erklären in alleiniger Verantwortung, dass die Produkte SP, auf die sich diese Erklärung bezieht, mit den folgenden Richtlinien des Rates zur Angleichung der Rechtsvorschriften der EU-Mitgliedsstaaten übereinstimmen:

— Maschinenrichtlinie (2006/42/EG).
Norm, die verwendet wurde: EN 809:1998 + A1:2009.

— ErP-Richtlinie (2009/125/EG).
Wasserpumpen:
Verordnung der Europäischen Kommission Nr. 547/2012.
Gilt nur für Pumpen, für die der Mindesteffizienzindex (MEI) anzugeben ist. Siehe das Typenschild der Pumpe.

Vor der Inbetriebnahme der Pumpe ist eine Konformitätserklärung für die gesamte Anlage, in die die Baugruppe "Pumpe mit freiem Wellenende" eingebaut ist, auszustellen.

EE: EL vastavusdeklaratsioon

Meie, Grundfos, deklareerime enda ainuvastutusel, et toode SP, mille kohta käesolev juhend käib, on vastavuses EÜ Nõukogu direktiividega EMÜ liikmesriikide seaduste ühitamise kohta, mis käsitlevad:

— Masinate ohutus (2006/42/EC).
Kasutatud standard: EN 809:1998 + A1:2009.

— Madalpinge direktiiv (2006/95/EC). Kehtib, kui nominaalvõimsus on alla 1,5 kW.
Kasutatud standardid: 60335-2-41:2003 + A1:2004 + A2:2010, välja arvatud paragrahvid 25.1 ja 25.8.

— Ökodisaini direktiiv (2009/125/EC).
Veepumbad:
Komisjoni regulatsioon nr 547/2012.
Kehtiv ainult veepumpadele, mis on märgitud miinimum kasuteguri indeksiga MEI. Vaata pumba silti.

Vaba v?lliga pump

Meie, Grundfos, deklareerime enda ainuvastutusel, et tooted SP, mille kohta käesolev juhend käib, on vastavuses EÜ Nõukogu direktiividega EMÜ liikmesriikide seaduste ühitamise kohta, mis käsitlevad:

— Masinate ohutus (2006/42/EC).
Kasutatud standard: EN 809:1998 + A1:2009.

— Ökodisaini direktiiv (2009/125/EC).
Veepumbad:
Komisjoni regulatsioon nr 547/2012.
Kehtiv ainult veepumpadele, mis on märgitud miinimum kasuteguri indeksiga MEI. Vaata pumba silti.

Enne pumba töösse võtmist peab kogu seadmestik, millesse pump kuulub, olema heakskiidetud vastavalt asjakohastele eeskirjadele.

GR: Δήλωση συμμόρφωσης EC

Εμείς, η Grundfos, δηλώνουμε με αποκλειστικά δική μας ευθύνη ότι τα προϊόντα SP, στα οποία αναφέρεται η παρούσα δήλωση, συμμορφώνονται με τις εξής Οδηγίες του Συμβουλίου περί προσέγγισης των νομοθεσιών των κρατών μελών της ΕΕ:

— Οδηγία για μηχανήματα (2006/42/EC).
Πρότυπο που χρησιμοποιήθηκε: EN 809:1998 + A1:2009.

— Οδηγία χαμηλής τάσης (2006/95/EC). Ισχύει για ονομαστική ισχύ μικρότερη από 1,5 kW.
Πρότυπα που χρησιμοποιήθηκαν: 60335-2-41:2003 + A1:2004 + A2:2010, εκτός των παραγράφων 25.1 και 25.8.

— Οδηγία Οικολογικού Σχεδιασμού (2009/125/EC).
Αντλίες νερού:
Ρύθμιση πρώτης εκκίνησης No 547/2012.
Ισχύει μόνο για αντλίες νερού που φέρουν τον ελάχιστο δείκτη απόδοσης MEI. Βλέπε πινακίδα αντλίας.

Α ν τ λ?α ε λ ε?θ ε ρ ο υ ?ξ ο ν α

Εμείς, η Grundfos, δηλώνουμε με αποκλειστικά δική μας ευθύνη ότι τα προϊόντα SP στα οποία αναφέρεται η παρούσα δήλωση, συμμορφώνονται με τις εξής Οδηγίες του Συμβουλίου περί προσέγγισης των νομοθεσιών των κρατών μελών της ΕΕ:

— Οδηγία για μηχανήματα (2006/42/EC).
Πρότυπο που χρησιμοποιήθηκε: EN 809:1998 + A1:2009.

— Οδηγία Οικολογικού Σχεδιασμού (2009/125/EC).
Αντλίες νερού:
Ρύθμιση πρώτης εκκίνησης No 547/2012.
Ισχύει μόνο για αντλίες νερού που φέρουν τον ελάχιστο δείκτη απόδοσης MEI. Βλέπε πινακίδα αντλίας.

Πριν η αντλία τεθεί σε λειτουργία, όλο το μηχάνημα στο οποίο η αντλία πρόκειται να ενσωματωθεί πρέπει να δηλωθεί σύμφωνα με όλους τους σχετικούς κανονισμούς.

ES: Declaración CE de conformidad

Nosotros, Grundfos, declaramos bajo nuestra propia responsabilidad que el producto SP, al cual se refiere esta declaración, está conforme con las Directivas del Consejo en la aproximación de las leyes de los Estados Miembros del EM:

— Directiva de Maquinaria (2006/42/CE).
Norma aplicada: EN 809:1998 + A1:2009.

— Directiva de Baja Tensión (2006/95/CE). Aplicable cuando el índice de potencia es inferior a 1,5 kW.
Normas aplicadas: 60335-2-41:2003 + A1:2004 + A2:2010, excepto las secciones 25.1 y 25.8.

— Directiva sobre diseño ecológico (2009/125/CE).
Bombas de agua:
Reglamento de la Comisión Nº 547/2012.
Aplicable únicamente a las bombas de agua marcadas con el índice de eficiencia mínima (IEM). Véase la placa de características de la bomba.

Bomba a eje libre

Nosotros, Grundfos, declaramos bajo nuestra entera responsabilidad que los productos SP, a los cuales se refiere esta declaración, están conformes con las Directivas del Consejo en la aproximación de las leyes de las Estados Miembros del EM:

— Directiva de Maquinaria (2006/42/CE).
Norma aplicada: EN 809:1998 + A1:2009.

— Directiva sobre diseño ecológico (2009/125/CE).
Bombas de agua:
Reglamento de la Comisión Nº 547/2012.
Aplicable únicamente a las bombas de agua marcadas con el índice de eficiencia mínima (IEM). Véase la placa de características de la bomba.

Antes de la puesta en marcha de la bomba, todo el sistema en que la bomba va a incorporarse, debe estar de acuerdo con todas las normativas en vigor.

FR: Déclaration de conformité CE

Nous, Grundfos, déclarons sous notre seule responsabilité, que le produit SP, auquel se réfère cette déclaration, est conforme aux Directives du Conseil concernant le rapprochement des législations des Etats membres CE relatives aux normes énoncées ci-dessous :

— Directive Machines (2006/42/CE).
Norme utilisée : EN 809:1998 + A1:2009.

— Directive Basse Tension (2006/95/CE). Applicable lorsque la puissance nominale est inférieure à 1,5 kW.
Normes utilisées : 60335-2-41:2003 + A1:2004 + A2:2010, sauf pour paragraphes 25.1 et 25.8.

— Directive sur l'éco-conception (2009/125/CE).
Pompes à eau:
Réglementation de la Commission N° 547/2012.
S'applique uniquement aux pompes à eau marquées de l'indice de performance minimum IEM. Voir plaque signalétique de la pompe.

Pompe à arbre nu

Nous, Grundfos, déclarons sous notre seule responsabilité, que les produits SP, auxquels se réfère cette déclaration, sont conformes aux Directives du Conseil concernant le rapprochement des législations des Etats membres CE relatives aux normes énoncées ci-dessous :

— Directive Machines (2006/42/CE).
Norme utilisée : EN 809:1998 + A1:2009.

— Directive sur l'éco-conception (2009/125/CE).
Pompes à eau:
Réglementation de la Commission N° 547/2012.
S'applique uniquement aux pompes à eau marquées de l'indice de performance minimum IEM. Voir plaque signalétique de la pompe.

Avant que la pompe ne soit mise en service, la machine complète, dans laquelle sera incorporée la pompe, doit être en accord avec toutes les réglementations en vigueur.

IT: Dichiarazione di conformità CE

Grundfos dichiara sotto la sua esclusiva responsabilità che il prodotto SP, al quale si riferisce questa dichiarazione, è conforme alle seguenti direttive del Consiglio riguardanti il riavvicinamento delle legislazioni degli Stati membri CE:

— Direttiva Macchine (2006/42/CE).
Norma applicata: EN 809:1998 + A1:2009.

— Direttiva Bassa Tensione (2006/95/CE). Applicabile quando la corrente nominale è inferiore a 1,5 kW.
Norme applicate: 60335-2-41:2003 + A1:2004 + A2:2010, eccetto per i paragrafi 25.1 e 25.8.

— Direttiva EuP per l'Ecodesign (2009/125/CE).
Pompe per acqua:
Regolamento CE n. 547/2012.
Applicabile solo a pompe per acqua con l'indice di efficienza minimo MEI. Vedi la targhetta identificativa della pompa.

Pompa ad asse nudo

Grundfos dichiara sotto la sua esclusiva responsabilità che i prodotti SP, ai quali si riferisce questa dichiarazione, sono conformi alle seguenti direttive del Consiglio riguardanti il riavvicinamento delle legislazioni degli Stati membri CE:

— Direttiva Macchine (2006/42/CE).
Norma applicata: EN 809:1998 + A1:2009.

— Direttiva EuP per l'Ecodesign (2009/125/CE).
Pompe per acqua:
Regolamento CE n. 547/2012.
Applicabile solo a pompe per acqua con l'indice di efficienza minimo MEI. Vedi la targhetta identificativa della pompa.

Si ricorda che se la pompa è inserita in un sistema, prima di avviare la pompa stessa, è necessario che tutto il sistema sia in accordo alle norme di riferimento.

HR: EZ izjava o usklađenosti

Mi, Grundfos, izjavljujemo pod vlastitom odgovornošću da je proizvod SP, na koji se ova izjava odnosi, u skladu s direktivama ovog Vijeća o usklađivanju zakona država članica EU:

— Direktiva za strojeve (2006/42/EZ).
Korištena norma: EN 809:1998 + A1:2009.

— Direktiva za niski napon (2006/95/EZ). Primjenjuje se kada je nazivna snaga niža od 1,5 kW.
Korištene norme: 60335-2-41:2003 + A1:2004 + A2:2010, osim odlomaka 25.1 i 25.8.

— Direktiva o ekološkoj izvedbi (2009/125/EZ).
Crpke za vodu:
Uredba Komisije No 547/2012.
Odnosi se samo na crpke za vodu označene s indeksom minimalne učinkovitosti MEI. Pogledajte natpisnu pločicu crpke.

Crpka s golim vratilom

Mi, Grundfos, izjavljujemo pod vlastitom odgovornošću da je proizvod SP, na koji se ova izjava odnosi, u skladu s direktivama ovog Vijeća o usklađivanju zakona država članica EU:

— Direktiva za strojeve (2006/42/EZ).
Korištena norma: EN 809:1998 + A1:2009.

— Direktiva o ekološkoj izvedbi (2009/125/EZ).
Crpke za vodu:
Uredba Komisije No 547/2012.
Odnosi se samo na crpke za vodu označene s indeksom minimalne učinkovitosti MEI. Pogledajte natpisnu pločicu crpke.

Prije puštanja u pogon crpke, kompletan uređaj u koji je crpka ugrađena mora biti u skladu s odgovarajućim propisima.

KZ: ЕО сәйкестік туралы мәлімдеме

Біз, Grundfos компаниясы, барлық жауапкершілікпен, осы мәлімдемеге қатысты болатын SP бұйымы ЕО мүше елдерінің заң шығарушы жарлықтарын үндестіру туралы мына Еуроодақ кеңесінің жарлықтарына сәйкес келетіндігін мәлімдейміз:

— Механикалық құрылғылар (2006/42/EC).
Қолданылған стандарт: EN 809:1998 + A1:2009.

— Төмен Кернеулі Жабдық (2006/95/EC).
Номиналды қуаты 1,5 кВт-тан аз болғанда қолдануға жарамды.
Қолданылған стандарттар: 60335-2-41:2003 + A1:2004 + A2:2010, Басқа тараулары 25.1 және 25.8.

— Қоршаған ортаны қорғауға арналған нұсқау (2009/125/EC).
Су сорғылар:
Еуропалық комиссия регламенті 547/2012.
Тек минималды тиімділік көрсіткішіпен МТК белгіленген су сорғыларына арналған. Сорғыдағы фирмалық тақтайшаны қараңыз.

Жала?дуал сор?ыш

Біз, Grundfos компаниясы, барлық жауапкершілікпен, осы мәлімдемеге қатысты болатын SP бұйымдары ЕО мүше елдерінің заң шығарушы жарлықтарын үндестіру туралы мына Еуроодақ Кеңесінің жарлықтарына сәйкес келетіндігін мәлімдейміз:

— Механикалық құрылғылар (2006/42/EC).
Қолданылған стандарт: EN 809:1998 + A1:2009.

— Қоршаған ортаны қорғауға арналған нұсқау (2009/125/EC).
Су сорғылар:
Еуропалық комиссия регламенті 547/2012.
Тек минималды тиімділік көрсіткішіпен МТК белгіленген су сорғыларына арналған. Сорғыдағы фирмалық тақтайшаны қараңыз.

Эксплуатацияға сорғыш жіберілмей тұрып, барлық құжат және ережелермен камтамасыз етулүі қажет.

LV: EK paziņojums par atbilstību prasībām

Sabiedrība GRUNDFOS ar pilnu atbildību dara zināmu, ka produkts SP, uz kuru attiecas šis paziņojums, atbilst šādām Padomes direktīvām par tuvināšanos EK dalībvalstu likumdošanas normām:

— Mašīnbūves direktīva (2006/42/EK).
Piemērotais standarts: EN 809:1998 + A1:2009.

— Zema sprieguma direktīva (2006/95/EK). Piemērojams, kad nominālā jauda ir mazāka par 1,5 kW.
Piemērotie standarti: 60335-2-41:2003 + A1:2004 + A2:2010, izņemot nodaļas 25.1 un 25.8.

— Ekodizaina direktīva (2009/125/EK).
Ūdens sūkņi:
Komisijas regula Nr. 547/2012.
Attiecas tikai uz ūdens sūkņiem, kuriem ir minimālais efektivitātes indekss MEI. Sk. sūkņa pases datu plāksnītē.

Atsegtas v ā rpstas s ū knis

Sabiedrība GRUNDFOS ar pilnu atbildību dara zināmu, ka produkti SP, uz kuriem attiecas šis paziņojums, atbilst šādām Padomes direktīvām par tuvināšanos EK dalībvalstu likumdošanas normām:

— Mašīnbūves direktīva (2006/42/EK).
Piemērotais standarts: EN 809:1998 + A1:2009.

— Ekodizaina direktīva (2009/125/EK).
Ūdens sūkņi:
Komisijas regula Nr. 547/2012.
Attiecas tikai uz ūdens sūkņiem, kuriem ir minimālais efektivitātes indekss MEI. Sk. sūkņa pases datu plāksnītē.

Pirms sūkņa nodošanas ekspluatācijā visai iekārtai, kurā sūknis tiek ietverts, jābūt atzītai par tādu, kas atbilst visiem piemērojamiem normatīviem.

LT: EB atitikties deklaracija

Mes, Grundfos, su visa atsakomybe pareiškiame, kad gaminys SP, kuriam skirta ši deklaracija, atitinka šias Tarybos Direktyvas dėl Europos Ekonominės Bendrijos šalių narių įstatymų suderinimo:

— Mašinų direktyva (2006/42/EB).
Taikomas standartas: EN 809:1998 + A1:2009.

— Žemų įtampų direktyva (2006/95/EB). Galioja, kai nominali galia yra mažesnė kaip 1,5 kW.
Taikomi standartai: 60335-2-41:2003 + A1:2004 + A2:2010, išskyrus skyrius 25.1 ir 25.8.

— Ekologinio projektavimo direktyva (2009/125/EB).
Vandens siurbliai:
Komisijos reglamentas Nr. 547/2012.
Galioja tik vandens siurbliams, ant kurių nurodytas minimalus efektyvumo koeficientas MEI. Žr. siurblio vardinę plokštelę.

Siurblys su laisvu velenu

Mes, Grundfos, su visa atsakomybe pareiškiame, kad gaminiai SP, kuriems skirta ši deklaracija, atitinka šias Tarybos Direktyvas dėl Europos Ekonominės Bendrijos šalių narių įstatymų suderinimo:

— Mašinų direktyva (2006/42/EB).
Taikomas standartas: EN 809:1998 + A1:2009.

— Ekologinio projektavimo direktyva (2009/125/EB).
Vandens siurbliai:
Komisijos reglamentas Nr. 547/2012.
Galioja tik vandens siurbliams, ant kurių nurodytas minimalus efektyvumo koeficientas MEI. Žr. siurblio vardinę plokštelę.

Prieš pradedant siurblį eksploatuoti, visa įranga, kurioje montuojamas siurblys, turi būti deklaruota pagal galiojančius reikalavimus.

HU: EK megfelelőségi nyilatkozat

Mi, a Grundfos, egyedüli felelősséggel kijelentjük, hogy a SP termék, amelyre jelen nyilatkozik vonatkozik, megfelel az Európai Unió tagállamainak jogi irányelveit összehangoló tanács alábbi előírásainak:

— Gépek (2006/42/EK).
Alkalmazott szabvány: EN 809:1998 + A1:2009.

— Kisfeszültségű Direktíva (2006/95/EK). 1,5 kW alatti névleges teljesítmény alatt érvényes.
Alkalmazott szabványok: 60335-2-41:2003 + A1:2004 + A2:2010, kivéve 25.1 és 25.8 fejezetek.

— Környezetbarát tervezésre vonatkozó irányelv (2009/125/EK).
Víz szivattyúk:
Az Európai Bizottság 547/2012. számú rendelete
Csak a MEI minimum hatásfok index-el jelölt víz szivattyúkra vonatkozik. Lásd a szivattyú adattábláján.

Szabad tengelyv é ges szivatty ú

Mi, a Grundfos, egyedüli felelősséggel kijelentjük, hogy a SP termékek, amelyekre jelen nyilatkozik vonatkozik, megfelelnek az Európai Unió tagállamainak jogi irányelveit összehangoló tanács alábbi előírásainak:

— Gépek (2006/42/EK).
Alkalmazott szabvány: EN 809:1998 + A1:2009.

— Környezetbarát tervezésre vonatkozó irányelv (2009/125/EK).
Víz szivattyúk:
Az Európai Bizottság 547/2012. számú rendelete
Csak a MEI minimum hatásfok index-el jelölt víz szivattyúkra vonatkozik. Lásd a szivattyú adattábláján.

A szivattyú üzembe helyezése előtt a teljes gépegységet, amelybe a szivattyú beépítésre került, a vonatkozó előírások szerint minősíteni kell.

NL: EC overeenkomstigheidsverklaring

Wij, Grundfos, verklaren geheel onder eigen verantwoordelijkheid dat het product SP waarop deze verklaring betrekking heeft, in overeenstemming is met de Richtlijnen van de Raad in zake de onderlinge aanpassing van de wetgeving van de EG lidstaten betreffende:

— Machine Richtlijn (2006/42/EC).
Gebruikte norm: EN 809:1998 + A1:2009.

— Laagspannings Richtlijn (2006/95/EC). Van toepassing wanneer het opgenomen vermogen lager is dan 1,5 kW.
Gebruikte normen: 60335-2-41:2003 + A1:2004 + A2:2010, behalve hoofdstukken 25.1 en 25.8.

— Ecodesign Richtlijn (2009/125/EC).
Waterpompen:
Verordening (EG) Nr. 547/2012 van de Commissie.
Is alleen van toepassing op waterpompen die gekenmerkt worden door de minimale efficiëntie index MEI. Zie het typeplaatje van de pomp.

Pomp met vrije aseinde

Wij, Grundfos, verklaren geheel onder eigen verantwoordelijkheid dat de producten SP waarop deze verklaring betrekking heeft, in overeenstemming zijn met de Richtlijnen van de Raad in zake de onderlinge aanpassing van de wetgeving van de EG Lidstaten betreffende:

— Machine Richtlijn (2006/42/EC).
Gebruikte norm: EN 809:1998 + A1:2009.

— Ecodesign Richtlijn (2009/125/EC).
Waterpompen:
Verordening (EG) Nr. 547/2012 van de Commissie.
Is alleen van toepassing op waterpompen die gekenmerkt worden door de minimale efficiëntie index MEI. Zie het typeplaatje van de pomp.

Voordat de pomp in gebruik wordt genomen, moet de gehele installatie waarin de pomp zich bevindt overeenstemmend zijn met alle relevante wetgevingen.

UA: Свідчення про відповідність вимогам ЄС

Компанія Grundfos заявляє про свою виключну відповідальність за те, що продукт SP, на який поширюється дана декларація, відповідає таким рекомендаціям Ради з уніфікації правових норм країн - членів ЄС:

— Механічні прилади (2006/42/ЄС).
Стандарти, що застосовувалися: EN 809:1998 + A1:2009.

— Низька напруга (2006/95/ЄС). Застосовується при потужності меншій ніж 1,5 кВт.
Стандарти, що застосовувалися: 60335-2-41:2003 + A1:2004 + A2:2010, крім розділів 25.1 і 25.8.

— Директива з екодизайну (2009/125/ЄС.
Насоси для води:
Регламент Комісії № 547/2012.
Стосується тільки насосів для води, що відзначені мінімальним показником ефективності MEI. Дивись заводський шильдик на насосі.

Насос без двигуна

Компанія Grundfos заявляє про свою виключну відповідальність за те, що продукти SP, на які поширюється дана декларація, відповідають таким рекомендаціям Ради з уніфікації правових норм країн - членів ЄС:

— Механічні прилади (2006/42/ЄС).
Стандарти, що застосовувалися: EN 809:1998 + A1:2009.

— Директива з екодизайну (2009/125/ЄС.
Насоси для води:
Регламент Комісії № 547/2012.
Стосується тільки насосів для води, що відзначені мінімальним показником ефективності MEI. Дивись заводський шильдик на насосі.

Перед введенням насосу в експлуатацію, механізм, що включає в себе даний насос, має бути задекларований згідно з усіма відповідними нормами.

PL: Deklaracja zgodności WE

My, Grundfos, oświadczamy z pełną odpowiedzialnością, że nasze wyroby SP, których deklaracja niniejsza dotyczy, są zgodne z następującymi wytycznymi Rady d/s ujednolicenia przepisów prawnych krajów członkowskich WE:

— Dyrektywa Maszynowa (2006/42/WE).
Zastosowana norma: EN 809:1998 + A1:2009.

— Dyrektywa Niskonapięciowa (LVD) (2006/95/WE). Mają zastosowanie w przypadku, gdy moc znamionowa jest mniejsza niż 1,5 kW.
Zastosowane normy: 60335-2-41:2003 + A1:2004 + A2:2010, z wyjątkiem rozdziałów: 25.1 i 25.8.

— Dyrektywa Ekoprojektowa (2009/125/WE).
Pompy do wody:
Rozporządzenie komisji nr 547/2012.
Dotyczy tylko pomp do tłoczenia wody z minimalnym indeksem sprawności MEI. Patrz tabliczka znamionowa.

Pompa z wolnym wa?em

My, Grundfos, oświadczamy z pełną odpowiedzialnością, że nasze wyroby SP, których deklaracja niniejsza dotyczy, są zgodne z następującymi wytycznymi Rady d/s ujednolicenia przepisów prawnych krajów członkowskich WE:

— Dyrektywa Maszynowa (2006/42/WE).
Zastosowana norma: EN 809:1998 + A1:2009.

— Dyrektywa Ekoprojektowa (2009/125/WE).
Pompy do wody:
Rozporządzenie komisji nr 547/2012.
Dotyczy tylko pomp do tłoczenia wody z minimalnym indeksem sprawności MEI. Patrz tabliczka znamionowa.

Wszystkie urządzenia współpracujące z pompą muszą być zgodne z wszystkimi odpowiednimi wytycznymi.

PT: Declaração de conformidade CE

A Grundfos declara sob sua única responsabilidade que o produto SP, ao qual diz respeito esta declaração, está em conformidade com as seguintes Directivas do Conselho sobre a aproximação das legislações dos Estados Membros da CE:

— Directiva Máquinas (2006/42/CE).
Norma utilizada: EN 809:1998 + A1:2009.

— Directiva Baixa Tensão (2006/95/CE). Aplicável quando a potência nominal é inferior a 1,5 kW.
Normas utilizadas: 60335-2-41:2003 + A1:2004 + A2:2010, excepto nos pontos 25.1 e 25.8.

— Directiva de Concepção Ecológica (2009/125/CE).
Bombas de água:
Regulamento da Comissão No 547/2012.
Aplica-se apenas a bombas de água registadas com o índice de eficiência mínimo MEI. Ver a chapa de características da bomba.

Bomba com ponta de veio livre

A Grundfos declara sob sua única responsabilidade que os produtos SP, aos quais diz respeito esta declaração, estão em conformidade com as seguintes Directivas do Conselho sobre a aproximação das legislações dos Estados Membros da CE:

— Directiva Máquinas (2006/42/CE).
Norma utilizada: EN 809:1998 + A1:2009.

— Directiva de Concepção Ecológica (2009/125/CE).
Bombas de água:
Regulamento da Comissão No 547/2012.
Aplica-se apenas a bombas de água registadas com o índice de eficiência mínimo MEI. Ver a chapa de características da bomba.

Antes de colocar a bomba em operação, o equipamento no qual a mesma irá ser incorporada deve ser declarado de acordo com todas as regulamentações relevantes.

RU: Декларация о соответствии ЕС

Мы, компания Grundfos, со всей ответственностью заявляем, что изделия SP, к которым относится настоящая декларация, соответствуют следующим Директивам Совета Евросоюза об унификации законодательных предписаний стран-членов ЕС:

— Механические устройства (2006/42/EC).
Применявшийся стандарт: EN 809:1998 + A1:2009.

— Низковольтное оборудование (2006/95/EC). Применимо, если номинальная мощность меньше 1,5 кВт.
Применявшиеся стандарты: 60335-2-41:2003 + A1:2004 + A2:2010, кроме разделов 25.1 и 25.8.

— Директива по экологическому проектированию энергопотребляющей продукции (2009/125/EC).
Насосы для перекачивания воды:
Регламент Комиссии ЕС № 547/2012.
Применимо только к насосам для перекачивания воды, промаркированным показателем минимальной эффективности MEI. См. фирменную табличку насоса.

Насос со свободным концом вала

Мы, компания Grundfos, со всей ответственностью заявляем, что изделия SP, к которым относится настоящая декларация, соответствуют следующим Директивам Совета Евросоюза об унификации законодательных предписаний стран-членов ЕС:

— Механические устройства (2006/42/EC).
Применявшийся стандарт: EN 809:1998 + A1:2009.

— Директива по экологическому проектированию энергопотребляющей продукции (2009/125/EC).
Насосы для перекачивания воды:
Регламент Комиссии ЕС № 547/2012.
Применимо только к насосам для перекачивания воды, промаркированным показателем минимальной эффективности MEI. См. фирменную табличку насоса.

Прежде чем насос будет введён в эксплуатацию, необходимо получить подтверждение, что агрегат в сборе, частью которого будет данный насос, соответствует всем основным требованиям и нормам.

RO: Declaraţie de conformitate CE

Noi, Grundfos, declarăm pe propria răspundere că produsele SP, la care se referă această declaraţie, sunt în conformitate cu aceste Directive de Consiliu asupra armonizării legilor Statelor Membre CE:

— Directiva Utilaje (2006/42/CE).
Standard utilizat: EN 809:1998 + A1:2009.

— Directiva Tensiune Joasă (2006/95/CE). Aplicabil când puterea înregistrată este mai mică decât 1,5 kW.
Standarde utilizate: 60335-2-41:2003 + A1:2004 + A2:2010, cu exceptia capitolelor 25.1 şi 25.8.

— Directiva Ecodesign (2009/125/CE).
Pompe de apa:
Regulamentul Comisiei nr. 547/2012.
Se aplica numai pompelor de apa cu marca de eficienta minima index MEI. Vezi plăcuţa de identificare a pompei.

Pomp? f?r? arbore

Noi, Grundfos, declarăm pe propria răspundere că produsele SP, la care se referă această declaraţie, sunt în conformitate cu aceste Directive de Consiliu asupra armonizării legilor Statelor Membre CE:

— Directiva Utilaje (2006/42/CE).
Standard utilizat: EN 809:1998 + A1:2009.

— Directiva Ecodesign (2009/125/CE).
Pompe de apa:
Regulamentul Comisiei nr. 547/2012.
Se aplica numai pompelor de apa cu marca de eficienta minima index MEI. Vezi plăcuţa de identificare a pompei.

Înainte de pornirea pompei, utilajul complet în care este încorporată pompa trebuie să fie în conformitate cu toate reglementările care li se aplică.

SK: Prehlásenie o konformite EÚ

My firma Grundfos prehlasujeme na svoju plnú zodpovednosť, že výrobok SP, na ktorý sa toto prehlásenie vzťahuje, je v súlade s ustanovením smernice Rady pre zblíženie právnych predpisov členských štátov Európskeho spoločenstva v oblastiach:

— Smernica pre strojové zariadenie (2006/42/EC).
Použitá norma: EN 809:1998 + A1:2009.

— Smernica pre nízkonapäťové aplikácie (2006/95/EC). Je možné použit', pokiaľ je menovitý výkon menší než 1,5 kW.
Použité normy: 60335-2-41:2003 + A1:2004 + A2:2010, okrem častí 25.1 a 25.8.

— Smernica o ekodizajne (2009/125/ES).
Čerpadlá na vodu:
Nariadenie Komisie č 547/2012.
Vzťahuje sa iba na čerpadlá pre vodu označené minimálnym indexom energetickej účinnosti MEI. Pozri typový štítok čerpadla.

Vlastn? hriade? ?erpadla

My firma Grundfos prehlasujeme na svoju plnú zodpovednosť, že výrobky SP, na ktoré sa toto prehlásenie vzťahuje, sú v súlade s ustanovením smernice Rady pre zblíženie právnych predpisov členských štátov Európskeho spoločenstva v oblastiach:

— Smernica pre strojové zariadenie (2006/42/EC).
Použitá norma: EN 809:1998 + A1:2009.

— Smernica o ekodizajne (2009/125/ES).
Čerpadlá na vodu:
Nariadenie Komisie č 547/2012.
Vzťahuje sa iba na čerpadlá pre vodu označené minimálnym indexom energetickej účinnosti MEI. Pozri typový štítok čerpadla.

Pred uvedením čerpadla do prevádzky, musí byť kompletné zariadenie - ktorého súčasťou je aj čerpadlo, deklarované v zhode so všetkými príslušnými predpismi.

SI: ES izjava o skladnosti

V Grundfosu s polno odgovornostjo izjavljamo, da so naši izdelki SP, na katere se ta izjava nanaša, v skladu z naslednjimi direktivami Sveta o približevanju zakonodaje za izenačevanje pravnih predpisov držav članic ES:

— Direktiva o strojih (2006/42/ES).
Uporabljena norma: EN 809:1998 + A1:2009.

— Direktiva o nizki napetosti (2006/95/ES). Primerno, kadar je nominalna moč nižja od 1,5 kW.
Uporabljeni normi: 60335-2-41:2003 + A1:2004 + A2:2010, z izjemo razdelkov 25.1 in 25.8.

— Eco-design direktiva (2009/125/ES).
Vodne črpalke:
Uredba komisije št. 547/2012.
Velja le za vodne črpalke označene z indeksom minimalne učinkovitosti MEI. Glejte tipsko ploščico črpalke.

?rpalka s prosto osjo

V Grundfosu s polno odgovornostjo izjavljamo, da so naši izdelki SP, na katere se ta izjava nanaša, v skladu z naslednjimi direktivami Sveta o približevanju zakonodaje za izenačevanje pravnih predpisov držav članic ES:

— Direktiva o strojih (2006/42/ES).
Uporabljena norma: EN 809:1998 + A1:2009.

— Eco-design direktiva (2009/125/ES).
Vodne črpalke:
Uredba komisije št. 547/2012.
Velja le za vodne črpalke označene z indeksom minimalne učinkovitosti MEI. Glejte tipsko ploščico črpalke.

Vse postrojenje, katerega del je črpalka, mora biti pred zagonom v skladu z vsemi relevantnimi regulativami.

RS: EC deklaracija o konformitetu

Mi, Grundfos, izjavljujemo pod vlastitom odgovornošću da je proizvod SP, na koji se ova izjava odnosi, u skladu sa direktivama Saveta za usklađivanje zakona država članica EU:

— Direktiva za mašine (2006/42/EC).
Korišćen standard: EN 809:1998 + A1:2009.

— Direktiva niskog napona (2006/95/EC). Primenljivo kada je nominalna snaga niža od 1,5 kW.
Korišćeni standardi: 60335-2-41:2003 + A1:2004 + A2:2010, osim odeljaka 25.1 i 25.8.

— Direktiva o ekološkom projektovanju (2009/125/EC).
Pumpe za vodu:
Uredba komisije br. 547/2012.
Odnosi se samo na pumpe za vodu označene sa indeksom minimalne efikasnosti MEI. Pogledajte natpisnu pločicu pumpe.

Vratilo pumpe

Mi, Grundfos, izjavljujemo pod vlastitom odgovornošću da je proizvod SP, na koji se ova izjava odnosi, u skladu sa direktivama Saveta za usklađivanje zakona država članica EU:

— Direktiva za mašine (2006/42/EC).
Korišćen standard: EN 809:1998 + A1:2009.

— Direktiva o ekološkom projektovanju (2009/125/EC).
Pumpe za vodu:
Uredba komisije br. 547/2012.
Odnosi se samo na pumpe za vodu označene sa indeksom minimalne efikasnosti MEI. Pogledajte natpisnu pločicu pumpe.

Pre nego što se pumpa pusti u rad kompletna mašinerija u koju je pumpa inkorporisana mora biti u skladu sa lokalnim bitnim regulativama.

FI: EY-vaatimustenmukaisuusvakuutus

Me, Grundfos, vakuutamme omalla vastuullamme, että tuote SP, jota tämä vakuutus koskee, on EY:n jäsenvaltioiden lainsäädännön yhdenmukaistamiseen tähtäävien Euroopan neuvoston direktiivien vaatimusten mukainen seuraavasti:

— Konedirektiivi (2006/42/EY).
Sovellettu standardi: EN 809:1998 + A1:2009.

— Pienjännitedirektiivi (2006/95/EY). Koskee alle 1,5 kW nimellistehoa.
Sovellettavat standardit: 60335-2-41:2003 + A1:2004 + A2:2010, lukuun ottamatta kappaleita 25.1 ja 25.8.

— Ekologista suunnittelua koskeva direktiivi (2009/125/EY).
Vesipumput:
Komission asetus nro 547/2012.
Koskee vain vesipumppuja, jotka on merkitty minimihyötysuhdeindeksillä MEI. Katso pumpun tyyppikilvestä.

Erillinen pumppu

Me, Grundfos, vakuutamme omalla vastuullamme, että tuotteet SP, joita tämä vakuutus koskee, ovat EY:n jäsenvaltioiden lainsäädännön yhdenmukaistamiseen tähtäävien Euroopan neuvoston direktiivien vaatimusten mukaisia seuraavasti:

— Konedirektiivi (2006/42/EY).
Sovellettu standardi: EN 809:1998 + A1:2009.

— Ekologista suunnittelua koskeva direktiivi (2009/125/EY).
Vesipumput:
Komission asetus nro 547/2012.
Koskee vain vesipumppuja, jotka on merkitty minimihyötysuhdeindeksillä MEI. Katso pumpun tyyppikilvestä.

Ennen pumpun käyttöönottoa koko järjestelmä, jossa pumppua tullaan käyttämään, on osoitettava kaikkien soveltuvien säädösten mukaiseksi.

SE: EG-försäkran om överensstämmelse

Vi, Grundfos, försäkrar under ansvar att produkten SP, som omfattas av denna försäkran, är i överensstämmelse med rådets direktiv om inbördes närmande till EU-medlemsstaternas lagstiftning, avseende:

— Maskindirektivet (2006/42/EG).
Tillämpad standard: EN 809:1998 + A1:2009.

— Lågspänningsdirektivet (2006/95/EG). Kan användas när märkeffekten är lägre än 1,5 kW.
Tillämpade standarder: 60335-2-41:2003 + A1:2004 + A2:2010, förutom avsnitt 25.1 och 25.8.

— Ekodesigndirektivet (2009/125/EG).
Vattenpumpar:
Kommissionens förordning nr. 547/2012.
Avser endast vattenpumpar markerade med min. effektivitetsindex (MEI). Se pumpens typskylt.

Pump utan koppling och motor

Vi, Grundfos, försäkrar under ansvar att produkterna SP, som omfattas av denna försäkran, är i överensstämmelse med rådets direktiv om inbördes närmande till EU-medlemsstaternas lagstiftning, avseende:

— Maskindirektivet (2006/42/EG).
Tillämpad standard: EN 809:1998 + A1:2009.

— Ekodesigndirektivet (2009/125/EG).
Vattenpumpar:
Kommissionens förordning nr. 547/2012.
Avser endast vattenpumpar markerade med min. effektivitetsindex (MEI). Se pumpens typskylt.

Före igångkörning av pumpen måste hela applikationen, som pumpen kommer att vara en del av, stämma överens med samtliga relevanta föreskrifter.

VN: Cam kết về sự phù hợp EC

Công ty Grundfos chúng tôi cam kết chịu trách nhiệm chính về sản phẩm SP cho những vấn đề liên quan đến cam kết này, phù hợp với các chỉ dẫn của các điều luật thành viên cộng đồng Châu Âu.

— Máy móc thiết bị (2006/42/EC).
Tiêu chuẩn áp dụng: EN 809:1998 + A1:2009.

— Thiết bị điện sử dụng nguồn điện thế thấp (2006/95/EC). Áp dụng khi dòng điện danh định thấp hơn 1,5 kW.
Tiêu chuẩn áp dụng: 60335-2-41:2003 + A1:2004 + A2:2010, ngoại trừ phần 25.1 và 25.8.

— Chỉ thị thiết kế sinh thái (2009/125/EC).
Máy bơm nước:
Bảng nội quy số 547/2012.
Chỉ áp dụng cho máy bơm nước được đánh dấu với chỉ số hiệu quả tối thiểu MEI. Xem bảng tên bơm.

??u b?m

Công ty Grundfos chúng tôi cam kết chịu trách nhiệm chính về sản phẩm SP cho những vấn đề liên quan đến cam kết này, phù hợp với các chỉ dẫn của các điều luật thành viên cộng đồng Châu Âu:

— Máy móc thiết bị (2006/42/EC).
Tiêu chuẩn áp dụng: EN 809:1998 + A1:2009.

— Chỉ thị thiết kế sinh thái (2009/125/EC).
Máy bơm nước:
Bảng nội quy số 547/2012.
Chỉ áp dụng cho máy bơm nước được đánh dấu với chỉ số hiệu quả tối thiểu MEI. Xem bảng tên bơm.

Trước khi máy bơm được đưa vào sử dụng, toàn bộ các hệ thống máy móc gắn kết với máy bơm cũng phải được lắp đặt phù hợp với những quy định liên quan.

TR: EC uygunluk bildirgesi

Grundfos olarak bu beyannameye konu olan SP ürünlerinin, AB Üyesi Ülkelerin kanunlarını birbirine yaklaştırma üzerine Konsey Direktifleriyle uyumlu olduğunun yalnızca bizim sorumluluğumuz altında olduğunu beyan ederiz:

— Makineler Yönetmeliği (2006/42/EC).
Kullanılan standart: EN 809:1998 + A1:2009.

— Düşük Voltaj Yönetmeliği (2006/95/EC). Nominal güç 1,5 kW'tan daha düşük olduğunda uygulanabilir.
Kullanılan standartlar: 60335-2-41:2003 + A1:2004 + A2:2010, 25.1 ve 25.8. bölümleri hariç.

— Çevreye duyarlı tasarım (Ecodesign) Direktifi (2009/125/EC).
Devirdaim su pompaları:
547/2012 sayılı Komisyon Yönetmeliği.
Yalnızca Minimum Enerji Verimlilik Endeksine (MEI) dahil olan olan devirdaim su pompaları için geçerlidir. Pompanın bilgi etiketine bakın.

??plak ?aft pompa

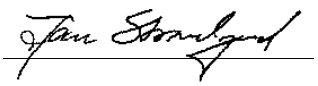
Grundfos olarak bu beyannameye konu olan SP ürünlerinin, AB Üyesi Ülkelerin kanunlarını birbirine yaklaştırma üzerine Konsey Direktifleriyle uyumlu olduğunun yalnızca bizim sorumluluğumuz altında olduğunu beyan ederiz:

— Makineler Yönetmeliği (2006/42/EC).
Kullanılan standart: EN 809:1998 + A1:2009.

— Çevreye duyarlı tasarım (Ecodesign) Direktifi (2009/125/EC).
Devirdaim su pompaları:
547/2012 sayılı Komisyon Yönetmeliği.
Yalnızca Minimum Enerji Verimlilik Endeksine (MEI) dahil olan olan devirdaim su pompaları için geçerlidir. Pompanın bilgi etiketine bakın.

Pompa kullanılmaya başlamadan önce pompayla birlikte çalışacak olan tüm makinelerin ilgili kanunlara uygunluğu beyan edilmelidir.

Bjerringbro, 15th September 2012



Jan Strandgaard
Technical Director
Grundfos Holding A/S
Poul Due Jensens Vej 7
8850 Bjerringbro, Denmark

Person authorised to compile technical file and empowered to sign the EC declaration of conformity.

Декларация о соответствии на территории РФ

Насосы типа SP сертифицированы на соответствие требованиям Технического регламента о безопасности машин и оборудования (Постановление правительства РФ от 15.09.2009 №753).
Сертификат соответствия:
№ C-DK.АЯ56.B.03740, срок действия до 27.05.2017г.

Истра, 1 августа 2012 г.



Касаткина В. В.
Руководитель отдела качества,
экологии и охраны труда
ООО Грундфос Истра, Россия
143581, Московская область,
Истринский район,
дер. Лешково, д.188

Original safety instructions.

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Warning

Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

1. Symbols used in this document



Warning

If these safety instructions are not observed, it may result in personal injury.



Warning

If these instructions are not observed, it may lead to electric shock with consequent risk of serious personal injury or death.

Caution ***If these safety instructions are not observed, it may result in malfunction or damage to the equipment.***

Note ***Notes or instructions that make the job easier and ensure safe operation.***

2. Introduction

These safety instructions apply to Grundfos submersible pumps, type SP, with Grundfos submersible motors, types MS or MMS.

If the pump is fitted with another motor make, please note that the motor data may differ from the data stated in this document.

Note ***The USB stick supplied with the product contains installation and operating instructions in various languages.***

3. Delivery

Caution ***The pump should remain in the packing until it is placed in vertical position during installation.***

Handle the pump with care.

4. Pumped liquids

Clean, thin, non-explosive liquids without solid particles or fibres.



Warning

If the pump is used for pumping hot liquids (40 to 60 °C), make sure that persons cannot come into contact with the pump and the installation, e.g. by installing a guard.

5. Preparations before installation



Warning

Before starting work on the product, switch off the power supply. Make sure that the power supply cannot be accidentally switched on.

5.1 Positional requirements



Warning

If the pump is to be installed in a position where it is accessible, the coupling must be suitably isolated from human touch. The pump can for instance be built into a flow sleeve.

5.2 Pipe connection



Warning

Make sure that the pipes are suitable for the actual liquid temperature and the pump pressure.

6. Electrical connection



Warning

During electrical installation, make sure that the power supply cannot be accidentally switched on.



Warning

The electrical installation should be carried out by an authorised person in accordance with local regulations.



Warning

The pump must be earthed.

The pump must be connected to an external mains switch with a minimum contact gap of 3 mm in all poles.



Warning

MS 402 motors for supply voltages up to and including 440 V (see motor nameplate) must be protected against voltage peaks higher than 650 V (peak value) between the supply terminals.

7. Startup

Caution ***Fix and submerge the pump before starting it.***

8. Maintenance and service



Warning

If a pump has been used for a liquid which is injurious to health or toxic, it will be classified as contaminated.

9. Disposal

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

Subject to alterations.

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Addresses Revised 24.10.2013

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ECM: 1075644

Appendix 5

Bravo Bore Technical Information

Group Pty Ltd

"Providing Irrigation & Pumping Solutions"

UNSW - Kensington

BRAVO Bore Pump
29-02-2016
Lic No. 10CA119351

GPS Co-ord Lat 33.91604° Long 151.22646°



Prepared by: Southwell Group Pty Ltd 29-02-2016
Hugh@southwells.com.au
Ph 02 46557004

Department of Primary Industries
Water

Contact: Richard Meares
Phone: 02 8838 7527
Email: richard_meares@dpi.nsw.gov.au

Our ref: 10WA119351
File No:
Your Ref:

Mr Hugh Southwell
PO Box 162,
CAMDEN NSW 2570

19 January 2016

Dear Hugh,

Re: Your water supply work(s) and/or use approval under the Water Management Act 2000 10WA119351- Lot3 DP 1104617

I am writing to notify you that your application for approval to construct a water supply work(s) and/or use water under s.95 of the *Water Management Act 2000* has been granted. A Statement of Approval is enclosed. Please take the time to read the terms and conditions of the Approval.

This approval will take effect from the date of this notice.

Right of Appeal: If you are dissatisfied with the terms and conditions of this approval, the *Water Management Act 2000* provides for a right of appeal to the Land and Environment Court in certain circumstances. The appeal must be lodged within 28 days from the due date of this notice.

Subject to the appeals process and the approval subsequently taking effect, this approval provides you with a right to construct a water supply work(s) and/or to use water from the aquifer, subject to the conditions in the enclosed approval and any water restrictions that may be in place.

Groundwater is a limited and valuable resource and the NSW Office of Water encourages its efficient use.

Your responsibility is to now:

- ensure that the works are drilled by a person who holds a current driller's licence issued by the NSW Office of Water. Drillers are required to carry their licence with them; and
- provide the driller with a copy of the approval to construct the bore and conditions sheets so that they are aware of any special construction requirements. The NSW Office of Water strongly advises that you obtain a written agreement from the driller for the work to be undertaken.

Drilling the bore and providing information

The NSW Office of Water recommends that the driller constructs the bore to the minimum requirements set out in the guidelines, *Minimum Construction Requirements for Water Bores in Australia,* which are available at www.iah.org.au/pdfs/mcrwba.pdf

Department of Primary Industries
Water

Statement of Approval

Water Management Act 2000

Approval details

Approval number	10WA119351
Status	CURRENT*
Approval kind	Water Supply Works
Water sharing plan	Greater Metropolitan Region Groundwater Sources
Date of effect	Should an appeal be made against the granting of this approval, this approval will not take effect until the appeal is finally disposed of.
Expiry date	18/01/2026
Approval holder(s)	Schedule 1
Water supply works	Schedule 2
Conditions	Schedule 3

Contact for service of documents

Name	THE UNIVERSITY OF NEW SOUTH WALES
Address	Att: Greg Fry Facilities Management Matthews Building, Level 3 KENSINGTON NSW-2052

* **Note: An approval has effect for such period as is specified in the approval, or if the period is extended under section 105, that extended period. If an application for extension of an approval is lodged before the approval expires, the term of the expiring approval is extended until either the date of the final decision on the application, or a date fixed by the Minister for the approval, whichever is the later date. An approval which has expired can be the subject of an application to extend it but it needs to be accompanied by a statutory declaration of the reasons for the delay in making the application. If the Minister accepts these reasons the term of the approval is taken to have been extended, and the application may be dealt with, as if the application had been made before the approval expired.**

It is an offence under the Water Management Act 2000 to breach a term or condition of the approval or to construct and use works to which the approval does not relate. It is also an offence to use works the subject of an approval if the approval has expired, been surrendered or cancelled.

Schedule 2 - Water supply works

Part A: Authorised water supply works

Subject to the conditions of this approval, in relation to each numbered work in the table, the holders of this approval are authorised to construct and use a water supply work of the type shown at the location specified:

Work 1

Specified work	Bore
Specified location	3//1104617 Whole Lot
Management zone (if applicable)	Botany Management Zone 2
Water source	Botany Sands Groundwater Source
Water sharing plan	Greater Metropolitan Region Groundwater Sources

MK0485-00001

Within sixty (60) days of completing construction of the water supply work authorised by this approval, the approval holder must provide a completed Form A for that work to DPI Water.

MW0051-00001

Once the approval holder becomes aware of a breach of any condition on this approval, the approval holder must notify the Minister as soon as practicable. The Minister must be notified by:
A. email: water.enquiries@dpi.nsw.gov.au,
or
B. telephone: 1800 353 104. Any notification by telephone must also be confirmed in writing within seven (7) business days of the telephone call.

Other conditions

No other conditions applicable

Glossary

cease to take - Cease to take conditions means any condition on this approval, or on the access licence under which water is proposed to be taken, that prohibits the taking of water in a particular circumstance.

form A - Form A is the form supplied to the approval holder by the driller at completion of the work. It includes details of location and construction of the bore, and quality of the bore water. All sections must be completed before the approval holder signs the form.

logbook - A logbook is a document, electronic or hard copy, that records specific required information.

metered water supply work - A metered water supply work is a water supply work fitted with a data logger and a water meter that complies with Australian Standard AS 4747: Meters for non-urban water supply.

water meter - A water meter is a device that measures the volume of water that is extracted over a known period of time. Examples of a water meter may include a mechanical meter, electromagnetic meter, channel meter with mobile phone, or an authorised meter equivalent.

General Notes

All conditions on an approval require compliance. An appeal to the Land and Environment Court against a decision to impose certain conditions on an approval can be made within 28 days after the date the decision is made. Conditions identified with the first letter "D" are those that can be appealed during the appeal period.

The words in this approval have the same meaning as in the *Water Management Act 2000*

Note: The words in this approval have the same meaning as in the WMA

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Driller's Licence No:	DL1771	1
Class of Licence:	Class 4	
Driller's Name:	Brett Delamont	
Assistant Driller:	Matt Blatch	
Contractor:	Highland Drilling	
New bore	X	Replacement bore
Deepened		Enlarged
Reconditioned		Other (specify)
Final Depth	30 m	

Work Licence No:	10WA114637	2
Name of Licensee:	University of NSW	
Intended Use:	Commercial	
Completion Date:	10th December 2015	

DRILLING DETAILS 3

From (m)	To (m)	Hole Diameter (mm)	Drilling Method See Code 3
0	30	330	7

WATER BEARING ZONES 4

From (m)	To (m)	Thickness (m)	S W L (m)	Estimated Yield (L/s) Individual Aquifer	Estimated Yield (L/s) Cumulative	Test method See Code 4		D D L at end of test (m)	Duration Hrs	Duration min	Salinity (Conductivity or TDS) Cond (µS/cm)	Salinity (Conductivity or TDS) TDS (mg/L)
24	30	6	6		12	1	A		7			120ppm

CASING / LINER DETAILS 5

Material Code 5	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Method Fixing Code 5
13	214	5.5	+.5	24	6

Casing support method — See Code 5: 2

Type of casing bottom — See Code 5: 2

Centralisers installed (Yes/No): Yes (indicate on sketch)

Sump installed (Yes/No): No — From ____ m To ____ m

Pressure cemented (Yes/No): No — From ____ m To ____ m

Casing Protector cemented in place

WATER ENTRY DESIGN 6

General Material Code 5	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Opening type See Code 6	Fixing See Code 5	Screen Aperture (mm)	Slot Details Length (mm)	Width (mm)	Alignment See Code 6
13	214	5.5	24	30	11	7	1			H

GRAVEL PACK 7

Type		Grade		Grain size (mm) From	Grain size (mm) To	Depth (m) From	Depth (m) To	Quantity Litres	Quantity m^3
Rounded	X	Graded	X	3	5	2	30	4000	
Crushed		Ungraded							

Bentonite/Grout seal (Yes/No): Yes

Method of placement of Gravel Pack — See Code 7: 1

For Departmental use only: G W

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Work Licence No: 10WA114637

BORE DEVELOPMENT 8

Chemical used for breaking down drilling mud (Yes/No)	Yes	Name:	Chlorine										
Method	Bailing/Surging		Jetting		Airlifting	X	Backwashing		Pumping		Other:		
Duration		hrs		hrs	7	hrs		hrs		hrs		hrs	

DISINFECTION ON COMPLETION 9

Chemical(s) used	Quantity applied (Litres)	Method of application

PUMPING TESTS ON COMPLETION 10

Test type		Date	Pump intake depth (m)	Initial Water Level (SWL) (m)	Pumping rate (L/s)	Water Level at end of pumping (DDL) (m)	Duration of Test (hrs)	Recovery		
								Water level (m)	Time taken (hrs)	(mins)
Multi stage (stepped drawdown)	Stage 1									
	Stage 2									
	Stage 3									
	Stage 4									
Single stage (constant rate)										

Height of measuring point above ground level ____ m Test Method ____ See Code 4

WORK PARTLY BACKFILLED OR ABANDONED 11

Original depth of work: ____ m Is work partly backfilled: (Yes/No) ____

Is work abandoned: (Yes/No) ____ Method of abandonment: Backfilled ☐ Plugged ☐ Capped ☐

Has any casing been left in the work (Yes/No) ____ From ____ m To ____ m

Sealing / fill type See Code 11	From depth (m)	To depth (m)	Sealing / fill type See Code 11	From depth (m)	To depth (m)

Site chosen by: Hydrogeologist ☐ Geologist ☐ Driller ☐ Diviner ☐ Client X Other ____ 12

Lot No ____ DP No ____ 13

Work Location Co ordinates Easting 151-13.608 Northing 3354.955(S) Zone ____

GPS: (Yes/No) Yes >> AMG/AGD ☐ or MGA/GDA ☐ (See explanation)

Please mark the work site with "X" on the CLID provided map.

Indicate also the distances in metres from two (2) adjacent boundaries, and attach the map to this Form A package.

Signatures:

Driller: ..... **Licensee:** .....

Date: ..... **Date:** .....

NSW GOVERNMENT Office of Water

Form A Particulars of completed work

Work Licence No: 10WA114637

DRILLER'S ROCK/STRATA DESCRIPTION (LITHOLOGY) — 15

Depth From (m)	Depth To (m)	Description (See Code 15)
0	30	Sand - white fine-med grain

WORK CONSTRUCTION SKETCH

WORK NOT CONSTRUCTED BY DRILLING RIG — 16

Method of excavation: Hand dug ☐ Back hoe ☐ Dragline ☐ Dozer ☐ Other

Depth (m)	Length (m)	Width (m)	Diameter (m)	Lining material	Dimentions of liner (m)	From Depth (m)	To Depth (m)

Please attach copies of the following if available — 17

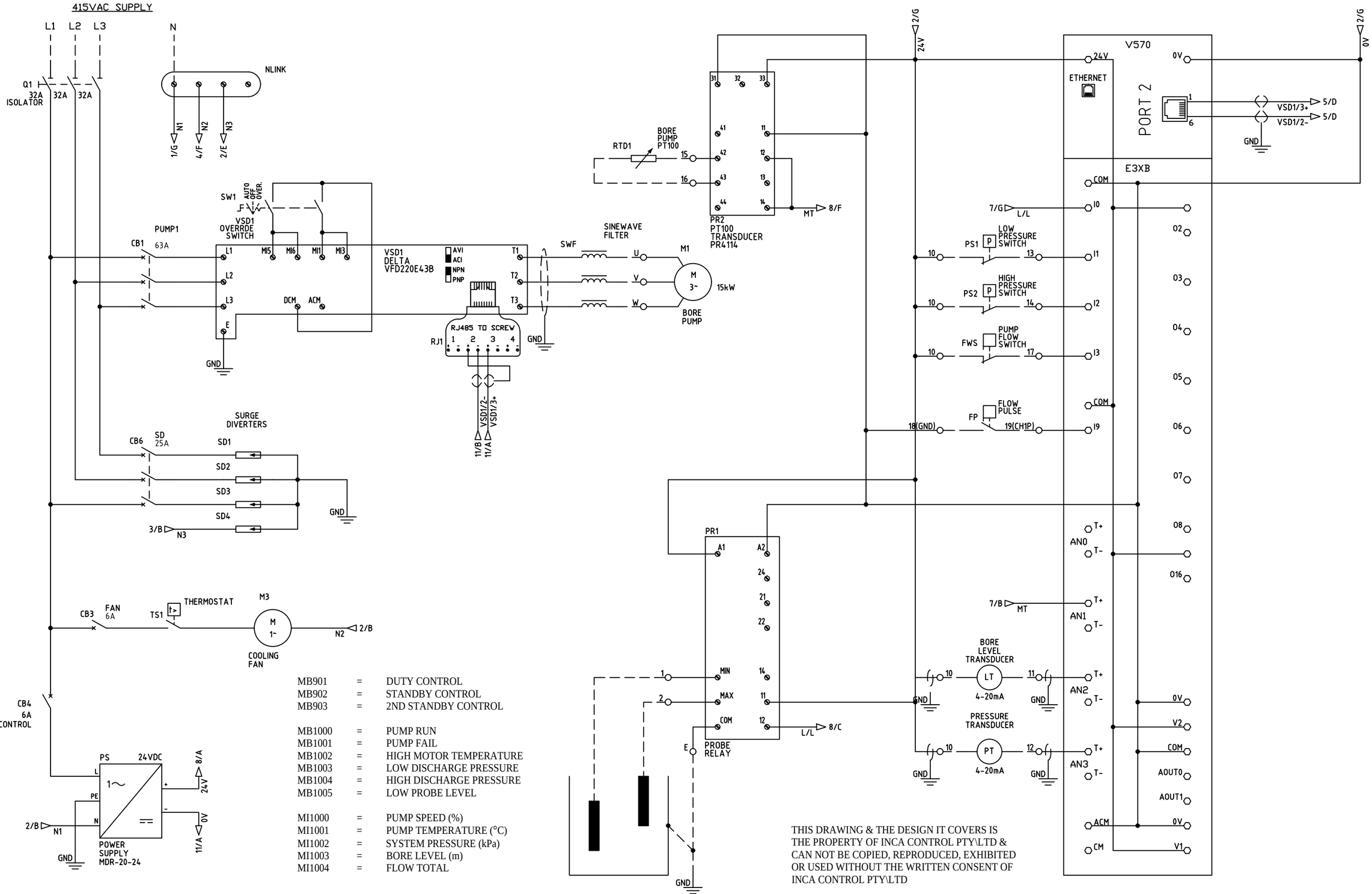
Geologist log	(Yes/No) ☐	Laboratory analysis of water Sample	(Yes/No) ☐	Pumping test(s)	(Yes/No) ☐
Geophysical log	(Yes/No) ☐	Sieve analysis of aquifer material	(Yes/No) ☐	Installed Pump details	(Yes/No) ☐

Irrigation

UNSW - Sydney

List of Critical Infrastructure
BRAVO Bore

	Description	Model
Pump	Grundfos SP Submersible pump	SP46-9
	with MS6000 15kw motor	15A21909P115500001
Pump Column	Permaglass Fibre column	100mm
Bore Cap	100mm Stainless Steel	
Rate of Flow Valve	ME Mack 50mm Rate of flow valve	P40 pilot ACV Series
	with orifice plate, stainless steel	P100 series valve
	control tube and pilot. Set at 8.0lps	
Water Meter	Elster 50mm H4000 water meter	H4000 50mm
	with PR7 optical reader	
Low level probe	3 x low level probes 11SN1	11SN1
	in 32mm conduit	
Level Transducer	Mercoid Level Transducer	DWY MBLT-2SC-IVPM-60-66
	in 32mm Conduit	
High / Low pressure switch	Condor Pressure Switch 1/4"	MDR3
Control Panel	Inca control VSD with Sine wave filter	Drawing no.
		11004



MB901 = DUTY CONTROL
MB902 = STANDBY CONTROL
MB903 = 2ND STANDBY CONTROL

MB1000 = PUMP RUN
MB1001 = PUMP FAIL
MB1002 = HIGH MOTOR TEMPERATURE
MB1003 = LOW DISCHARGE PRESSURE
MB1004 = HIGH DISCHARGE PRESSURE
MB1005 = LOW PROBE LEVEL

MI1000 = PUMP SPEED (%)
MI1001 = PUMP TEMPERATURE (°C)
MI1002 = SYSTEM PRESSURE (kPa)
MI1003 = BORE LEVEL (m)
MI1004 = FLOW TOTAL

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No:	Revision	Date	By

INCA CONTROL PTY LTD
UNIT14/02 OWEN ST
GLENDENNING NSW 2761
Phone: (02) 9675 3815
Web: www.incacontrol.com.au

SCALE 1:1

	DATE	NAME
Edit	08/07/2015	F.E.
Chec.		

FILENAME 20165

Single VSD Pressure System Pump Controls

ROUND HOUSE

11004

SHEETS 1

UNSW Commission Test
BRAVO Bore

SOUTHWELL Irrigation

38 Edward St Camden

Date: 16-02-2016

Client Name: University of New South Wales

Project Name: Commission tests for BRAVO Bore

Present: Brenton Nicholson, Peter Lea

Item no.		Operation	Comment	Target	Checked
1		Pressure test Mainline for 24 hr		1600kpa	√
2		Pump Start Duty	Controlled from downstream tapping transducer	570 Kpa	√
3		Pump Set Pressure	Controlled from downstream tapping transducer	600 Kpa	√
4		Pump Stop Duty	Controlled from downstream tapping transducer	600 Kpa	√
5		Pump run on time to stop (all duties)	Hold 600 Kpa for 60 Seconds	60 seconds	√
6		System High Press Pump Stop & Alarm	Controlled from downstream tapping transducer	700 Kpa	√
7		High Press Stop and Alarm	Controlled from up stream tapping pressure switch	750 Kpa	√
8		Low Press Stop and Alarm	Controlled from up stream tapping pressure switch	400 Kpa	√
9		Low aquifer Level	Pump will NOT Start and Alarm	RL 18.5 mt	√
10		Aquifer reset level	via level transducer	RL 13.5 mt	√
11		Check operation of cooling fans	Visual	Yes	√
12		Check maximum flow rate of bore	via water meter	8 lt/sec	√

H4000 Woltmann Helix
Helical Vane Cold Water Meters

Product specification



The H4000 is a high capacity in-line Woltmann helical vane type meter with a precision injection moulded measurement mechanism eminently suitable for high and sustained flows associated with bulk metering. Low pressure loss characteristics are due to minimum restriction and no change in flow direction as water flows through the meter. For maintenance purposes the complete measuring mechanism may be quickly replaced with a pre-calibrated measuring mechanism, or alternatively a blank cover may be fitted, making a by-pass unnecessary in most cases. The Helix H4000 meter range complies with the Metrological and Technical Requirements of NMI R 49-1 (Water Meters Intended for the Metering of Cold Potable Water and Hot Water) in horizontal, vertical and inclined pipelines.

Measurement mechanism

The measurement mechanism incorporates state of the art features to give optimum long term accuracy, extended wear life and reduced maintenance. The balanced rotor has a specific gravity of 1.0 to minimise bearing loads and reduce friction. This ensures that even the slightest movement of water will be translated to the rotor, giving improved flow sensitivity at low flows. The measurement mechanism has been specially designed to give the rotor a "thrust relief" effect as water passes through the meter. This, together with the use of jeweled rotor bearings plus tungsten carbide thrust pads and stub shafts result in greater linear accuracy and longer wear life.

Register

The Helix H4000 has a hermetically sealed register with kilolitres shown in a bold straight reading drum and pointers indicating litres. An e^{sens} patented inductive resonant pulse target is also incorporated into the register optimising the overall sensing capability. The "copper can" outer barrier and mineral glass lens, together with a small drain hole in the lid preventing stagnant water pooling in the lid if left open, ensures moisture is kept out to give clear, condensation free readings over the life of the meter, even in the most severe environments. The register is protected by a robust housing and lid. The resonant target is not affected by a static magnet placed directly above the target pointer.

Reliable connectivity

The H4000 uses an e^{sens} inductive register to deliver enhanced communications performance and tamper proof security offering protection against fraud. The H4000 is compatible with the Emeris PR7 inductive pulse transmitter fully compatible with Elster's Emeris range of intelligent meter reading systems and is fully compatible with other common ancillary devices including data loggers and AMR systems. The H4000 can provide even more vital management information to assist with effective distribution management, reduce water losses from leakage and improve customer service. When combined with ancillary monitoring equipment, a range of intelligent features including leakage alarms, data logging and tariffs enables a complete metering system that addresses the efficiency objectives for water providers.

Key features

- Generous length integral flow straightening vanes to negate the effect of non-ideal upstream flow conditions.
- e^{sens} Inductive register for improved output performance and security. The register can be rotated 359°.
- Accurate in both forward and reverse flow for network management.
- Flanges drilled to Australian Standard AS 4087 Table D. (Other drill patterns available on request).
- Maximum working pressure 1600 kPa.
- Maximum limiting temperature 50°C.
- Longer wear life for optimum accuracy.





Optional features

- Emeris PR7 inductive pulse transmitters for use with data loggers, remote counters, rate of flow and process control equipment.
- Remote battery operated totalising counter with LCD display (ScanCounter).
- Inline strainer.
- Alternative flange drilling provided on request.

Materials

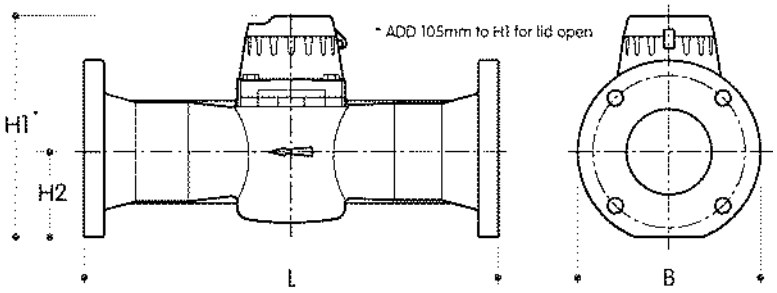
All Helix H4000 meters are manufactured from the highest quality materials, ensuring maximum resistance to wear and corrosion. The meter body is powder coated for protection in all environments.

All materials in contact with potable water comply with the Australian Standard AS 4020.

Flow performance to NMI R49-1 / Class 2

Nominal diameter (DN mm)	Units	40	50	65	80	100	150	200	250	300
Minimum flowrate - $Q_1 \pm 5\%$	kL/h	0.50	0.50	1.00	1.28	1.28	2.00	3.94	6.25	12.80
Transitional flowrate - $Q_2 \pm 2\%$	kL/h	0.81	0.81	1.60	2.05	2.05	3.20	6.30	10.0	20.48
Permanent flowrate - $Q_3 \pm 2\%$	kL/h	63.0	63.0	63.0	160	160	400	630	1000	1600
Overload flowrate - $Q_4 \pm 2\%$	kL/h	79.0	79.0	79.0	200	200	500	787.5	1250	2000
Q_3/Q_1 ratio		125	125	63	125	125	200	160	160	125
Minimum registration flowrate	kL/h	0.15	0.16	0.17	0.22	0.25	0.9	1.2	1.8	1.8
Pressure loss @ Q3	kPa	39	24	19	18	18	15	12	15	37
Maximum working pressure	kPa	1600	1600	1600	1600	1600	1600	1600	1600	1600
Maximum limiting temperature	°C	50	50	50	50	50	50	50	50	50
1st pointer registration (per revolution)	L	1	1	1	1	1	10	10	10	10
Maximum counter registration	kL	999999	999999	999999	999999	999999	9999999	9999999	9999999	9999999
PR7 Pulse Unit	L/pulse	1, 10, 100 or 1000					10, 100, 1000 or 10000			
		Please consult an Elster sales office for details								
Dimensions										
Overall meter length (L)	mm	311	311	200	413	483	500	520	450	500
Meter height - Lid closed (H1)	mm	220	220	228	247	259	335	387	438	465
Centreline height (H2)	mm	78	78	86	94	106	135	165	198	225
Flange width (B)	mm	151	166	186	201	228	286	341	409	461
Approx. meter weight (std. packed)	kg	13	14	15.5	22	26	47	64	95	120

Meter dimensions



Register details



esens patented pulse target technology

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elster
Vital Connections

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SML011 15/03

PR6 and PR7

Wiring Elster's Inductive Output Pulsers.



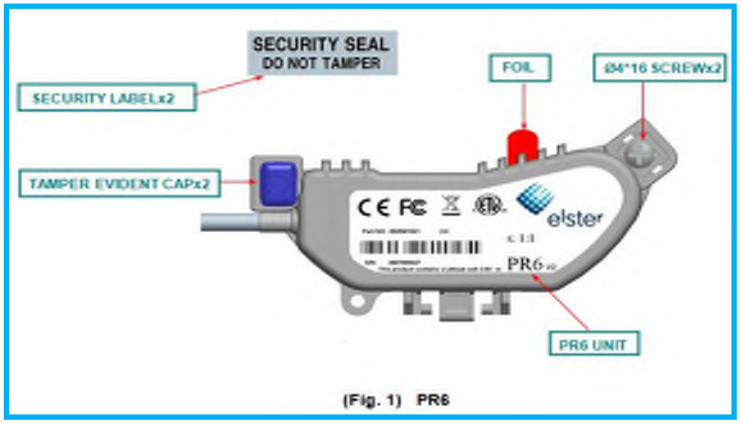


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WIRING PR6 AND PR7

What PR6 and PR7 are used for



(Fig. 1) PR6

1. Elster PR6 inductive pulse unit.

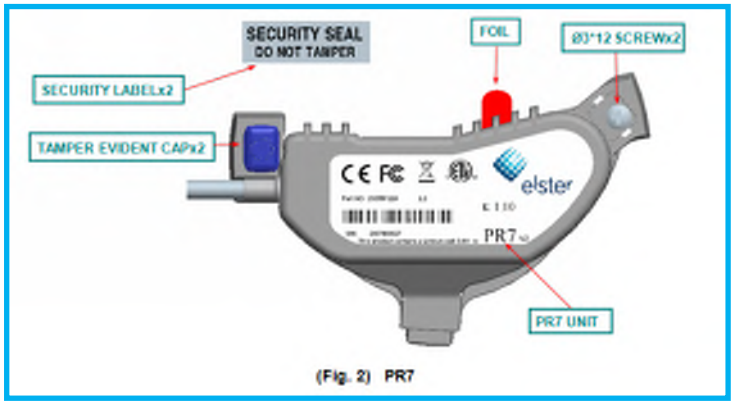
Its fitted to the **V200/V210/V220**



and the **H4000P** series of meters



Remember to remove the foil tab before fitting the pulse unit to the meter!



(Fig. 2) PR7

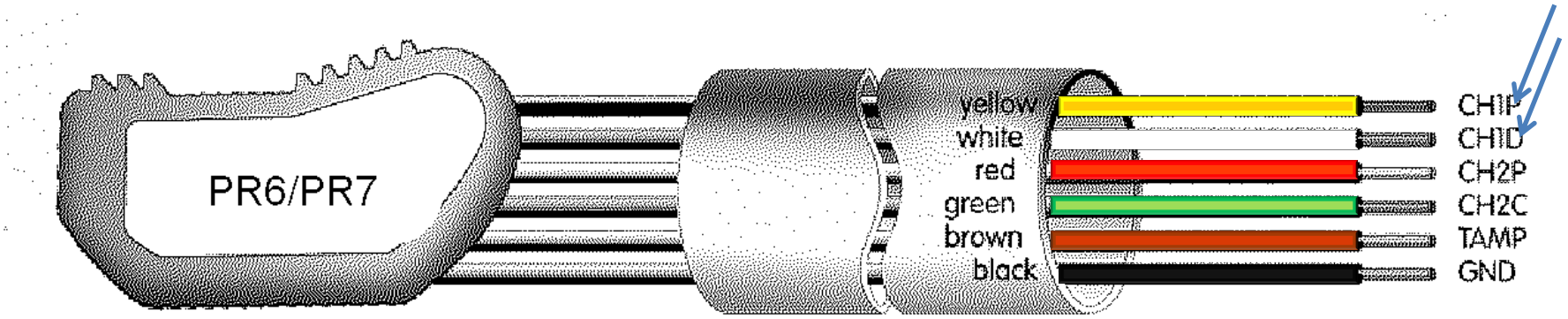
2. Elster PR7 inductive pulse unit.

Its fitted to the **H4000,C4000 and S2000** series of inductive output meters

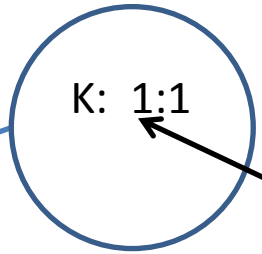


WIRING PR6 AND PR7

What each wire does







The **yellow** wire is the primary pulse output and labelled Channel 1 Pulse (CH1P)

The K factor of this pulse output is the <u>first</u> number after the 'K' on the PR6/PR7 label
(see page 7 for pulse value calculation)
CH1P outputs all pulses regardless of direction, whether the meter is running backwards or forwards.

The **white** wire labelled Channel 1 Direction (CH1D) gives the direction of the pulses on CH1P. The signal is High for Forward Flow and Low for Reverse Flow

WIRING PR6 AND PR7

What each wire does





The **red** wire is the secondary pulse output and labelled Channel 2 Pulse (CH2P)

The K factor of this output is the second number after the 'K' on the PR6/PR7 label (see page 7 for pulse value calculation)

CH2P outputs pulses that are compensated for backwards flow. The PR6/7 counts the backwards flow and stops outputting until the same forward flow has occurred.

The **green** wire labelled Channel 2 Compensation (CH2C) indicates when compensation is occurring by going to Low state during backflow compensation.

WIRING PR6 AND PR7

What each wire does



The **brown** wire is the alarm output and labelled Tamper (TAMP)
It activates to High state when the PR6/7 is removed from the meter.
It also activates to High state if the PR6/7 battery is low.

The **black** wire is the common or 0v wire and labelled Ground (GND)

WIRING PR6 AND PR7

Pulse outputs – Primary or Secondary

The PR6/7 is suitable for use with most data loggers, radio end points and counters.

- Use the Secondary (**Red**) CH2P compensated output for general data logging, remote displays, or AMR equipment.

- Use the Primary (**Yellow**) CH1P output where reverse flow monitoring is required. Most data loggers support bidirectional monitoring. However it's best to check with the data logger supplier before buying.

For applications such as SCADA, BMS, PLC, the outputs may be connected via pull-up resistor to up to 30V. Maximum sink current is 30mA.

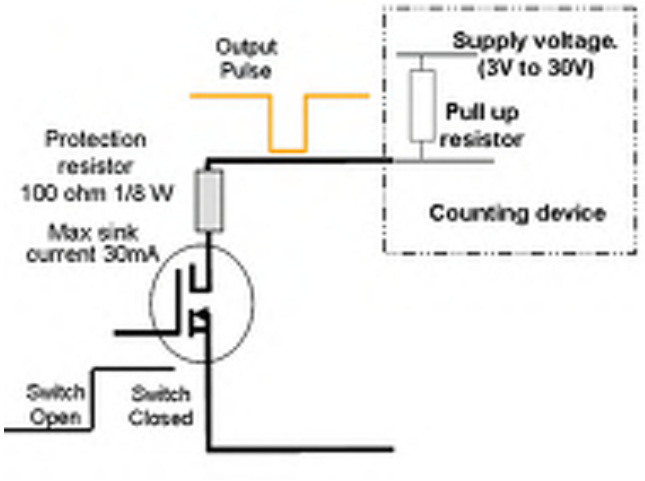


Fig1. PR6/7 Pulse output schematic

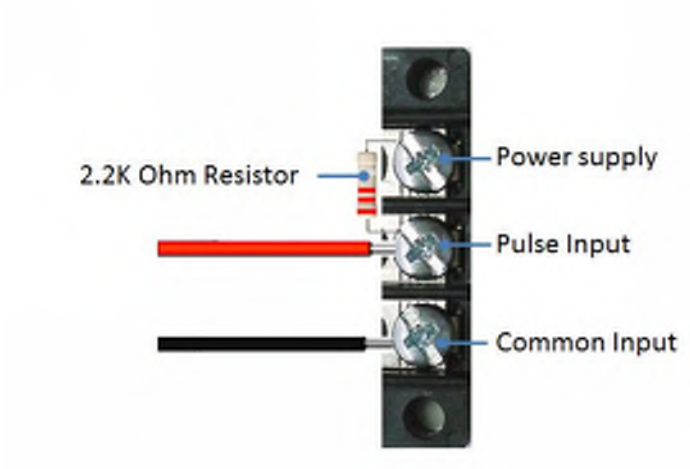
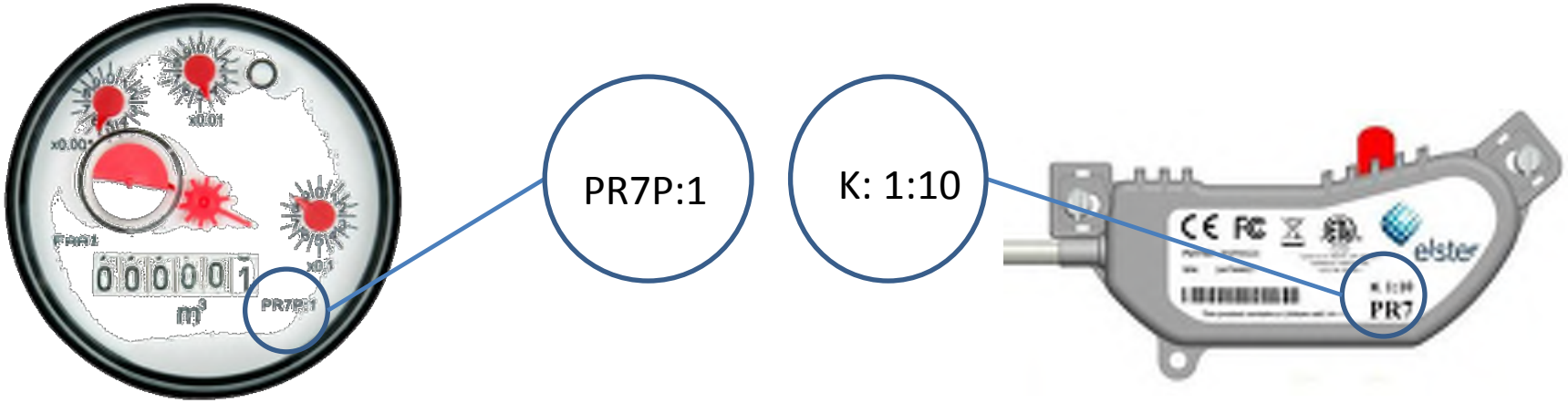


Fig 2. Wiring layout showing CH2P connected to PLC

WIRING PR6 AND PR7

K Factor – Calculating the pulse value



The pulse value (weight) is calculated by multiplying the Pulse Value P from the meter dial face by the K Value from the PR6/7 pulser label.

In the example above;-
For the Primary Pulse Output **Yellow** CH1P the pulse weight = 1x1 = 1 litre per pulse
For the Secondary Pulse Output **Red** CHP2 the pulse weight = 1x10 = 10 litres per pulse.

WIRING PR6 AND PR7

Pulser types, K Factors and example pulse values

Type	K Factor	Elster Part Number	Register Type	Primary Pulse Value	Secondary Pulse Value
PR6	1:1	2925M1221	PR6P:1	1litre/pulse	1litre/pulse
PR6	1:10	2925M1265	PR6P:1	1 litre/pulse	10litres/pulse
PR6	1:100	2925M1261	PR6P:1	1 litre/pulse	100 litres/pulse
PR6	1:1000	2925M1262	PR6P:1	1 litre/pulse	1000 litres/pulse
PR7	10:10	2925M1222	PR7P:1	10 litres/pulse	10 litres/pulse
PR7	10:100	2925M1280	PR7P:10	100 litres/pulse	1000 litres/pulse
PR7	1:-	2925M1223	PR7P:10	10 litres/pulse	n/a
PR7	1:10	2925M1224	PR7P:10	10 litres/pulse	100 litres/pulse
PR7	1:100	2925M1263	PR7P:10	10 litres/pulse	1000 litres/pulse
PR7	1:1000	2925M1264	PR7P:1	1 litre/pulse	1000 litres/pulse

Pulse widths (milliseconds) PR6 K:1 = 80, PR7 K:1 = 10, all other PR6/7 = 100.

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Standard Product Warranty

Scope of Warranty

This warranty applies exclusively to all Water Meters (the "Water Meter") and Associated Products (the "Associated Product") listed within appendix A and supplied by Elster Metering Pty Ltd ("Elster"). The warranties given in respect of the Water Meter or its Associated Product will apply when it is installed, operated, maintained and used in accordance with Elster's guidelines which include, but are not limited to, information contained in Elster's Terms and Conditions for Sale of Products and/or Services, Specifications and Installation Instructions, User and Maintenance Manuals (the "Guidelines").

This warranty applies exclusively to the original purchaser (the "Purchaser") that purchases the Water Meter or its Associated Product directly from Elster and may be extended also by an Elster authorised distributor (the "Distributor") to its purchasers.

Materials and Workmanship

If installed, operated, used and maintained in accordance with Elster's Guidelines, Elster warrants the Water Meters and its Associated Product (with the exception of software listed within Appendix A ("Software Products") to be free from defects in design, materials and workmanship for a period of twelve (12) months (the "Warranty Period") after date of shipment by Elster or its Distributor.

Elster warrants that Software Products will substantially conform with Elster's Guidelines (but does not warrant Software Products to be error free or without interruptions) and are warranted for a period of ninety (90) days after date of shipment by Elster or its distributor.

Water Meter Accuracy

If installed, operated, used and maintained in accordance with Elster's Guidelines, Elster warrants that its Water Meters will perform within the following in service maximum permissible errors as set out in their relevant Specification for the duration of the Warranty Period:

(a) The maximum permissible error, positive or negative, on volumes delivered at flowrates between the minimum flowrate (Q1) (included) and the transitional flowrate (Q2) (excluded) is 10% for water having any temperature; and

(b) The maximum permissible error, positive or negative, on volumes delivered at flowrates between the transitional flowrate (Q2) (included) and the overload flowrate (Q4) (included) is 4% for water having a temperature ≤30°C or 6% for water having a temperature >30°C.

Water Meter accuracy must be ascertained by a method and facility approved by Elster.

Electronic Devices Used to Store and Communicate Data

Where the Water Meter or Associated Product incorporates an electronic device used to store and communicate data by radio or a communicating wire and has been installed, operated, used and maintained in accordance with Elster's Guidelines, Elster warrants that the Water Meter or Associated Product will function in accordance with the Guidelines for the Warranty Period, provided it is not subjected to electromagnetic phenomena such as, but not limited to, un-natural magnetic field, radiation, electro-magnetic pulse or any mechanical intervention leading to the degradation of the ingress protection of the Water Meter or Associated Product.

The Water Meter or Associated Product may offer a number of Purchaser configurable data features, that are factory programmed by Elster during production of the Water Meter or Associated Product, such as data logging, date stamp marking, leak, burst and tamper alarms. Whilst Elster will use all reasonable efforts to ensure that these features comply with the Purchaser's requirements on dispatch from the factory, their performance is not warranted. Likewise, radio transmission ranges can vary depending on environmental conditions and installation sites and are not warranted.

Battery Powered Products

Where the Water Meter or Associated Product incorporates a battery and has been installed, operated, used and maintained in accordance with Elster's Guidelines, Elster warrants that the battery will operate in accordance with the Guidelines for twelve (12) months from the date of manufacture of the Water Meter or Associated Product, as evidenced by the serial number or otherwise marked on the Water Meter or Associated Product, provided the frequency of communication events does not exceed one (1) communication of a normal data set event per day.

ABN 98 004 088 680

If a failure in the materials and workmanship of the Water Meter or Associated Product during the Warranty Period, when installed, operated, used and maintained in accordance with Elster's Guidelines, causes premature discharge of battery power, then this failure will be covered under the specific materials and workmanship warranty specified above.

Evidence of tampering or removal of the battery at any time during the life of the Water Meter or Associated Product will invalidate this warranty.

Limits of Warranty

The warranties set forth in this document shall not apply: (a) to consumable parts, such as protective coatings that are designed to diminish over time, unless failure has occurred due to a defect in materials or workmanship; (b) to cosmetic damage, including but not limited to scratches, dents and broken plastic on ports; (c) to any failure, non-conformity or defect of the Water Meter or Associated Product or component thereof caused by aggressive water or environmental conditions (including submersion in contaminated ground water or foreign matter in the environment; (d) to damage caused by use with another product; (e) to damage caused by accident, abuse, vandalism, deliberate tampering, theft, mishandling, misapplication, misuse, fire, earthquake or other external cause; (f) to improper installation and/or damage caused by operating the Water Meter or Associated Product outside Elster's Guidelines; (g) to damage caused by services (including but limited to upgrades, maintenance, repairs and expansions) performed by anyone who is not a representative of Elster or authorised by Elster to undertake such work; (h) to a Water Meter or Associated Product that has been modified to alter functionality or capability without the written permission of Elster; (i) to defects caused by normal wear and tear or otherwise due to the normal aging of the Water Meter or Associated Product, (j) to negligent acts or omissions or malfeasance of the Purchaser or any third party; (k) to damage to the Water Meter or Associated Product caused by the Purchaser or any third party or other conditions beyond the control of Elster; or (l) if any serial number or security seals have been removed or defaced from the Water Meter or Associated Product.

ABN 98 004 088 680

Appendix A

Water Meters

Cold Water Meters (water temperature ≤30°C):

V100	Marly 3	S100P	H2000	C3000
V110	M100	S110	H3000	C3100
V130	M110	EH	H3010	C3200
V150	M120	S120	H3200	C4000
V200	M130	S150	H3500	C4200
V200P	M140	S150P	H4000	R1000
V200H	M160	S220	H4000P	R2000
V210	MOF	S220P	H4010	SM250
V210P	MOH	Y250	H4100	SM700
V210H	M170	Y250M	H4200	SM800
V230	M200	Y290	H4300	Q200
V300	M210	Y290M	H4400	Q700
Marly 2	S100	S2000	H5000	

Warm Water Meters (water temperature ≤90°C):

Marly 2	MOF	M190	S110
M130	MOH	S100	EH

Associated Products

Automatic Meter Reading (AMR) Products:

LRP	PR7	ScanCoder	Wavesense	Wavegate
LRT	TPR6	eLog	Wavetherm	Wavehub
LRB	TPR7	Beltbox	Wavelog	Waveport
BPG20	SR50	Wavecard	Wavetag	Wavelook
TRC600	PSR140	Wavefront	Wavetalk	
PR6	ScanCounter	Waveflow	Wavecell	

Software Products:

ERMII	ECM	iNet

Boundary Box Products:

Ajusta Box

Rigid Box

Contaminated Land Box

Corrugated Guard Tube

SMF01A 14/10

ABN 98 004 088 680

Montageanweisung
Operating Instructions
Instrucciones de Montaje
Instructions de Montage
Instruzioni d'impiego

MDR 3

Max. zul. Motorleistung / Max. Motor Performance / Max. Potencia Admisible del motor
Puissance max. du moteur / Pot. max. ammissibile dei motori

Ue (50 / 60 Hz)	3 (AC-3)	1 (AC-3)
120 V	3,0 kW	1,1 kW
230 V	5,5 kW	2,2 kW
400 V	7,5 kW (11 kW)*	-
500 V	7,5 kW (11 kW)*	-
690 V	7,5 kW (15 kW)*	-

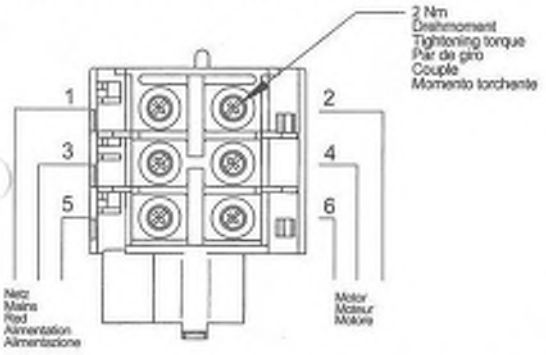
* = mit SK 3 H, SK-R3 H - with SK 3 H, SK-R3 H - con SK 3 H, SK-R3 H avec SK 3 H, SK-R3 H - con SK 3 H, SK-R3 H

Zul. Verschmutzungsgrad	3
Permissible Degree of Pollution	3
Grado polución permisible	3
Degré de pollution permissive	3
Grado di inquinamento amesso	3

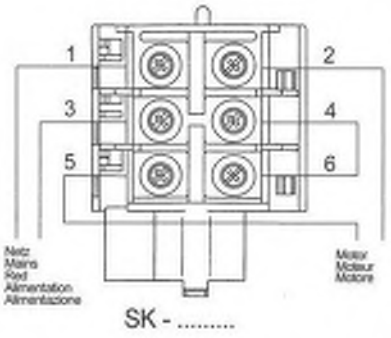


SCHALTBILD / WIRING DIAGRAM / ESQUEMA DE CONEXION / SCHEMA DE RACCORDEMENT / SCHEMA ELETTRICO

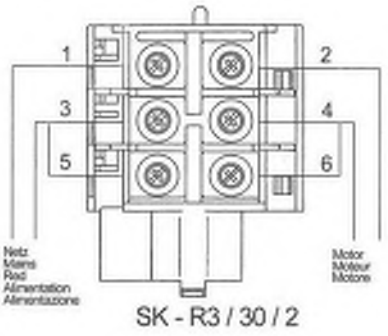
3-PHASIG / 3-PHASE / TRIFASICO / TRIPHASE / TRIFASE



1-PHASIG / 1-PHASE / MONOFASICO / MONOPHASE / MONOFASE



SK - .....



SK - R3 / 30 / 2

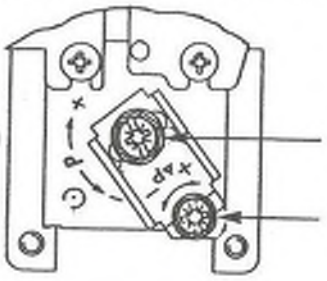
ACHTUNG: Vor der Druckeinstellung ist der Druckschalter freizuschalten. Die Druckeinstellung ist nur am montiertem Druckschalter bei unter Druck stehendem Gerät möglich.

ATTENTION: Adjustments are to be carried out only when the switch is mounted, under pressure and voltage-free.

ATENCION: Cambios de presión deberán ser efectuados solo con el presóstato montado, bajo presión y libre de tensión.

ATTENTION: Le réglage de pression ne peut se faire que lorsque l´appareil est monté, sous pression et libre de tension.

ATTENZIONE: La regolazione va effettuata solo col pressostato montato, sotto pressione e disinserito.



Druckeinstellung / Pressure setting / Ajuste de presión / Réglage de la pression / Regolazione della pressione

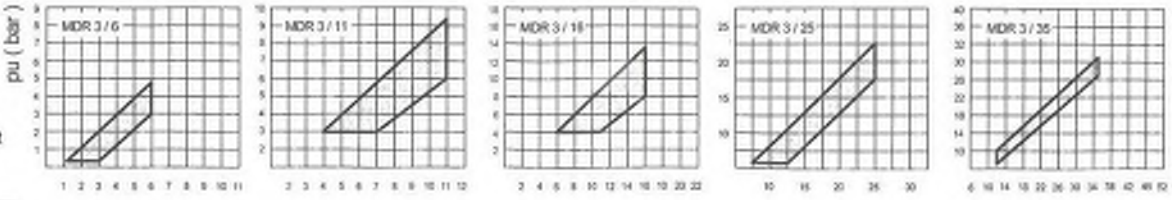
Oberer Druckwert / Upper Pressure Setting / Presion de Disparo Superior / Pression Supérieure / Pression di Distacco

Druckdifferenz / Pressure Differential / Diferencial de Presión / Différentiel de Pression / Differenziale di Pressione

Einbau und Anschluß nur durch Fachkraft; nach Anbringung von Zubehör Funktionsüberprüfung durch Elektrofachkraft erforderlich.
Installation and assembly of electrical equipment shall be carried out by qualified personnel only.
Instalación y asemblaje de equipos eléctricos deberán ser efectuados solamente por personal cualificado.
L'installation et raccordement des appareils doit être effectué par du personnel qualifié.
L'installazione e l'assemblaggio delle parti elettriche vanno eseguite esclusivamente da personale qualificato.

DRUCKDIAGRAMME / PRESSURE DIAGRAMS / DIAGRAMAS DE REGULACION / DIAGRAMMES DE REGLAGE / DIAGRAMMI TARATURE

Einschaltdruck *
Cut-in pressure
Presión de disparo inferior
Pression de d'enclenchement
Pressione di attacco

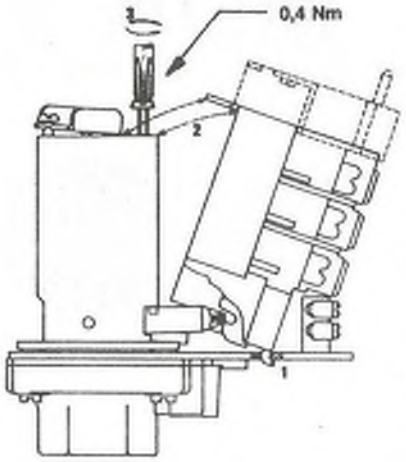


po (bar)

* MDR 3 EA in Position / I Auto
MDR 3 EA in position / I Auto
MDR 3 EA en posición / I Auto
MDR 3 EA dans position / I Auto
MDR 3 EA in posizione / I Auto

Ausschaltdruck
Cut-out pressure
Presión de disparo superior
Pression déclenchement
Pressione di distacco

ANBAU DER MODULE / MOUNTING ADD-ON MODULES / MONTAJE DE LOS MODULES / MONTAGE DES MODULES / MONTAGIO DEI MODULI



ANBAU DER MODULE / MOUNTING ADD-ON MODULES / MONTAJE DE LOS MODULES / MONTAGE DES MODULES / MONTAGIO DEI MODULI

1. - Nase wie im Piktogramm schräg einsetzen
2. - Modul nach hinten kippen
3. - Befestigungsschrauben festdrehen

Wechsel bereits montierter Module:
in umgekehrter Reihenfolge verfahren

1. - Insert catch as shown
2. - Push the module backwards
3. - Tighten screws

Changing mounted modules: proceed in reverse

1. - Insertar el tetón como en la pictografía
2. - Presionar hacia atras
3. - Apretar tornillos

Cambiar módulos ya montados: proceder al inverso

1. - Insérer le teton en oblique
2. - Pousser le module vers l'arrière
3. - Serrer les vis de fixation

Pour remplacer un module: fait l'opération inverse

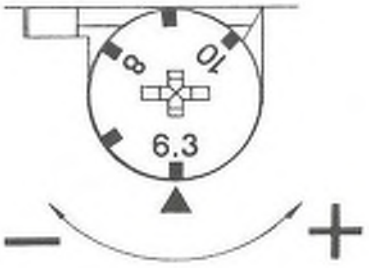
1. - Inserire obliquamente il beccuccio come da schema illustrativo
2. - Raddrizzare il modulo
3. - Serrare le viti di fissagio

Sostituzione moduli: procedere in senso inverso

Haubenbefestigung / Cover fastening / Fijación de la tapa / Fixation par coiffe / Fissaggio coperchio: 1Nm
Anbau der Module / Add-on Modules / Módules Montables / Modules complementaires / I Moduli:
s.Katalog / see catalogue / ver cátalogo / voyez notre catalogue / vedere catalogo

Kurzschlußschutzeinrichtung für MDR 3 / Protection against short-circuit for MDR 3 / Protección contra corto circuito para MDR 3
Protection contre court-circuit pour MDR 3 / Protezione contro corto circuito per MDR 3 Iq ≤ 50kA

Type / Tipo	Koordination "1" Co-ordination "1" Coordinación "1" Coordination "1" Coordinamento "1"		Koordination "2" Co-ordination "2" Coordinación "2" Coordination "2" Coordinamento "2"	
Überstromrelais Overload relais Relé térmico Relais disjoncteur Relé termico	max. Sich. gL max. Fuse (slow) max. Fusible (retardado) max. Fusible (retardé) max. Fusible (ritardato)	oder or o ou o	LS-Schalter (400 V) MCB (400 V) Automático (400 V) Disjoncteur Automatiques (400 V) Interruptore modulare (400 V)	
	400 V	690 V	400 V	690 V
SK-R3/1,0	80 A	63 A	6 A	4 A
SK-R3/1,6	80 A	63 A	10 A	6 A
SK-R3/2,5	80 A	63 A	20 A	10 A
SK-R3/4,0	80 A	63 A	35 A	20 A
SK-R3 (H)/6,3 ... 24	80 A	63 A	35 A	35 A
SK-R3 (H) / SK-R3 (H-S)	80 A	63 A	35 A	35 A



Motornennstrom am Excenter des SK-R3 Überstromrelais wie abgebildet einstellen.

Use dial to adjust the overload relay SK-R3 to the rated motor current as shown

Usar la excéntrica para ajustar el relé térmico SK-R3 a la corriente nominal del motor como en la pictografía

Déplacé l'excentrique du thermique SK-R3 a la valeur du courant nominal du moteur comme indiqué

Tarare la corrente nominale del motore sul relais termico SK-R3 agendo sull'eccentrico come indicato

Horsepower Ratings und Short Circuit Protection acc. to UL 508										
Contact Block	110 - 120 V		220 - 240 V		440 - 480 V		550 - 600 V		Short Circuit Protection	
Type	1-ph	3-ph	1-ph	3-ph	1-ph	3-ph	1-ph	3-ph	max. V	max. Fuse
SK-R3/1	-	-	-	-	-	½	-	½	600	15 A
SK-R3/1,6	-	-	1/10	⅓	-	¾	-	1	600	15 A
SK-R3/2,5	-	-	⅛	½	½	1	½	1½	600	15 A
SK-R3/4	⅛	½	⅓	1	1	2	1½	3	600	15 A
SK-R3/6,3	¼	¾	½	1½	2	3	2	5	600	25 A
SK-R3/10	½	1	1½	3	3	5	3	7½	600	40 A
SK-R3/16	1	2	2	5	5	10	7½	10	600	60 A
SK-R3/20	1½	3	3	-	-	-	10	-	600	80 A
SK-R3/24	2	-	-	7½	7½	-	10	-	600	100 A
SK-R3H/16	1	2	2	5	5	10	7½	10	600	60 A
SK-R3H/20	1½	3	3	-	-	-	10	15	600	80 A
SK-R3H/24	2	-	-	7½	7½	15	10	20	600	100 A
SK-R3/30/2	2	-	5	-	-	-	-	-	240	110 A

1. Suitable for use on a circuit capable of delivering not more than 5 kA rms symmetrical Amperes, 600 Volts maximum (240 Volts for SK-R3/30/2) when protected by nontime delay fuses as noted in the table above.
2. Suitable for group fusing of 5 kA rms symmetrical Amperes 600 V, 3-ph maximum (SK-R3/30/2 240V, 1-ph max.) when protected by time delay fuses rated max. 100 A.
3. Use 75° copper wire AWG 10 - AWG 14
4. AC Motor Load
5. Break all lines
6. Trip current is 125% of dial setting

Max. Operating pressure*	
MDR 3 / 6	90 psi / 600 kPa
MDR 3 / 11	160 psi / 1100 kPa
MDR 3 / 16	230 psi / 1600 kPa
MDR 3 / 25	360 psi / 2500 kPa
MDR 3 / 35	510 psi / 3500 kPa

* see pressure diagrams

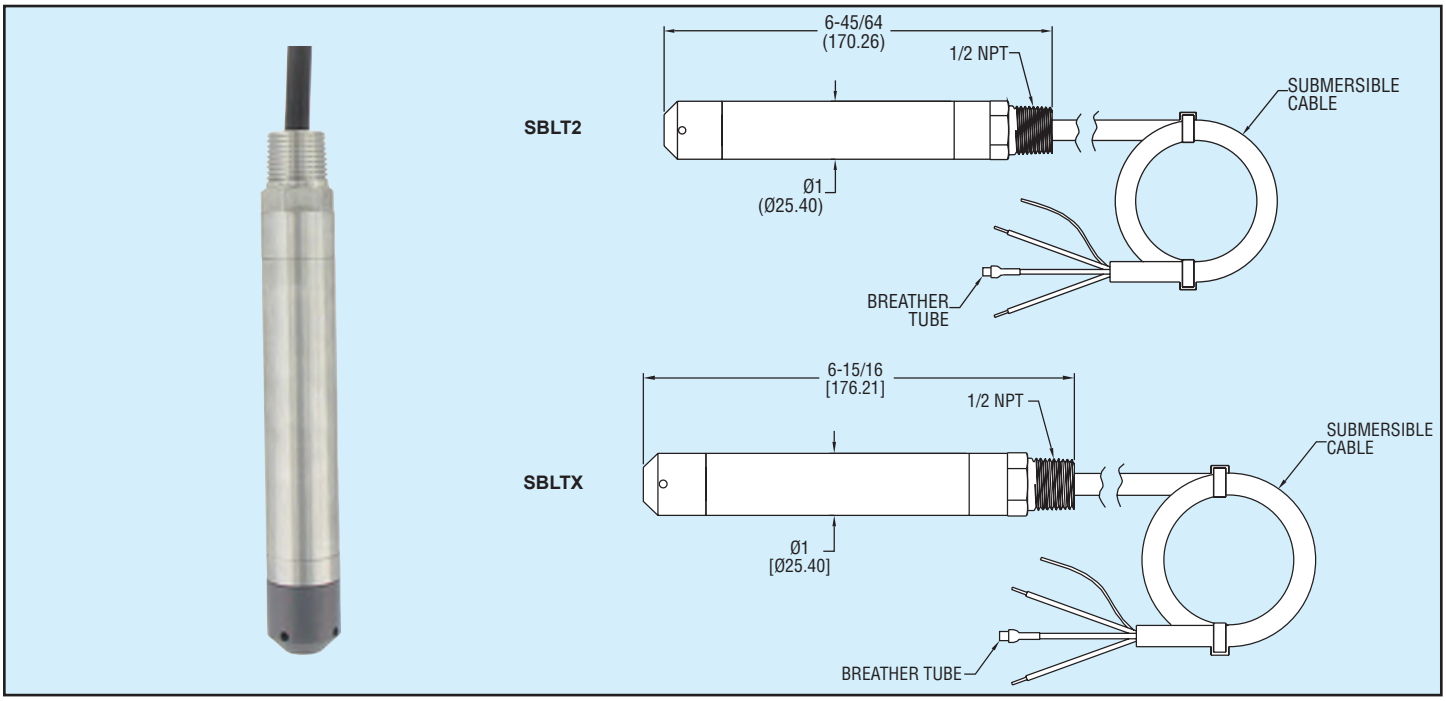
Condor-Werke
Gebr. Frede GmbH & Co. KG
Warendorfer Straße 47-51
D-59320 Ennigerloh
vertrieb@condor-werke.com
Telefon (0 25 87) 89-0
Telefax (0 25 87) 89 140
www.condor-werke.com

30.310.93.001 04/04

Series SBLT2 & SBLTX

Submersible Level Transmitters

Perfect for Ground Water and Wells, Lightning Protected or Intrinsically Safe



SBLT2 and SBLTX Submersible Level Transmitters are manufactured for years of trouble free service in the harshest applications. Both measure the height of liquid above the position in the tank referenced to atmospheric pressure. The transmitters consist of a piezoresistive sensing element, encased in a 316 SS housing. Bullet nose design protects the diaphragm from damage.

The SBLT2 incorporates lightning and surge protection utilizing dual arrestor technology, grounded to case, eliminating both power supply surges and lightning ground strike transients (surge protection is not guaranteed and is not covered by warranty). The SBLTX is UL approved intrinsically safe for use in hazardous locations when used with proper barrier.

Units come equipped with a 270-pound tensile strength shielded and vented cable. Ventilation tube in the cable automatically compensates for changes in atmospheric pressure above the tank. The vent is protected with a maintenance free filter eliminating particulate or water droplets from entering the transducers.

- Excellent chemical compatibility
- Lightning and surge protection on SBLT2 models
- Maintenance free vent filter
- UL approved intrinsically safe on SBLTX models
- Slim design for tight applications

APPLICATIONS

Well monitoring; Ground water monitoring; Environmental remediation; Surface water monitoring; Down hole; Water tanks.

Model	Range psi (ft w.c.) [m w.c.]	Cable Length ft (m)	Cable Type
SBLT2-5-40-ETFE	5 (11.54) [3.52]	40 (12.2)	ETFE
SBLT2-10-40-ETFE	10 (23.09) [7.04]	40 (12.2)	ETFE
SBLT2-15-60-ETFE	15 (34.63) [10.56]	60 (18.3)	ETFE
SBLT2-20-60-ETFE	20 (46.18) [14.08]	60 (18.3)	ETFE
SBLT2-5-40	5 (11.54) [3.52]	40 (12.2)	Polyurethane
SBLT2-10-40	10 (23.09) [7.04]	40 (12.2)	Polyurethane
SBLT2-15-60	15 (34.63) [10.56]	60 (18.3)	Polyurethane
SBLT2-20-60	20 (46.18) [14.08]	60 (18.3)	Polyurethane
SBLT2-3.5M-5M	4.97 (11.48) [3.5]	16.40 (5)	Polyurethane
SBLT2-5M-10M	14.21 (32.81) [10]	32.81 (10)	Polyurethane
SBLT2-10M-18M	25.58 (59.06) [18]	59.06 (18)	Polyurethane

OPTIONS

Intrinsically Safe Approval- Change model number from SBLT2 to SBLTX

Custom ranges or Cable Lengths- Contact the factory

SPECIFICATIONS

Service: Compatible liquids.
Wetted Materials: 316 SS, 316L SS, epoxy; Cable: Polyurethane or ETFE; Bullet nose: PVC.
Accuracy: ±0.25% of full-scale.
Temperature Limit: SBLT2: 0 to 150°F (-18 to 66°C); SBLTX: 0 to 176°F (-18 to 80°C).
Compensated Temperature Range: SBLT2: 0 to 140°F (-18 to 60°C); SBLTX: 0 to 176°F (-18 to 80°C).
Thermal Effect: ±0.02% full-scale/°F.
Pressure Limit: 2X full-scale.
Power Requirement: SBLT2: 13 to 30 VDC; SBLTX: 10 to 28 VDC.
Output Signal: 4 to 20 mA DC, 2-wire.
Response Time: 50 ms.
Max. Loop Resistance: 900 Ω at 30 VDC.
Electrical Connections: Wire pigtail.
Mounting Orientation: Suspended in tank below level being measured.
Weight: 2.2 lb (1.0 kg).
Electrical Protection: SBLT2: Lightning and surge protection; SBLTX: None.
Agency Approvals: SBLT2: None; SBLTX: CE, cUL intrinsically safe for Class I, Div. 1, Groups A, B, C, D; Class II, Div. 1, Groups E, F, G; Class III Div. 1. (According to control drawing 01-700797-00).

ACCESSORIES

MTL5041, intrinsically safe galvanic isolator
MTL7706, intrinsically safe zener barrier



A-297, Dessicant Filter for vent tube. Removes humidity for protection of the sensor. Changes color to show saturation



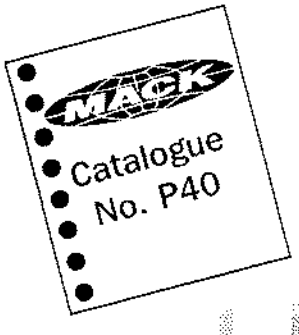
A-625, 316 SS Cable Hanger use with NPT option for attaching chain for easy pulling out of application

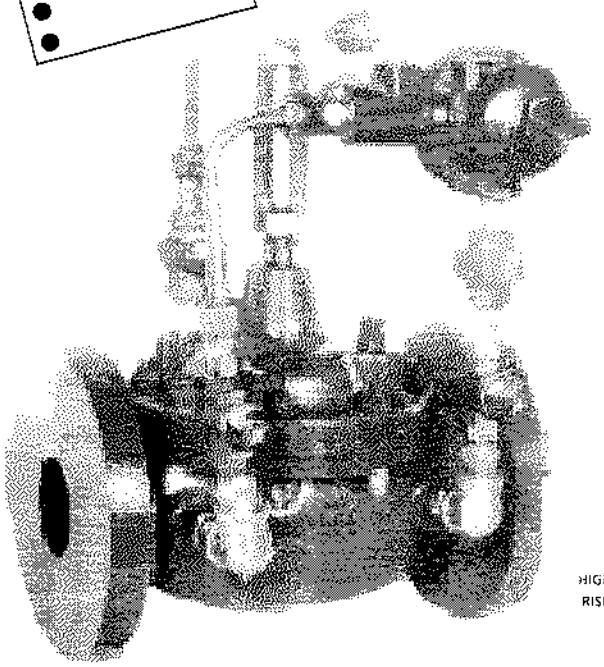
INSTALLATION AND MAINTENANCE MANUAL

Cat. No. P40 Mack ACV Series Rate of Flow Control Valve

CONTENTS

1. Installation
2. Operation
3. Adjustment Procedures
4. Maintenance Procedure
5. Spare Parts
6. Troubleshooting

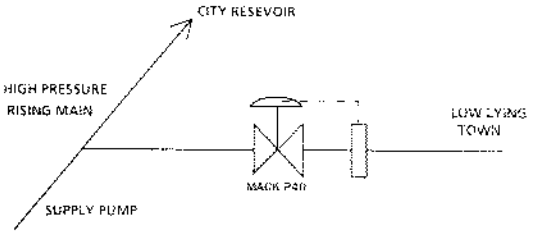




P40

TYPICAL FUNCTION & APPLICATION

- Hydraulically operated.
- Actuated by the differential pressure.
- Accurate control.
- Rate of flow adjustment by varying a spring loading on pilot valve control.
- Prevents lowering of supply pressure.
- Easily set to maintain maximum allowable flow rate.
- Limits primary water supply to a pre-set flow.



DIMENSIONS & FLOW CHART

VALVE SIZE (mm)		40F	50F	80F	80YG	100F	100YG	150F	150YG	200F	250F	300F	350F	400Y
Dimensions in mm	A	220	245	349	335	403	403	533	533	671	791	914	1000	1092
	B	143	168	235	225	292	292	405	405	508	604	707	831	940
	C	115	135	180	180	227	337	306	573	350	446	800	608	940
Dimensions in inches	A	8.66	9.63	13.75	13.00	15.88	15.88	21.00	21.00	26.41	31.13	36.00	39.38	43.00
	B	5.60	6.60	9.30	8.88	11.50	11.50	16.00	16.00	20.00	23.80	27.90	32.70	37.00
	C	4.50	5.30	7.10	7.10	8.90	13.30	12.10	22.60	13.80	17.60	31.50	24.00	37.00
Minimum Flow	l/s	0.8	0.9	1.9	2.5	3.2	4.2	7.3	9.4	12.9	18.9	25.0	31.8	60.00
	GPM	10	12	25	33	42	55	96	124	170	250	330	420	800.00
Maximum Continuous Flow	l/s	7.9	13.1	29.2	37.9	50.4	65.5	113.7	147.8	195.5	309.1	439.5	536.5	960
	GPM	104	173	385	500	665	864	1500	1950	2580	4080	5800	7080	12660
Maximum Intermittent Flow	l/s	10.6	16.7	36.0	46.8	63.6	82.7	159.1	206.9	246.3	378.9	541.8	663.0	1235
	GPM	140	220	475	618	840	1092	2100	2730	3250	5000	7150	8750	16350

Y = Angle seated pattern with flanged end connection. YG = Angle seated pattern with rolled groove end connection.
When size only quoted standard end connection shown is (F) flanged

MACK VALVES PTY LTD 30 Burgess Road, Bayswater VIC 3153 Ph: 61 3 9720 2122 Fx. 61 3 9720 1344
Email: enquiries@mackvalves.com.au Web Site. http://www.mackvalves.com.au

INSTALLATION

Before valve is installed flush pipelines of all foreign matter. Failure to do so may result in failure of the valve to operate correctly or damage to the valve not covered by warranty.

1. It is recommended that gate valves be installed at either end of the valve to facilitate maintenance that may periodically be required.

2. Install valve in the line with flow in the direction as indicated on the inlet plate or flow arrows.

3. Pressure gauges should be installed to indicate both inlet and outlet pressures along with a flow meter to facilitate the adjustment and setting of valve.

4. Orifice plate assembly should be installed downstream of main valve with5 pipe diameters of straight pipe either side.

5. Allow sufficient room around the valve to allow for adjustment and disassembly when required or as required by the local authority for safe working environment.

6. Mack ACV's operate with maximum efficiency when installed in horizontal pipelines with the cover up. However other orientations are acceptable. Due to the weight of the cover and internal components Mack Valves recommend valves of 150mm or larger are installed with the cover up so that maintenance can be carried out effectively.

7. If a pilot system is installed on the valve care must be taken to prevent damage, if necessary remove all components and fittings from the valve. Ensure they are kept clean and refitted exactly as they were.

8. After installation and when valve is first pressurised any air trapped in the cover or control tubing must be vented. Ensure all ball valves are in the fully open position and loosen fitting at high points till no more air is left in the valve.

9. If the pipeline is to be pressure tested after the valve is installed ensure that the valves rated test pressure is not exceeded.

Operation

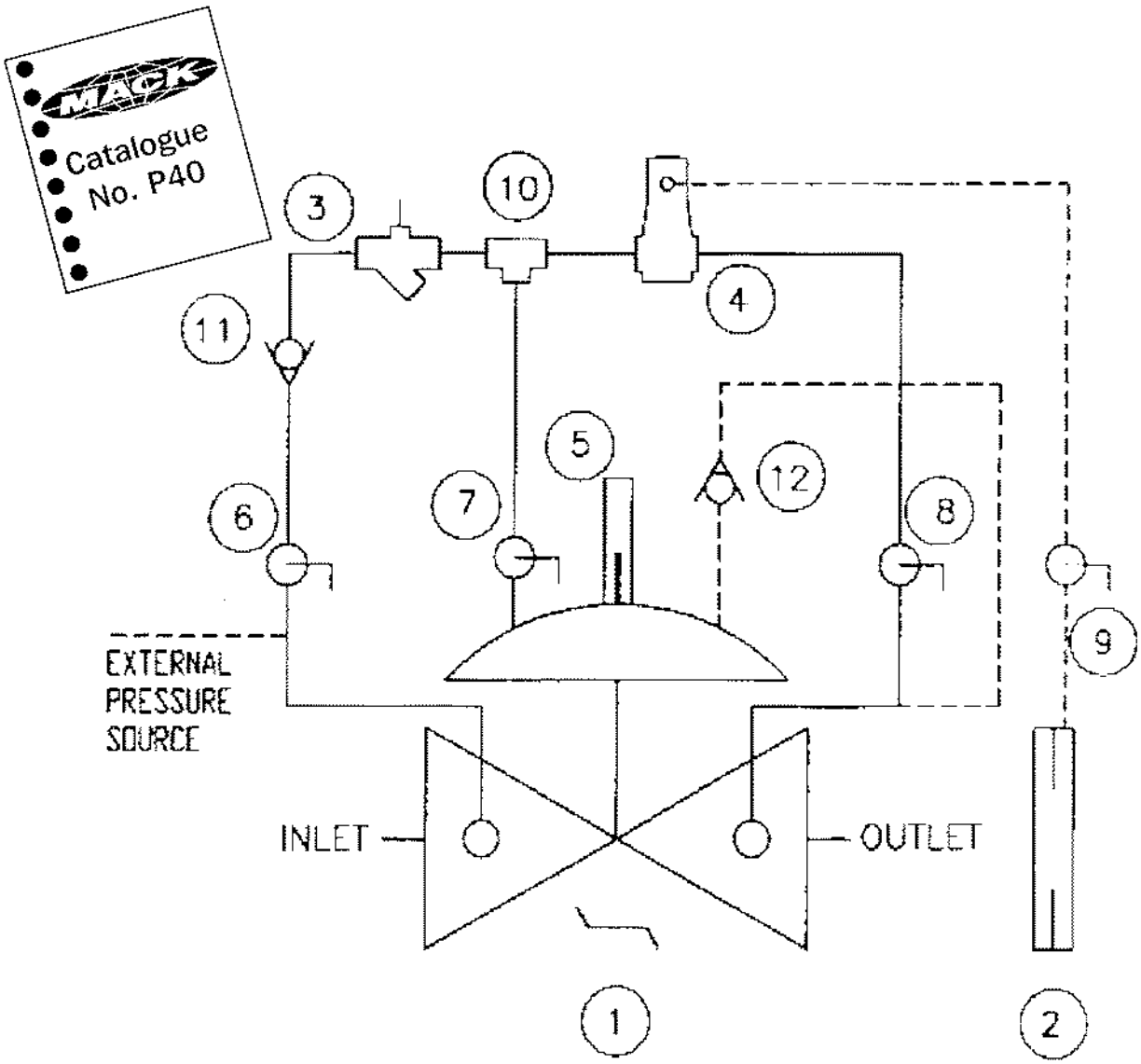
- Pilot control (4) is a normally open differential control and reacts to changes in differential pressure across calibrated orifice plate (2)

- Flow through orifice plate (2) above set point increases differential pressure causing pilot control (4) to throttle towards closed position causing more flow to top cover of main valve (1) thus throttling this valve shut.

- A decrease in flow through the orifice plate (2) decreases differential pressure causing pilot valve (4) to throttle further open allowing more flow to come of the cover of main valve (1) allowing it to open further with the ejector (10) assisting in removing pressure from cover.

- Item (3) needle valve strainer assembly keeps the pilot system clear of debris and grit and is adjusted to control the closing rate of the valve.

- Check valves items (11 & 12) are an optional extra to shut the main valve (1) in case of a flow reversal.



ITEM	TITLE
1	MAIN VALVE
2	ORIFICE PLATE ASSEMBLY
3	STRAINER / NEEDLE VALVE
4	DIFFERENTIAL CONTROL VALVE
5	POSITION INDICATOR (OPTIONAL)
6 - 8 inclusive	BALL VALVE FITTED TO 80 MM VALVES & LARGER
9	BALL VALVE SUPPLIED WITH ALL ORIFICE PLATE ASSEMBLIES
10	EJECTOR
11 & 12	CHECK VALVE (OPTIONAL)

Adjustment Procedure

To adjust the flow rate of the P40 have the downstream valves opened so that flow is going through the main valve.

Remove the cap from the CDHS18 pilot control. Wind adjusting screw clockwise to increase flow and wind anti-clockwise to decrease flow. After final setting tighten lockscrew.

The CDHS18 is sensitive to small changes in differential pressure so it is advisable to use small adjustments.

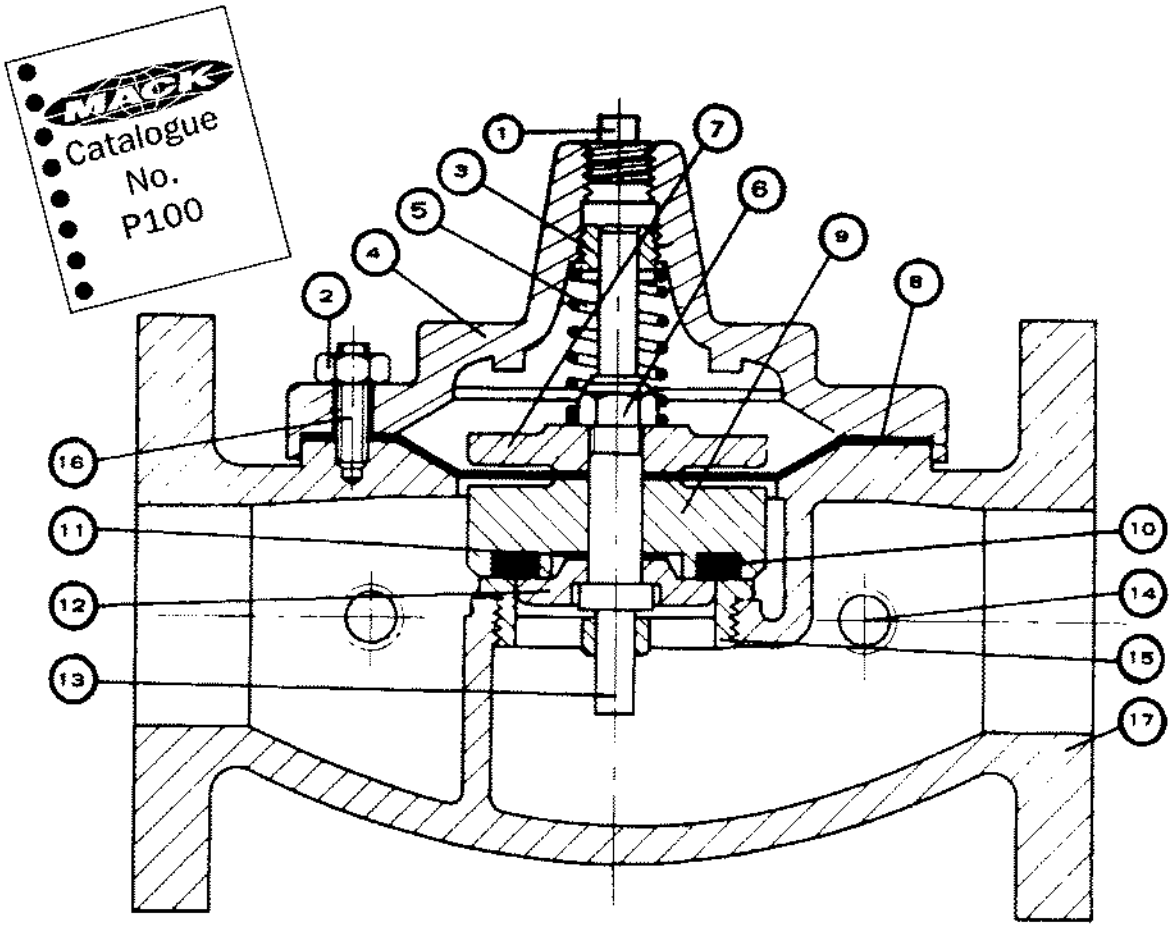
The inlet needle valve adjusts the sensitivity of the valve and the rate at which it shuts.

The valve is despatched from the factory with this set in approximately the correct position which is a small opening of 1 – 2 turns off its seat.

If the opening is too large it may cause water hammer.

If the opening is too small it may cause hunting and surging.

To adjust loosen locknut and screw adjuster clockwise to restrict opening and anti-clockwise to increase opening.



Sizes:

25mm, 40mm, 50mm, 80mm, 100mm, 150mm, 200mm, 250mm, 300mm, 350mm, 400mm

1" 1¼" 2" 3" 4" 6" 8" 10" 12" 14" 16"

ITEM	TITLE	MATERIALS	
		STANDARD	OPTIONAL
1	COVER PLUG	Galvanised steel AS1074	S/S 316 AS1444
2	COVER NUT	Plated steel	S/S 316 AS1444
3	COVER BEARING	Bronze AS2728.3/1984/C92410	
4	COVER	Cast Iron AS1830	Steel AS2074 C3 Austenitic C.1. AS1833 or Bronze AS2738 3/1984/C92410 up to 80mm
5	SPRING	S/S 304 AS1444	
6	STEM NUT	Bronze AS2728.3/1984/C92410	S/S 316 AS1444
7	DIAPHRAGM WASHER	Cast Iron AS1830	Steel AS2074 C3 Austenitic C.1. AS1833 or Bronze AS2738.3/1984/C92410 up to 80mm
8	DIAPHRAGM	Nitrile ASTM D-2000	Viton ASTM D-2000
9	DISC RETAINER	Cast Iron AS1830	Steel AS2074 C3 Austenitic C.1. AS1833 or Bronze AS2738 3/1984/C92410 up to 80mm
10	DISC	Nitrile ASTM D-2000	Viton ASTM D 2000
11	SPACER WASHER	Fibre	
12	DISC GUIDE	Bronze AS2728.3/1984/C92410	S/S 316 AS1444
13	STEM	S/S 316 AS1444	
14	BODY PLUG	Galvanised steel AS1074	S/S 316 AS1444
15	SEAT	Bronze AS2728.3/1984/C92410	S/S 316 AS1444
16	BODY STUD	Plated steel	S/S 316 AS 1444
17	BODY	Cast Iron AS1830	Steel AS2074 Austenitic C.1. AS1833 or Bronze AS2738.3/1984/C92410 up to 80mm

MACK VALVES PTY LTD 30 Burgess Road, Bayswater VIC 3153 Ph: 61 3 9720 2122 Fx: 61 3 9720 1344
Email: enquiries@mackvalves.com.au Web Site: http://www.mackvalves.com.au

MAINTENANCE PROCEDURE MAIN VALVE P100

1. Mack Valves recommends that all maintenance is carried out by a qualified technician.

2. Prior to any maintenance being carried out the pressure in the line should be isolated from the valve. Make sure also to relieve any pressure trapped in the body or cover chambers.

3. Disconnect pilot lines at fittings.

4. Unscrew cover nuts (2) and remove cover (4) on 150mm diameter and larger size valves jacking or lifting holes are provided for this purpose.

5. Remove spring (5) and diaphragm assembly (8,9 & 11)

6. Metal seat should only be removed if it needs replacing due to damage to the seating surface.

7. Examine diaphragm assembly by checking diaphragm and disc for rupture, wear or surface damage.

8. If diaphragm assembly needs to be disassembled to replace parts follow following procedure

   8.1. Hold bottom of stem (13) in vice using soft jaws so as not to damage precision machined surface

   8.2. Remove stem nut (6), diaphragm washer (7), diaphragm (8), disc retainer (9), disc guide (12) and spacer washers (11)

   8.3. All worn and damaged parts should be replaced

9. To reassemble diaphragm assembly follow the reverse procedure of disassembly the area where the disc guide (12) and disc retainer (9) sit on the stem should be smeared with a sealing silastic.

   9.1. Ensure there is enough pressure exerted on the disc (10) by the disc guide (12) when the stem nut is tight by using sufficient numbers of spacer washers (11).

10. Lightly grease top and bottom of stem (13).

11. Fit diaphragm assembly back into valve body, position spring (5) and refit cover (4) into the position it was removed from

12. Tighten cover nuts in an equal and opposite manner.

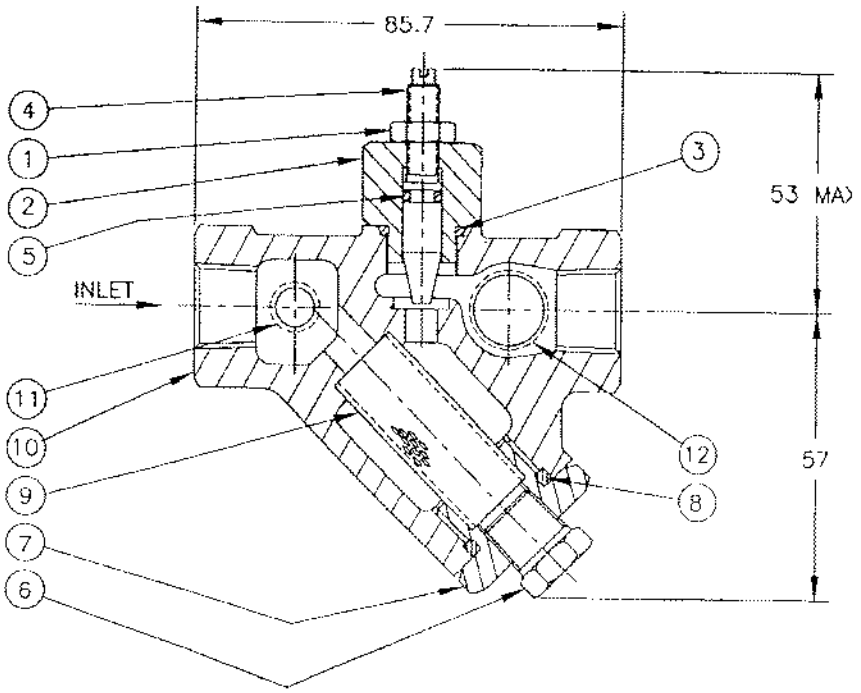
13. Refit pilot system.

Procedure to Determine if Diaphragm is Ruptured.

This procedure can be used to determine if there is damage to the diaphragm without removing cover (4) from the valve. Apply pressure to the valve inlet by ensuring the upstream gate valve is opened. Close all control line isolating ball valves. Remove a fitting from the cover if there is continuous flow the diaphragm is ruptured or the diaphragm assembly on the stem is loose.

X42N STRAINER AND NEEDLE VALVE ASSEMBLY

The Mack Valves Model X42N is a "Y" Type in-line strainer in combination with an adjustable needle valve. It's duty is to filer water before it enters ACV pilot controls and to create a predictable pressure differential at specific flows.

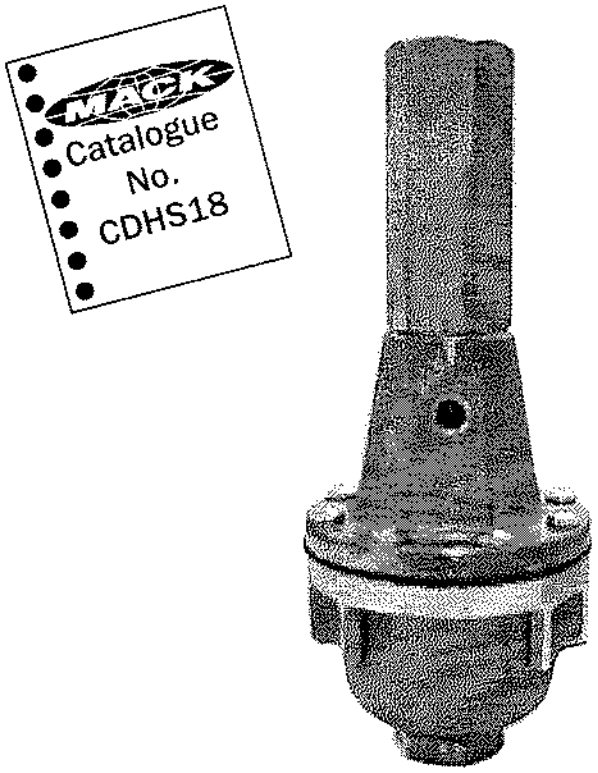


Item Number	Description
1	Hex Locknut
2	Bonnet
3	'O' Ring
4	Stem stainless steel
5	'O' Ring
6	Plug
7	Cap
8	'O' Ring
9	Screen
10	Body gun metal
11	Hex Plug
12	Hex Head Plug

MAINTENANCE PROCEDURE FOR STRAINER NEEDLE VALVE ASSEMBLY X42N-1

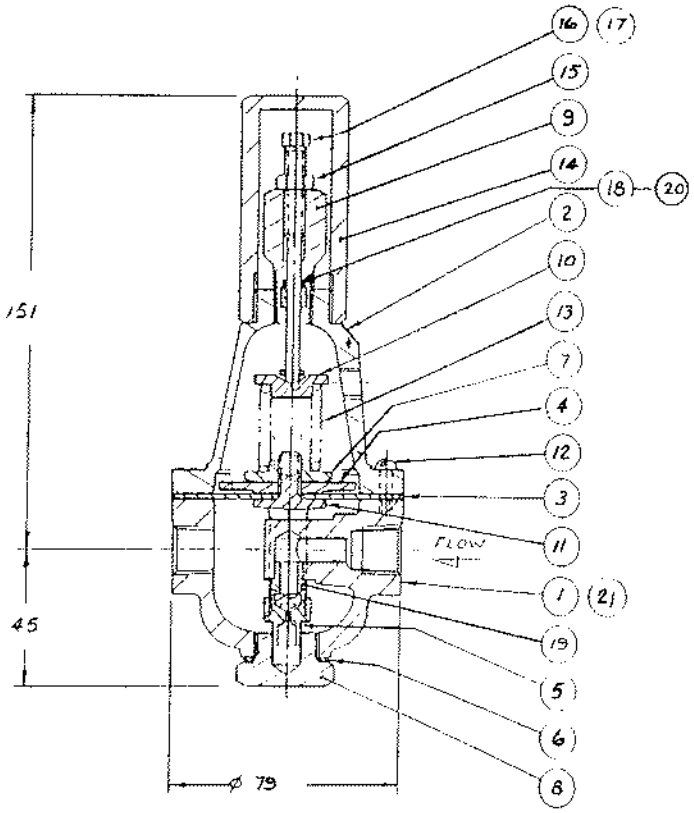
Remove strainer (9) element and remove foreign material from strainer needle valve model X42N. This procedure should be carried out every 12 months in the case of pollution this should be carried out every 3 months. No other adjustments should be made to the setting.

MACK DIFFERENTIAL CONTROL



- The **MACK** CDHS18 Differential Control closes when controlling pressure exceeds the predetermined setting.
- The **MACK** CDHS18 Differential Control is designed for use in conjunction with a **MACK** Model P40 rate of flow valve and Model P49 combination Pressure Reducing and rate of flow valve and operates within very tight pressure limits.
- The **MACK** CDHS18 Differential Control is actuated by the differential produced across an orifice plate in the main line. Accurate control is assured as very small changes in the controlling differential produce immediate corrective action of the main valve.

  Rate of flow is adjustable by varying the spring load on the control



ITEM	TITLE
1	Body
2	Cover
3	Diaphragm
4	Diaphragm Washer
5	Disc Retainer Assembly
6	Gasket
7	Diaphragm Nut
8	Plug
9	Stem Guide
10	Spring Pad
11	Stirrup Gun Metal
12	Round Head Screw
13	Spring
14	Cap
15	Hex Locknut
16	Adjusting Screw
17	Spring Pin
18	Bush
19	Seat
20	"O" Ring
21	Hex Head Plug

MAINTENANCE PROCEDURE CDHS18
DIFFERENTIAL CONTROL

1. Remove cap (14) and release all tension on spring via adjuster (16)

2. Remove screws (12) and spring cover (2).

3. Undo plug (8), the disc retainer assembly (5) can now be screwed out take care not to damage.

4. Diaphragm assembly (3,4,7 & 11) can now be removed.

5. Inspect and replace all damaged and worn parts.

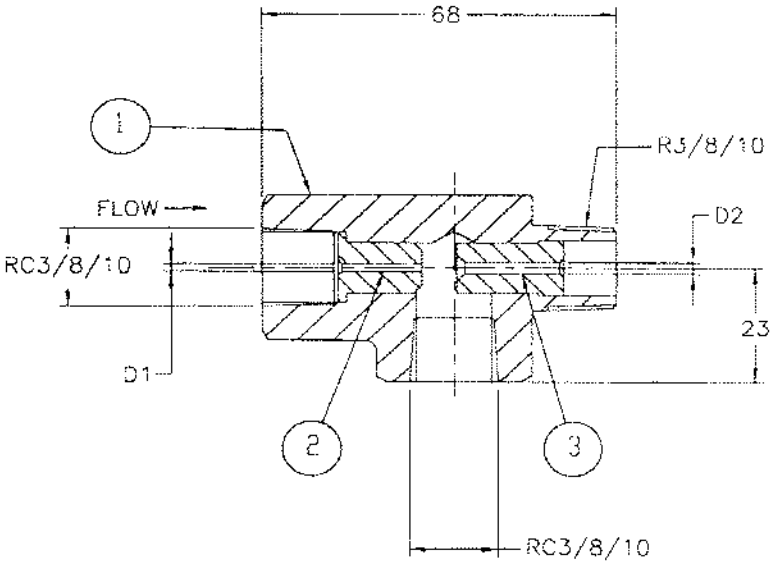
6. Reassembly is the reverse of disassembly

7. Ensure stirrup (11) does not drag on inlet nozzle.

X47 Ejector

The Mack Valves X47 ejector is a precision manufactured Tee fitting manufactured with a primary and secondary nozzle. Flow from the primary nozzle to the secondary nozzle creates a low pressure zone at the third port.

It's main use is in Mack ACV pilot systems to create a suction to assist in venting of the main cover and opening of the valve.



Item No.	Description
1	Body
2	Primary Nozzle
3	Secondary Nozzle

The X47 has no serviceable parts, should it's performance deteriorate, inspect and ensure ports are clean if there is any evidence of damage to the orifice replace entire ejector.

SPARE PARTS

Spare parts can be obtained from your nearest Mack Valves office or distributor.

When ordering spares parts provide the following information.

Valve model and size.
Date of original purchase or serial number off name plate.
Media the valve is being used on.
Inlet and outlet pressures
Any special material requirements.

SYMPTOM	POSSIBLE CAUSE	TEST PROCEDURE	REMEDY
Valve won't open.	Low pressure sensing shut-off valve in closed position	Visual check of this valve. It should be open.	Open valve
	Adjustment below desired set point.	Turn adjusting screwed "IN" and watch for the main valve to open.	Re-adjust the valve to the desired set point.
	Sensing lines reversed.	Visually check location of sensing lines. Downstream tapping on orifice flange should go to the spring chamber of the differential pilot control valve.	Connect the lines properly.
	Pilot Valve stuck closed.	Turn the adjusting screw "IN" until the spring compresses solid. You can tell this by the sudden increase in resistance to turning. Turn the adjusting screw about ¼ to ½ turn more in an effort to free the control.	Disassemble the pilot control valve, clean all parts, replace any worn ones, and reassemble. If cause of the sticking was a heavy mineral deposit, you should set up more frequent maintenance for this control.
	Main Valve stuck closed.	Close inlet control system shutoff cock. Remove plug from main valve cover. Valve should open if there is any pressure at inlet. NB:- Valve will not open with no pressure at inlet.	Disassemble main valve and clean all parts thoroughly. Pay particular attention to stem and bearing surfaces. Also make sure the disc guide is not dragging in the seat.
Valve won't close.	Flow rate is below set point.	If possible, increase the flow rate to the set point. Further attempts to increase flow rates should result in the valve throttling. If it is not possible to increase the flow rate to the set point, you can check this possibility by turning the adjusting screw "OUT". Keep track of the turns so you can return the control to its original setting.	Re-adjust the flow rate setting of the control.

SYMPTOM	POSSIBLE CAUSE	TEST PROCEDURE	REMEDY
Valve won't close.	Pilot Control valve diaphragm worn or loose diaphragm nut.	Disconnect low-pressure sense line. Apply pressure to the high-pressure sense line. Flow should appear at the open low-pressure connection of the pilot control valve.	Replace the diaphragm or tighten the diaphragm nut.
	Clogged primary jet in ejector.	Disconnect low-pressure sense line and apply pressure to high-pressure sense line. Main valve cover pressure should equal inlet pressure.	Remove ejector and clean jet. Make sure you do not enlarge the jet diameter as you clean it. This is a good time to check the strainer too.
	Worm main valve diaphragm.	Close inlet control system shutoff cock. Remove plug from main valve cover. Apply pressure at valve inlet. Continuous flow form the open port indicates damage diaphragm.	Disassemble and replace main valve diaphragm. Try to determine the immediate cause of failure and remedy this condition if possible.
	Main Valve stuck open.	Slowly close block valve "B" and observe main valve position indicator. Main valve should slowly close.	Disassemble and clean all parts of the main valve. Particular attention should be given to the stem and bearing surfaces. If this condition is chronic and is due to excessive scale build-up, you should open up the clearances to 0.4mm on the diameter, or install delrin sleeved stem.
	Pilot Valve stuck open.	Turn adjusting screw "IN" until the spring compresses solid. You can tell this by the sudden increase in resistance to turning. Turn the adjusting screw about ¼ to ½ turn more in an effort to free the control.	Pilot valve must be disassembled and cleaned. Replace any worn parts, reassemble, and test. If cause of the sticking is excessive build-up of mineral deposits, you should set up more frequent maintenance checks.
	Plugged or partly plugged orifice sensing ports.	Disconnect sense lines. Open shut-off cocks. Large stream of water under high pressure should be present.	With a suitable size rod, for out sensing ports in orifice holder. Make sure you get all the way into the middle of the pipe.

ADVANCED PUMP TECHNOLOGIES PTY LTD

PERMAGLASS TECHNICAL MANUAL
-PUMP COLUMN-



First Edition SEP 2014

Foreword

Welcome to the First Edition of the Permaglass® Technical Manual. Permaglass has enjoyed a long and successful history in Australia for the manufacture and supply of premium FRP piping systems for Bore Pump Column & Bore Casing applications. The products have been utilized in some of the harshest applications imaginable in Australia. It is widely considered that Australia can, and does produce some of the most challenging expectations from product manufacturers in terms of the installation environment and the poor water quality the products are subjected to. In this manual, we cover detailed requirements and identify application considerations when designing systems utilizing premium, Permaglass® FRP products.

Permaglass is a registered product with intellectual property owned by Advanced Pump Technologies and is manufactured under a licensed joint-venture by RPC Technologies.

Disclaimer

All reasonable care has been taken to ensure the accuracy of the contents, however Advanced Pump Technologies shall not be liable for any loss whether direct, indirect, incidental or consequential arising out of the use of, or reliance upon any of the content of this publication.

This publication is designed to provide technical data and information gathered from various sources. The data and information is presented with the express understanding that Advanced Pump Technologies and RPC Technologies are not engaging in the design of complete water infrastructure systems.

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2 INTRODUCTION – WHAT IS FRP?

Fibreglass Reinforced Plastic (FRP/GRP) or GRE are all material names for “Fibreglass” Pipe.

Permaglass® FRP PUMP COLUMN is high quality Fibreglass Pipe which has been used in Australian and International pump installations for over 25 years. Permaglass® is manufactured to Australian Standards and also incorporates Testing and Post Curing to ensure the highest quality and mechanical strength is achieved.

FRP is constructed with a Filament Wound Glass Reinforced Polyester Resin with material content as follows:

- Corrosion Resistant Isophthalic Polyester Resin – Dion 61386
- ‘E’ Glass reinforcement in chopped and continuous strands. Minimum glass content 50%.
- High Performance internal Isophthalic C veil reinforced resin applied to the internal mould surface.
- High performance externally applied Isophthalic NPG Flowcoat for external finish.

3 PRODUCT DESCRIPTION, FEATURES & BENEFITS

Permaglass® FRP PUMP COLUMN is a lightweight, rigid rising main, specifically designed for submersible borepump installations. It will not corrode like steel or twist and stretch like flexible hose, and is very quick and easy to install.

Permaglass® FRP PUMP COLUMN is suitable for nominal pump settings up to 200mts for Standard Duty, and 350mts for Heavy Duty. Deeper applications can be accommodated in some instances. Please contact your supplier to verify maximum tensile loads for applications outside the tables shown in section 5.1.

FEATURES:	BENEFITS:
• KWIK-LOK Joints (very quick and easy to assemble). • Anti-Torque Non-Rotating Joints. • Corrosion Resistant • Lightweight Column • Various Lengths • High Tensile Loads for deeper bores.	• Fast Installation and Removal (by a team of 2) • Long Service Life- Reuse Over Many Years • Easy to Add or Remove Sections for specific and varying depths. • Rigid design. Does not stretch, expand or twist causing potential failure of electrical drop cables and motors. • Standard Lifting Practises are employed to reduce OH&S hazards. • Deeper bore applications due to high tensile load capability.

4 APPROVALS

Permaglass® manufacturing facilities are fully certified to AS/NZS ISO 9001:2008.


BUREAU VERITAS
Certification

Certification

RPC TECHNOLOGIES PTY LTD

AS/NZS ISO 9001:2008

5 PERFORMANCE DATA

When selecting Permaglass® Column, take careful consideration of critical factors such as:

- The OD at the coupling joints. Ensuring there is sufficient available area between the borecasing ID and column annulus to allow for drop cable to fit.
- Total weight of the entire installation does not exceed the Maximum Equivalent Tensile Load (see Performance Table below).
- Water quality. If water is corrosive, consider using alternative PEEK locking cords and duplex End-Connectors. See section 8.4 for further details.
- Total system pressure does not exceed the Maximum Allowable Internal Pressure.

5.1 DIMENSIONS & PERFORMANCE TABLE

- SD Suffix = Standard Duty Column
- HD Suffix = Heavy Duty Column

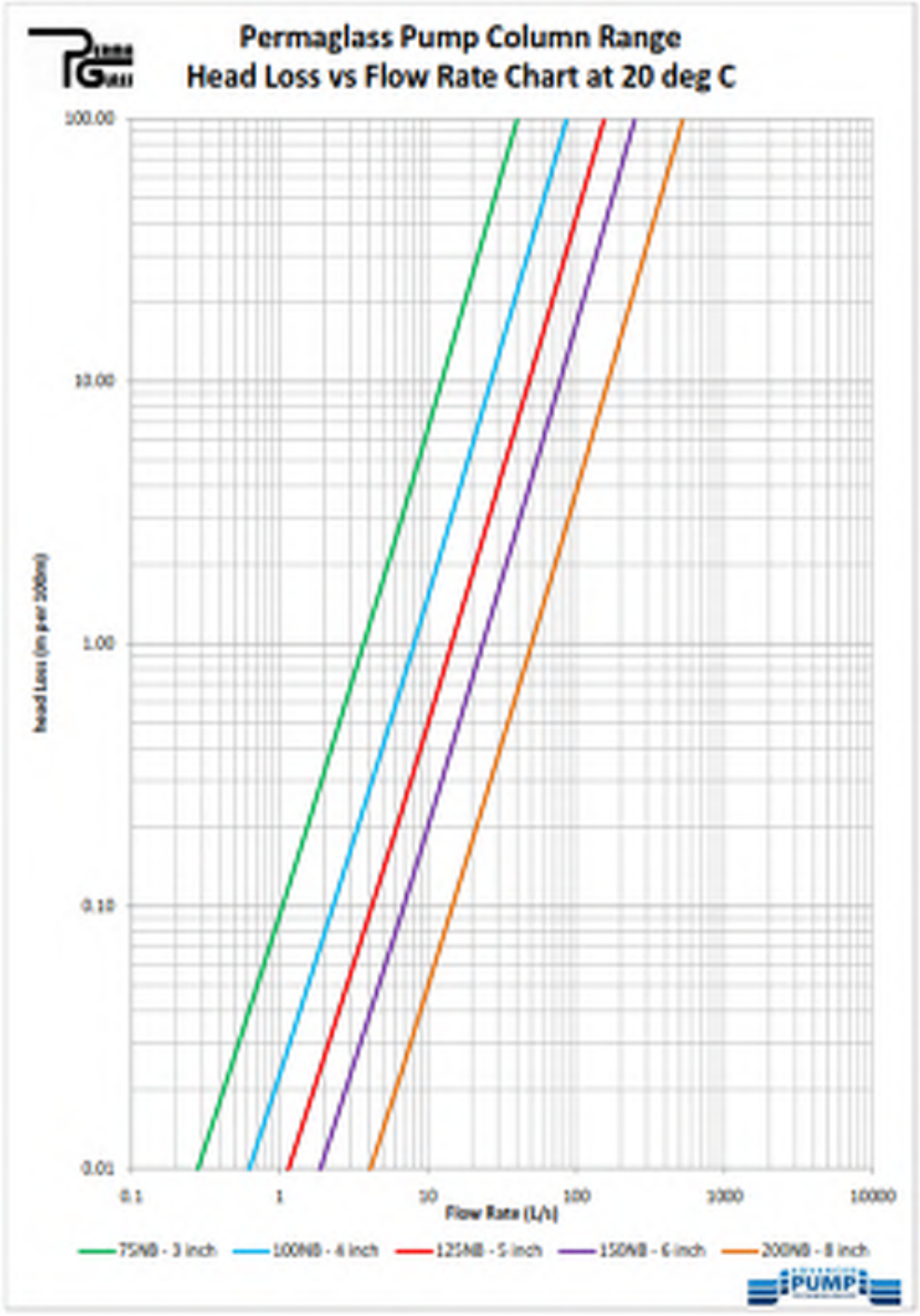
Size	Internal Diameter	OD at Coupling	Standard Wall Thickness	Locking Cord Diameter	Weight	Maximum Equivalent Tensile Load*	Maximum Allowable Torque	Maximum Allowable Internal Pressure
	mm(in.)	mm	mm	mm	kg/m	kg	kg.m	kPa
75SD	76(3)	112	5	6	2.1	3580	40	6430
75HD	76(3)	112	6.5	6	2.7	4630	56	8420
100SD	101.7(4)	143	5	6	2.8	6390	71	4875
100HD	101.7(4)	143	8	6	4.5	8070	125	7905
125SD	127.1(5)	169	6.5	6	4.6	8110	151	5190
125HD	127.1(5)	169	9.5	6	6.7	9850	235	7610
150SD	152.5(6)	202	6.5	8	5.5	11340	215	4355
150HD	152.5(6)	202	9.5	8	8	14250	334	6415
200SD	203(8)	267	8	10	8.9	14840	479	4100
200HD	203(8)	267	11	10	12.3	18920	688	5660

- *Tensile load = axial stress due to the combination of internal pressure, weight of pump & motor, electrical cable, shutoff head, FRP column and the water in the column.
- Refer to supplier if uncertain of load calculation or should load exceed maximum load.
- Effective lengths available - 5m (standard), 3m, 2m, 1m.
- Handles 80C. Up to 100C (refer to supplier for over 80C).
- Suitable for potable water.
- Locking wires in 316 stainless steel (standard) special composite PEEK cord for highly corrosive water.

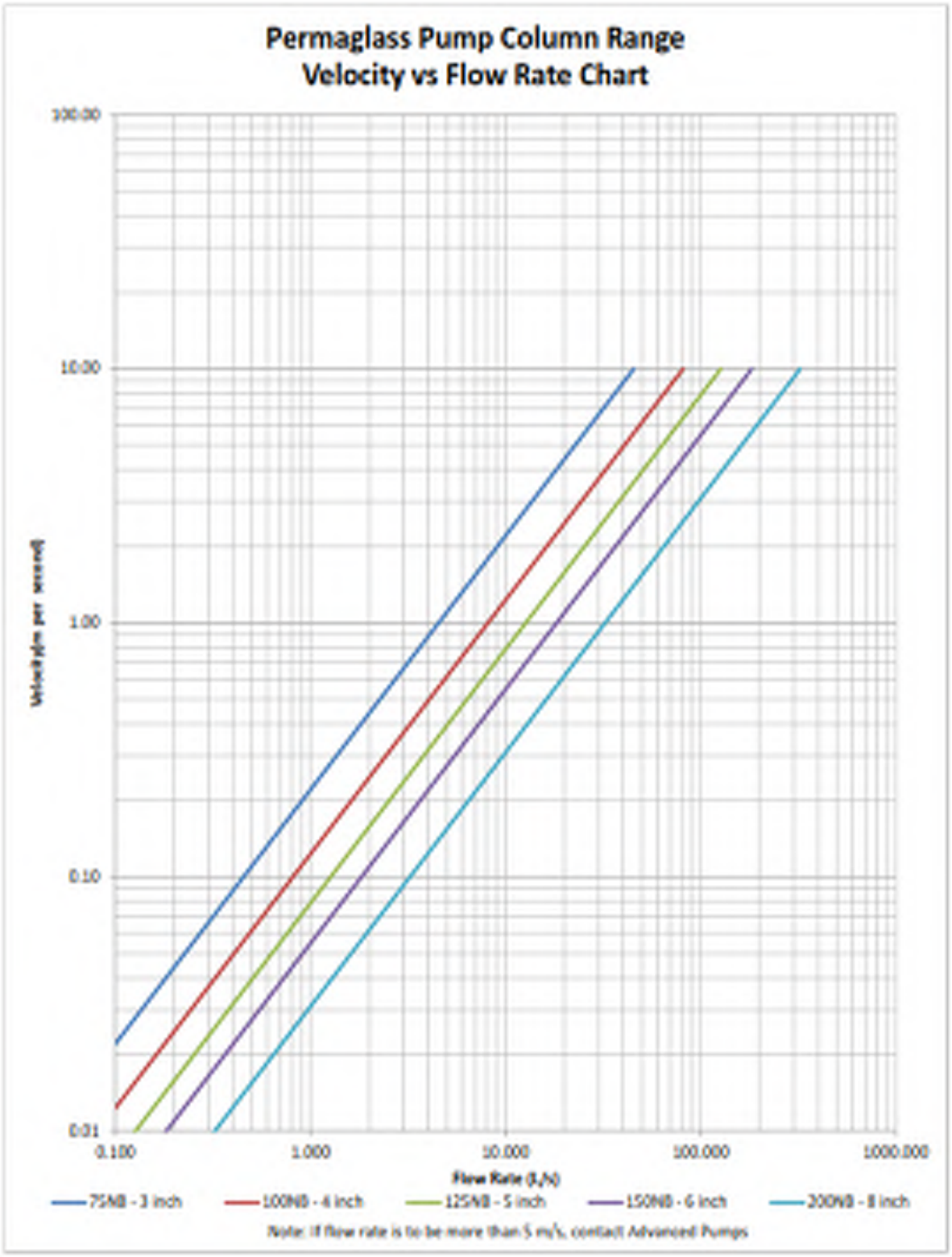
5.2 FRICTION LOSS - CHART

The friction loss table below is applicable for both Standard Duty and Heavy Duty Permaglass®. Heavy Duty Permaglass® has a larger OD. The ID remains the same for both Standard Duty and Heavy Duty.

Note: Joint OD remains the same for both Standard & Heavy Duty Permaglass®.



5.3 VELOCITY CHART



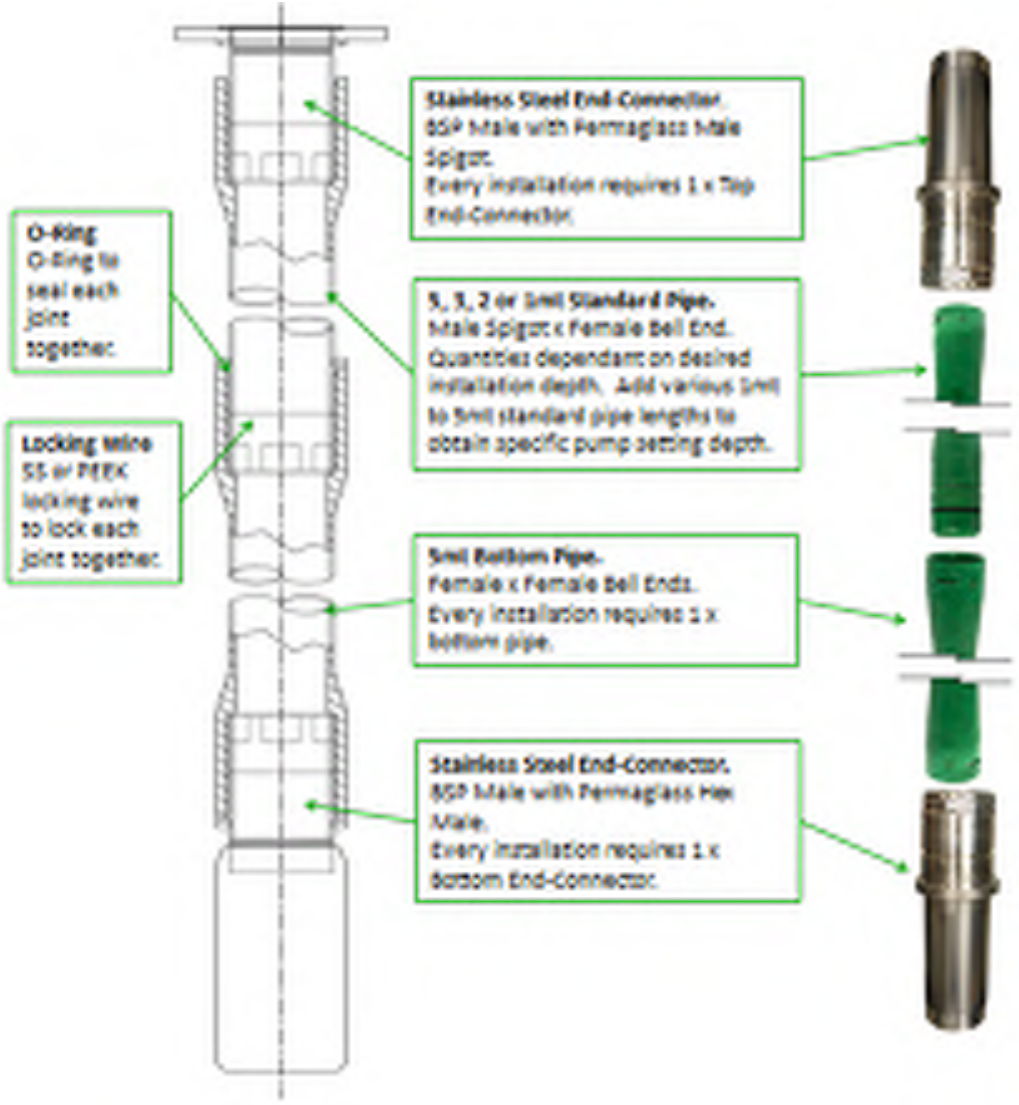
6 SYSTEM COMPONENTS

This section describes each of the components required for one complete bore installation.

The following sections describe each component in further detail.

6.1 GENERAL ARRANGEMENT

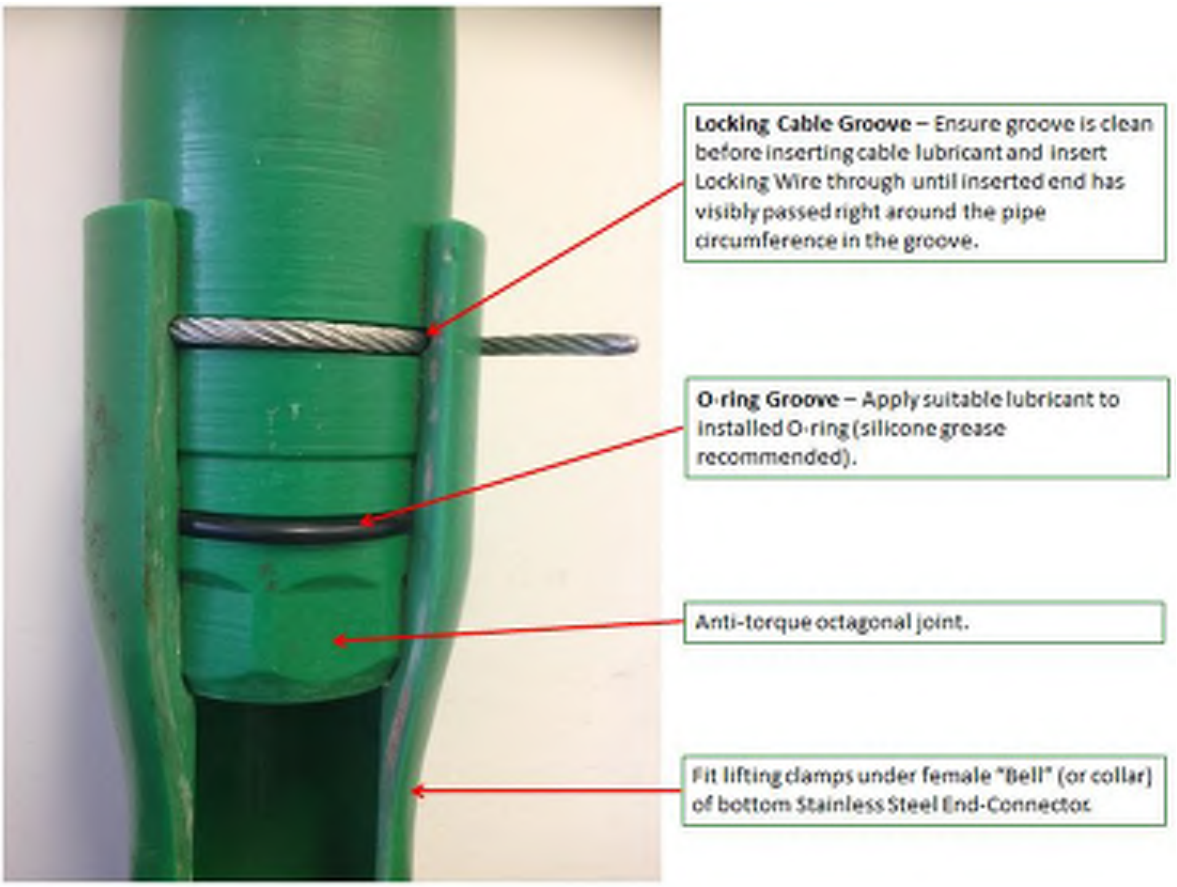
Below is a basic arrangement diagram of a typical installation. Please observe the following sections to learn about each component in further detail.



6.2 JOINTS

Permaglass FRP Pump Column is coupled using the Kwik-Lok joint which consists of an O-ring for pressure sealing and a 316 stainless steel Locking Wire.

Permaglass FRP Pump Column has an Anti-Torque Octagonal male spigot end to stop rotation of the pipe joint with pump thrust. The 316ss End-Connectors are threaded one end for pump and headworks connection, and the other end is a machined Permaglass male spigot for connecting into the double-ended female (bottom pipe) and standard female bell (top).



It is recommended to wrap PermaTape around each bell end connection to prevent dirt ingress in the joint. This will assist to separate the joints at a later stage if needed, as well as preventing the Locking Wire being caught on installation/removal.

6.3 LOCKING WIRES & CORDS

Locking Wires are used to secure each joint together. Standard Locking Wires are made of 316ss materials which are suitable for most raw water applications.

A standard 316ss Locking Wire is supplied with each standard length of Permaglass®.

For aggressive water applications, an optional locking cord made of "PEEK" (Polyether Ether Ketone) is available. See section 8.4 for further details for aggressive water applications.



CODE	SIZE (to suit column)	Description
PER3-LOCKWIRE	80mm	80mm Stainless Steel Locking Wire
PER4-LOCKWIRE	100mm	100mm Stainless Steel Locking Wire
PER5-LOCKWIRE	125mm	125mm Stainless Steel Locking Wire
PER6-LOCKWIRE	150mm	150mm Stainless Steel Locking Wire
PER8-LOCKWIRE	200mm	200mm Stainless Steel Locking Wire
PEEK3- LOCKCORD	80mm	80mm PEEK1000 Locking Cord
PEEK4- LOCKCORD	100mm	100mm PEEK1000 Locking Cord
PEEK5- LOCKCORD	125mm	125mm PEEK1000 Locking Cord
PEEK6- LOCKCORD	150mm	150mm PEEK1000 Locking Cord
PEEK8- LOCKCORD	200mm	200mm PEEK1000 Locking Cord

The Locking Wires supplied are suitable for both the Standard-Duty and Heavy-Duty pump column.

6.4 O-RINGS

O-Rings are used to seal the joints. O-Rings are made of EPDM elastomers.



O-Rings are not required to be ordered separately. O-Rings and Standard Locking Wires are supplied with each standard pipe length.

However, replacement O-Rings are available if required.

CODE	SIZE (to suit column)	Description
PER3-O-RING	80mm	80mm O-Ring
PER3-O-RING	100mm	100mm O-Ring
PER3-O-RING	125mm	125mm O-Ring
PER3-O-RING	150mm	150mm O-Ring
PER3-O-RING	200mm	200mm O-Ring

The O-Rings supplied are suitable for both the Standard-Duty and Heavy-Duty pump column.

6.5 END-CONNECTORS

Each complete Permaglass installation requires two (2x) End-Connectors.

One is to connect to the pump discharge head, referred to as the "Bottom End-Connector". The second is to connect to the discharge headworks at the surface, referred to as the "Top End-Connector".

The Bottom End-Connector is available with, or without a break-off pin fitted. See section 6.6 for further information regarding the use of break-off pin.

All End-Connectors are 316ss materials and have BSP Tapered Male connections.

For aggressive water applications, Duplex End-Connectors are available as an option. See section 8.4 for further details for aggressive water applications.





If an exact pump-setting depth target is desired, please note that each End Connector will add a short length to the overall column dimensions. The table below illustrates the additional "effective length" added by the End-Connectors to the overall column length.

END CONNECTOR DIA	EFFECTIVE LENGTH per END-CONNECTOR
80mm	200mm
100mm	250mm
125mm	260mm
150mm	310mm
200mm	350mm

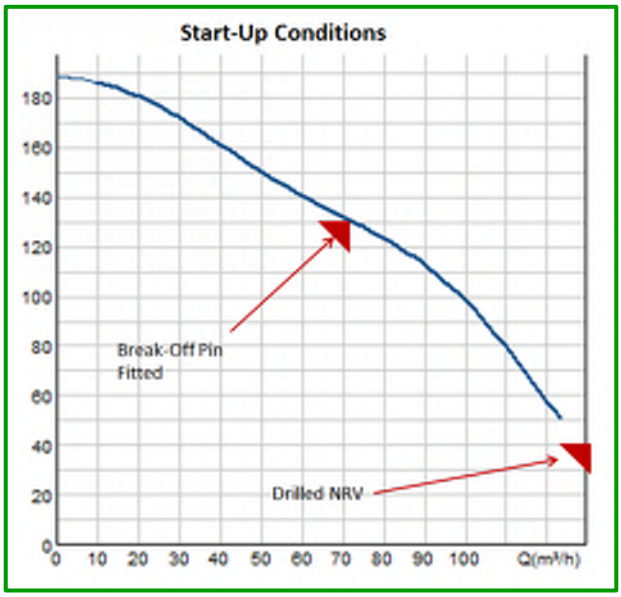
6.6 BREAK-OFF PINS

Break–off Pins are the preferred alternative to drilling a hole in the pump's non-return valve (NRV). In the past, drilling a hole in the NRV has evolved as a widely accepted practice for borehole applications. This was attributed to the limitations of flexible hose columns, as this was the only viable option to enable the retrieval of a flexible hose column. The full column of water needed to be drained in order to lift the flexible hose.

As Permaglass® is installed in maximum 5mt sections; the water is able to be drained when each section is disconnected. However, using this technique resulted in a wet work area which presents undesirable OH&S outcomes in the current day work environment.

Drilling NRV's was a result of the above two scenarios and had become the only solution (albeit a remedial effort), until the development of the Break-Off Pin.

Moreover, pump manufacturers do not endorse drilling NRV's as "good practice". When a pump is in standby mode, the water level in the column drains to the well's natural standing water level. When the pump is called to start, the pump is now starting under no load and the performance duty is now running off-the-curve (see illustration to the right). The result can be:



- Upthrust of the pump shaft & impellers
- Cavitation

Both of these conditions will cause premature pump failure.

In addition to this, it is quite common that the pump may be contributing to a pressurised pipeline network. In this circumstance, on pump start-up, the column will eventually fill up and meet a pressurised main which is held by the non-return valve fitted to the bore headworks at the surface. The result is a fast moving column of water meets a stationary column of water at a rapid rate. The result can be:

- Increased water hammer
- Damaged motor thrust bearings
- Breaking Pump Shafts
- Stress on all mechanical components

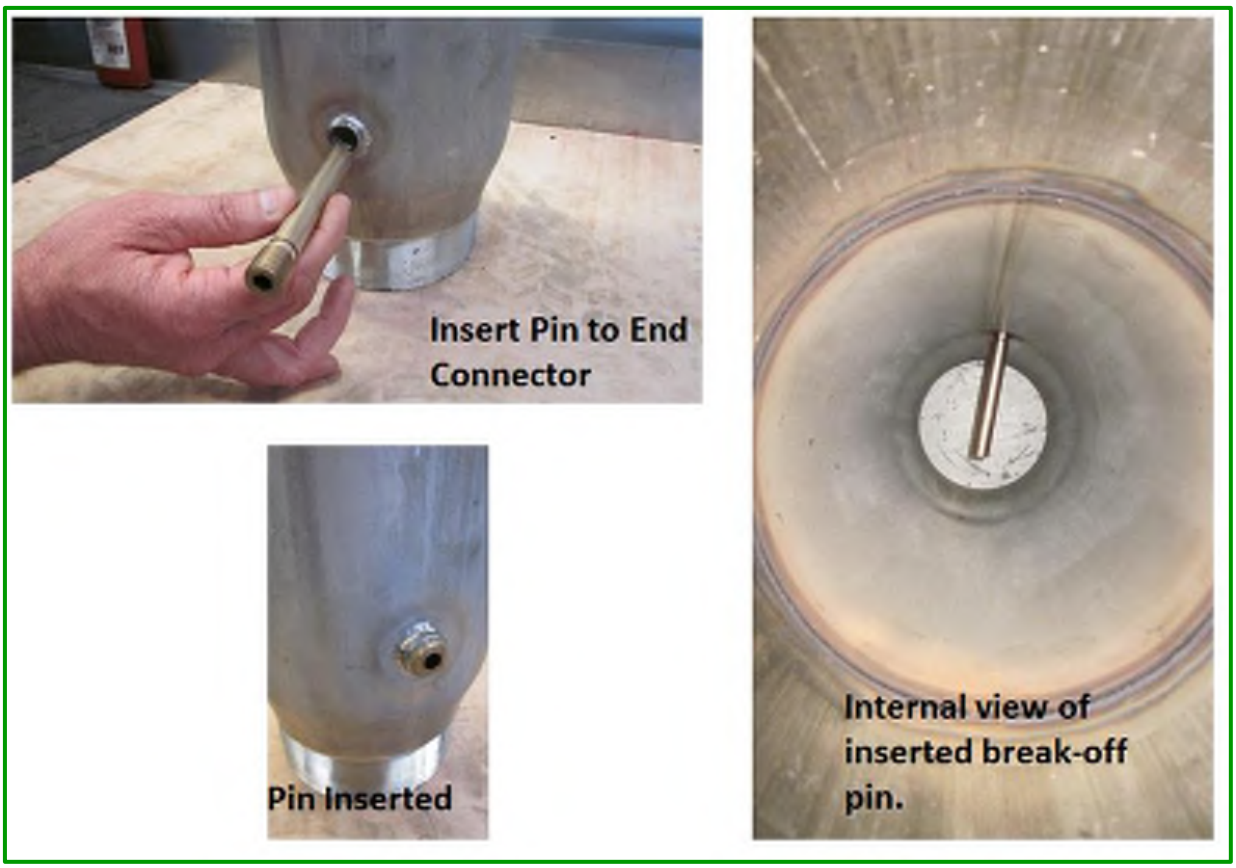
All causing premature failure of pumps & motors.

To address these issues, Permaglass developed a break-off pin.

The Break-Off Pin is inserted into the Bottom End-Connector. When the pump needs to be retrieved, a heavy, narrow weight (TORPEDO) is gently lowered down the centre of the column until it comes to rest (bottoms-out) on the "bar" of the break-off pin. The weight is then lifted a few centimeters and

then left to “drop” onto the pin, thus breaking the pin and allowing water to evacuate the column out into the borecasing.

Before re-installing the column, replace with a new break-off pin.



6.7 CABLE SUPPORT OPTIONS

For small cable diameters, PermaTape can be used to secure the drop cable to the pump column. Larger (heavier) cable diameters require PermaStrap.

The following table details the recommended quantity of cable supports required.

As Permaglass® is a rigid column; there is no need to allow for additional slack in the drop cable to allow for column "stretch".

POWER CABLE WEIGHT (P/MTR)	Minimum Qty of cable supports	
	PermaTape	PermaStrap
Less than 1.7kg/m	Every 2 mtr	Not required
1.8kg/m to 2.5kg/m	not suitable	Every 3mt
2.6kg/m to 4.0kg/m	not suitable	Every 2mt
4.1kg/m to 5.0kg/m	not suitable	Every 1mt
Over 5kg/m	Consult Permaglass	



PermaTape Cable Support

PermaTape is a heavy duty PVC pipe protection tape coated with an anti-corrosive and aggressive adhesive. It is designed for above ground and underground applications making it suitable for use in bore holes.

PermaTape is user-friendly in its installation and is designed to provide ease and flexibility in fastening cables to Permaglass® Pump Column.

The recommended installation is for PermaTape to be wrapped around the bell ends to prevent silt build up in the joint. PermaTape should also be wrapped around the stainless steel locking wire to prevent damage to the cable and bore casing.

Advantages of the Perma-Tape System Include:

- 5 years of proven bore service.
- No sharp edges.
- High tensile strength after fastening.

Specifications . . . . . .

- Dimensions: 72mm wide x 0.25mm thick
- Roll length: 33m
- Breaking load: 44N/cm
- Elongation: 220%
- Continuous Use Temperature: -5 C to 80 C
- Colour: Black



PermaStrap Cable Support



The PermaStrap Cable Strap System is a user-friendly product designed to provide ease and flexibility in fastening heavier cables to Permaglass® Pump Column.

This system includes weather-resistant acetyl cable straps and marine grade locking devices.

Advantages of the PermaStrap System Include:

- 10 years + proven bore service.
- No sharp edges.
- High tensile strength after fastening.

Specifications . . . . . .

- Minimum Tensile Strength: 1,211N minimum.
- Outdoor Life: Designed to last a minimum of 20 years.
- Continuous Load: 9.07 kg
- Continuous Use Temperature: -65 C to 90 C
- Colour: Black.
- Strap and Body: Weatherable acetyl; offers superior resistance to sunlight, moisture, and salt environments.
- Locking Device: Marine-grade corrosion-resistant silicon copper alloy.

6.8 LIFTING CLAMPS

To ensure the safe handling and installation of Permaglass® FRP Pump Column, a pair (x2) of certified lifting clamps is required.



Both the Standard Duty and Heavy Duty Permaglass® use the same lifting clamp.

The clamps can be re-used many times, and should be considered a necessary tool for every installation. Installer should regularly check the condition of the clamps to ensure they are in good working order and the lifting wings have not been damaged. If wings are damaged, the clamps may need to be re-tested for SWL certification.

Genuine Permaglass Lifting Clamps are certified tested with SWL stamped on each clamp. Certification documents are provided with each clamp.

CODE	SIZE (to suit column)	Description	SWL (Tonne)
PER3-LC	80mm	80mm Lifting Clamp – Certified (per unit)	3T
PER4-LC	100mm	100mm Lifting Clamp – Certified (per unit)	5T
PER5-LC	125mm	125mm Lifting Clamp – Certified (per unit)	7T
PER6-LC	150mm	150mm Lifting Clamp – Certified (per unit)	11T
PER8-LC	200mm	200mm Lifting Clamp – Certified (per unit)	20T

7 SYSTEM CHECK LIST

A check list has been provided to ensure all items are accounted for when making a materials take off list for a bore installation.

CHECK LIST – ESSENTIAL ITEMS				
Description	**STD Duty/ Heavy Duty**	**Nominal Bore**	**QTY**	**CHECK**
Stainless Steel End Connector – Top				
Stainless Steel End Connector – Bottom. Fitted with break off pin/dewatering plug.				
Bottom Pipe – 5mt				
Standard Pipe – 5mt				
Standard Pipe – 3mt				
Standard Pipe – 2mt				
Standard Pipe – 1mt				
PermaTape (30mt Roll)				
PermaStrap Cable Support Strapping (330mt Roll)				
PermaStrap Cable Support Toggles (Box 500)				

CHECK LIST – OPTIONAL ACCESSORIES				
Description		**Nominal Bore**	**QTY**	**CHECK**
Lifting Clamps (2 required for installation)				
Torpedo Weight				
PEEK Locking Cords (for aggressive water)				

Note: there is no need to order O-Rings and Locking Wires separately. Standard S/S Locking Wires and O-Rings are supplied with every length of Permaglass® ordered. Additional spare O-Rings and Locking Wires are available as spares. See section 6 for part numbers.

For aggressive water applications, non-corrosive PEEK Locking Cords are available as an option and must be ordered separately.

8 APPLICATION CONSIDERATIONS

8.1 SAFETY CABLE

The Permaglass® column is manufactured to withstand very high tensile loads, and as such, safety cable is not required. However, if desired, safety cable can be used without causing any damage to the column.

8.2 BOREHOLE DIMENSIONS

Ensure there is adequate room in the annulus between the Permaglass® OD and the bore casing ID for all ancillary equipment to fit.

Items to consider would be:

- Electrical drop cable – Power (for the motor).
- Electrical drop cable - Control or Monitoring (i.e. PT100 temperature sensor, level sensors etc.).
- Level sensor probes.
- Dip tubes
- Centralisers

Take note of the Permaglass® dimensions table as shown in section 5.1. Note that the joint is wider than the nominal pipe diameter. Ensure there is enough room to hang the column in a central position within the bore, and adequate room is available to accommodate all the other items being installed.

8.3 MAXIMUM PERMISSIBLE LOADS

Ensure the maximum tensile load of the installation does not exceed the maximum permissible loads as specified in section 5.1.



Maximum load of the installation will consist of:

- Mass of the pump and motor assembly;
- Mass of the electrical drop cables;
- Mass of safety cable (if used);
- Mass of any other ancillary cables/sensors/items supported by the column;
- Pump shut-off head;
- Maximum pump torque;
- Water SG (Specific Gravity);

- Mass of the column; and
- Mass of column full of water.

If unsure of how to calculate the maximum tensile load, contact Advanced Pump Technologies for further advice.

8.4 AGRESSIVE WATER CONDITIONS

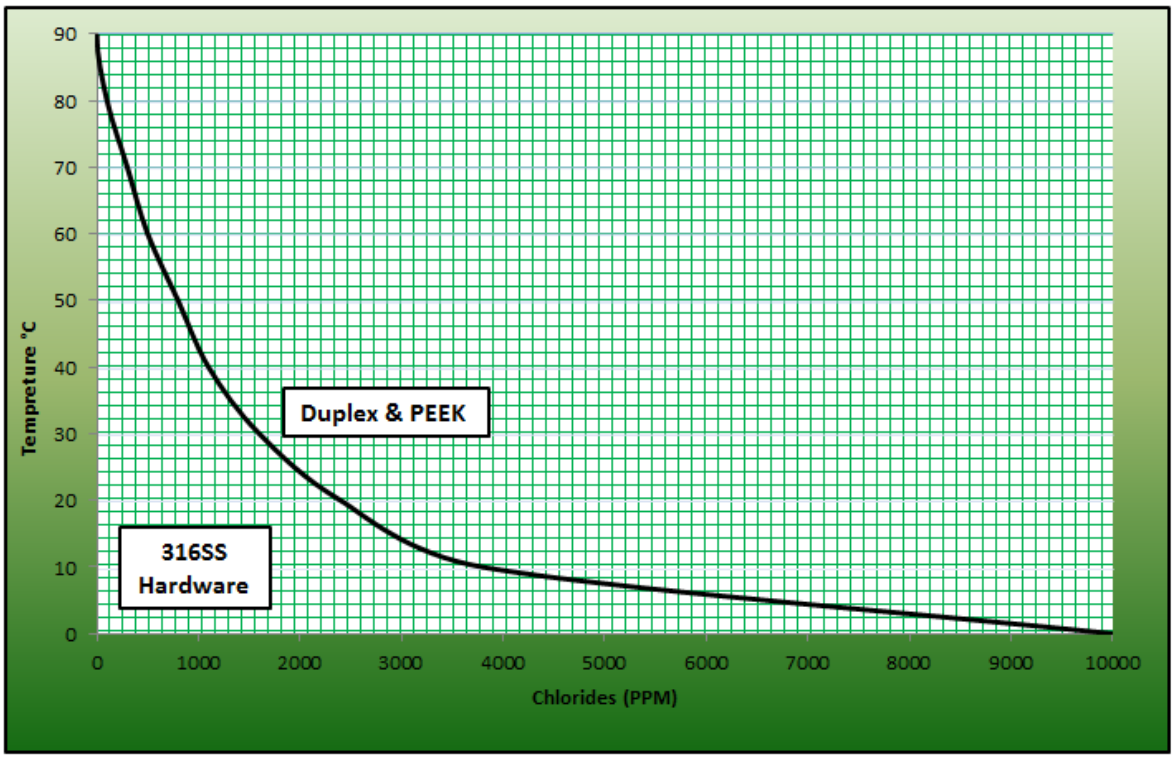
Water wells that produce poor quality raw water can cause premature corrosion of mechanical components installed in the well.

For these applications, alternative materials are available for consideration.

PEEK locking cords provide a non-corrosive solution to the standard 316ss locking wires delivered with each length of Permaglass®.

End Connectors made from Duplex steel should be used for water with high chloride contents.

Refer to the chart below for the recommended component selection in aggressive operating conditions. Please use this chart as a guide only. Accurate duration of life cycle cannot be guaranteed due to many operating factors of the installation that would not be known by the manufacturer.



- Below the line, use 316SS End-Connectors and 316ss Locking Wires.
- Above the line, use Duplex End-Connectors and PEEK Locking Cords.

Based on pH levels between 5 to 8.

9 INSTALLATION

PERMAGLASS® PUMP COLUMN Installation Guide

The following is a guide for the installation of Permaglass® Pump Column. It is a guide only and may depend upon the type of equipment used or circumstances at the time of installation.

A risk management process should be undertaken prior to installation and it is recommended that the four step process be followed. Starting with the identification of hazards in the working environment. Then determine the nature of the harm that could be caused by the hazard, how serious it could be and the likelihood of it happening. Once this has been identified, implement the most effective control measures that is reasonable practicable, then review the control measures to ensure they are working as planned.

Good safety practices should always be maintained during the installation process and consideration should be given to the most suitable type of Personal Protective Equipment (PPE) that is required to safely undertake the work.

Installers should satisfy themselves that their equipment is correctly sized and fit for purpose.

Lifting of 2 or more joined lengths of Permaglass® from the horizontal plain will result in distortion and permanent damage to joints; therefore this practice is not approved and will void warranty.



9.1 CONVENTIONAL CRANE METHOD

This method employs the standard lifting practices using a mobile crane. Planning is the first step in ensuring that lifting of a load is done safely. The following steps are recommended:

- Development of an initial work scope of works;
- Selection and acquisition of the crane;
- Planning, programming, scheduling and organising the work; and
- Managing the work.

Hazards can be introduced if crane characteristics do not match the work requirements or work environment.

The person operating the crane and the persons working with the crane, for example a dogger or rigger must hold an appropriate high risk work (HRW) licence.

STEP 1 - Lubrication

a) Lubricate locking wire groove in female end with a suitable silicone grease (suitable for potable water applications if required) for ease of insertion of locking wire;
b) Lubricate all O-rings for smooth insertion of male spigot into the female end to avoid damaging the O-ring, and to prevent the O-ring from “rolling”;

STEP 2 - Install bottom SS316 end connector.

Method employing a pair of lifting clamps or elevators

a) Thread the Permaglass® 316 stainless steel BSP End Connector into the female threaded connection of the submersible pump;
b) Install O-ring on the protruding Permaglass® male spigot;
c) Place lifting clamp under the collar of the End Connector;
d) Connect clamp to crane with a rated chain or rated sling(s) and carefully lift assembly into the bore.
e) Hold with the clamp supported on a suitable seating device such as a“C-plate or similar arrangement mounted over the bore.



STEP 3 - Install Permaglass® bottom pipe

a) Disconnect the sling from the lifting clamp fitted under the collar of the stainless steel end-connector and attach to a second lifting clamp;
b) Fit the second clamp under the top bell of the double-ended female bottom pipe;
c) Lift pipe into position over the male spigot of the end-connector;
d) Lower into position and install locking wire;
e) Wrap PermaTape several times around the end of the locking wire
f) Use PermaTape or PermaStrap to secure the electrical drop cable to the column and finish by wrapping PermaTape around the joint;
g) Take up tension on the sling to allow the removal of the first clamp;
h) Lower the pump and bottom pipe into the bore until the second lifting clamp under the top bell of the bottom pipe rests on the C-plate (as for the first lifting clamp). Be sure to secure

the electrical drop cable at regular intervals with PermaTape or PermaStrap according to relevant requirements as detailed in Section 6.7 “Cable Support Systems”.

STEP 4 - Install remaining Permaglass pipe

a) Insert the first lifting clamp under the female bell of the next length of Permaglass;
b) Attach the slings removed from the second lifting clamp and lift a pipe until vertical over the bottom pipe which is now secured in the bore;
c) Lower until the male spigot is above the female, install a lubricated O-ring then insert into the female bell until locking wire grooves are aligned;
d) Insert the locking wire.

Repeat **STEP 4** until all pipe is installed. Be sure to secure the electrical drop cable at regular intervals with PermaTape or PermaStrap according to relevant requirements as detailed in Section 6.7 “Cable Support Systems”.

STEP 5 – Install Top SS316 End-Connector

a) Fit a lubricated O-Ring to the second male end connector and install into the top female;
b) Secure with a locking wire.

The assembly is now ready to accept head works



If using a hydraulic or pneumatic clamping device, care must be taken not to exceed 70% of the external collapse pressure of the Permaglass® (as stated in the manufacturer’s specifications).

Lifting clamps should be positioned evenly under the bell and closed with a pin.

9.2 PERMASAFE INSTALLATION METHOD

In some installation environments such as major mine sites, working under suspended loads using a crane is undesirable.

After many months of market research, development and construction, the Permaglass design team has set a new standard in innovation and safety with the introduction of the industry's first bore pump and Permaglass® Pump Column installation and retrieval rig.

PermaSafe® is a custom-built rig specifically designed for the installation, testing and removal of bore pumps in a safe and efficient manner, reducing the risks associated with working under and in the line of fire of a suspended load.

Responsibly built and tested in consultation with leading mining industry water management experts, the PermaSafe® Rig delivers the highest level of safety for installers of Permaglass®. It is designed as a fully integrated unit built to safely install bore pumps, Permaglass® and power cable to depths of more than 200 metres. The depth is only limited by the maximum Kg load which is 13Tonne.

For further details on the PermaSafe Rig, please contact Advanced Pump Technologies.





10 REMOVAL

To remove Permaglass, simply reverse the steps in section 9.

If a “Break-Off Pin” is fitted, a Torpedo weight should be lowered down inside the pump column as described in section 6.6. The water level inside the column should start to slowly drop. If the water level does not change, the pin has not been successfully broken off. The Torpedo weight should then be slightly lifted and dropped onto the pin again until the water level starts to drop.

11 STORAGE AND HANDLING

Permaglass® FRP Pump Column and Bore Casing is a rigid pipe with high tensile strength properties.

However the pipe must be handled and stored with some care to ensure the sealing faces are protected and the pipe surface is not damaged. The user should also ensure that no heavy items are dropped on the pipe or the pipe itself is not dropped.

The chemical composition of Permaglass® allows for short term storage in direct sunlight as well as high humidity without causing any damage to the surface or structural properties of the pipe, provided it remains strapped in the bundles. However incorrect storage can cause the pipe to bend under certain conditions. Extended direct exposure to UV radiation from the sun will cause some

degradation of the surface over time and should be avoided. A simple tarpaulin or black plastic sheeting to cover the bundles is recommended.

11.1 TRANSPORT INSTRUCTION

- It is preferable that Permaglass® is transported in the packs supplied by the Manufacturer.
- Plastic strapping should be used to hold the packs together, however if metal straps are used, they should not be in direct contact with the pipe surface. Some form of protective material (eg tape or matting strip) should be used to insulate the two surfaces.
- Complete packs should be supported in a minimum of 4 places along the length of pipe to ensure the rigidity of the pack.
- During transport the packs should be securely fastened with proper ratchet straps to ensure the pack does not move or tip over.

11.2 SHORT TERM STORAGE INSTRUCTION

- For short term storage Permaglass® can be kept in full sun conditions for periods less than 4 weeks, provided that the pipe remains in the manufacturer's packs.
- The male and female ends should be protected from damage. Damage to the O-ring groove in either the male or female end may cause sealing issues with the pipe.
- Pipes stored in direct sunlight can bow due to the temperature differential between the exposed side and the shaded side of the pipe. This is a temporary phenomenon and is fully reversible. If this creates installation issues the bow can be rectified by storing the pipe in shade for several hours prior to installation.

11.3 LONG TERM STORAGE

- For longer term (4 weeks+) outdoor storage it is recommended that the Permaglass® pipe is stored under a tarpaulin type cover as a minimum or preferably out of direct sunlight.
- As is the case with short term storage, the recommendation is to store in packs similar to those supplied by manufacturer. If these are not available then the pipe should be stored off the ground with minimum 40mm x 40mm gluts equally spaced in at least 4 points along the length of the pipe with a maximum of 400mm overhanging the outer most gluts. Between each row of pipe horizontal and vertical gluts of the same dimensions needs to be used to keep the pack rigid.
- Loose pipes should be stored flat and covered to stop the potential bowing of the pipe.
- The male and female ends should be protected from damage. Damage to the O-ring groove in either the male or female end may cause sealing issues with the pipe.

12 WARRANTY

CONSUMER WARRANTY

ADVANCED PUMP TECHNOLOGIES PTY LTD.

This Warranty only applies to PERMAGLASS goods distributed by Advanced Pump Technologies Pty Ltd (***Seller***) where the Buyer acquires the goods for his/her own use and not for the purpose of re-supply. This warranty is additional to any rights and remedies that Buyer may have under the Australian Consumer Law and other laws.

If this Warranty applies, Seller warrants that its goods will be free from defects in material and workmanship for a period of one (1) year from the date of installation or eighteen (18) months from the date of purchase, whichever shall occur first. Seller shall, at its option and at no cost to Buyer, either repair or replace any product which fails to conform with the foregoing warranty; provided, however, that under either option, Seller shall not be obligated
to remove the defective product or install the replaced or repaired product and the Buyer shall be responsible for all other costs, including, but not limited to, service costs, shipping fees and expenses. Seller shall have complete discretion as to the method or means of repair or replacement. Buyer's failure to comply with Seller's repair or replacement directions shall constitute a waiver of its rights and render this Warranty void. Any parts repaired or replaced under this limited Warranty are warranted only for the balance of the warranty period on the parts that were repaired or replaced. Seller's warranty is conditioned on Buyer giving written notice to Seller of any defects in material or workmanship of warranted goods within ten (10) days of the date when any defects are first manifest.

This Warranty does not apply to any parts of products that: (a) have been subject to misuse, misapplication, neglect, alteration, accident, or physical damage; (b) have been used in a manner contrary to Seller's instructions for installation, operation and maintenance; (c) have been damaged from ordinary wear and tear, corrosion, or chemical attack; (d) have been damaged due to abnormal conditions; or (e) have been damaged resulting from the use of accessory equipment not sold by Seller or not approved by Seller in connection with products supplied by Seller. This Warranty does not apply to products not manufactured by Seller; however, Seller will extend to Buyer any warranty received from Seller's supplier of such products.

Should the Buyer require an alleged defect to be investigated by the Seller and that investigation results in a defect not being discovered, or a defect is discovered which is not covered by this Warranty, then all costs and expenses incurred by the Seller in carrying out that investigation shall be to the Buyers account.

Statutory rights
Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

To the extent our goods are not of a kind ordinarily acquired for personal, domestic or household use or consumption, then we limit our liability to repair or replacement of goods or the payment of the cost of repairing or replacing goods, or supplying services again or payment for the cost of supplying services again, in accordance with section 64A of the Australian Consumer Law.

Limitation of liability
SUBJECT TO THE BUYER'S STATUTORY RIGHTS AS SET OUT ABOVE AND OTHERWISE *TO THE EXTENT PERMITTED BY LAW*, BUYER'S EXCLUSIVE REMEDY AND SELLER'S AGGREGATE LIABILITY FOR BREACH OF THIS WARRANTY ARE LIMITED TO REPAIRING OR REPLACING THE PRODUCT AND SHALL IN ALL CASES BE LIMITED TO THE AMOUNT PAID BY THE BUYER HEREUNDER AND IN NO EVENT IS SELLER LIABLE FOR ANY OTHER FORM OF DAMAGES, WHETHER DIRECT, INDIRECT, LIQUIDATED, INCIDENTAL, CONSEQUENTIAL, PUNITIVE, EXEMPLARY OR SPECIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF PROFIT, LOSS OF ANTICIPATED

SAVINGS OR REVENUE, LOSS OF INCOME, LOSS OF BUSINESS, LOSS OF PRODUCTION, LOSS OF OPPORTUNITY OR LOSS OF REPUTATION.

The terms of this warranty policy may be inconsistent with the warranty statement in the product owner's manual. To the extent of any inconsistency other than warranty duration, the terms of this warranty shall prevail.

Claims process: To make a warranty claim, check first with the dealer from whom you purchased the product or call the following number for the name and location of the nearest dealer providing warranty service +618 61431000 .Alternatively, you can make a claim under this warranty by writing to:
Advanced Pump Technologies Pty Ltd, 72 May Holman Dr, Bassendean, Western Australia, 6054, AUSTRALIA.

Distributed by:
Advanced Pump Technologies Pty Ltd
Tel. +618 6143 1000
www.advancedpumps.com.au

SP

Installation and operating instructions



EC declaration of conformity

We, Grundfos, declare under our sole responsibility that the products SP, to which this declaration relates, are in conformity with these Council directives on the approximation of the laws of the EC member states:

— Machinery Directive (2006/42/EC).
Standard used: EN 809:1998 + A1:2009.

— Low Voltage Directive (2006/95/EC). Applicable when the rated power is lower than 1.5 kW.
Standards used: 60335-2-41:2003 + A1:2004 + A2:2010, except sections 25.1 and 25.8.

— Ecodesign Directive (2009/125/EC).
Water pumps:
Commission Regulation No 547/2012.
Applies only to water pumps marked with the minimum efficiency index MEI. See the pump nameplate.

Bare shaft pump

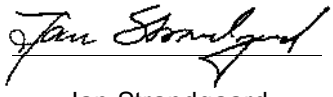
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— Machinery Directive (2006/42/EC).
Standard used: EN 809:1998 + A1:2009.

— Ecodesign Directive (2009/125/EC).
Water pumps:
Commission Regulation No 547/2012.
Applies only to water pumps marked with the minimum efficiency index MEI. See the pump nameplate.

Before the pump is taken into operation, the complete machinery into which the pump is to be incorporated must be declared in accordance with all relevant regulations.

Bjerringbro, 15th September 2012



Jan Strandgaard
Technical Director
Grundfos Holding A/S
Poul Due Jensens Vej 7
8850 Bjerringbro, Denmark

Person authorised to compile technical file and
empowered to sign the EC declaration of conformity.

Original installation and operating instructions.

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Warning

Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

1. Symbols used in this document

Warning

If these safety instructions are not observed, it may result in personal injury.

Warning

If these instructions are not observed, it may lead to electric shock with consequent risk of serious personal injury or death.

Caution ***If these safety instructions are not observed, it may result in malfunction or damage to the equipment.***

Note ***Notes or instructions that make the job easier and ensure safe operation.***

2. Introduction

These instructions apply to Grundfos submersible pumps, type SP, with submersible motors, types Grundfos MS/MMS or Franklin 4"-8".

If the pump is fitted with a motor of another motor make than Grundfos MS or MMS, note that the motor data may differ from the data stated in these instructions.

Note ***The USB stick supplied with the product contains installation and operating instructions in various languages.***

3. Delivery and storage

3.1 Delivery

Caution ***The pump should remain in the packing until it is placed in vertical position during installation. Handle the pump with care.***

When the pump part and motor are supplied as separate units (long pumps), fit the motor to the pump as described in section *7.1 Fitting the motor to the pump*.

Note ***The extra nameplate supplied with the pump should be fixed at the installation site.***

The pump should not be exposed to unnecessary impact and shocks.

3.2 Storage

Storage temperature

Pump: -20 °C to +60 °C.
Motor: -20 °C to +70 °C.

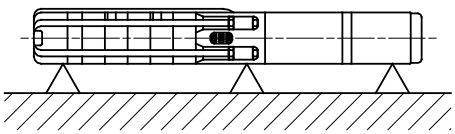
The motors must be stored in a closed, dry and well ventilated room.

Caution ***If MMS motors are stored, the shaft must be turned by hand at least once a month. If a motor has been stored for more than one year before installation, the rotating parts of the motor must be dismantled and checked before use.***

The pump should not be exposed to direct sunlight.

If the pump has been unpacked, it should be stored horizontally, adequately supported, or vertically to prevent misalignment of the pump. Make sure that the pump cannot roll or fall over.

During storage, the pump can be supported as shown in fig. 1.



TM00 1349 2495

Fig. 1 Pump position during storage

3.2.1 Frost protection

If the pump has to be stored after use, it must be stored on a frost-free location, or the motor liquid must be frost-proof.

4. Applications

Grundfos SP submersible pumps are designed for a wide range of water supply and liquid transfer applications, such as the supply of fresh water to private homes or waterworks, water supply in horticulture and agriculture, drawdown of groundwater and pressure boosting, and various industrial jobs.

The pump must be installed so that the suction interconnector is completely submerged in the liquid. The pump can be installed horizontally or vertically. See section *5.2 Positional requirements*.

4.1 Pumped liquids

Clean, thin, non-explosive liquids without solid particles or fibres.

The maximum sand content of the water must not exceed 50 g/m^3. A larger sand content will reduce the life of the pump and increase the risk of blocking.

Caution ***When pumping liquids with a density higher than that of water, motors with correspondingly higher outputs must be used.***

If liquids with a viscosity higher than that of water are to be pumped, contact Grundfos.

The pump versions SP A N, SP A R, SP N, SP R and SPE are designed for liquids with higher aggressiveness than drinking water.

The maximum liquid temperature appears from section *5.4 Liquid temperatures/cooling*.

4.2 Sound pressure level

The sound pressure level has been measured in accordance with the rules laid down in the EC machinery directive 2006/42/EC.

Sound pressure level of pumps

The values apply to pumps submerged in water, without external regulating valve.

Pump type	$\overline{L}_{pA}$ [dB(A)]
SP 1A	< 70
SP 2A	< 70
SP 3A	< 70
SP 5A	< 70
SP 8A	< 70
SP 14A	< 70
SP 17	< 70
SP 30	< 70
SP 46	< 70
SP 60	< 70
SP 77	< 70
SP 95	< 70
SP 125	79
SP 160	79
SP 215	82

Sound pressure level of motors

The sound pressure level of Grundfos MS and MMS motors is lower than 70 dB(A).

Other motor makes: See installation and operating instructions for these motors.

5. Preparations before installation

Warning

Before starting work on the product, switch off the power supply. Make sure that the power supply cannot be accidentally switched on.

5.1 Checking the motor liquid

The motors are factory-filled with a special non-poisonous liquid which is frost-proof down to -20 °C.

Note ***Check the level of motor liquid and refill if required. Use clean water.***

Caution ***If frost protection is required, special Grundfos liquid must be used to refill the motor. Otherwise clean water may be used for refilling (however, never use distilled water).***

Refill liquid as described below.

5.1.1 Grundfos MS 4000 and MS 402 motors

The filling hole for motor liquid is placed in the following positions:

- MS 4000: in the top of the motor.
- MS 402: in the bottom of the motor.

1. Position the submersible pump as shown in fig. 2. The filling screw must be at the highest point of the motor.
2. Remove the screw from the filling hole.
3. Inject liquid into the motor with the filling syringe, see fig. 2, until the liquid runs back out of the filling hole.
4. Replace the screw in the filling hole and tighten securely before changing the position of the pump.

Torques

- MS 4000: 3.0 Nm.
- MS 402: 2.0 Nm.

The submersible pump is now ready for installation.

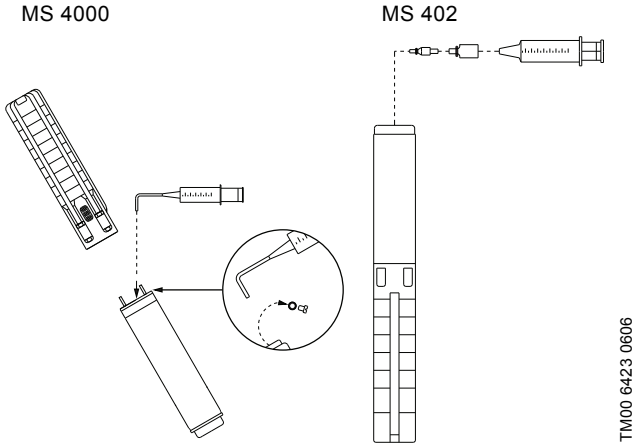


Fig. 2 Motor position during filling - MS 4000 and MS 402

5.1.2 Grundfos MS6 and MS 6000 motors

- If the motor is delivered from stock, check the level of motor liquid before fitting the motor to the pump. See fig. 3.
- When pumps are delivered direct from Grundfos, the level has already been checked.
- Check the level in connection with service. See fig. 3.

The filling hole for motor liquid is placed at the top of the motor.

1. Position the submersible pump as shown in fig. 3. The filling screw must be at the highest point of the motor.
2. Remove the screw from the filling hole.
3. Inject liquid into the motor with the filling syringe, see fig. 3, until the liquid runs back out of the filling hole.
4. Replace the screw in the filling hole and tighten securely before changing the position of the pump.

Torque: 3.0 Nm.

The submersible pump is now ready for installation.

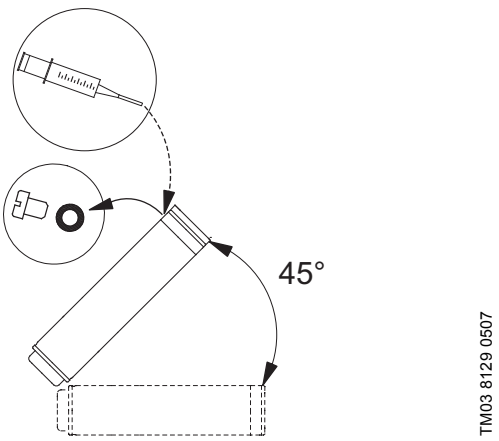


Fig. 3 Motor position during filling - MS6 and MS 6000

5.1.3 Grundfos MMS 6000, MMS 8000, MMS 10000 and MMS 12000 motors

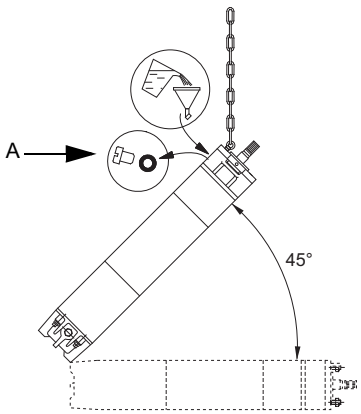
1. Place the motor at a 45 ° angle with the top of the motor upwards. See fig. 4.
2. Unscrew the plug A and place a funnel in the hole.
3. Pour tap water into the motor until the motor liquid inside the motor starts running out at A.

Caution ***Do not use motor liquid as it contains oil.***

4. Remove the funnel and refit the plug A.

Caution ***Before fitting the motor to a pump after a long period of storage, lubricate the shaft seal by adding a few drops of water and turning the shaft.***

The submersible pump is now ready for installation.



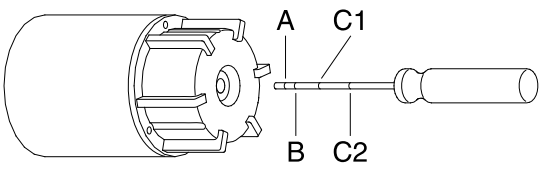
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Fig. 4 Motor position during filling - MMS

5.1.4 Franklin motors from 3 kW and up

Check the level of motor liquid in Franklin 4" and 6" motors by measuring the distance from the bottom plate to the built-in rubber diaphragm. The distance can be measured by inserting a rule or a small rod through the hole until it touches the diaphragm. See fig. 5.

Caution ***Take care not to damage the diaphragm.***

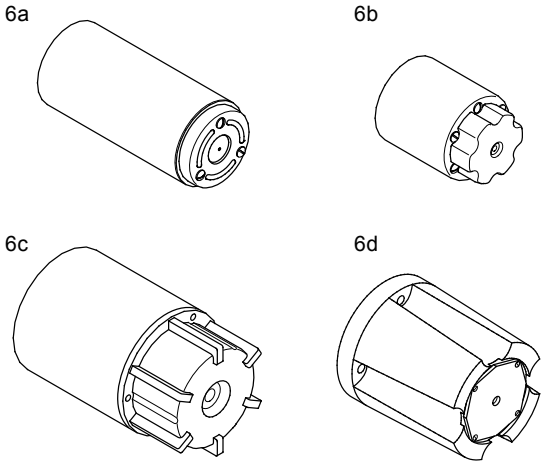


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Fig. 5 Measuring the distance from bottom plate to diaphragm

The table below shows the correct distance from the outside of the bottom plate to the diaphragm:

Motor	Dimension	Distance
Franklin 4", 0.25 - 3 kW (fig. 6a)	A	8 mm
Franklin 4", 3 - 7.5 kW (fig. 6b)	B	16 mm
Franklin 6", 4 - 45 kW (fig. 6c)	C1	35 mm
Franklin 6", 4 - 22 kW (fig. 6d)	C2	59 mm



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Fig. 6 Franklin motors

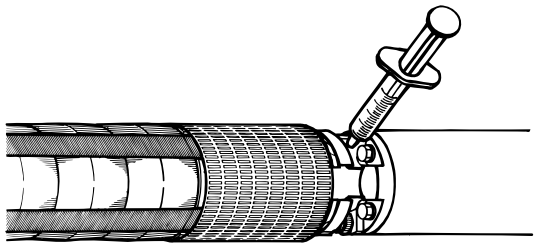
If the distance is not correct, carry out an adjustment as described in section *5.1.5 Franklin motors*.

5.1.5 Franklin motors

Check the level of motor liquid in Franklin 8" motors as follows:

1. Prise out the filter in front of the valve at the top of the motor using a screwdriver. If the filter is slotted, unscrew. Figure 7 shows the position of the filling valve.
2. Press the filling syringe against the valve and inject the liquid. See fig. 7. If the valve cone is depressed too far, it may be damaged thus causing the valve to leak.
3. Remove any air in the motor by pressing the point of the filling syringe lightly against the valve.
4. Repeat the process of injecting liquid and releasing air until the liquid starts running out or the diaphragm is in its correct position (Franklin 4" and 6").
5. Refit the filter.

The submersible pump is now ready for installation.



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Fig. 7 Position of filling valve

5.2 Positional requirements

Warning

If the pump is to be installed in a position where it is accessible, the coupling must be suitably isolated from human touch. The pump can for instance be built into a flow sleeve.

Depending on motor type, the pump can be installed either vertically or horizontally. A complete list of motor types suitable for horizontal installation is shown in section *5.2.1*.

If the pump is installed horizontally, the discharge port should never fall below the horizontal plane. See fig. 8.

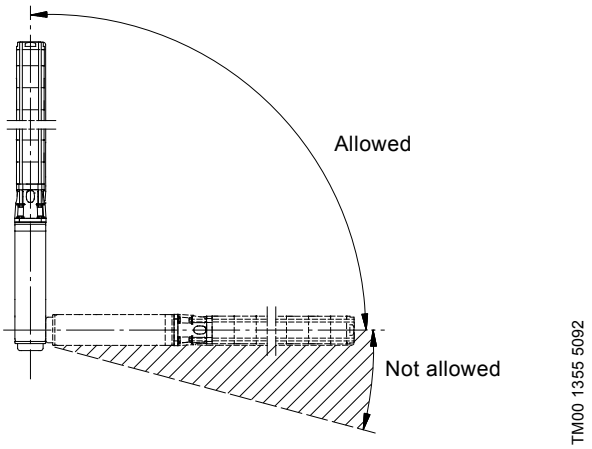


Fig. 8 Positional requirements

If the pump is installed horizontally, e.g. in a tank, we recommend to fit it in a flow sleeve.

5.2.1 Motors suitable for horizontal installation

Motor	Output power 50 Hz	Output power 60 Hz
	[kW]	[kW]
MS	All	All
MMS 6000	3.7 - 30	3.7 - 30
MMS 8000	22 - 92	22 - 92
MMS 10000	75 - 170	75 - 170
MMS 12000	147 - 220	-

When Franklin 4" motors up to and including 2.2 kW are started more than 10 times a day, we recommend to incline the motor at least 15 ° above the horizontal plane in order to minimise wearing of the upthrust disc.

Caution ***During operation, the suction interconnector of the pump must always be completely submerged in the liquid.***

Warning

If the pump is used for pumping hot liquids (40 to 60 °C), make sure that persons cannot come into contact with the pump and the installation, e.g. by installing a guard.

5.3 Pump/motor diameter

We recommend to check the borehole with an inside calliper to ensure unobstructed passage.

5.4 Liquid temperatures/cooling

The maximum liquid temperature and the minimum flow velocity past the motor appear from the table below.

We recommend to install the motor above the well screen in order to achieve proper motor cooling.

Caution ***In cases where the stated flow velocity cannot be achieved, a flow sleeve must be installed.***

If there is a risk of sediment build-up, such as sand, around the motor, use a flow sleeve in order to ensure proper cooling of the motor.

5.4.1 Maximum liquid temperature

Out of consideration for the rubber parts in pump and motor, the liquid temperature must not exceed 40 °C (~105 °F). See also the table below.

The pump can operate at liquid temperatures between 40 °C and 60 °C (~105 °F and 140 °F) provided that all rubber parts are replaced every third year.

Motor	Installation		
	Flow past the motor	Vertical	Horizontal
Grundfos MS 402 MS 4000 MS 6000	**0.15 m/s**	40 °C (~ 105 °F)	40 °C (~ 105 °F)
Grundfos MS 4000I* MS 6000I*	**0.15 m/s**	60 °C (~ 140 °F) Flow sleeve recommended	60 °C (~ 140 °F) Flow sleeve recommended
Grundfos MS6T30	**0.15 m/s**	30 °C (~ 86 °F)	30 °C (~ 86 °F)
Grundfos MS6T60	**1.0 m/s**	60 °C (~ 140 °F)	60 °C (~ 140 °F)
Grundfos MMS	**0.15 m/s**	25 °C (~ 77 °F)	25 °C (~ 77 °F)
	0.50 m/s	30 °C (~ 86 °F)	30 °C (~ 86 °F)
Franklin 4"	**0.08 m/s**	30 °C (~85 °F)	30 °C (~85 °F)
Franklin 6" and 8"	**0.16 m/s**	30 °C (~85 °F)	30 °C (~85 °F)

* At an ambient pressure of minimum 1 bar (1 MPa).

Note ***37 kW MMS 6000, 110 kW MMS 8000 and 170 kW MMS 10000:***
The maximum liquid temperature is 5 °C lower than the values stated in the above table.
190 kW MMS 10000:
The temperature is 10 °C lower.

5.5 Pipe connection

If noise may be transmitted to the building through the pipework, we recommend to use plastic pipes.

Note ***We recommend plastic pipes for 4" pumps only.***

When plastic pipes are used, the pump should be secured by an unloaded straining wire.

Warning

Make sure that the plastic pipes are suitable for the actual liquid temperature and the pump pressure.

When connecting plastic pipes, a compression coupling should be used between the pump and the first pipe section.

6. Electrical connection

Warning

During electrical installation, make sure that the power supply cannot be accidentally switched on.

Warning

The electrical installation should be carried out by an authorised person in accordance with local regulations.

The supply voltage, rated maximum current and cos φ appear from the loose data plate which must be fitted close to the installation site.

The required voltage quality for MS and MMS motors, measured at the motor terminals, is - 10 %/+ 6 % of the nominal voltage during continuous operation (including variation in the supply voltage and losses in cables).

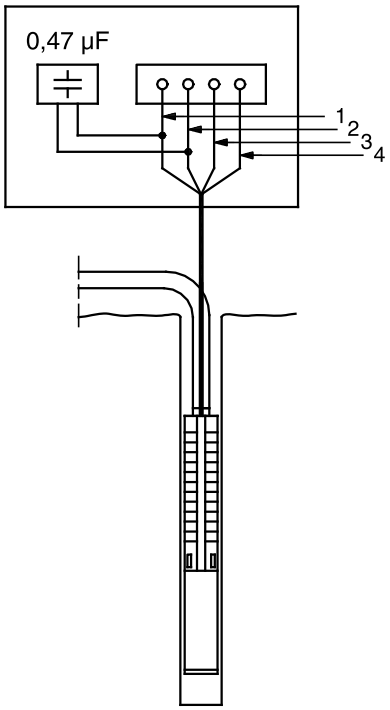
Check also that there is voltage symmetry in the power supply lines, i.e. same difference of voltage between the individual phases. See section *11. Checking motor and cable*, item 2.

Warning

The pump must be earthed.

The pump must be connected to an external mains switch with a minimum contact gap of 3 mm in all poles.

If MS motors with a built-in temperature transmitter (Tempcon) are not installed together with a MP 204 or similar Grundfos motor protection, they must be connected to a 0.47 µF capacitor approved for phase-phase operation (IEC 384-14) to meet the EC EMC directive (2004/108/EC). The capacitor must be connected to the two phases to which the temperature transmitter is connected. See fig. 9.



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Fig. 9 Connection of capacitor

Colours of the leads		
Lead	**Flat cable**	**Single leads**
1 = L1	Brown	Black
2 = L2	Black	Yellow
3 = L3	Grey	Red
4 = PE	Yellow/green	Green

The motors are wound for direct-on-line starting or star-delta starting, and the starting current is between four and six times the rated current of the motor.

The run-up time of the pump is only about 0.1 second. Direct-on-line starting is therefore normally approved by the power supply company.

6.1 Frequency converter operation

6.1.1 Grundfos motors

Three-phase Grundfos motors can be connected to a frequency converter.

Caution

If an MS motor with temperature transmitter is connected to a frequency converter, a fuse incorporated in the transmitter will melt and the transmitter will be inactive. The transmitter cannot be reactivated. This means that the motor will operate like a motor without a temperature transmitter.

If a temperature transmitter is required, Grundfos offers a Pt100 sensor for the submersible motor.

Caution

The motor should not run at a frequency higher than the rated frequency (50 or 60 Hz) during frequency converter operation. In connection with pump operation, never reduce the frequency (and consequently the speed) to such a level that the necessary flow of cooling liquid past the motor is no longer ensured.

To avoid damage to the pump part, the motor must stop when the pump flow falls below 0.1 x nominal flow.

Depending on the frequency converter type, it may expose the motor to detrimental voltage peaks.



Warning

MS 402 motors for supply voltages up to and including 440 V (see motor nameplate) must be protected against voltage peaks higher than 650 V (peak value) between the supply terminals.

We recommend to protect other motors against voltage peaks higher than 850 V.

The above disturbance can be abated by installing an RC filter between the frequency converter and the motor.

Possible increased acoustic noise from the motor can be abated by installing an LC filter which will also eliminate voltage peaks from the frequency converter.

We recommend to install an LC filter when using a frequency converter. See section *6.7.6 Frequency converter operation*.

For further details, contact your frequency converter supplier or Grundfos.

6.1.2 Other motor makes than Grundfos

Contact Grundfos or the motor manufacturer.

6.2 Motor protection

6.2.1 Single-phase motors

Single-phase MS 402 motors incorporate a thermal switch and require no additional motor protection.



Warning

When the motor has been thermally switched off, the motor terminals are still live.
When the motor has cooled sufficiently, it will restart automatically.

Single-phase MS 4000 motors must be protected. A protective device can either be incorporated in a control box or be separate.

Franklin 4" PSC motors must be connected to a motor-protective circuit breaker.

6.2.2 Three-phase motors

MS motors are available with or without a built-in temperature transmitter.

The following motors must be protected by a motor-protective circuit breaker with thermal relay, or an MP 204 and contactor(s):

- motors with a built-in and intact temperature transmitter
- motors without or with a defective temperature transmitter
- motors with or without a Pt100 sensor.

MMS motors have no built-in temperature transmitter. The Pt100 sensor is available as an accessory.

6.2.3 Required settings of motor-protective circuit breaker

For cold motors, the tripping time of the motor-protective circuit breaker must be less than 10 seconds at 5 times the rated maximum current of the motor. During normal operating conditions the motor must be running at full speed in less than 3 seconds.

Caution

If this requirement is not met, the motor warranty will be invalidated.

In order to ensure optimum motor protection, the motor-protective circuit breaker should be set as follows:

1. Set the motor-protective circuit breaker to the rated maximum current of the motor.
2. Start the pump and let it run for half an hour at normal performance.
3. Slowly grade down the scale indicator until the motor trip point is reached.
4. Increase the setting by 5 %.

The highest permissible setting is the rated maximum current of the motor.

For motors wound for star-delta starting, the motor-protective circuit breaker should be set as above, but the maximum setting should be rated maximum current x 0.58.

The highest permissible start-up time for star-delta starting or autotransformer starting is 2 seconds.

6.3 Lightning protection

The installation can be fitted with a special overvoltage protective device to protect the motor from voltage surges in the power supply lines when lightning strikes somewhere in the area.
See fig. 10.

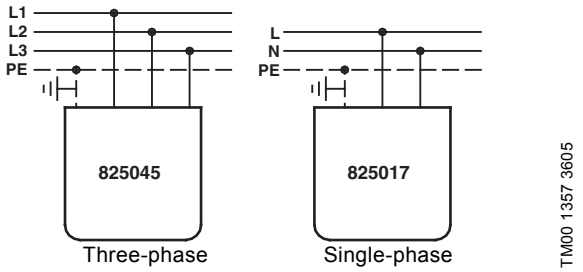


Fig. 10 Fitting an overvoltage protective device

The overvoltage protective device will not, however, protect the motor against a direct stroke of lightning.

The overvoltage protective device should be connected to the installation as close as possible to the motor and always in accordance with local regulations.
Ask Grundfos for lightning protective devices.

MS 402 motors, however, require no further lightning protection as they are highly insulated.

A special cable termination kit with a built-in overvoltage protective device is available for Grundfos 4" motors (product No 799911 or 799912).

6.4 Cable sizing

Make sure that the submersible drop cable can withstand permanent submersion in the actual liquid and at the actual temperature.

Grundfos can supply submersible drop cables for a wide range of installations.

The cross-section (q) of the cable should meet the following requirements:

1. The submersible drop cable should be sized to the rated maximum current (I) of the motor. *
2. The cross-section should be sufficient to make a voltage drop over the cable acceptable.

Use the largest of the cross-sections found under items 1 and 2.

* The table below specifies the current value of Grundfos submersible drop cables (i.e. the maximum current tolerated by the drop cable) at an ambient temperature of maximum 30 °C. Contact Grundfos if the ambient temperature lies above 30 °C.

When sizing the submersible drop cable, make sure that the rated maximum current does not exceed the current value (I_s).

For star-delta starting, however, size the cables so that 0.58 x the rated maximum current of the motor does not exceed the current value (I_s) of the cables.

q [mm²]	I_s [A]	q [mm²]	I_s [A]
1.5	23	50	202
2.5	30	70	250
4	41	95	301
6	53	120	352
10	74	150	404
16	99	185	461
25	131	240	547
35	162	300	633

If Grundfos submersible drop cables are not used, the cross-section should be selected on the basis of the current values of the actual cables.

6.5 Control of single-phase MS 402 motors

Warning

The single-phase MS 402 motor incorporates motor protection which cuts out the motor in case of excessive winding temperatures while the motor is still supplied with voltage. Allow for this, when the motor forms part of a control system.

If a compressor is included in a control system together with an ochre filter, the compressor will run continuously once the motor protection has cut out the motor, unless other special precautions have been taken.

6.6 Connection of single-phase motors

6.6.1 2-wire motors

MS 402 2-wire motors incorporate motor protection and a starter device and can therefore be connected direct to the mains.
See fig. 11.

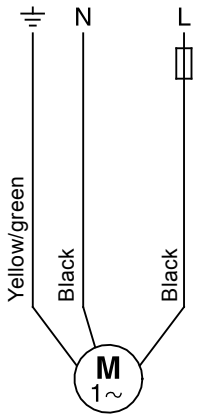


Fig. 11 2-wire motors

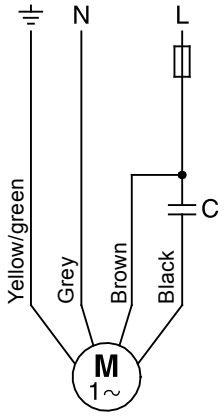
6.6.2 PSC motors

The PSC motors are connected to the mains via an operating capacitor which should be sized for continuous operation.

Select the correct capacitor size from the table below:

Motor [kW]	Capacitor [µF] 400 V, 50 Hz
0.25	12.5
0.37	16
0.55	20
0.75	30
1.10	40
1.50	50
2.20	75

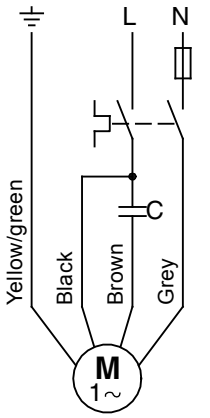
MS 402 PSC motors incorporate motor protection and should be connected to the mains as shown in fig. 12.



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Fig. 12 PSC motors

See www.franklin-electric.com and fig. 13.



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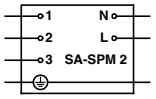
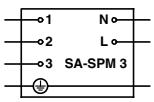
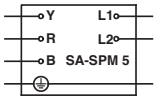
Fig. 13 Franklin motors

6.6.3 3-wire motors

MS 4000 3-wire motors should be connected to the mains via a Grundfos control box SA-SPM 2, 3 or 5 incorporating motor protection.

MS 402 3-wire motors incorporate motor protection and should be connected to the mains via a Grundfos control box SA-SPM 2, 3 or 5 without motor protection.

The connection of MS 402 and MS 4000 motors appears from the table below:

Motor	Cable	Control box	Mains
Up to 0.75 kW 50 Hz	Grey Brown Black Yellow/green		N L PE
From 1.10 kW 50 Hz	Grey Brown Black Yellow/green		N L PE
1.1 - 3.7 kW (~ 1.5 - 5.0 hp) 60 Hz	Yellow Red Black Yellow/green		L1 L2 PE

6.7 Connection of three-phase motors

Three-phase motors must be protected.
See section *6.2.2 Three-phase motors*.

For electrical connection via the MP 204, see the separate installation and operating instructions for this unit.

When a conventional motor-protective circuit breaker is being used, the electrical connection should be carried out as described below.

6.7.1 Checking the direction of rotation

Caution ***The pump must not be started until the suction interconnector has been completely submerged in the liquid.***

When the pump has been connected to the power supply, check the direction of rotation:

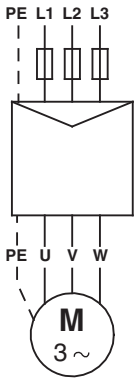
1. Start the pump and measure quantity of water and head.
2. Stop the pump and interchange two phases.
3. Start the pump and measure quantity of water and head.
4. Stop the pump.
5. Compare the two results. The connection giving the larger quantity of water and the higher head is the correct one.

6.7.2 Grundfos motors - direct-on-line starting

The connection of Grundfos motors wound for direct-on-line starting appears from the table below and fig. 14.

Mains	Cable/connection
	Grundfos 4" and 6" motors
PE	PE (yellow/green)
L1	U (brown)
L2	V (black)
L3	W (grey)

Check the direction of rotation as described in section *6.7.1 Checking the direction of rotation*.



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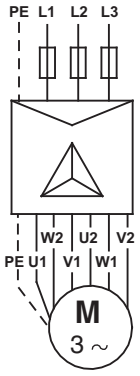
Fig. 14 Grundfos motors - direct-on-line starting

6.7.3 Grundfos motors - star-delta starting

The connection of Grundfos motors wound for star-delta starting appears from the table below and fig. 15.

Connection	Grundfos 6" motors
PE	Yellow/green
U1	Brown
V1	Black
W1	Grey
W2	Brown
U2	Black
V2	Grey

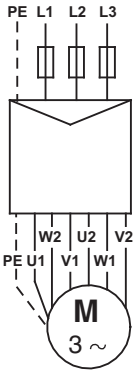
Check the direction of rotation as described in section *6.7.1 Checking the direction of rotation*.



TM03 2100 3705

Fig. 15 Grundfos motors wound for star-delta starting

If direct-on-line starting is required, the motors should be connected as shown in fig. 16.



TM03 2101 3705

Fig. 16 Grundfos motors wound for star-delta starting - direct-on-line starting

6.7.4 Connection in the case of unidentified cable marking/connection (Franklin motors)

If it is unknown where the individual leads are to be connected to the mains in order to ensure the correct direction of rotation, proceed as follows:

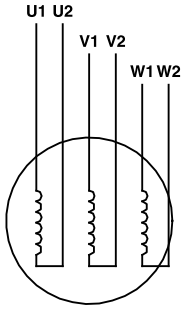
Motors wound for direct-on-line starting

Connect the pump to the mains as is expected to be right.

Then check the direction of rotation as described in section *6.7.1 Checking the direction of rotation*.

Motors wound for star-delta starting

Determine the windings of the motor by means of an ohmmeter and name the lead sets for the individual windings accordingly: U1-U2, V1-V2, W1-W2. See fig. 17.



TM00 1367 5092

Fig. 17 Unidentified cable marking/connection - motors wound for star-delta starting

If star-delta starting is required, connect the leads as shown in fig. 15.

If direct-on-line starting is required, connect the leads as shown in fig. 16.

Then check the direction of rotation as described in section *6.7.1 Checking the direction of rotation*.

6.7.5 Soft starter

We only recommend the use of soft starters which control the voltage on all three phases and which are provided with a bypass switch.

Ramp times: Maximum 3 seconds.

For further details, contact your soft starter supplier or Grundfos.

6.7.6 Frequency converter operation

Three-phase MS motors can be connected to a frequency converter.

Note ***To enable the monitoring of the motor temperature, we recommend to install a Pt100 sensor together with a PR 5714 relay.***

Permissible frequency ranges: 30-50 Hz and 30-60 Hz.

Ramp times: Maximum 3 seconds for start and stop.

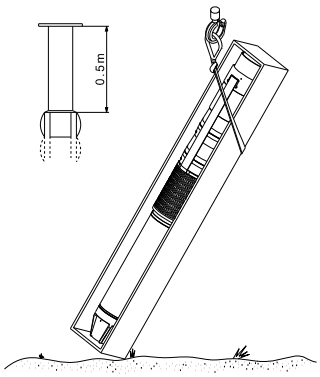
Depending on the type, the frequency converter may cause increased acoustic noise from the motor. Furthermore, it may expose the motor to detrimental voltage peaks. This can be abated by installing an LC filter between the frequency converter and the motor.

For further details, contact your frequency converter supplier or Grundfos.

7. Installation

We recommend that you first fit a 50 cm long pipe to the pump to facilitate handling of the pump during installation.

Caution ***Lift the pump to vertical position before removing it from the wooden box.***



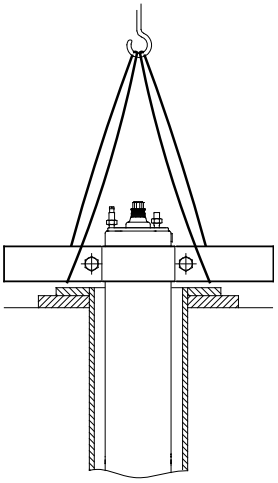
TM05 1617 3311

Fig. 18 Lifting the pump into vertical position

7.1 Fitting the motor to the pump

When the pump part and the motor are supplied as separate units (long pumps), fit the motor to the pump as follows:

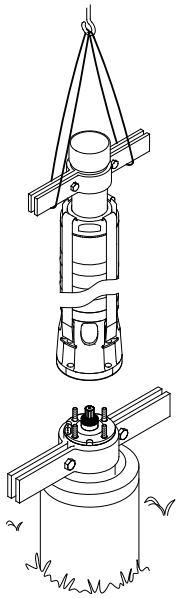
1. Use pipe clamps when handling the motor.
2. Place the motor in vertical position at the borehole seal. See fig. 19.



TM00 5259 2402

Fig. 19 Motor in vertical position

3. Lift the pump part by means of pipe clamps fitted to the extension pipe. See fig. 20.



TM02 5263 2502

Fig. 20 Lifting the pump into position

4. Place the pump part on top of the motor.
5. Fit and tighten the nuts. See table below.

Caution ***Make sure that the coupling between the pump and motor engages properly.***

The bolts and nuts securing the straps to the pump must be cross-tightened to the following torques:

Bolt/nut	Torque [Nm]
M8	18
M10	35
M12	45
M16	120
SP 215, 50 Hz, with more than 8 stages SP 215, 60 Hz, with more than 5 stages	150

When fitting the motor to the pump part, cross-tighten the nuts to the following torques:

Staybolt diameter	Torque [Nm]
3/8 UNF	18
1/2 UNF	50
M8	18
M12	70
M16	150
M20	280

Caution ***Make sure that the pump chambers are aligned when assembly has been completed.***

7.2 Removing and fitting the cable guard

If the cable guard is screwed on to the pump, it should be removed and fitted by means of screws.

Caution ***Make sure that the pump chambers are aligned when the cable guard has been fitted.***

7.3 Connecting the submersible drop cable

7.3.1 Grundfos motors

Before connecting the submersible drop cable to the motor, make sure that the cable socket is clean and dry.

To facilitate the connection of the cable, lubricate the rubber parts of the cable plug with non-conducting silicone paste.

Tighten the screws holding the cable to these torques [Nm]:

MS 402: 2.0.
MS 4000: 3.0.
MS6: 6.0.
MS 6000: 4.5.
MMS 6000: 10.
MMS 8000: 18.
MMS 10000: 18.
MMS 12000: 15.

7.4 Riser pipe

If a tool, e.g. a chain pipe wrench, is used when the riser pipe is fitted to the pump, the pump must only be gripped by the pump discharge chamber.

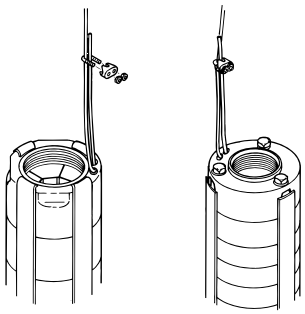
The threaded joints on the riser pipe must all be well cut and fit together to ensure that they do not work loose when subjected to torque reaction caused by the starting and stopping of the pump.

The thread on the first section of the riser pipe which is to be screwed into the pump should not be longer than the threads in the pump.

If noise may be transmitted to the building through the pipework, we recommend to use plastic pipes.

Note ***We recommend plastic pipes for 4" pumps only.***

When plastic pipes are used, secure the pump by an unloaded straining wire to be fastened to the discharge chamber of the pump. See fig. 21.



TM00 1368 2298

Fig. 21 Fixing the straining wire

When connecting plastic pipes, use a compression coupling between the pump and the first pipe section.

Where flanged pipes are used, the flanges should be slotted to take the submersible drop cable and a water indicator hose, if fitted.

7.5 Maximum installation depth below water level [m]

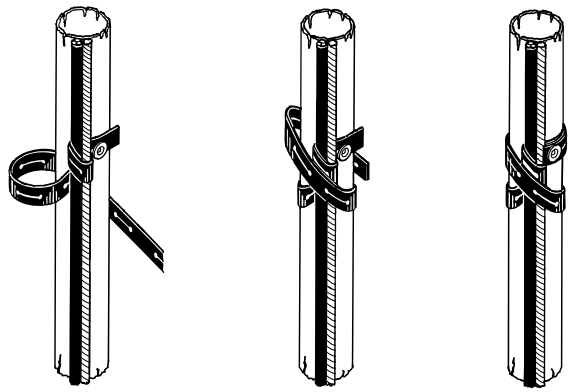
Grundfos MS 402: 150.
Grundfos MS 4000: 600.
Grundfos MS6: 600.
Grundfos MS 6000: 600.
Grundfos MMS: 600.
Franklin motors: 350.

7.6 Cable clips

Fit cable clips every 3 metres to fix the submersible drop cable and the straining wire, if fitted, to the riser pipe of the pump.

Grundfos supplies cable clip sets on request.

1. Cut off the rubber band so that the piece with no slit becomes as long as possible.
2. Insert a button in the first slit.
3. Position the wire alongside the submersible drop cable as shown in fig. 22.



TM00 1369 5092

Fig. 22 Fitting the cable clips

4. Wind the band once around the wire and the cable. Then wind it tightly at least twice around the pipe, wire and the cable.
5. Push the slit over the button and cut off the band.

Where large cable cross-sections are used, it will be necessary to wind the band several times.

Where plastic pipes are used, some slackness must be left between each cable clip as plastic pipes expand when loaded.

When flanged pipes are used, the cable clips should be fitted above and below each joint.

7.7 Lowering the pump

We recommend to check the borehole by means of an inside calliper before lowering the pump to ensure unobstructed passage.

Lower the pump carefully into the borehole, taking care not to damage the motor cable and the submersible drop cable.

Caution ***Do not lower or lift the pump by means of the motor cable.***

7.8 Installation depth

The dynamic water level should always be above the suction interconnector of the pump. See section *5.2 Positional requirements* and fig. 23.

Minimum inlet pressure is indicated in the NPSH curve for the pump. The minimum safety margin should be 1 metre head.

We recommend to install the pump so that the motor part is above the well screen in order to ensure optimum cooling.
See section *5.4 Liquid temperatures/cooling*.

When the pump has been installed to the required depth, the installation should be finished by means of a borehole seal.

Slacken the straining wire so that it becomes unloaded and lock it to the borehole seal by means of wire locks.

Note ***For pumps fitted with plastic pipes, the expansion of the pipes when loaded should be taken into consideration, when deciding on the installation depth of the pump.***

8. Start-up and operation

8.1 Start-up

When the pump has been connected correctly and it is submerged in the liquid to be pumped, it should be started with the discharge valve closed off to approx. 1/3 of its maximum volume of water.

Check the direction of rotation as described in section *6.7.1 Checking the direction of rotation*.

If there are impurities in the water, the valve should be opened gradually as the water becomes clearer. The pump should not be stopped until the water is completely clean, as otherwise the pump parts and the non-return valve may become blocked.

As the valve is being opened, the drawdown of the water level should be checked to ensure that the pump always remains submerged.

The dynamic water level should always be above the suction interconnector of the pump. See section *5.2 Positional requirements* and fig. 23.

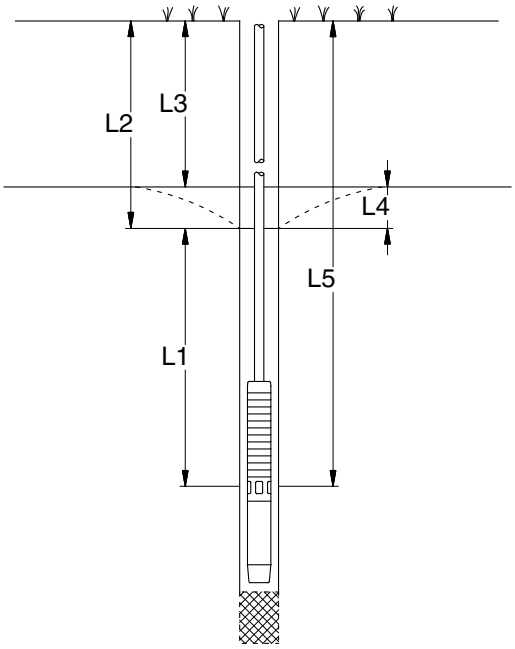


Fig. 23 Comparison of various water levels

L1: Minimum installation depth below dynamic water level. We recommend minimum 1 metre.

L2: Depth to dynamic water level.

L3: Depth to static water level.

L4: Drawdown. This is the difference between the dynamic and the static water levels.

L5: Installation depth.

If the pump can pump more than yielded by the well, we recommend to install the Grundfos MP 204 motor protector or some other type of dry-running protection.

If no water level electrodes or level switches are installed, the water level may be drawn down to the suction interconnector of the pump and the pump will then draw in air.

Caution ***Long time of operation with water containing air may damage the pump and cause insufficient cooling of the motor.***

8.2 Operation

8.2.1 Minimum flow rate

To ensure the necessary cooling of the motor, the pump flow rate should never be set so low that the cooling requirements in section *5.4 Liquid temperatures/cooling* cannot be met.

8.2.2 Frequency of starts and stops

Motor type	Number of starts
MS 402	Minimum 1 per year is recommended. Maximum 100 per hour. Maximum 300 per day.
MS 4000	Minimum 1 per year is recommended. Maximum 100 per hour. Maximum 300 per day.
MS6	Minimum 1 per year is recommended. Maximum 30 per hour. Maximum 300 per day.
MS 6000	Minimum 1 per year is recommended. Maximum 30 per hour. Maximum 300 per day.
MMS 6000	Minimum 1 per year is recommended. Maximum 15 per hour. Maximum 360 per day.
MMS 8000	Minimum 1 per year is recommended. Maximum 10 per hour. Maximum 240 per day.
MMS 10000	Minimum 1 per year is recommended. Maximum 8 per hour. Maximum 190 per day.
MMS 12000	Minimum 1 per year is recommended. Maximum 5 per hour. Maximum 120 per day.
Franklin	Minimum 1 per year is recommended. Maximum 100 per day.

9. Maintenance and service

All pumps are easy to service.

Service kits and service tools are available from Grundfos.

The pumps can be serviced at a Grundfos service centre.

Warning

If a pump has been used for a liquid which is injurious to health or toxic, the pump will be classified as contaminated.

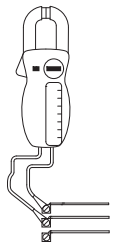
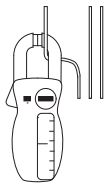
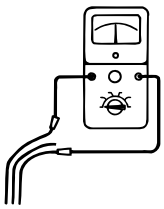
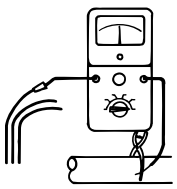
If Grundfos is requested to service the pump, Grundfos must be contacted with details about the pumped liquid, etc. before the pump is returned for service. Otherwise Grundfos can refuse to accept the pump for service.

Possible costs of returning the pump are paid by the customer.

10. Fault finding

Fault	Cause	Remedy
1. The pump does not run.	a) The fuses are blown.	Replace the blown fuses. If the new ones blow too, the electric installation and the submersible drop cable should be checked.
	b) The ELCB or the voltage-operated ELCB has tripped.	Cut in the circuit breaker.
	c) No power supply.	Contact the power supply company.
	d) The motor-protective circuit breaker has tripped.	Reset the motor-protective circuit breaker (automatically or possibly manually). Check the voltage if it trips again. If the voltage is okay, see items 1e to 1h.
	e) The motor-protective circuit breaker/contactor is defective.	Replace the motor-protective circuit breaker/contactor.
	f) Starter device is defective.	Repair or replace the starter device.
	g) The control circuit has been interrupted or is defective.	Check the electric installation.
	h) The dry-running protection has cut off the power supply to the pump due to low water level.	Check the water level. If it is okay, check the water level electrodes/level switch.
	i) The pump/submersible drop cable is defective.	Repair or replace the pump/cable.
2. The pump runs but gives no water.	a) The discharge valve is closed.	Open the valve.
	b) No water or too low water level in borehole.	See item 3a.
	c) The non-return valve is stuck in closed position.	Pull out the pump and clean or replace the valve.
	d) The suction strainer is blocked.	Pull out the pump and clean the strainer.
	e) The pump is defective.	Repair or replace the pump.
3. The pump runs at reduced capacity.	a) The drawdown is larger than anticipated.	Increase the installation depth of the pump, throttle the pump or install a pump with a smaller capacity.
	b) Wrong direction of rotation.	See section *6.7.1 Checking the direction of rotation*.
	c) The valves in the discharge pipe are partly closed/blocked.	Clean or replace the valves.
	d) The discharge pipe is partly blocked by impurities (ochre).	Clean or replace the pipe.
	e) The non-return valve of the pump is partly blocked.	Pull out the pump and clean or replace the valve.
	f) The pump and the riser pipe are partly blocked by impurities (ochre).	Pull out the pump and clean or replace it. Clean the pipes.
	g) The pump is defective.	Repair or replace the pump.
	h) Leakage in the pipework.	Check and repair the pipework.
	i) The riser pipe is defective.	Replace the pipe.
4. Frequent starts and stops.	a) The differential of the pressure switch between the start and stop pressures is too small.	Increase the differential. The stop pressure must not exceed the operating pressure of the pressure tank, and the start pressure should be high enough to ensure sufficient water supply.
	b) The water level electrodes or level switches in the reservoir have not been installed correctly.	Adjust the intervals of the electrodes/level switches to ensure suitable time between the cutting-in and cutting-out of the pump. See installation and operating instructions for the electrodes/level switches. If the intervals between stop/start cannot be changed via the automatics, the pump capacity may be reduced by throttling the discharge valve.
	c) The non-return valve is leaking or stuck half-open.	Pull out the pump and clean or replace the valve.
	d) The tank precharge pressure is too small.	Adjust the tank precharge pressure in accordance with its installation and operating instructions.
	e) The tank is too small.	Increase the capacity of the by replacing or supplementing with another tank.
	f) The diaphragm of the tank is defective.	Check the diaphragm tank.

11. Checking motor and cable

1. Supply voltage  TM00 1371 5092	Measure the voltage between the phases by means of a voltmeter. On single-phase motors, measure between phase and neutral or between two phases, depending on the type of supply. Connect the voltmeter to the terminals in the motor-protective circuit breaker.	The voltage should, when the motor is loaded, be within the range specified in section *6. Electrical connection*. The motor may burn if there are larger variations in voltage. Large variations in voltage indicate poor power supply, and the pump should be stopped until the defect has been remedied.
2. Current consumption  TM00 1372 5092	Measure the amps of each phase while the pump is operating at a constant discharge head (if possible, at the capacity where the motor is most heavily loaded). For maximum operating current, see nameplate.	On three-phase motors, the difference between the current in the phase with the highest consumption and the current in the phase with the lowest consumption should not exceed 5 %. If so, or if the current exceeds the rated current, there are the following possible faults: • The contacts of the motor-protective circuit breaker are burnt. Replace the contacts or the control box for single-phase operation. • Poor connection in leads, possibly in the cable joint. See item 3. • Too high or too low supply voltage. See item 1. • The motor windings are short-circuited or partly disjointed. See item 3. • Damaged pump is causing the motor to be overloaded. Pull out the pump for overhaul. • The resistance value of the motor windings deviates too much (three-phase). Move the phases in phase order to a more uniform load. If this does not help, see item 3.
Items 3 and 4: Measurement is not necessary when the supply voltage and the current consumption are normal.		
3. Winding resistance  TM00 1373 5092	Disconnect the submersible drop cable from the motor-protective circuit breaker. Measure the winding resistance between the leads of the drop cable.	For three-phase motors, the deviation between the highest and the lowest value should not exceed 10 %. If the deviation is higher, pull out the pump. Measure motor, motor cable and drop cable separately, and repair or replace defective parts. **Note:** The operating winding of single-phase 3-wire motors will assume the lowest resistance value.
4. Insulation resistance  TM00 1374 5092	Disconnect the submersible drop cable from the motor-protective circuit breaker. Measure the insulation resistance from each phase to earth (frame). Make sure that the earth connection was made carefully.	If the insulation resistance is less than 0.5 MΩ, the pump should be pulled out for motor or cable repair. Local regulations may specify other values for the insulation resistance.

12. Disposal

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

Subject to alterations.

SP A

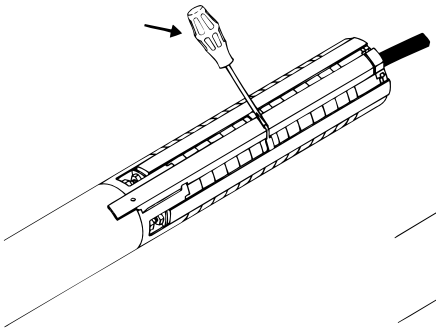


Fig. 1

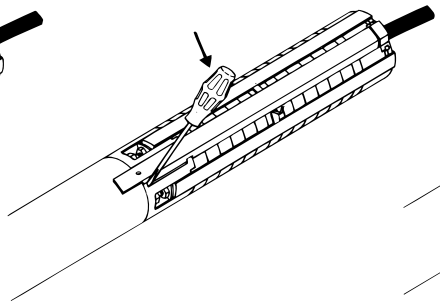


Fig. 2

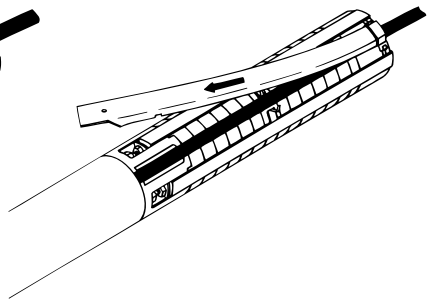


Fig. 3

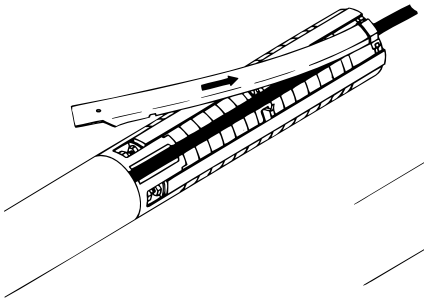


Fig. 1

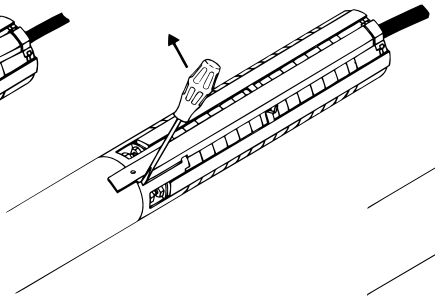


Fig. 2

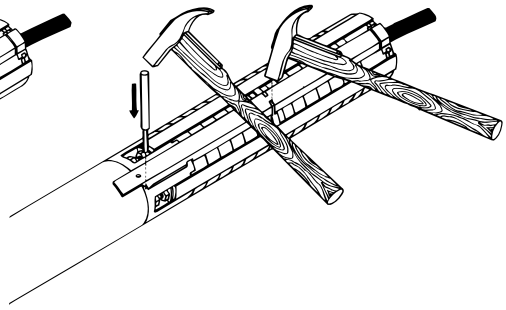


Fig. 3

TM00 1323 5092

SP A

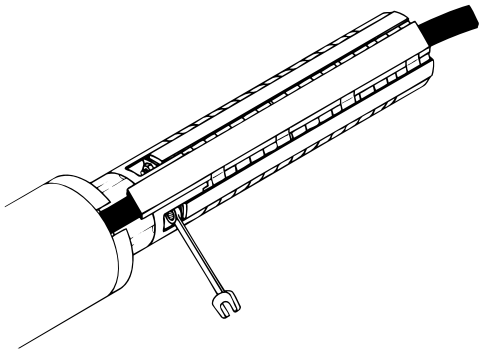


Fig. 1

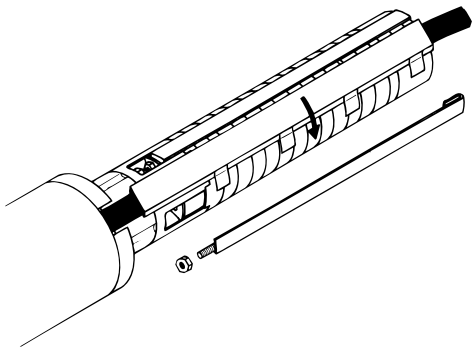


Fig. 2

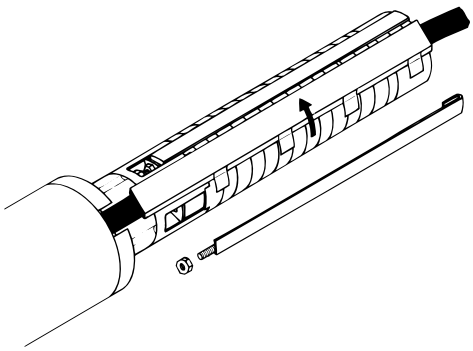


Fig. 1

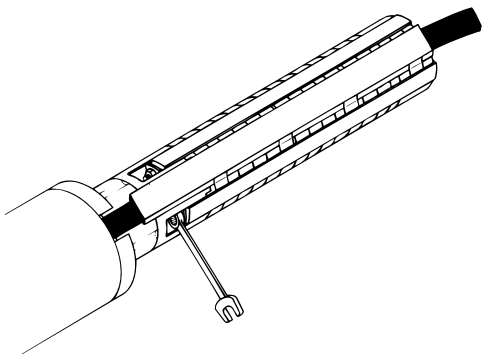


Fig. 2

TM00 1324 5092

SP 17 - SP 30 - SP 46 - SP 60

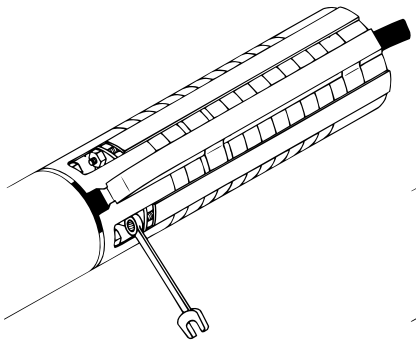


Fig. 1

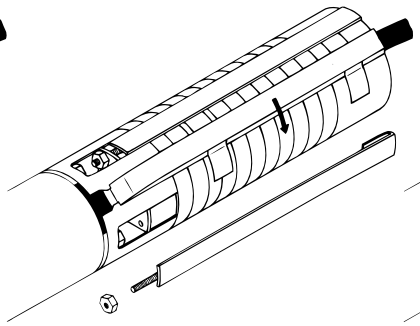


Fig. 2

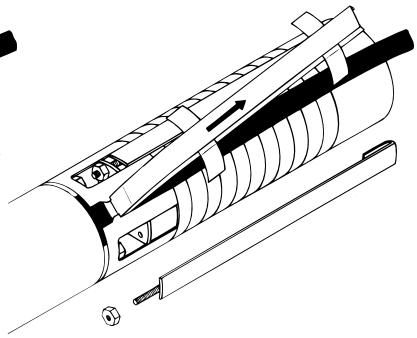


Fig. 3

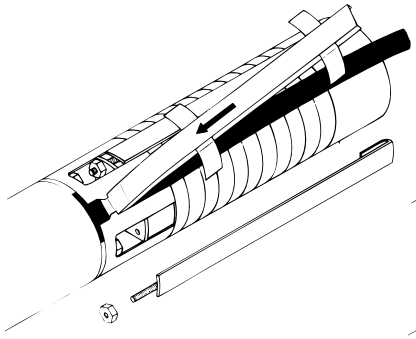


Fig. 1

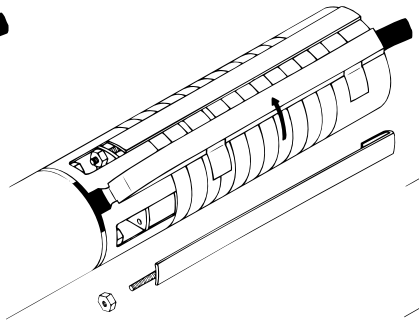


Fig. 2

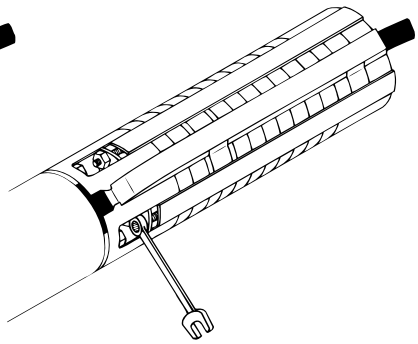


Fig. 3

TM00 1325 5092

SP 77 - SP 95 - SP 125 - SP 160 - SP 215

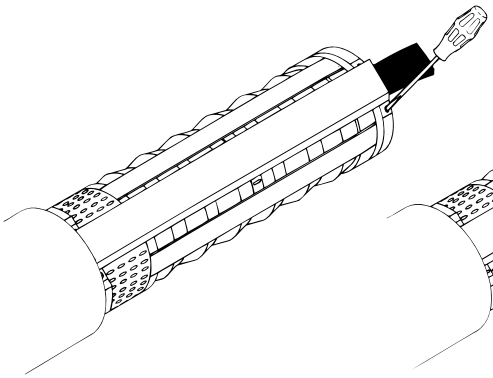


Fig. 1

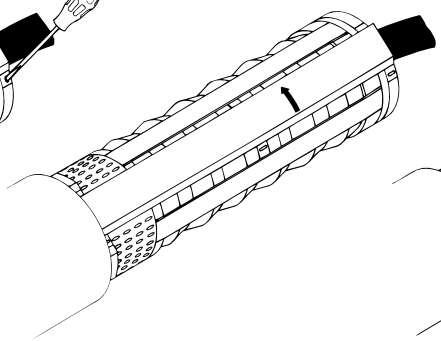


Fig. 2

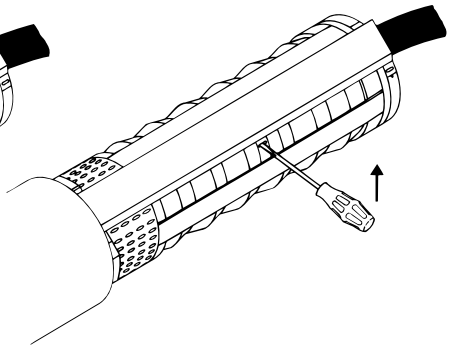


Fig. 3

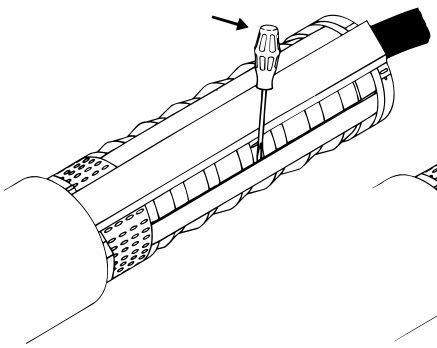


Fig. 1

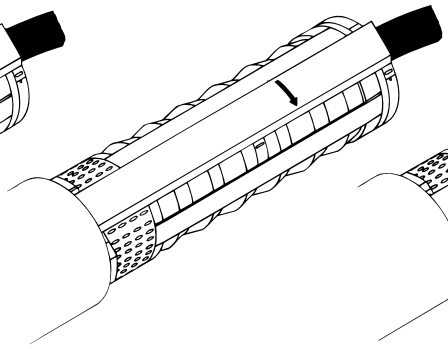


Fig. 2

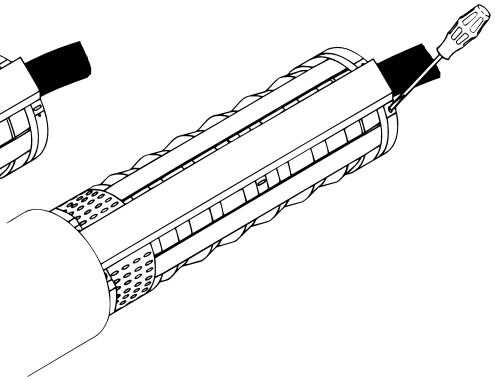


Fig. 3

TM00 1326 5092

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ECM: 1075639

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SP

Safety instructions



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GRUNDFOS

Declaration of conformity

GB: EC declaration of conformity

We, Grundfos, declare under our sole responsibility that the product SP, to which this declaration relates, is in conformity with these Council directives on the approximation of the laws of the EC member states:

— Machinery Directive (2006/42/EC).
Standard used: EN 809:1998 + A1:2009.

— Low Voltage Directive (2006/95/EC). Applicable when the rated power is lower than 1.5 kW.
Standards used: 60335-2-41:2003 + A1:2004 + A2:2010, except sections 25.1 and 25.8.

— Ecodesign Directive (2009/125/EC).
Water pumps:
Commission Regulation No 547/2012.
Applies only to water pumps marked with the minimum efficiency index MEI. See the pump nameplate.

Bare shaft pump

We, Grundfos, declare under our sole responsibility that the products SP, to which this declaration relates, are in conformity with these Council directives on the approximation of the laws of the EC member states:

— Machinery Directive (2006/42/EC).
Standard used: EN 809:1998 + A1:2009.

— Ecodesign Directive (2009/125/EC).
Water pumps:
Commission Regulation No 547/2012.
Applies only to water pumps marked with the minimum efficiency index MEI. See the pump nameplate.

Before the pump is taken into operation, the complete machinery into which the pump is to be incorporated must be declared in accordance with all relevant regulations.

BG: ЕС декларация за съответствие

Ние, фирма Grundfos, заявяваме с пълна отговорност, че продукта SP, за който се отнася настоящата декларация, отговаря на следните указания на Съвета за уеднаквяване на правните разпоредби на държавите членки на ЕС:

— Директива за машините (2006/42/EC).
Приложен стандарт: EN 809:1998 + A1:2009.

— Директива за нисковолтови системи (2006/95/EC). Приложим за помпи с номинална мощност по-нсика от 1,5 kW.
Приложени стандарти: 60335-2-41:2003 + A1:2004 + A2:2010, с изключение на раздели 25.1 и 25.8.

— Директива за екодизайн (2009/125/EC).
Водни помпи:
Наредба No 547/2012 на Европейската комисия.
Отнася се само за водни помпи, маркирани с минималният индекс за ефективност MEI. Вижте табелата с данни на помпата.

Помпа със свободен вал

Ние, фирма Grundfos, заявяваме с пълна отговорност, че продуктите SP, за които се отнася настоящата декларация, отговарят на следните указания на Съвета за уеднаквяване на правните разпоредби на държавите членки на ЕС:

— Директива за машините (2006/42/EC).
Приложен стандарт: EN 809:1998 + A1:2009.

— Директива за екодизайн (2009/125/EC).
Водни помпи:
Наредба No 547/2012 на Европейската комисия.
Отнася се само за водни помпи, маркирани с минималният индекс за ефективност MEI. Вижте табелата с данни на помпата.

Преди да се въведе в експлоатация помпата, трябва да се декларира съответствието на цялото съоръжение, в което се вгражда тази помпа, към съответните актуални наредби и стандарти.

CZ: ES prohlášení o shodě

My firma Grundfos prohlašujeme na svou plnou odpovědnost, že výrobek SP, na nějž se toto prohlášení vztahuje, je v souladu s ustanoveními směrnice Rady pro sblížení právních předpisů členských států Evropského společenství v oblastech:

— Směrnice pro strojní zařízení (2006/42/ES).
Použitá norma: EN 809:1998 + A1:2009.

— Směrnice pro nízkonapěťové aplikace (2006/95/ES). Je možno použít, pokud jmenovitý výkon je menší než 1,5 kW.
Použité normy: 60335-2-41:2003 + A1:2004 + A2:2010, mimo části 25.1 a 25.8.

— Směrnice o ekodesignu (2009/125/ES).
Vodní čerpadla:
Nařízení Komise č. 547/2012.
Vztahuje se pouze na vodní čerpadla označená minimální účinností index MEI. Viz typový štítek čerpadla.

?erpadlo s voln?m koncem h? í dele

My firma Grundfos prohlašujeme na svou plnou odpovědnost, že výrobky SP, na něž se toto prohlášení vztahuje, jsou v souladu s ustanoveními směrnice Rady pro sblížení právních předpisů členských států Evropského společenství v oblastech:

— Směrnice pro strojní zařízení (2006/42/ES).
Použitá norma: EN 809:1998 + A1:2009.

— Směrnice o ekodesignu (2009/125/ES).
Vodní čerpadla:
Nařízení Komise č. 547/2012.
Vztahuje se pouze na vodní čerpadla označená minimální účinností index MEI. Viz typový štítek čerpadla.

Před uvedením čerpadla do provozu, musí být kompletní strojní zařízení, jehož součástí čerpadlo je, deklarováno ve shodě se všemi příslušnými předpisy.

DK: EF-overensstemmelseserklæring

Vi, Grundfos, erklærer under ansvar at produktet SP som denne erklæring omhandler, er i overensstemmelse med disse af Rådets direktiver om indbyrdes tilnærmelse til EF-medlemsstaternes lovgivning:

— Maskindirektivet (2006/42/EF).
Anvendt standard: EN 809:1998 + A1:2009.

— Lavspændingsdirektivet (2006/95/EF). Gælder når mærkeeffekten er lavere end 1,5 kW.
Anvendte standarder: 60335-2-41:2003 + A1:2004 + A2:2010, undtagen afsnit 25.1 og 25.8.

— Ecodesigndirektivet (2009/125/EF).
Vandpumper:
Kommissionens forordning nr. 547/2012.
Gælder kun vandpumper der er mærket med mindsteeffektivitetsindekset MEI. Se pumpens typeskilt.

Pumpe uden kobling og motor

Vi, Grundfos, erklærer under ansvar at produkterne SP som denne erklæring omhandler, er i overensstemmelse med disse af Rådets direktiver om indbyrdes tilnærmelse til EF-medlemsstaternes lovgivning:

— Maskindirektivet (2006/42/EF).
Anvendt standard: EN 809:1998 + A1:2009.

— Ecodesigndirektivet (2009/125/EF).
Vandpumper:
Kommissionens forordning nr. 547/2012.
Gælder kun vandpumper der er mærket med mindsteeffektivitetsindekset MEI. Se pumpens typeskilt.

Før pumpen tages i brug, skal det komplette maskinanlæg hvori den skal inkorporeres, erklæres i overensstemmelse med alle relevante bestemmelser.

DE: EG-Konformitätserklärung

Wir, Grundfos, erklären in alleiniger Verantwortung, dass das Produkt SP, auf das sich diese Erklärung bezieht, mit den folgenden Richtlinien des Rates zur Angleichung der Rechtsvorschriften der EU-Mitgliedsstaaten übereinstimmt:

— Maschinenrichtlinie (2006/42/EG).
Norm, die verwendet wurde: EN 809:1998 + A1:2009.

— Niederspannungsrichtlinie (2006/95/EG). Nur anwendbar für Nennleistungen kleiner 1,5 kW.
Normen, die verwendet wurden: 60335-2-41:2003 + A1:2004 + A2:2010, ausgenommen Abschnitt 25.1 und 25.8.

— ErP-Richtlinie (2009/125/EG).
Wasserpumpen:
Verordnung der Europäischen Kommission Nr. 547/2012.
Gilt nur für Pumpen, für die der Mindesteffizienzindex (MEI) anzugeben ist. Siehe das Typenschild der Pumpe.

Pumpe mit freiem Wellenende

Wir, Grundfos, erklären in alleiniger Verantwortung, dass die Produkte SP, auf die sich diese Erklärung bezieht, mit den folgenden Richtlinien des Rates zur Angleichung der Rechtsvorschriften der EU-Mitgliedsstaaten übereinstimmen:

— Maschinenrichtlinie (2006/42/EG).
Norm, die verwendet wurde: EN 809:1998 + A1:2009.

— ErP-Richtlinie (2009/125/EG).
Wasserpumpen:
Verordnung der Europäischen Kommission Nr. 547/2012.
Gilt nur für Pumpen, für die der Mindesteffizienzindex (MEI) anzugeben ist. Siehe das Typenschild der Pumpe.

Vor der Inbetriebnahme der Pumpe ist eine Konformitätserklärung für die gesamte Anlage, in die die Baugruppe "Pumpe mit freiem Wellenende" eingebaut ist, auszustellen.

EE: EL vastavusdeklaratsioon

Meie, Grundfos, deklareerime enda ainuvastutusel, et toode SP, mille kohta käesolev juhend käib, on vastavuses EÜ Nõukogu direktiividega EMÜ liikmesriikide seaduste ühitamise kohta, mis käsitlevad:

— Masinate ohutus (2006/42/EC).
Kasutatud standard: EN 809:1998 + A1:2009.

— Madalpinge direktiiv (2006/95/EC). Kehtib, kui nominaalvõimsus on alla 1,5 kW.
Kasutatud standardid: 60335-2-41:2003 + A1:2004 + A2:2010, välja arvatud paragrahvid 25.1 ja 25.8.

— Ökodisaini direktiiv (2009/125/EC).
Veepumbad:
Komisjoni regulatsioon nr 547/2012.
Kehtiv ainult veepumpadele, mis on märgitud miinimum kasuteguri indeksiga MEI. Vaata pumba silti.

Vaba v?lliga pump

Meie, Grundfos, deklareerime enda ainuvastutusel, et tooted SP, mille kohta käesolev juhend käib, on vastavuses EÜ Nõukogu direktiividega EMÜ liikmesriikide seaduste ühitamise kohta, mis käsitlevad:

— Masinate ohutus (2006/42/EC).
Kasutatud standard: EN 809:1998 + A1:2009.

— Ökodisaini direktiiv (2009/125/EC).
Veepumbad:
Komisjoni regulatsioon nr 547/2012.
Kehtiv ainult veepumpadele, mis on märgitud miinimum kasuteguri indeksiga MEI. Vaata pumba silti.

Enne pumba töösse võtmist peab kogu seadmestik, millesse pump kuulub, olema heakskiidetud vastavalt asjakohastele eeskirjadele.

GR: Δήλωση συμμόρφωσης EC

Εμείς, η Grundfos, δηλώνουμε με αποκλειστικά δική μας ευθύνη ότι τα προϊόντα SP, στα οποία αναφέρεται η παρούσα δήλωση, συμμορφώνονται με τις εξής Οδηγίες του Συμβουλίου περί προσέγγισης των νομοθεσιών των κρατών μελών της ΕΕ:

— Οδηγία για μηχανήματα (2006/42/EC).
Πρότυπο που χρησιμοποιήθηκε: EN 809:1998 + A1:2009.

— Οδηγία χαμηλής τάσης (2006/95/EC). Ισχύει για ονομαστική ισχύ μικρότερη από 1,5 kW.
Πρότυπα που χρησιμοποιήθηκαν: 60335-2-41:2003 + A1:2004 + A2:2010, εκτός των παραγράφων 25.1 και 25.8.

— Οδηγία Οικολογικού Σχεδιασμού (2009/125/EC).
Αντλίες νερού:
Ρύθμιση πρώτης εκκίνησης No 547/2012.
Ισχύει μόνο για αντλίες νερού που φέρουν τον ελάχιστο δείκτη απόδοσης MEI. Βλέπε πινακίδα αντλίας.

Α ν τ λ?α ε λ ε?θ ε ρ ο υ ?ξ ο ν α

Εμείς, η Grundfos, δηλώνουμε με αποκλειστικά δική μας ευθύνη ότι τα προϊόντα SP στα οποία αναφέρεται η παρούσα δήλωση, συμμορφώνονται με τις εξής Οδηγίες του Συμβουλίου περί προσέγγισης των νομοθεσιών των κρατών μελών της ΕΕ:

— Οδηγία για μηχανήματα (2006/42/EC).
Πρότυπο που χρησιμοποιήθηκε: EN 809:1998 + A1:2009.

— Οδηγία Οικολογικού Σχεδιασμού (2009/125/EC).
Αντλίες νερού:
Ρύθμιση πρώτης εκκίνησης No 547/2012.
Ισχύει μόνο για αντλίες νερού που φέρουν τον ελάχιστο δείκτη απόδοσης MEI. Βλέπε πινακίδα αντλίας.

Πριν η αντλία τεθεί σε λειτουργία, όλο το μηχάνημα στο οποίο η αντλία πρόκειται να ενσωματωθεί πρέπει να δηλωθεί σύμφωνα με όλους τους σχετικούς κανονισμούς.

ES: Declaración CE de conformidad

Nosotros, Grundfos, declaramos bajo nuestra propia responsabilidad que el producto SP, al cual se refiere esta declaración, está conforme con las Directivas del Consejo en la aproximación de las leyes de los Estados Miembros del EM:

— Directiva de Maquinaria (2006/42/CE).
Norma aplicada: EN 809:1998 + A1:2009.

— Directiva de Baja Tensión (2006/95/CE). Aplicable cuando el índice de potencia es inferior a 1,5 kW.
Normas aplicadas: 60335-2-41:2003 + A1:2004 + A2:2010, excepto las secciones 25.1 y 25.8.

— Directiva sobre diseño ecológico (2009/125/CE).
Bombas de agua:
Reglamento de la Comisión Nº 547/2012.
Aplicable únicamente a las bombas de agua marcadas con el índice de eficiencia mínima (IEM). Véase la placa de características de la bomba.

Bomba a eje libre

Nosotros, Grundfos, declaramos bajo nuestra entera responsabilidad que los productos SP, a los cuales se refiere esta declaración, están conformes con las Directivas del Consejo en la aproximación de las leyes de las Estados Miembros del EM:

— Directiva de Maquinaria (2006/42/CE).
Norma aplicada: EN 809:1998 + A1:2009.

— Directiva sobre diseño ecológico (2009/125/CE).
Bombas de agua:
Reglamento de la Comisión Nº 547/2012.
Aplicable únicamente a las bombas de agua marcadas con el índice de eficiencia mínima (IEM). Véase la placa de características de la bomba.

Antes de la puesta en marcha de la bomba, todo el sistema en que la bomba va a incorporarse, debe estar de acuerdo con todas las normativas en vigor.

FR: Déclaration de conformité CE

Nous, Grundfos, déclarons sous notre seule responsabilité, que le produit SP, auquel se réfère cette déclaration, est conforme aux Directives du Conseil concernant le rapprochement des législations des Etats membres CE relatives aux normes énoncées ci-dessous :

— Directive Machines (2006/42/CE).
Norme utilisée : EN 809:1998 + A1:2009.

— Directive Basse Tension (2006/95/CE). Applicable lorsque la puissance nominale est inférieure à 1,5 kW.
Normes utilisées : 60335-2-41:2003 + A1:2004 + A2:2010, sauf pour paragraphes 25.1 et 25.8.

— Directive sur l'éco-conception (2009/125/CE).
Pompes à eau:
Réglementation de la Commission N° 547/2012.
S'applique uniquement aux pompes à eau marquées de l'indice de performance minimum IEM. Voir plaque signalétique de la pompe.

Pompe à arbre nu

Nous, Grundfos, déclarons sous notre seule responsabilité, que les produits SP, auxquels se réfère cette déclaration, sont conformes aux Directives du Conseil concernant le rapprochement des législations des Etats membres CE relatives aux normes énoncées ci-dessous :

— Directive Machines (2006/42/CE).
Norme utilisée : EN 809:1998 + A1:2009.

— Directive sur l'éco-conception (2009/125/CE).
Pompes à eau:
Réglementation de la Commission N° 547/2012.
S'applique uniquement aux pompes à eau marquées de l'indice de performance minimum IEM. Voir plaque signalétique de la pompe.

Avant que la pompe ne soit mise en service, la machine complète, dans laquelle sera incorporée la pompe, doit être en accord avec toutes les réglementations en vigueur.

IT: Dichiarazione di conformità CE

Grundfos dichiara sotto la sua esclusiva responsabilità che il prodotto SP, al quale si riferisce questa dichiarazione, è conforme alle seguenti direttive del Consiglio riguardanti il riavvicinamento delle legislazioni degli Stati membri CE:

— Direttiva Macchine (2006/42/CE).
Norma applicata: EN 809:1998 + A1:2009.

— Direttiva Bassa Tensione (2006/95/CE). Applicabile quando la corrente nominale è inferiore a 1,5 kW.
Norme applicate: 60335-2-41:2003 + A1:2004 + A2:2010, eccetto per i paragrafi 25.1 e 25.8.

— Direttiva EuP per l'Ecodesign (2009/125/CE).
Pompe per acqua:
Regolamento CE n. 547/2012.
Applicabile solo a pompe per acqua con l'indice di efficienza minimo MEI. Vedi la targhetta identificativa della pompa.

Pompa ad asse nudo

Grundfos dichiara sotto la sua esclusiva responsabilità che i prodotti SP, ai quali si riferisce questa dichiarazione, sono conformi alle seguenti direttive del Consiglio riguardanti il riavvicinamento delle legislazioni degli Stati membri CE:

— Direttiva Macchine (2006/42/CE).
Norma applicata: EN 809:1998 + A1:2009.

— Direttiva EuP per l'Ecodesign (2009/125/CE).
Pompe per acqua:
Regolamento CE n. 547/2012.
Applicabile solo a pompe per acqua con l'indice di efficienza minimo MEI. Vedi la targhetta identificativa della pompa.

Si ricorda che se la pompa è inserita in un sistema, prima di avviare la pompa stessa, è necessario che tutto il sistema sia in accordo alle norme di riferimento.

HR: EZ izjava o usklađenosti

Mi, Grundfos, izjavljujemo pod vlastitom odgovornošću da je proizvod SP, na koji se ova izjava odnosi, u skladu s direktivama ovog Vijeća o usklađivanju zakona država članica EU:

— Direktiva za strojeve (2006/42/EZ).
Korištena norma: EN 809:1998 + A1:2009.

— Direktiva za niski napon (2006/95/EZ). Primjenjuje se kada je nazivna snaga niža od 1,5 kW.
Korištene norme: 60335-2-41:2003 + A1:2004 + A2:2010, osim odlomaka 25.1 i 25.8.

— Direktiva o ekološkoj izvedbi (2009/125/EZ).
Crpke za vodu:
Uredba Komisije No 547/2012.
Odnosi se samo na crpke za vodu označene s indeksom minimalne učinkovitosti MEI. Pogledajte natpisnu pločicu crpke.

Crpka s golim vratilom

Mi, Grundfos, izjavljujemo pod vlastitom odgovornošću da je proizvod SP, na koji se ova izjava odnosi, u skladu s direktivama ovog Vijeća o usklađivanju zakona država članica EU:

— Direktiva za strojeve (2006/42/EZ).
Korištena norma: EN 809:1998 + A1:2009.

— Direktiva o ekološkoj izvedbi (2009/125/EZ).
Crpke za vodu:
Uredba Komisije No 547/2012.
Odnosi se samo na crpke za vodu označene s indeksom minimalne učinkovitosti MEI. Pogledajte natpisnu pločicu crpke.

Prije puštanja u pogon crpke, kompletan uređaj u koji je crpka ugrađena mora biti u skladu s odgovarajućim propisima.

KZ: ЕО сәйкестік туралы мәлімдеме

Біз, Grundfos компаниясы, барлық жауапкершілікпен, осы мәлімдемеге қатысты болатын SP бұйымы ЕО мүше елдерінің заң шығарушы жарлықтарын үндестіру туралы мына Еуроодақ кеңесінің жарлықтарына сәйкес келетіндігін мәлімдейміз:

— Механикалық құрылғылар (2006/42/EC).
Қолданылған стандарт: EN 809:1998 + A1:2009.

— Төмен Кернеулі Жабдық (2006/95/EC).
Номиналды қуаты 1,5 кВт-тан аз болғанда қолдануға жарамды.
Қолданылған стандарттар: 60335-2-41:2003 + A1:2004 + A2:2010, Басқа тараулары 25.1 және 25.8.

— Қоршаған ортаны қорғауға арналған нұсқау (2009/125/EC).
Су сорғылар:
Еуропалық комиссия регламенті 547/2012.
Тек минималды тиімділік көрсіткішіпен МТК белгіленген су сорғыларына арналған. Сорғыдағы фирмалық тақтайшаны қараңыз.

Жала?дуал сор?ыш

Біз, Grundfos компаниясы, барлық жауапкершілікпен, осы мәлімдемеге қатысты болатын SP бұйымдары ЕО мүше елдерінің заң шығарушы жарлықтарын үндестіру туралы мына Еуроодақ Кеңесінің жарлықтарына сәйкес келетіндігін мәлімдейміз:

— Механикалық құрылғылар (2006/42/EC).
Қолданылған стандарт: EN 809:1998 + A1:2009.

— Қоршаған ортаны қорғауға арналған нұсқау (2009/125/EC).
Су сорғылар:
Еуропалық комиссия регламенті 547/2012.
Тек минималды тиімділік көрсіткішіпен МТК белгіленген су сорғыларына арналған. Сорғыдағы фирмалық тақтайшаны қараңыз.

Эксплуатацияға сорғыш жіберілмей тұрып, барлық құжат және ережелермен камтамасыз етулүі қажет.

LV: EK paziņojums par atbilstību prasībām

Sabiedrība GRUNDFOS ar pilnu atbildību dara zināmu, ka produkts SP, uz kuru attiecas šis paziņojums, atbilst šādām Padomes direktīvām par tuvināšanos EK dalībvalstu likumdošanas normām:

— Mašīnbūves direktīva (2006/42/EK).
Piemērotais standarts: EN 809:1998 + A1:2009.

— Zema sprieguma direktīva (2006/95/EK). Piemērojams, kad nominālā jauda ir mazāka par 1,5 kW.
Piemērotie standarti: 60335-2-41:2003 + A1:2004 + A2:2010, izņemot nodaļas 25.1 un 25.8.

— Ekodizaina direktīva (2009/125/EK).
Ūdens sūkņi:
Komisijas regula Nr. 547/2012.
Attiecas tikai uz ūdens sūkņiem, kuriem ir minimālais efektivitātes indekss MEI. Sk. sūkņa pases datu plāksnītē.

Atsegtas v ā rpstas s ū knis

Sabiedrība GRUNDFOS ar pilnu atbildību dara zināmu, ka produkti SP, uz kuriem attiecas šis paziņojums, atbilst šādām Padomes direktīvām par tuvināšanos EK dalībvalstu likumdošanas normām:

— Mašīnbūves direktīva (2006/42/EK).
Piemērotais standarts: EN 809:1998 + A1:2009.

— Ekodizaina direktīva (2009/125/EK).
Ūdens sūkņi:
Komisijas regula Nr. 547/2012.
Attiecas tikai uz ūdens sūkņiem, kuriem ir minimālais efektivitātes indekss MEI. Sk. sūkņa pases datu plāksnītē.

Pirms sūkņa nodošanas ekspluatācijā visai iekārtai, kurā sūknis tiek ietverts, jābūt atzītai par tādu, kas atbilst visiem piemērojamiem normatīviem.

LT: EB atitikties deklaracija

Mes, Grundfos, su visa atsakomybe pareiškiame, kad gaminys SP, kuriam skirta ši deklaracija, atitinka šias Tarybos Direktyvas dėl Europos Ekonominės Bendrijos šalių narių įstatymų suderinimo:

— Mašinų direktyva (2006/42/EB).
Taikomas standartas: EN 809:1998 + A1:2009.

— Žemų įtampų direktyva (2006/95/EB). Galioja, kai nominali galia yra mažesnė kaip 1,5 kW.
Taikomi standartai: 60335-2-41:2003 + A1:2004 + A2:2010, išskyrus skyrius 25.1 ir 25.8.

— Ekologinio projektavimo direktyva (2009/125/EB).
Vandens siurbliai:
Komisijos reglamentas Nr. 547/2012.
Galioja tik vandens siurbliams, ant kurių nurodytas minimalus efektyvumo koeficientas MEI. Žr. siurblio vardinę plokštelę.

Siurblys su laisvu velenu

Mes, Grundfos, su visa atsakomybe pareiškiame, kad gaminiai SP, kuriems skirta ši deklaracija, atitinka šias Tarybos Direktyvas dėl Europos Ekonominės Bendrijos šalių narių įstatymų suderinimo:

— Mašinų direktyva (2006/42/EB).
Taikomas standartas: EN 809:1998 + A1:2009.

— Ekologinio projektavimo direktyva (2009/125/EB).
Vandens siurbliai:
Komisijos reglamentas Nr. 547/2012.
Galioja tik vandens siurbliams, ant kurių nurodytas minimalus efektyvumo koeficientas MEI. Žr. siurblio vardinę plokštelę.

Prieš pradedant siurblį eksploatuoti, visa įranga, kurioje montuojamas siurblys, turi būti deklaruota pagal galiojančius reikalavimus.

HU: EK megfelelőségi nyilatkozat

Mi, a Grundfos, egyedüli felelősséggel kijelentjük, hogy a SP termék, amelyre jelen nyilatkozik vonatkozik, megfelel az Európai Unió tagállamainak jogi irányelveit összehangoló tanács alábbi előírásainak:

— Gépek (2006/42/EK).
Alkalmazott szabvány: EN 809:1998 + A1:2009.

— Kisfeszültségű Direktíva (2006/95/EK). 1,5 kW alatti névleges teljesítmény alatt érvényes.
Alkalmazott szabványok: 60335-2-41:2003 + A1:2004 + A2:2010, kivéve 25.1 és 25.8 fejezetek.

— Környezetbarát tervezésre vonatkozó irányelv (2009/125/EK).
Víz szivattyúk:
Az Európai Bizottság 547/2012. számú rendelete
Csak a MEI minimum hatásfok index-el jelölt víz szivattyúkra vonatkozik. Lásd a szivattyú adattábláján.

Szabad tengelyv é ges szivatty ú

Mi, a Grundfos, egyedüli felelősséggel kijelentjük, hogy a SP termékek, amelyekre jelen nyilatkozik vonatkozik, megfelelnek az Európai Unió tagállamainak jogi irányelveit összehangoló tanács alábbi előírásainak:

— Gépek (2006/42/EK).
Alkalmazott szabvány: EN 809:1998 + A1:2009.

— Környezetbarát tervezésre vonatkozó irányelv (2009/125/EK).
Víz szivattyúk:
Az Európai Bizottság 547/2012. számú rendelete
Csak a MEI minimum hatásfok index-el jelölt víz szivattyúkra vonatkozik. Lásd a szivattyú adattábláján.

A szivattyú üzembe helyezése előtt a teljes gépegységet, amelybe a szivattyú beépítésre került, a vonatkozó előírások szerint minősíteni kell.

NL: EC overeenkomstigheidsverklaring

Wij, Grundfos, verklaren geheel onder eigen verantwoordelijkheid dat het product SP waarop deze verklaring betrekking heeft, in overeenstemming is met de Richtlijnen van de Raad in zake de onderlinge aanpassing van de wetgeving van de EG lidstaten betreffende:

— Machine Richtlijn (2006/42/EC).
Gebruikte norm: EN 809:1998 + A1:2009.

— Laagspannings Richtlijn (2006/95/EC). Van toepassing wanneer het opgenomen vermogen lager is dan 1,5 kW.
Gebruikte normen: 60335-2-41:2003 + A1:2004 + A2:2010, behalve hoofdstukken 25.1 en 25.8.

— Ecodesign Richtlijn (2009/125/EC).
Waterpompen:
Verordening (EG) Nr. 547/2012 van de Commissie.
Is alleen van toepassing op waterpompen die gekenmerkt worden door de minimale efficiëntie index MEI. Zie het typeplaatje van de pomp.

Pomp met vrije aseinde

Wij, Grundfos, verklaren geheel onder eigen verantwoordelijkheid dat de producten SP waarop deze verklaring betrekking heeft, in overeenstemming zijn met de Richtlijnen van de Raad in zake de onderlinge aanpassing van de wetgeving van de EG Lidstaten betreffende:

— Machine Richtlijn (2006/42/EC).
Gebruikte norm: EN 809:1998 + A1:2009.

— Ecodesign Richtlijn (2009/125/EC).
Waterpompen:
Verordening (EG) Nr. 547/2012 van de Commissie.
Is alleen van toepassing op waterpompen die gekenmerkt worden door de minimale efficiëntie index MEI. Zie het typeplaatje van de pomp.

Voordat de pomp in gebruik wordt genomen, moet de gehele installatie waarin de pomp zich bevindt overeenstemmend zijn met alle relevante wetgevingen.

UA: Свідчення про відповідність вимогам ЄС

Компанія Grundfos заявляє про свою виключну відповідальність за те, що продукт SP, на який поширюється дана декларація, відповідає таким рекомендаціям Ради з уніфікації правових норм країн - членів ЄС:

— Механічні прилади (2006/42/ЄС).
Стандарти, що застосовувалися: EN 809:1998 + A1:2009.

— Низька напруга (2006/95/ЄС). Застосовується при потужності меншій ніж 1,5 кВт.
Стандарти, що застосовувалися: 60335-2-41:2003 + A1:2004 + A2:2010, крім розділів 25.1 і 25.8.

— Директива з екодизайну (2009/125/ЄС.
Насоси для води:
Регламент Комісії № 547/2012.
Стосується тільки насосів для води, що відзначені мінімальним показником ефективності MEI. Дивись заводський шильдик на насосі.

Насос без двигуна

Компанія Grundfos заявляє про свою виключну відповідальність за те, що продукти SP, на які поширюється дана декларація, відповідають таким рекомендаціям Ради з уніфікації правових норм країн - членів ЄС:

— Механічні прилади (2006/42/ЄС).
Стандарти, що застосовувалися: EN 809:1998 + A1:2009.

— Директива з екодизайну (2009/125/ЄС.
Насоси для води:
Регламент Комісії № 547/2012.
Стосується тільки насосів для води, що відзначені мінімальним показником ефективності MEI. Дивись заводський шильдик на насосі.

Перед введенням насосу в експлуатацію, механізм, що включає в себе даний насос, має бути задекларований згідно з усіма відповідними нормами.

PL: Deklaracja zgodności WE

My, Grundfos, oświadczamy z pełną odpowiedzialnością, że nasze wyroby SP, których deklaracja niniejsza dotyczy, są zgodne z następującymi wytycznymi Rady d/s ujednolicenia przepisów prawnych krajów członkowskich WE:

— Dyrektywa Maszynowa (2006/42/WE).
Zastosowana norma: EN 809:1998 + A1:2009.

— Dyrektywa Niskonapięciowa (LVD) (2006/95/WE). Mają zastosowanie w przypadku, gdy moc znamionowa jest mniejsza niż 1,5 kW.
Zastosowane normy: 60335-2-41:2003 + A1:2004 + A2:2010, z wyjątkiem rozdziałów: 25.1 i 25.8.

— Dyrektywa Ekoprojektowa (2009/125/WE).
Pompy do wody:
Rozporządzenie komisji nr 547/2012.
Dotyczy tylko pomp do tłoczenia wody z minimalnym indeksem sprawności MEI. Patrz tabliczka znamionowa.

Pompa z wolnym wa?em

My, Grundfos, oświadczamy z pełną odpowiedzialnością, że nasze wyroby SP, których deklaracja niniejsza dotyczy, są zgodne z następującymi wytycznymi Rady d/s ujednolicenia przepisów prawnych krajów członkowskich WE:

— Dyrektywa Maszynowa (2006/42/WE).
Zastosowana norma: EN 809:1998 + A1:2009.

— Dyrektywa Ekoprojektowa (2009/125/WE).
Pompy do wody:
Rozporządzenie komisji nr 547/2012.
Dotyczy tylko pomp do tłoczenia wody z minimalnym indeksem sprawności MEI. Patrz tabliczka znamionowa.

Wszystkie urządzenia współpracujące z pompą muszą być zgodne z wszystkimi odpowiednimi wytycznymi.

PT: Declaração de conformidade CE

A Grundfos declara sob sua única responsabilidade que o produto SP, ao qual diz respeito esta declaração, está em conformidade com as seguintes Directivas do Conselho sobre a aproximação das legislações dos Estados Membros da CE:

— Directiva Máquinas (2006/42/CE).
Norma utilizada: EN 809:1998 + A1:2009.

— Directiva Baixa Tensão (2006/95/CE). Aplicável quando a potência nominal é inferior a 1,5 kW.
Normas utilizadas: 60335-2-41:2003 + A1:2004 + A2:2010, excepto nos pontos 25.1 e 25.8.

— Directiva de Concepção Ecológica (2009/125/CE).
Bombas de água:
Regulamento da Comissão No 547/2012.
Aplica-se apenas a bombas de água registadas com o índice de eficiência mínimo MEI. Ver a chapa de características da bomba.

Bomba com ponta de veio livre

A Grundfos declara sob sua única responsabilidade que os produtos SP, aos quais diz respeito esta declaração, estão em conformidade com as seguintes Directivas do Conselho sobre a aproximação das legislações dos Estados Membros da CE:

— Directiva Máquinas (2006/42/CE).
Norma utilizada: EN 809:1998 + A1:2009.

— Directiva de Concepção Ecológica (2009/125/CE).
Bombas de água:
Regulamento da Comissão No 547/2012.
Aplica-se apenas a bombas de água registadas com o índice de eficiência mínimo MEI. Ver a chapa de características da bomba.

Antes de colocar a bomba em operação, o equipamento no qual a mesma irá ser incorporada deve ser declarado de acordo com todas as regulamentações relevantes.

RU: Декларация о соответствии ЕС

Мы, компания Grundfos, со всей ответственностью заявляем, что изделия SP, к которым относится настоящая декларация, соответствуют следующим Директивам Совета Евросоюза об унификации законодательных предписаний стран-членов ЕС:

— Механические устройства (2006/42/EC).
Применявшийся стандарт: EN 809:1998 + A1:2009.

— Низковольтное оборудование (2006/95/EC). Применимо, если номинальная мощность меньше 1,5 кВт.
Применявшиеся стандарты: 60335-2-41:2003 + A1:2004 + A2:2010, кроме разделов 25.1 и 25.8.

— Директива по экологическому проектированию энергопотребляющей продукции (2009/125/EC).
Насосы для перекачивания воды:
Регламент Комиссии ЕС № 547/2012.
Применимо только к насосам для перекачивания воды, промаркированным показателем минимальной эффективности MEI. См. фирменную табличку насоса.

Насос со свободным концом вала

Мы, компания Grundfos, со всей ответственностью заявляем, что изделия SP, к которым относится настоящая декларация, соответствуют следующим Директивам Совета Евросоюза об унификации законодательных предписаний стран-членов ЕС:

— Механические устройства (2006/42/EC).
Применявшийся стандарт: EN 809:1998 + A1:2009.

— Директива по экологическому проектированию энергопотребляющей продукции (2009/125/EC).
Насосы для перекачивания воды:
Регламент Комиссии ЕС № 547/2012.
Применимо только к насосам для перекачивания воды, промаркированным показателем минимальной эффективности MEI. См. фирменную табличку насоса.

Прежде чем насос будет введён в эксплуатацию, необходимо получить подтверждение, что агрегат в сборе, частью которого будет данный насос, соответствует всем основным требованиям и нормам.

RO: Declaraţie de conformitate CE

Noi, Grundfos, declarăm pe propria răspundere că produsele SP, la care se referă această declaraţie, sunt în conformitate cu aceste Directive de Consiliu asupra armonizării legilor Statelor Membre CE:

— Directiva Utilaje (2006/42/CE).
Standard utilizat: EN 809:1998 + A1:2009.

— Directiva Tensiune Joasă (2006/95/CE). Aplicabil când puterea înregistrată este mai mică decât 1,5 kW.
Standarde utilizate: 60335-2-41:2003 + A1:2004 + A2:2010, cu exceptia capitolelor 25.1 şi 25.8.

— Directiva Ecodesign (2009/125/CE).
Pompe de apa:
Regulamentul Comisiei nr. 547/2012.
Se aplica numai pompelor de apa cu marca de eficienta minima index MEI. Vezi plăcuţa de identificare a pompei.

Pomp? f?r? arbore

Noi, Grundfos, declarăm pe propria răspundere că produsele SP, la care se referă această declaraţie, sunt în conformitate cu aceste Directive de Consiliu asupra armonizării legilor Statelor Membre CE:

— Directiva Utilaje (2006/42/CE).
Standard utilizat: EN 809:1998 + A1:2009.

— Directiva Ecodesign (2009/125/CE).
Pompe de apa:
Regulamentul Comisiei nr. 547/2012.
Se aplica numai pompelor de apa cu marca de eficienta minima index MEI. Vezi plăcuţa de identificare a pompei.

Înainte de pornirea pompei, utilajul complet în care este încorporată pompa trebuie să fie în conformitate cu toate reglementările care li se aplică.

SK: Prehlásenie o konformite EÚ

My firma Grundfos prehlasujeme na svoju plnú zodpovednosť, že výrobok SP, na ktorý sa toto prehlásenie vzťahuje, je v súlade s ustanovením smernice Rady pre zblíženie právnych predpisov členských štátov Európskeho spoločenstva v oblastiach:

— Smernica pre strojové zariadenie (2006/42/EC).
Použitá norma: EN 809:1998 + A1:2009.

— Smernica pre nízkonapäťové aplikácie (2006/95/EC). Je možné použit', pokiaľ je menovitý výkon menší než 1,5 kW.
Použité normy: 60335-2-41:2003 + A1:2004 + A2:2010, okrem častí 25.1 a 25.8.

— Smernica o ekodizajne (2009/125/ES).
Čerpadlá na vodu:
Nariadenie Komisie č 547/2012.
Vzťahuje sa iba na čerpadlá pre vodu označené minimálnym indexom energetickej účinnosti MEI. Pozri typový štítok čerpadla.

Vlastn? hriade? ?erpadla

My firma Grundfos prehlasujeme na svoju plnú zodpovednosť, že výrobky SP, na ktoré sa toto prehlásenie vzťahuje, sú v súlade s ustanovením smernice Rady pre zblíženie právnych predpisov členských štátov Európskeho spoločenstva v oblastiach:

— Smernica pre strojové zariadenie (2006/42/EC).
Použitá norma: EN 809:1998 + A1:2009.

— Smernica o ekodizajne (2009/125/ES).
Čerpadlá na vodu:
Nariadenie Komisie č 547/2012.
Vzťahuje sa iba na čerpadlá pre vodu označené minimálnym indexom energetickej účinnosti MEI. Pozri typový štítok čerpadla.

Pred uvedením čerpadla do prevádzky, musí byť kompletné zariadenie - ktorého súčasťou je aj čerpadlo, deklarované v zhode so všetkými príslušnými predpismi.

SI: ES izjava o skladnosti

V Grundfosu s polno odgovornostjo izjavljamo, da so naši izdelki SP, na katere se ta izjava nanaša, v skladu z naslednjimi direktivami Sveta o približevanju zakonodaje za izenačevanje pravnih predpisov držav članic ES:

— Direktiva o strojih (2006/42/ES).
Uporabljena norma: EN 809:1998 + A1:2009.

— Direktiva o nizki napetosti (2006/95/ES). Primerno, kadar je nominalna moč nižja od 1,5 kW.
Uporabljeni normi: 60335-2-41:2003 + A1:2004 + A2:2010, z izjemo razdelkov 25.1 in 25.8.

— Eco-design direktiva (2009/125/ES).
Vodne črpalke:
Uredba komisije št. 547/2012.
Velja le za vodne črpalke označene z indeksom minimalne učinkovitosti MEI. Glejte tipsko ploščico črpalke.

?rpalka s prosto osjo

V Grundfosu s polno odgovornostjo izjavljamo, da so naši izdelki SP, na katere se ta izjava nanaša, v skladu z naslednjimi direktivami Sveta o približevanju zakonodaje za izenačevanje pravnih predpisov držav članic ES:

— Direktiva o strojih (2006/42/ES).
Uporabljena norma: EN 809:1998 + A1:2009.

— Eco-design direktiva (2009/125/ES).
Vodne črpalke:
Uredba komisije št. 547/2012.
Velja le za vodne črpalke označene z indeksom minimalne učinkovitosti MEI. Glejte tipsko ploščico črpalke.

Vse postrojenje, katerega del je črpalka, mora biti pred zagonom v skladu z vsemi relevantnimi regulativami.

RS: EC deklaracija o konformitetu

Mi, Grundfos, izjavljujemo pod vlastitom odgovornošću da je proizvod SP, na koji se ova izjava odnosi, u skladu sa direktivama Saveta za usklađivanje zakona država članica EU:

— Direktiva za mašine (2006/42/EC).
Korišćen standard: EN 809:1998 + A1:2009.

— Direktiva niskog napona (2006/95/EC). Primenljivo kada je nominalna snaga niža od 1,5 kW.
Korišćeni standardi: 60335-2-41:2003 + A1:2004 + A2:2010, osim odeljaka 25.1 i 25.8.

— Direktiva o ekološkom projektovanju (2009/125/EC).
Pumpe za vodu:
Uredba komisije br. 547/2012.
Odnosi se samo na pumpe za vodu označene sa indeksom minimalne efikasnosti MEI. Pogledajte natpisnu pločicu pumpe.

Vratilo pumpe

Mi, Grundfos, izjavljujemo pod vlastitom odgovornošću da je proizvod SP, na koji se ova izjava odnosi, u skladu sa direktivama Saveta za usklađivanje zakona država članica EU:

— Direktiva za mašine (2006/42/EC).
Korišćen standard: EN 809:1998 + A1:2009.

— Direktiva o ekološkom projektovanju (2009/125/EC).
Pumpe za vodu:
Uredba komisije br. 547/2012.
Odnosi se samo na pumpe za vodu označene sa indeksom minimalne efikasnosti MEI. Pogledajte natpisnu pločicu pumpe.

Pre nego što se pumpa pusti u rad kompletna mašinerija u koju je pumpa inkorporisana mora biti u skladu sa lokalnim bitnim regulativama.

FI: EY-vaatimustenmukaisuusvakuutus

Me, Grundfos, vakuutamme omalla vastuullamme, että tuote SP, jota tämä vakuutus koskee, on EY:n jäsenvaltioiden lainsäädännön yhdenmukaistamiseen tähtäävien Euroopan neuvoston direktiivien vaatimusten mukainen seuraavasti:

— Konedirektiivi (2006/42/EY).
Sovellettu standardi: EN 809:1998 + A1:2009.

— Pienjännitedirektiivi (2006/95/EY). Koskee alle 1,5 kW nimellistehoa.
Sovellettavat standardit: 60335-2-41:2003 + A1:2004 + A2:2010, lukuun ottamatta kappaleita 25.1 ja 25.8.

— Ekologista suunnittelua koskeva direktiivi (2009/125/EY).
Vesipumput:
Komission asetus nro 547/2012.
Koskee vain vesipumppuja, jotka on merkitty minimihyötysuhdeindeksillä MEI. Katso pumpun tyyppikilvestä.

Erillinen pumppu

Me, Grundfos, vakuutamme omalla vastuullamme, että tuotteet SP, joita tämä vakuutus koskee, ovat EY:n jäsenvaltioiden lainsäädännön yhdenmukaistamiseen tähtäävien Euroopan neuvoston direktiivien vaatimusten mukaisia seuraavasti:

— Konedirektiivi (2006/42/EY).
Sovellettu standardi: EN 809:1998 + A1:2009.

— Ekologista suunnittelua koskeva direktiivi (2009/125/EY).
Vesipumput:
Komission asetus nro 547/2012.
Koskee vain vesipumppuja, jotka on merkitty minimihyötysuhdeindeksillä MEI. Katso pumpun tyyppikilvestä.

Ennen pumpun käyttöönottoa koko järjestelmä, jossa pumppua tullaan käyttämään, on osoitettava kaikkien soveltuvien säädösten mukaiseksi.

SE: EG-försäkran om överensstämmelse

Vi, Grundfos, försäkrar under ansvar att produkten SP, som omfattas av denna försäkran, är i överensstämmelse med rådets direktiv om inbördes närmande till EU-medlemsstaternas lagstiftning, avseende:

— Maskindirektivet (2006/42/EG).
Tillämpad standard: EN 809:1998 + A1:2009.

— Lågspänningsdirektivet (2006/95/EG). Kan användas när märkeffekten är lägre än 1,5 kW.
Tillämpade standarder: 60335-2-41:2003 + A1:2004 + A2:2010, förutom avsnitt 25.1 och 25.8.

— Ekodesigndirektivet (2009/125/EG).
Vattenpumpar:
Kommissionens förordning nr. 547/2012.
Avser endast vattenpumpar markerade med min. effektivitetsindex (MEI). Se pumpens typskylt.

Pump utan koppling och motor

Vi, Grundfos, försäkrar under ansvar att produkterna SP, som omfattas av denna försäkran, är i överensstämmelse med rådets direktiv om inbördes närmande till EU-medlemsstaternas lagstiftning, avseende:

— Maskindirektivet (2006/42/EG).
Tillämpad standard: EN 809:1998 + A1:2009.

— Ekodesigndirektivet (2009/125/EG).
Vattenpumpar:
Kommissionens förordning nr. 547/2012.
Avser endast vattenpumpar markerade med min. effektivitetsindex (MEI). Se pumpens typskylt.

Före igångkörning av pumpen måste hela applikationen, som pumpen kommer att vara en del av, stämma överens med samtliga relevanta föreskrifter.

VN: Cam kết về sự phù hợp EC

Công ty Grundfos chúng tôi cam kết chịu trách nhiệm chính về sản phẩm SP cho những vấn đề liên quan đến cam kết này, phù hợp với các chỉ dẫn của các điều luật thành viên cộng đồng Châu Âu.

— Máy móc thiết bị (2006/42/EC).
Tiêu chuẩn áp dụng: EN 809:1998 + A1:2009.

— Thiết bị điện sử dụng nguồn điện thế thấp (2006/95/EC). Áp dụng khi dòng điện danh định thấp hơn 1,5 kW.
Tiêu chuẩn áp dụng: 60335-2-41:2003 + A1:2004 + A2:2010, ngoại trừ phần 25.1 và 25.8.

— Chỉ thị thiết kế sinh thái (2009/125/EC).
Máy bơm nước:
Bảng nội quy số 547/2012.
Chỉ áp dụng cho máy bơm nước được đánh dấu với chỉ số hiệu quả tối thiểu MEI. Xem bảng tên bơm.

??u b?m

Công ty Grundfos chúng tôi cam kết chịu trách nhiệm chính về sản phẩm SP cho những vấn đề liên quan đến cam kết này, phù hợp với các chỉ dẫn của các điều luật thành viên cộng đồng Châu Âu:

— Máy móc thiết bị (2006/42/EC).
Tiêu chuẩn áp dụng: EN 809:1998 + A1:2009.

— Chỉ thị thiết kế sinh thái (2009/125/EC).
Máy bơm nước:
Bảng nội quy số 547/2012.
Chỉ áp dụng cho máy bơm nước được đánh dấu với chỉ số hiệu quả tối thiểu MEI. Xem bảng tên bơm.

Trước khi máy bơm được đưa vào sử dụng, toàn bộ các hệ thống máy móc gắn kết với máy bơm cũng phải được lắp đặt phù hợp với những quy định liên quan.

TR: EC uygunluk bildirgesi

Grundfos olarak bu beyannameye konu olan SP ürünlerinin, AB Üyesi Ülkelerin kanunlarını birbirine yaklaştırma üzerine Konsey Direktifleriyle uyumlu olduğunun yalnızca bizim sorumluluğumuz altında olduğunu beyan ederiz:

— Makineler Yönetmeliği (2006/42/EC).
Kullanılan standart: EN 809:1998 + A1:2009.

— Düşük Voltaj Yönetmeliği (2006/95/EC). Nominal güç 1,5 kW'tan daha düşük olduğunda uygulanabilir.
Kullanılan standartlar: 60335-2-41:2003 + A1:2004 + A2:2010, 25.1 ve 25.8. bölümleri hariç.

— Çevreye duyarlı tasarım (Ecodesign) Direktifi (2009/125/EC).
Devirdaim su pompaları:
547/2012 sayılı Komisyon Yönetmeliği.
Yalnızca Minimum Enerji Verimlilik Endeksine (MEI) dahil olan olan devirdaim su pompaları için geçerlidir. Pompanın bilgi etiketine bakın.

??plak ?aft pompa

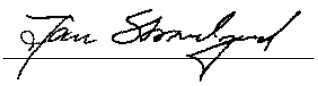
Grundfos olarak bu beyannameye konu olan SP ürünlerinin, AB Üyesi Ülkelerin kanunlarını birbirine yaklaştırma üzerine Konsey Direktifleriyle uyumlu olduğunun yalnızca bizim sorumluluğumuz altında olduğunu beyan ederiz:

— Makineler Yönetmeliği (2006/42/EC).
Kullanılan standart: EN 809:1998 + A1:2009.

— Çevreye duyarlı tasarım (Ecodesign) Direktifi (2009/125/EC).
Devirdaim su pompaları:
547/2012 sayılı Komisyon Yönetmeliği.
Yalnızca Minimum Enerji Verimlilik Endeksine (MEI) dahil olan olan devirdaim su pompaları için geçerlidir. Pompanın bilgi etiketine bakın.

Pompa kullanılmaya başlamadan önce pompayla birlikte çalışacak olan tüm makinelerin ilgili kanunlara uygunluğu beyan edilmelidir.

Bjerringbro, 15th September 2012



Jan Strandgaard
Technical Director
Grundfos Holding A/S
Poul Due Jensens Vej 7
8850 Bjerringbro, Denmark

Person authorised to compile technical file and empowered to sign the EC declaration of conformity.

Декларация о соответствии на территории РФ

Насосы типа SP сертифицированы на соответствие требованиям Технического регламента о безопасности машин и оборудования (Постановление правительства РФ от 15.09.2009 №753).
Сертификат соответствия:
№ C-DK.АЯ56.B.03740, срок действия до 27.05.2017г.

Истра, 1 августа 2012 г.



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Original safety instructions.

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Warning

Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

1. Symbols used in this document



Warning

If these safety instructions are not observed, it may result in personal injury.



Warning

If these instructions are not observed, it may lead to electric shock with consequent risk of serious personal injury or death.

Caution ***If these safety instructions are not observed, it may result in malfunction or damage to the equipment.***

Note ***Notes or instructions that make the job easier and ensure safe operation.***

2. Introduction

These safety instructions apply to Grundfos submersible pumps, type SP, with Grundfos submersible motors, types MS or MMS.

If the pump is fitted with another motor make, please note that the motor data may differ from the data stated in this document.

Note ***The USB stick supplied with the product contains installation and operating instructions in various languages.***

3. Delivery

Caution ***The pump should remain in the packing until it is placed in vertical position during installation.***

Handle the pump with care.

4. Pumped liquids

Clean, thin, non-explosive liquids without solid particles or fibres.



Warning

If the pump is used for pumping hot liquids (40 to 60 °C), make sure that persons cannot come into contact with the pump and the installation, e.g. by installing a guard.

5. Preparations before installation



Warning

Before starting work on the product, switch off the power supply. Make sure that the power supply cannot be accidentally switched on.

5.1 Positional requirements



Warning

If the pump is to be installed in a position where it is accessible, the coupling must be suitably isolated from human touch. The pump can for instance be built into a flow sleeve.

5.2 Pipe connection



Warning

Make sure that the pipes are suitable for the actual liquid temperature and the pump pressure.

6. Electrical connection



Warning

During electrical installation, make sure that the power supply cannot be accidentally switched on.



Warning

The electrical installation should be carried out by an authorised person in accordance with local regulations.



Warning

The pump must be earthed.

The pump must be connected to an external mains switch with a minimum contact gap of 3 mm in all poles.



Warning

MS 402 motors for supply voltages up to and including 440 V (see motor nameplate) must be protected against voltage peaks higher than 650 V (peak value) between the supply terminals.

7. Startup

Caution ***Fix and submerge the pump before starting it.***

8. Maintenance and service



Warning

If a pump has been used for a liquid which is injurious to health or toxic, it will be classified as contaminated.

9. Disposal

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

Subject to alterations.

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ECM: 1075644

Appendix 6

Charlie Bore Technical Information

Charlie Bore is the oldest active bore and control panel on campus and as such no O&M manuals for Charlie Bore were available to add to this manual.

The current configuration of the light rail, landscaping, site access within UNSW and overhead trees would mean that the crane required to removal of the bore pump would be extremely difficult to position onsite. Considering the age of the bore, it is recommended that if this bore fails, then an alternate bore location and new equipment be considered.

We note that majority of the equipment, pumps etc are like Alpha Bore. It is recommended that the Alpha Bore manual be reviewed to further explain Charlie Bores operations.

Appendix 7

Tyree Raw Bore Water equipment

Trevor Stocker

From: Trevor Stocker
Sent: Tuesday, 5 April 2016 10:24 AM
To: Caine Chin Poy (caine@knightplumbingandgas.com.au)
Cc: 'martial@enhancecabling.com.au'
Subject: Tyree bore water tank amended levels.

Caine

The arrangement of the modified pump suction inlets within the tank are as follows:

The new vortex plate is to be set at 110mm from the base of the vortex plate to the finished floor level of the tank.

The vortex plate is to have 500mm clear (of walls and other obstructions) around the plate.

We need to confirm with a dumpy the exact depth of both of the tanks to ensure that both of the vortex plates are at the same level. Can you arrange to have a dumpy onsite at some point so we can confirm the levels.

The lowest water level within the tank can be set at 135mm above the base of the tank, however I recommend that we set the minimum water level at 150mm above the FFL of the tank at the Vortex plate. This will still be a major improvement on what was there previously.

Martial, You and I need to think about the pump levels (on & off levels before we refill the tank).

Regards,

Trevor Stocker
Hydraulic Engineer, UNSW Facilities Management
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PLEASE NOTE: Engineering advice provided as part of this email is intended as advice only and does not automatically constitute a variation. It is the installing contractors responsibility to provide compliant installation in accordance with the BCA, Australian Standards, revelant Codes and UNSW Design & Construction Requirements (http://www.facilities.unsw.edu.au/sites/all/files/page_file_attachment/aPart%20E.1%20DC%20Requirements%20Rev5.8.pdf).

CRICOS Provider Code: 00098G

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CE

LOWARA

LOWARA srl UNIPERSONALE
VIA LOMBARDI 14-36075
MONTECCHIO MAGGIORE - VI - ITALY

Pump	22SV07F075T		
Seal	Q1BEGG	E	
Code	AVD2207FNL		
Q	11 — 29		m3/h
H	103.1 — 48.8		m
H min	48.8		m
n	2900		1/min
Hz	50		
PN	25		bar
t max	120		°c
P2	7.5		kW
No	RDSV1011 — 06736		

MADE IN ITALY

ITT

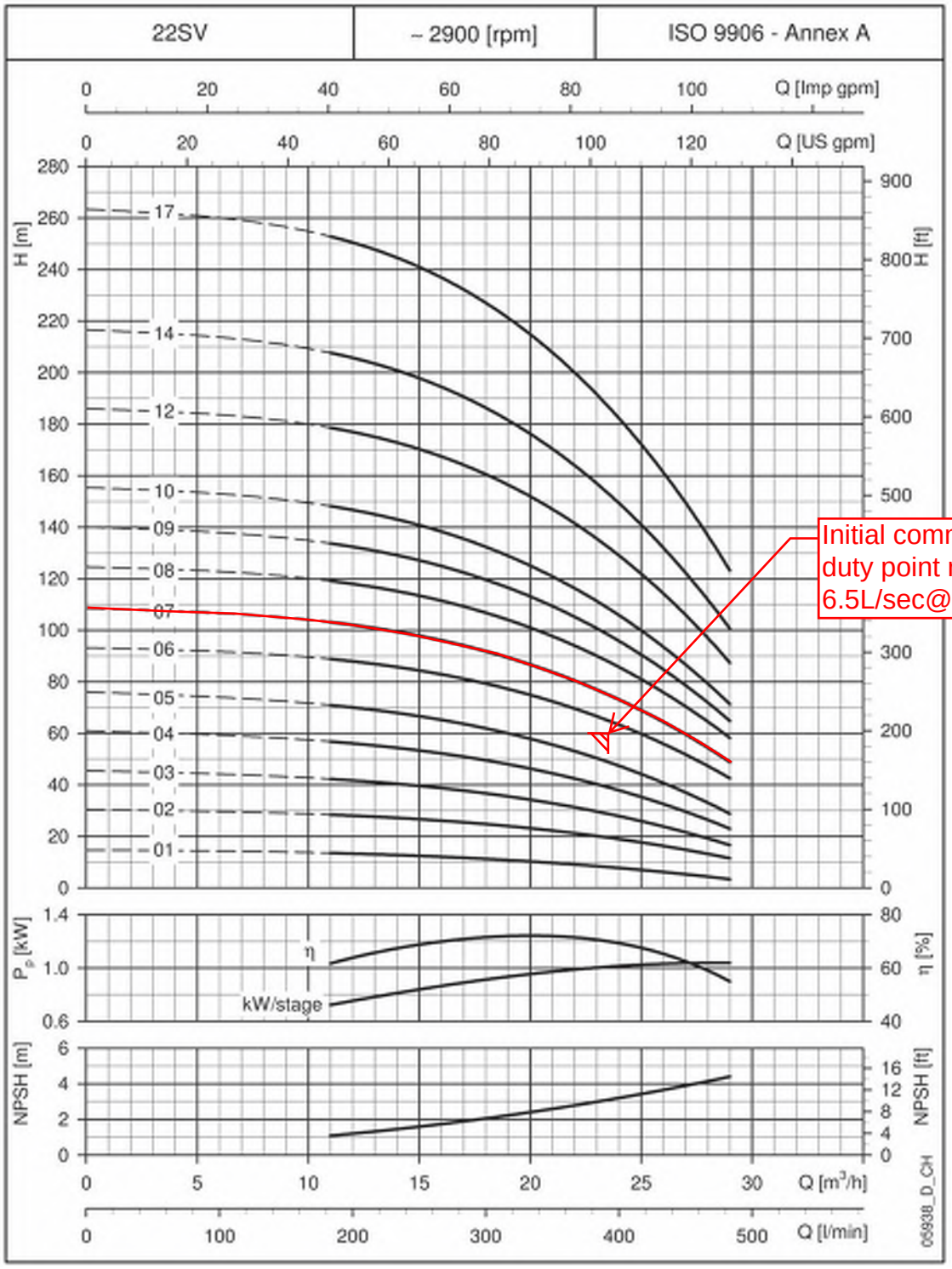
10, 15, 22SV Series
HYDRAULIC PERFORMANCE TABLE AT 50 Hz, 2 POLES

PUMP TYPE	RATED POWER		Q = DELIVERY													
			l/min 0	83,34	100	133	170	183,34	233	270	330	350	400	430	460	483,33
			m^3/h 0	5,0	6,0	8,0	10,2	11,0	14,0	16,2	19,8	21,0	24,0	25,8	27,6	29,0
	kW	HP	H = TOTAL HEAD IN METRES OF COLUMN OF WATER													
10SV01	0,75	1	11,8	11,2	10,9	9,9	8,3	7,6	4,3							
10SV02	0,75	1	23,6	21,9	21,3	19,6	17,0	15,8	10,0							
10SV03	1,1	1,5	35,7	33,0	32,1	29,6	25,8	24,1	16,0							
10SV04	1,5	2	47,7	44,2	43,0	39,9	34,8	32,6	21,7							
10SV05	2,2	3	60,0	56,1	54,7	50,9	44,9	42,2	29,0							
10SV06	2,2	3	71,8	66,8	65,0	60,4	53,1	49,8	33,9							
10SV07	3	4	83,6	78,3	76,2	70,8	62,1	58,3	39,8							
10SV08	3	4	95,3	88,9	86,5	80,1	70,2	65,7	44,5							
10SV09	4	5,5	106,3	100,1	97,5	90,8	80,0	75,1	52,1							
10SV10	4	5,5	118,0	110,8	107,9	100,3	88,2	82,8	57,2							
10SV11	4	5,5	129,6	121,3	118,1	109,6	96,3	90,3	62,1							
10SV13	5,5	7,5	156,0	146,5	142,7	132,6	116,4	109,2	74,3							
10SV15	5,5	7,5	179,5	167,9	163,4	151,6	132,8	124,3	83,9							
10SV17	7,5	10	205,0	193,2	188,5	175,7	154,7	145,2	98,8							
10SV18	7,5	10	216,9	204,2	199,1	185,5	163,2	153,1	104,0							
10SV20	7,5	10	240,6	226,0	220,3	205,0	180,2	168,9	114,3							
10SV21	11	15	253,6	241,0	235,5	220,2	195,0	183,5	127,5							
15SV01	1,1	1,5	14,0			12,9	12,4	12,2	11,3	10,4	8,4	7,6	5,1			
15SV02	2,2	3	28,7			26,7	25,9	25,5	23,9	22,4	18,9	17,4	13,1			
15SV03	3	4	43,3			40,4	39,1	38,6	36,2	33,8	28,7	26,5	20,1			
15SV04	4	5,5	58,4			54,7	53,1	52,5	49,4	46,3	39,7	36,9	28,7			
15SV05	4	5,5	72,7			67,8	65,8	65,0	61,0	57,1	48,7	45,2	34,9			
15SV06	5,5	7,5	87,6			81,5	79,4	78,4	74,1	69,9	60,3	56,3	44,2			
15SV07	5,5	7,5	101,9			94,5	91,9	90,8	85,7	80,6	69,4	64,7	50,5			
15SV08	7,5	10	117,4			110,9	108,0	106,8	100,8	94,9	82,0	76,7	60,6			
15SV09	7,5	10	131,9			124,4	121,0	119,6	112,8	106,1	91,5	85,5	67,4			
15SV10	11	15	147,7			138,8	135,3	133,8	126,7	119,6	103,9	97,4	77,5			
15SV11	11	15	162,3			152,4	148,5	146,8	138,9	131,1	113,8	106,5	84,7			
15SV13	11	15	191,3			179,2	174,5	172,5	163,1	153,7	133,1	124,5	98,6			
15SV15	15	20	222,1			209,9	204,8	202,6	192,2	181,7	158,3	148,5	118,8			
15SV17	15	20	251,6			237,3	231,4	228,9	216,9	205,0	178,4	167,3	133,6			
22SV01	1,1	1,5	14,7					13,5	12,7	12,0	10,4	9,7	7,7	6,3	4,7	3,4
22SV02	2,2	3	30,4					28,4	27,2	26,0	23,3	22,2	18,9	16,6	13,8	11,5
22SV03	3	4	45,4					42,2	40,4	38,5	34,5	32,8	27,8	24,2	20,2	16,6
22SV04	4	5,5	60,9					56,8	54,4	51,9	46,6	44,4	37,9	33,1	27,7	23,0
22SV05	5,5	7,5	76,0					70,9	67,9	64,9	58,3	55,6	47,4	41,4	34,7	28,8
22SV06	7,5	10	93,2					88,8	85,7	82,5	75,4	72,4	63,3	56,7	49,1	42,6
22SV07	7,5	10	108,5					103,1	99,4	95,7	87,2	83,7	73,1	65,3	56,5	48,8
22SV08	11	15	124,6					119,2	115,2	111,0	101,6	97,7	85,7	77,0	66,9	58,2
22SV09	11	15	140,1					133,7	129,2	124,4	113,8	109,3	95,8	86,0	74,6	64,8
22SV10	11	15	155,4					148,2	143,1	137,8	125,9	120,9	105,8	94,8	82,3	71,3
22SV12	15	20	186,1					178,6	172,9	166,8	152,9	147,0	129,1	115,9	100,7	87,4
22SV14	15	20	216,6					207,7	200,9	193,7	177,4	170,4	149,4	133,9	116,1	100,6
22SV15	18,5	25	232,7					223,6	216,5	208,9	191,6	184,2	161,8	145,3	126,3	109,8

Performances in compliance with ISO 9906 - Annex A.

10-22sv-2p50-en_a_th

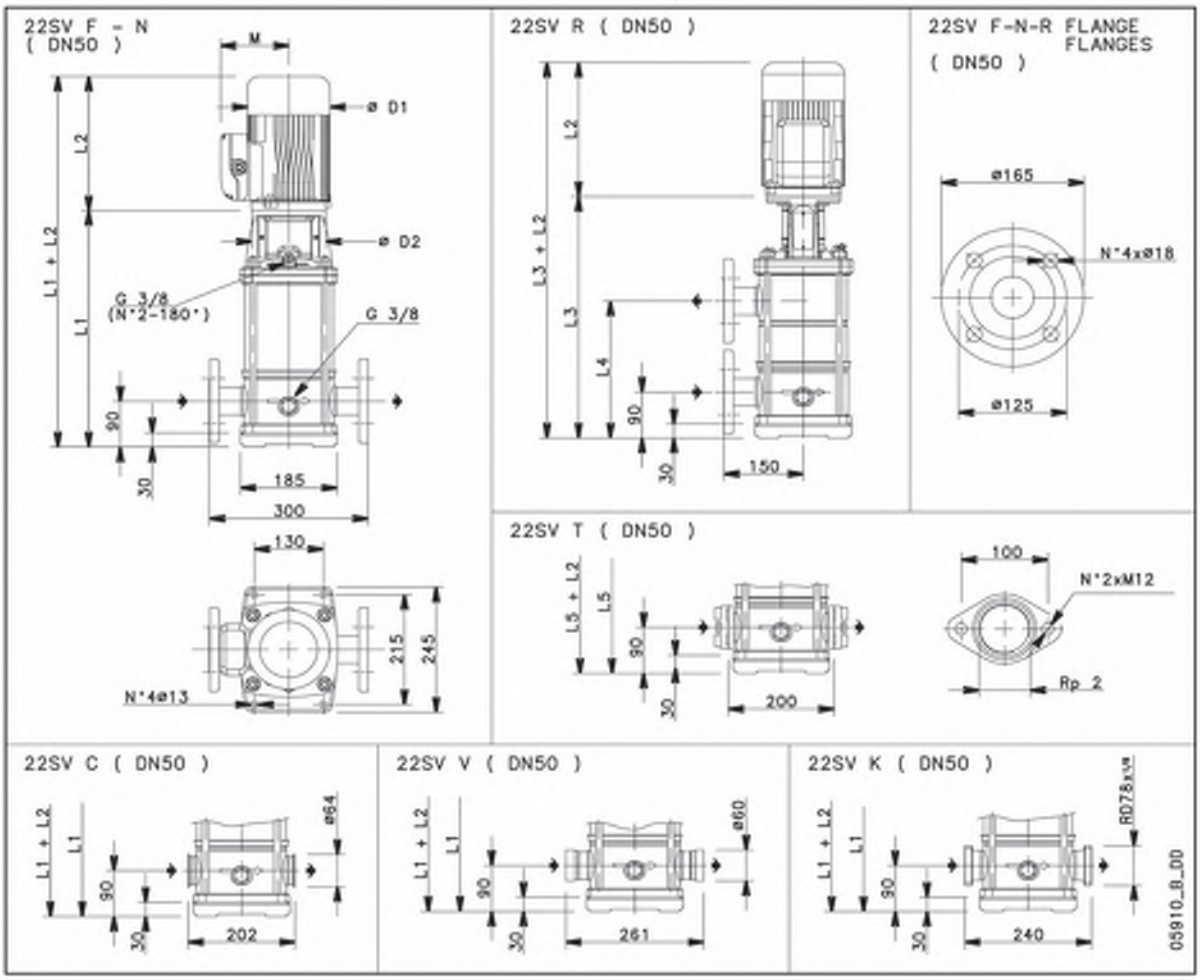
22SV Series
OPERATING CHARACTERISTICS AT 50 Hz, 2 POLES



These performances are valid for liquids with density ρ = 1.0 kg/dm³ and kinematic viscosity ν = 1 mm²/s.

Engineered for life

22SV Series
DIMENSIONS AND WEIGHTS AT 50 Hz, 2 POLES



PUMP TYPE	MOTOR		DIMENSIONS (mm)											WEIGHT kg	
				L2					M		D1				ELECTRIC
	kW	SIZE	L1	1 ~	3 ~	L3	L4	L5	1 ~	3 ~	1 ~	3 ~	D2	PUMP	PUMP
22SV01	1,1	80	399	263	263	-	-	399	137	129	155	155	120	15,5	28,3
22SV02	2,2	90	409	298	298	-	-	409	151	134	174	174	140	17,2	35,4
22SV03	3	100	467	-	298	-	-	467	-	134	-	174	160	19,4	40,4
22SV04	4	112	515	-	319	515	301	515	-	154	-	197	160	20,7	47,1
22SV05	5,5	132	630	-	375	630	349	630	-	168	-	214	300	26,7	65
22SV06	7,5	132	678	-	367	678	397	678	-	191	-	256	300	28	84
22SV07	7,5	132	726	-	367	726	445	726	-	191	-	256	300	29,3	86
22SV08	11	160	804	-	428	804	493	804	-	191	-	256	350	33,1	104
22SV09	11	160	852	-	428	852	541	852	-	191	-	256	350	34,4	105
22SV10	11	160	900	-	428	900	589	900	-	191	-	256	350	35,8	107
22SV12	15	160	996	-	494	996	685	-	-	240	-	313	350	38,4	141
22SV14	15	160	1092	-	494	1092	781	-	-	240	-	313	350	41,1	144
22SV17	18,5	160	1236	-	494	1236	925	-	-	240	-	313	350	45,1	156

22sv-2p50-en_a_td

CITY PUMP SERVICES AUSTRALIA P/L

SITE COMMISSIONING REPORT

Customer: AJAX PLUMBING	O/No. 139
Site Address: UNSW TYREE BUILDING – ANZAC PARADE, KENSINGTON	Job No. 5873
Contact: BRETT MALLYON Phone No: 0416 096 897	BORE WATER PRESSURE PUMPS

Risk Assessment Complete: YES Sub-Soil ☐ Sewage ☐ Stormwater ☐ Grease ☐

Confined Space: NO C.W. Boosters ☐ Hot Water ☐ Primary ☐ Secondary ☐

(If so permit completed) NO Pressure System ■ Vari-Speed ■

GENERAL CHECKS		*DESCRIPTION:*	Single ☐ Dual ☐ Triplex ☐ Quad ■ Other		
Holding Down Bolts	OK	Model 22SV07 Pump 1	13.87 Amps	13.59 Amps	12.99 Amps
Guards	OK	7.5kW 415 volts Pump 2	14.01 Amps	13.67 Amps	13.88 Amps
Coupling	OK	Pump 3	12.64 Amps	12.41 Amps	12.86 Amps
		Pump 4	13.19 Amps	12.79 Amps	13.27 Amps

Surplus Valve	N/A	SUBMERSIBLE PUMP		GREASE PUMP		HOT WATER	
Pressure Transducers	OK	Sub Inspection		Excessive Noise		Excessive Noise	
Sub. Inspection	OK	Impeller Trim		Holding Bolts		Holding Bolts	
Seals/Packing	OK	Oil Reservoir		All Valves		All Valves	
Nameplate/Stickers	OK	Pit Condition		Fittings		Fittings	
Auto/Manual Operation	OK	Excessive Noise		Pit Condition		Eliminators	
Pipe work	OK	Holding Bolts		Other		Gauges	
Paint work	OK	All Valves				Paint	
Rotation	OK	Fittings				Other	
Other		Float Switches					

CONTROL CABINETS		C.W. BOOSTERS PRESSURE SYSTEMS VARI-SPEED SYSTEM		OTHER PUMPS DESCRIPTION		OH&S ITEMS	
Enclosure	OK					Access to Area	OK
Circuit Breakers	OK					Lighting to Room	OK
Isolation Switch	OK	Excessive Noise	NO	Excessive Noise		Floor Drains	OK
Battery Indicators	N/A	Holding Bolts	OK	Holding Bolts		Area Safe	YES
Main Isolator	OK	All Valves	OK	All Valves		Other	
Indicator Lights	OK	Fittings	OK	Fittings			
Relays/Contactors	OK	Pressure Tank/s	OK	Pressure Tank/s			
Activation Buttons	OK	Shaft Seal/s	OK	Shaft Seal/s			
Alarm Bell	OK	All Fittings	OK	All Fittings			
Timers	N/A	Eliminators	OK	Eliminators			
Meters	N/A	Gauges	OK	Gauges			
Power	OK	Paint	OK	Paint			

COMMENTS: PUMPS HAVE BEEN SET TO OPERATE AT 650 kPa

PUMPS AND HYDROVAR VARIABLE SPEED DRIVES ARE OPERATING CORRECTLY AND MAINTAINING A SMOOTH PRESSURE.

Name: David Coltom	Commissioning Date: 20th January 2012

UNSW - FACILITIES MANAGEMENT

ELECTRICAL DRAWINGS
BORE WATER MONITORING

REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	ORDER No.
	A	DESIGN	12/06/15	ML	DC	TS	
	0	AS BUILT	31/07/15	ML	DC	SG	

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1221_000 PLOTTED ON: 2015-08-05

CONTRACTOR IDENTIFICATION

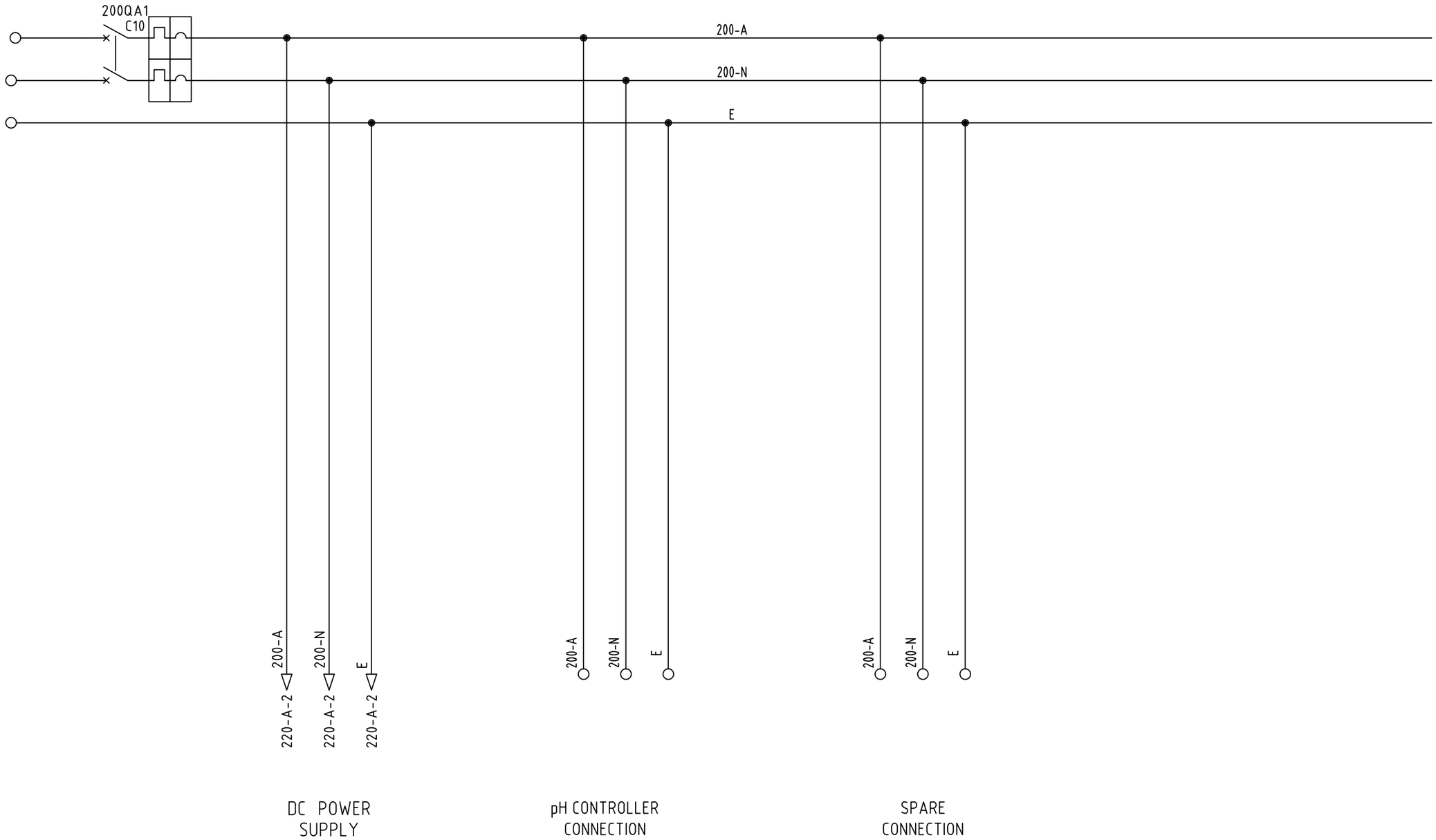
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DATE:	12/06/2015
CHECKED:	D COSTA
DATE:	12/06/2015
DESIGN ENG:	M LAWSON
DATE:	22/05/2015
APPROVED:	T STOCKER
DATE:	1/06/2015

PROJECT: BORE WATER MONITORING

TITLE: ELECTRICAL DRAWING SET COVER PAGE

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
1221-E-000	N.T.S.	1	0



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	ORDER No.
	A	DESIGN	12/06/15	ML	DC	TS	
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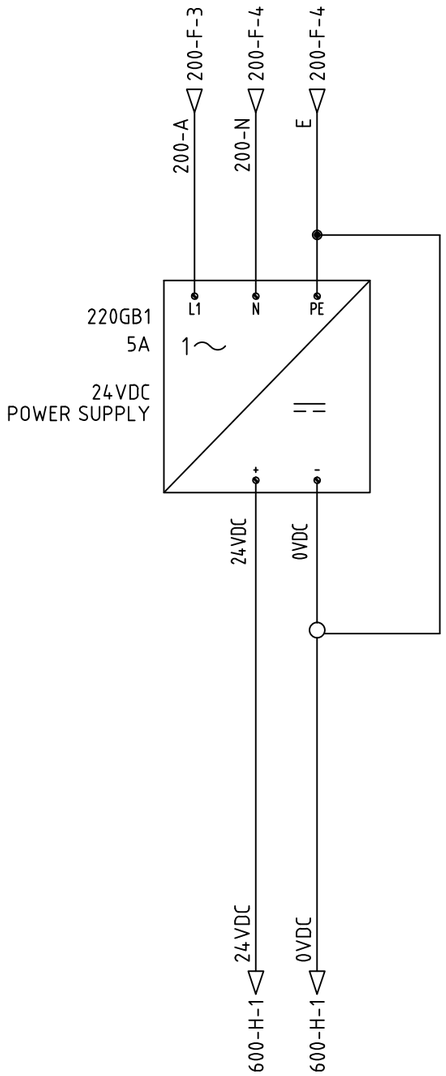
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DATE:	22/05/2015	
APPROVED:	T STOCKER	
DATE:	1/06/2015	

PROJECT: BORE WATER MONITORING

TITLE: ELECTRICAL DRAWING SET 230VAC DISRIBUTION

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
1221-E-200	N.T.S.	1	0



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	ORDER No.
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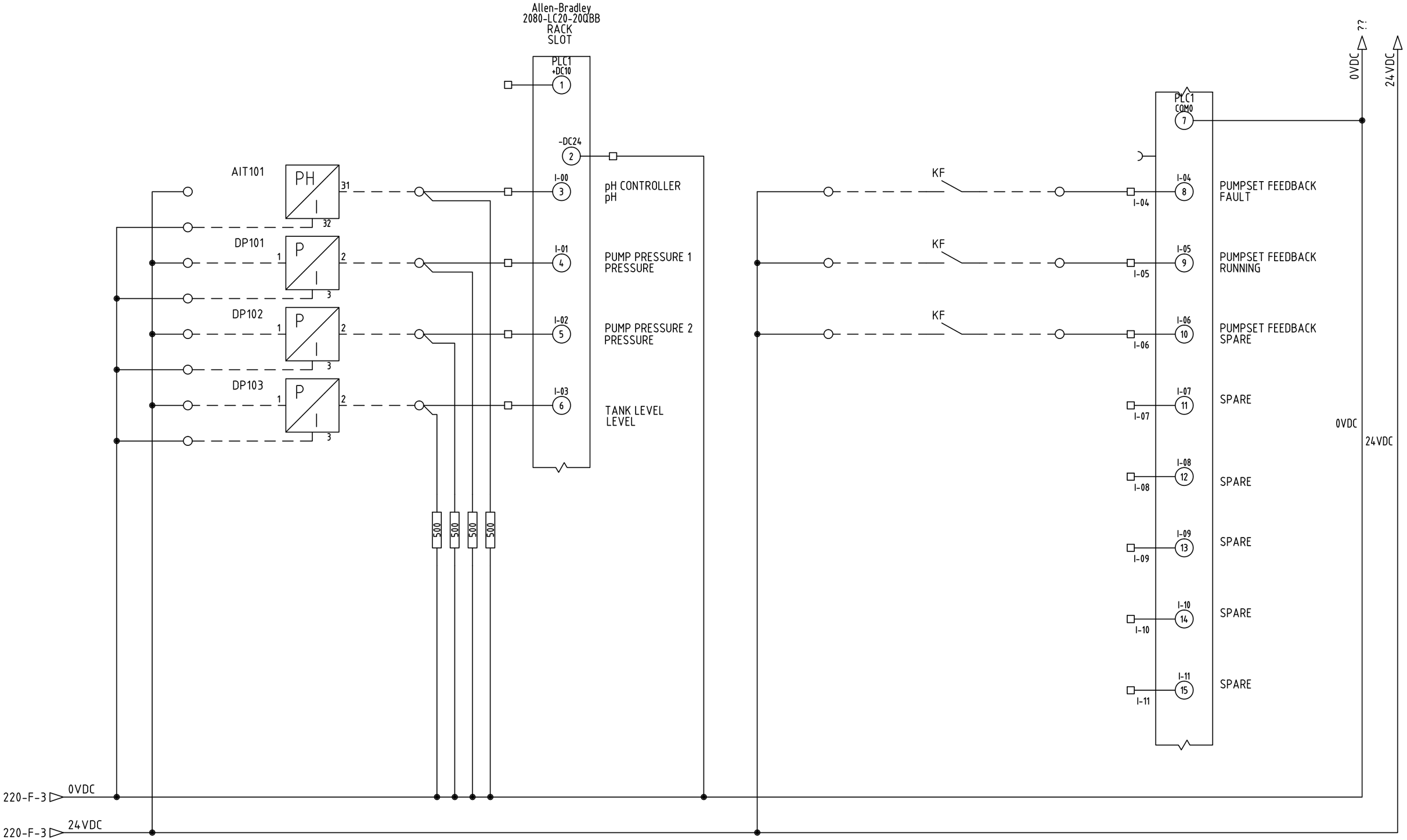
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DATE:	22/05/2015	
APPROVED:	T STOCKER	
DATE:	1/06/2015	

PROJECT: BORE WATER MONITORING

TITLE: ELECTRICAL DRAWING SET
24VDC DISTRIBUTION

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
1221-E-220	N.T.S.	1	0



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	ORDER No.
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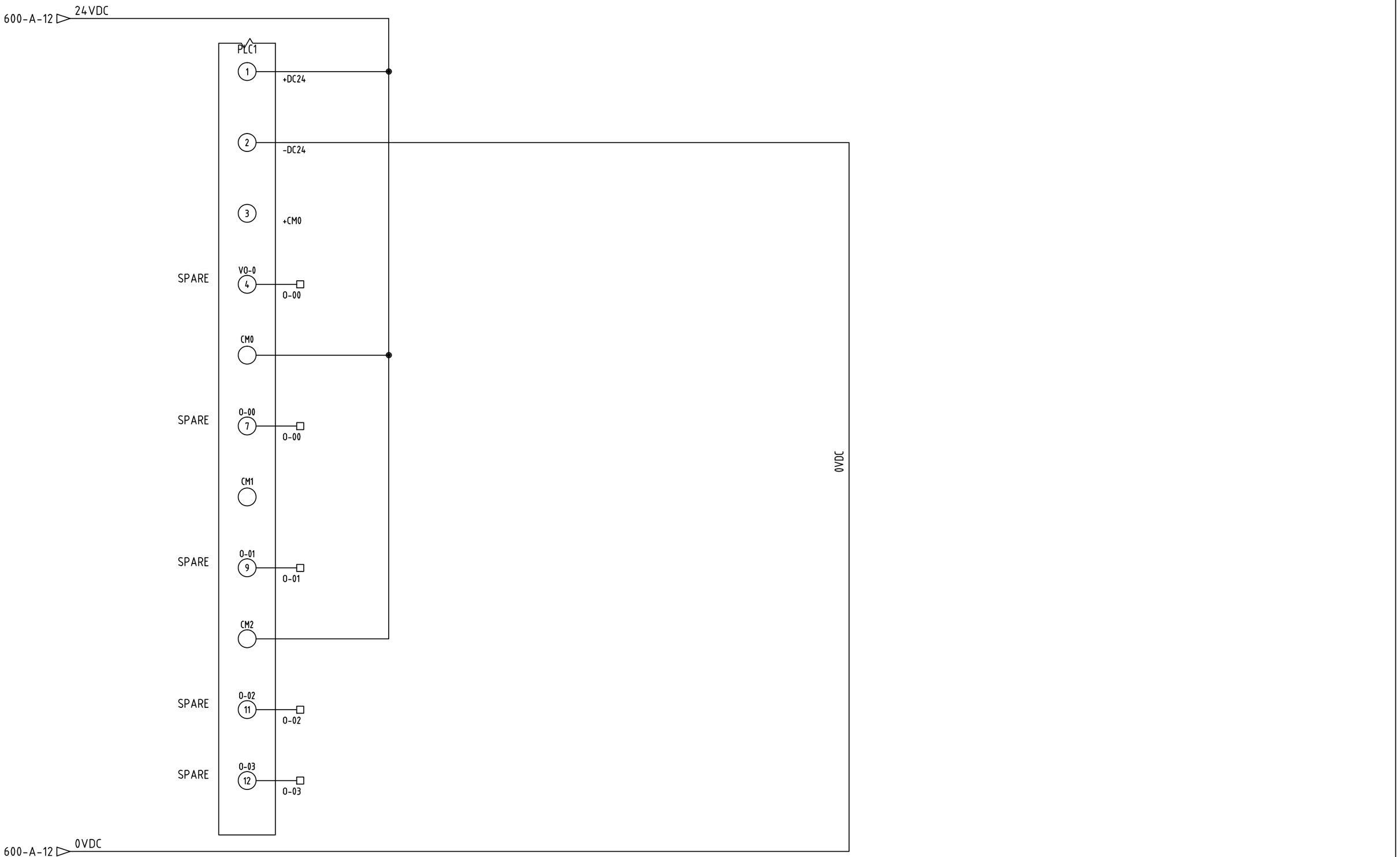
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DATE:	12/06/2015	
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DATE:	22/05/2015	
APPROVED:	T STOCKER	
DATE:	1/06/2015	

PROJECT: BORE WATER MONITORING

TITLE: ELECTRICAL DRAWING SET
PLC INPUTS

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
1221-E-600	N.T.S.	1	0



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	ORDER No.
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1221_601 PLOTTED ON: 2015-08-05

CONTRACTOR IDENTIFICATION

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DATE:	22/05/2015	
APPROVED:	T STOCKER	
DATE:	1/06/2015	

PROJECT: BORE WATER MONITORING

TITLE: ELECTRICAL DRAWING SET
PLC OUTPUTS

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
1221-E-601	N.T.S.	1	0

UNSW FACILITIES MANAGEMENT

BORE WATER SYSTEM MASTER CONTROLLER & LOWER CAMPUS BORE WATER RETICULATION PUMPS CONTROLLER

REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	PROJ. No.
	A	DESIGN	15/07/2016	ML	AB	TS	1723
	0	AS BUILT	1/08/16	ML	AB	TS	
	1	AS INSTALLED	22/12/16	ML	AB	TS	

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1606_000 PLOTTED ON: 2016-12-28

CONTRACTOR IDENTIFICATION

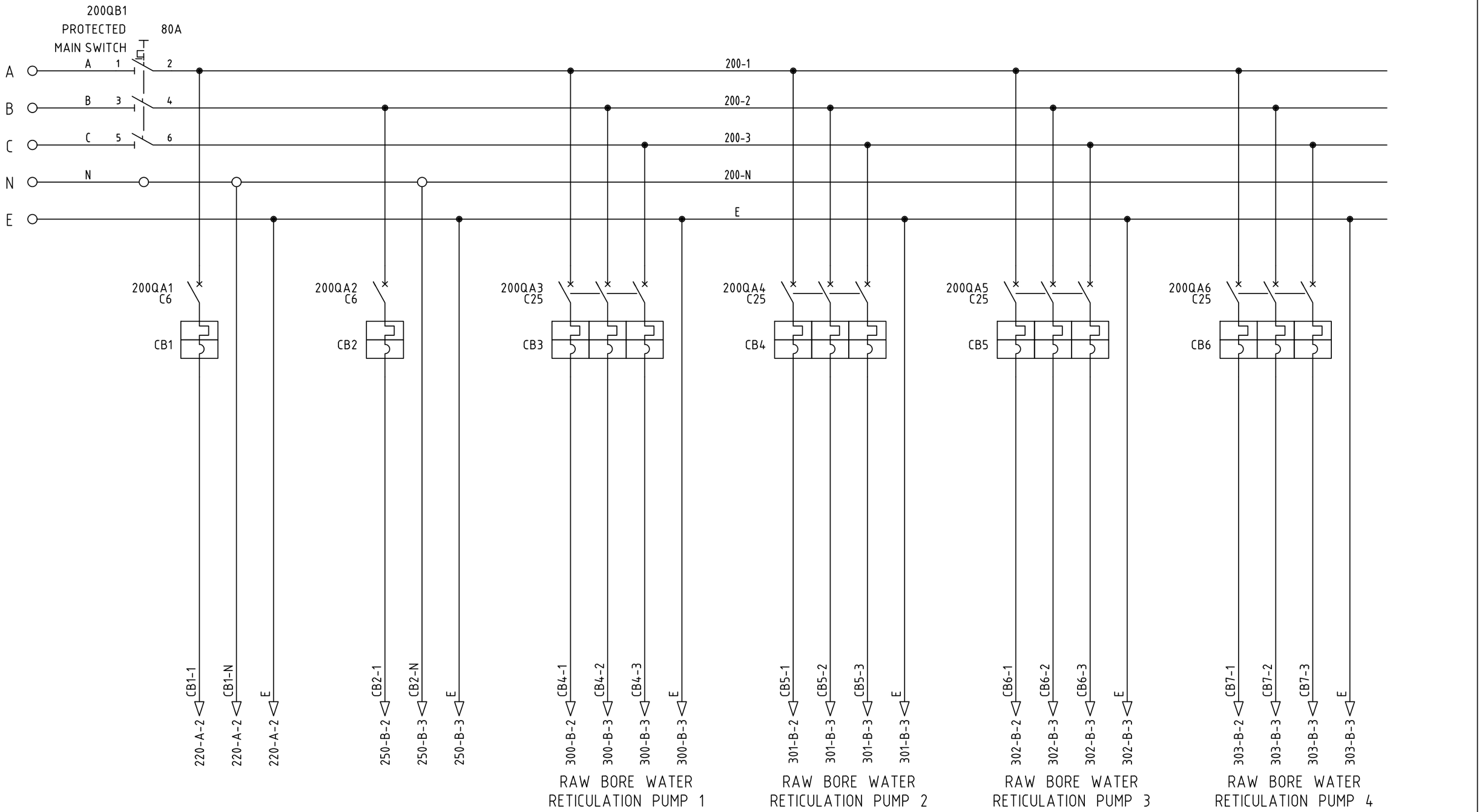
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CHECKED: DATE:	A BOX 16/07/2016
DESIGN ENG: DATE:	M LAWSON 4/07/2016
APPROVED: DATE:	T STOCKER

PROJECT: BORE SYSTEM MASTER CONTROLLER

TITLE: ELECTRICAL DRAWING SET
COVER SHEET

CLIENT: UNSW FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
1606-E - 000	N.T.S.	1	1



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	PROJ. No.
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	1	AS INSTALLED	22/12/16	ML	AB	TS	

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1606_200_1 PLOTTED ON: 2016-12-28

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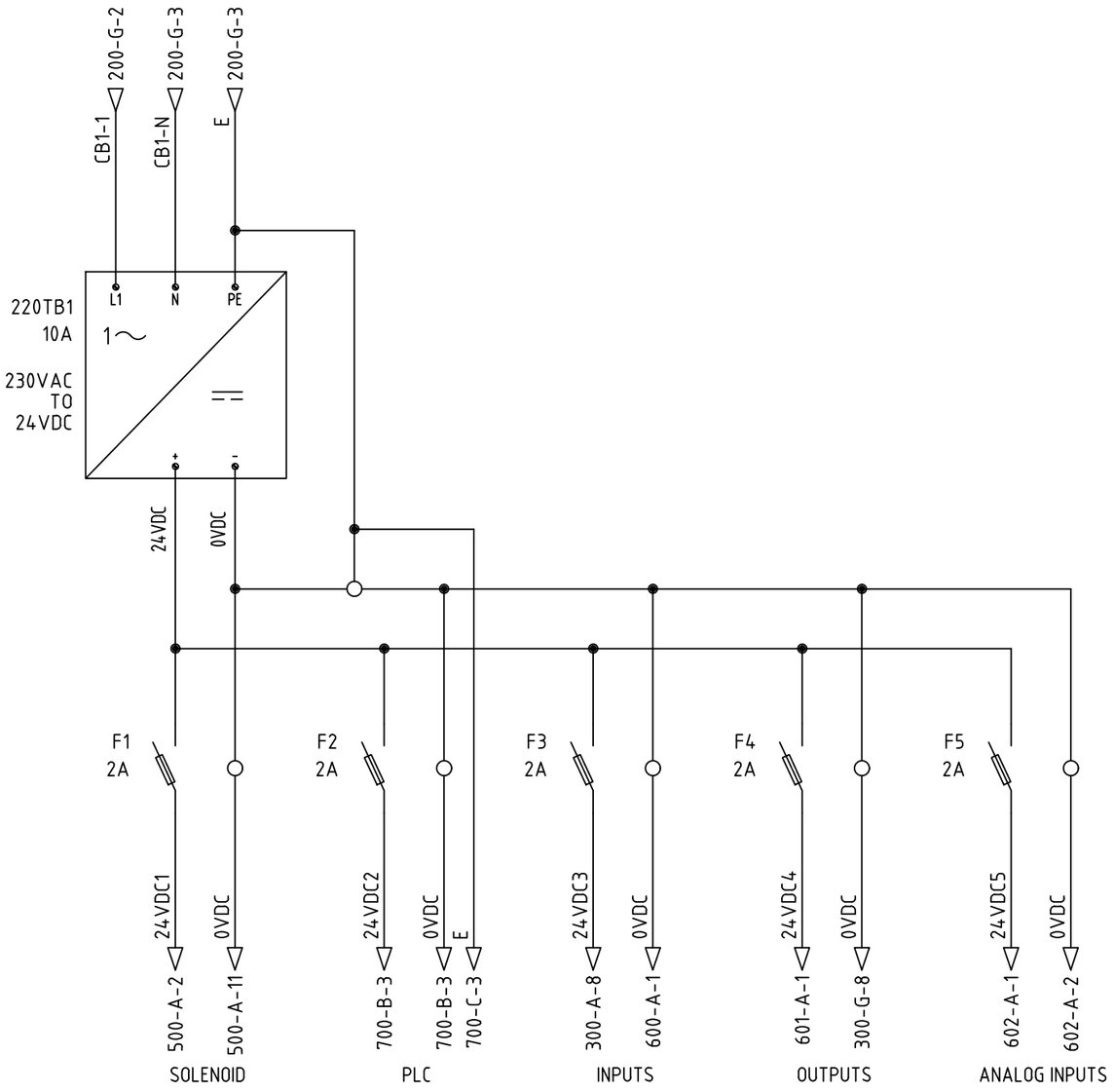
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APPROVED: DATE:	T STOCKER

PROJECT: BORE SYSTEM MASTER CONTROLLER

TITLE: ELECTRICAL DRAWING SET
400/230V AC DISTRIBUTION

CLIENT: UNSW FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
1606-E - 200	N.T.S.	1	1



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	PROJ. No.
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	1	AS INSTALLED	22/12/16	ML	AB	TS	

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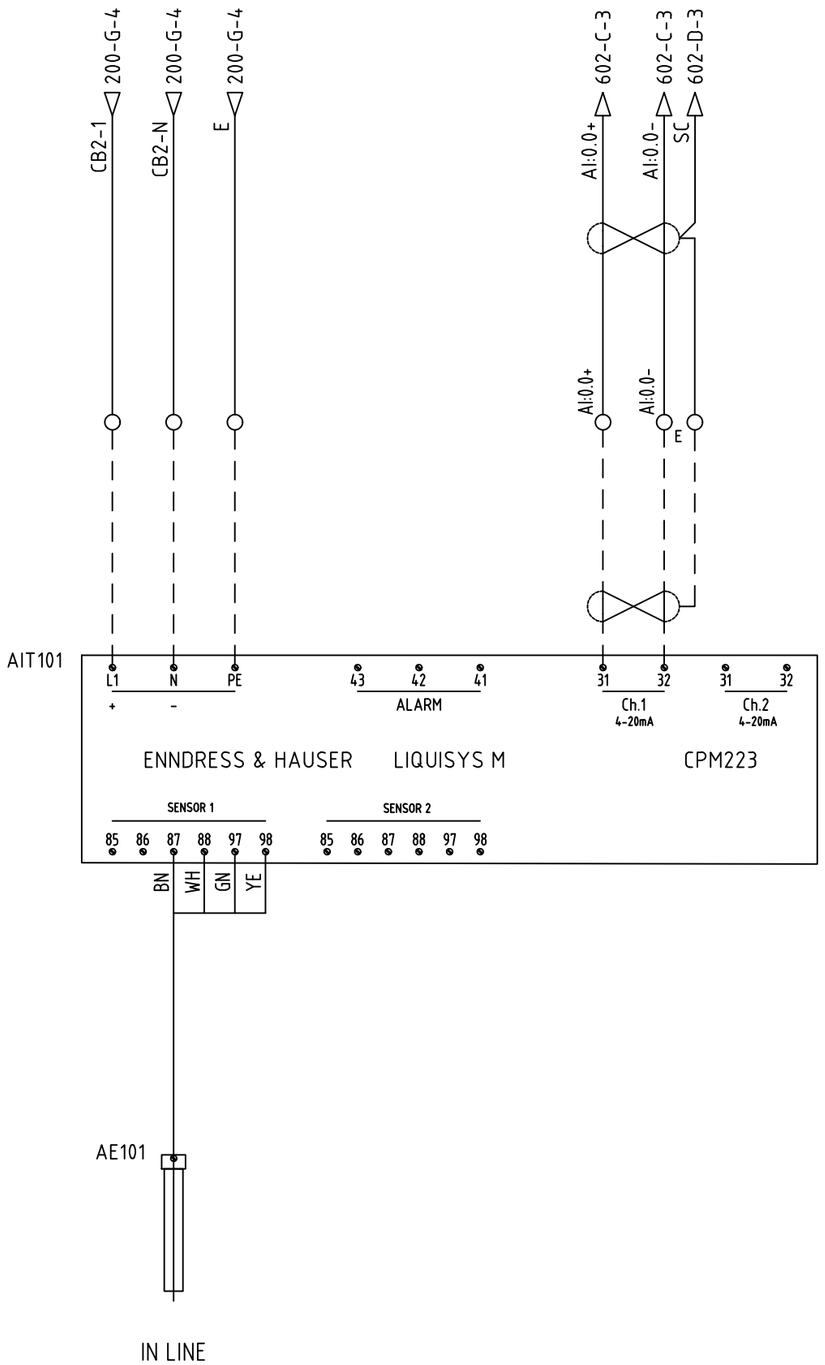
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DATE:	16/07/2016
DESIGN ENG:	M LAWSON
DATE:	4/07/2016
APPROVED:	T STOCKER
DATE:	

PROJECT: BORE SYSTEM MASTER CONTROLLER

TITLE: ELECTRICAL DRAWING SET
24V DC DISTRIBUTION

CLIENT: UNSW FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
1606-E - 220	N.T.S.	1	1



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	PROJ. No.
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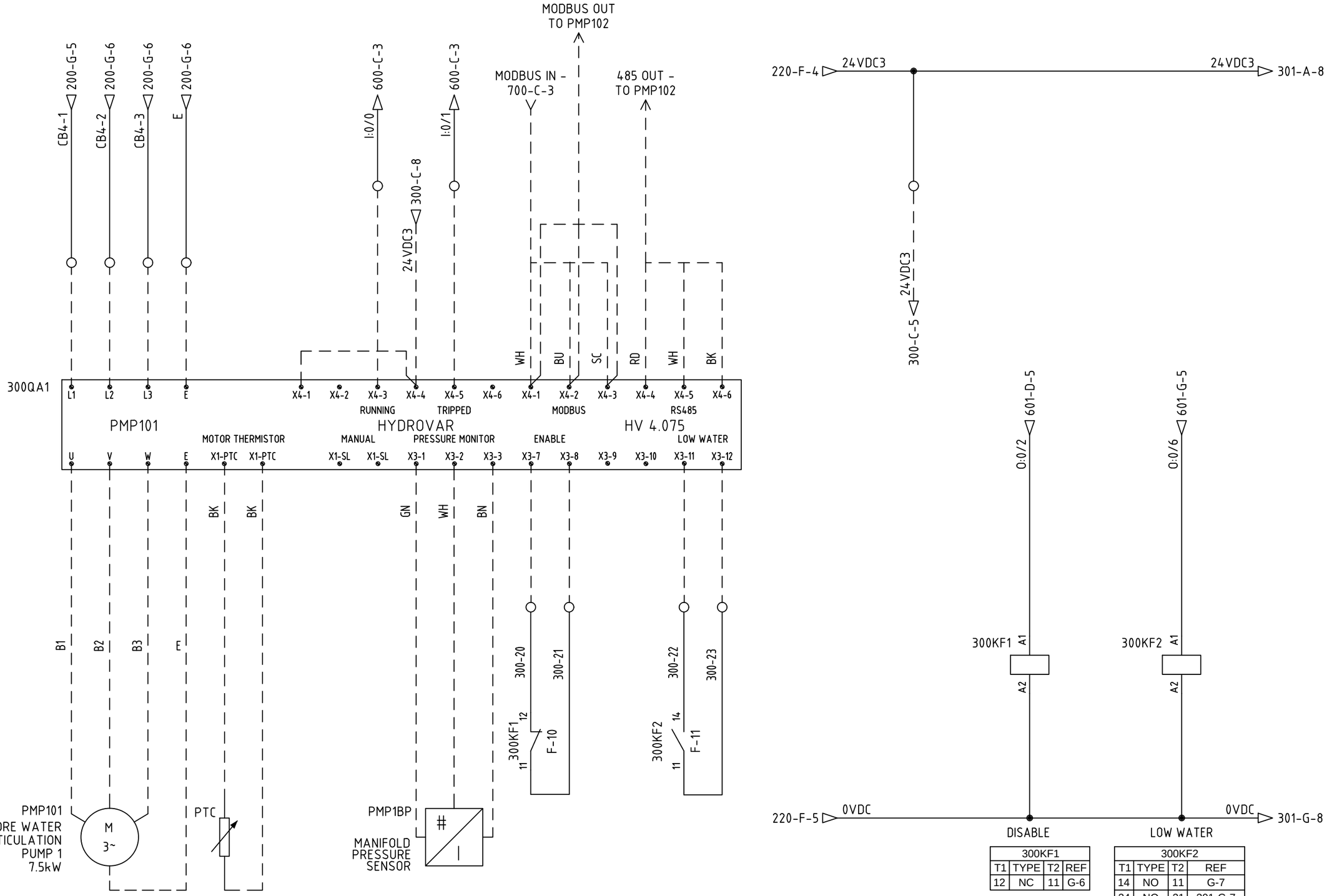
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CHECKED:	A BOX	DATE: 16/07/2016
DESIGN ENG:	M LAWSON	DATE: 4/07/2016
APPROVED:	T STOCKER	DATE:

PROJECT: BORE SYSTEM MASTER CONTROLLER

TITLE: ELECTRICAL DRAWING SET
ATC101 - RAW BORE WATER pH TRANSMITTER

CLIENT: UNSW FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
1606-E - 250	N.T.S.	1	1



300KF1			
T1	TYPE	T2	REF
12	NC	11	G-6

300KF2			
T1	TYPE	T2	REF
14	NO	11	G-7
24	NO	21	301-G-7
34	NO	31	302-G-7
44	NO	41	303-G-7

REVISION

REV:	DESC:	DATE:	DRN:	CHK:	APR:	PROJ. No.
A	DESIGN	15/07/2016	ML	AB	TS	1723
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1	AS INSTALLED	22/12/16	ML	AB	TS	

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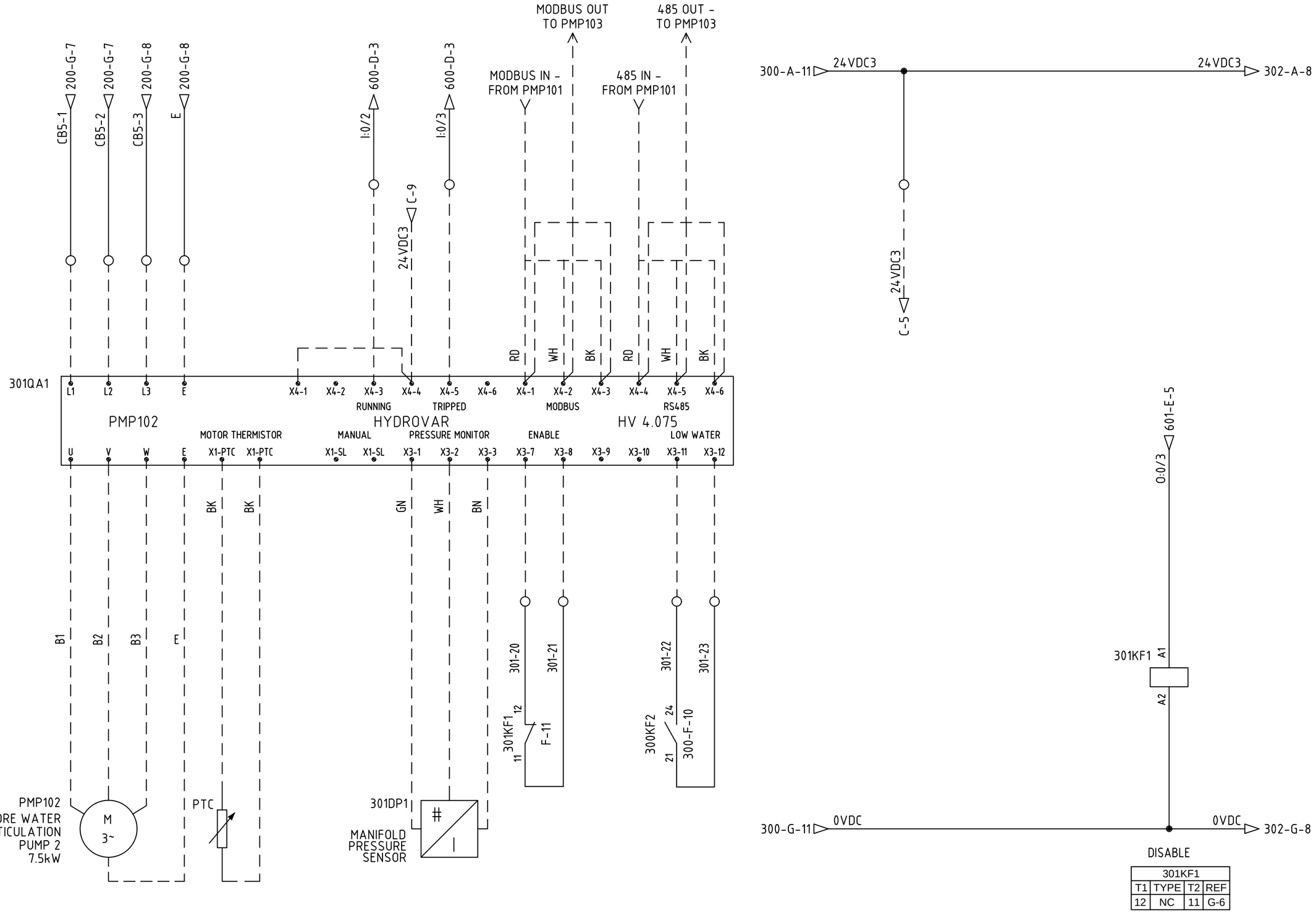
CONTRACTOR IDENTIFICATION

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DATE:	15/07/2016	
CHECKED:	A BOX	
DATE:	16/07/2016	
DESIGN ENG:	M LAWSON	
DATE:	4/07/2016	
APPROVED:	T STOCKER	
DATE:		

PROJECT:
BORE SYSTEM MASTER CONTROLLER
TITLE:
ELECTRICAL DRAWING SET
RAW BORE WATER RETICULATION PUMP 1

CLIENT:
UNSW FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
1606-E - 300	N.T.S.	1	1



301KF1			
T1	TYPE	T2	REF
12	NC	11	G-6

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	1	AS INSTALLED	22/12/16	ML	AB	TS	

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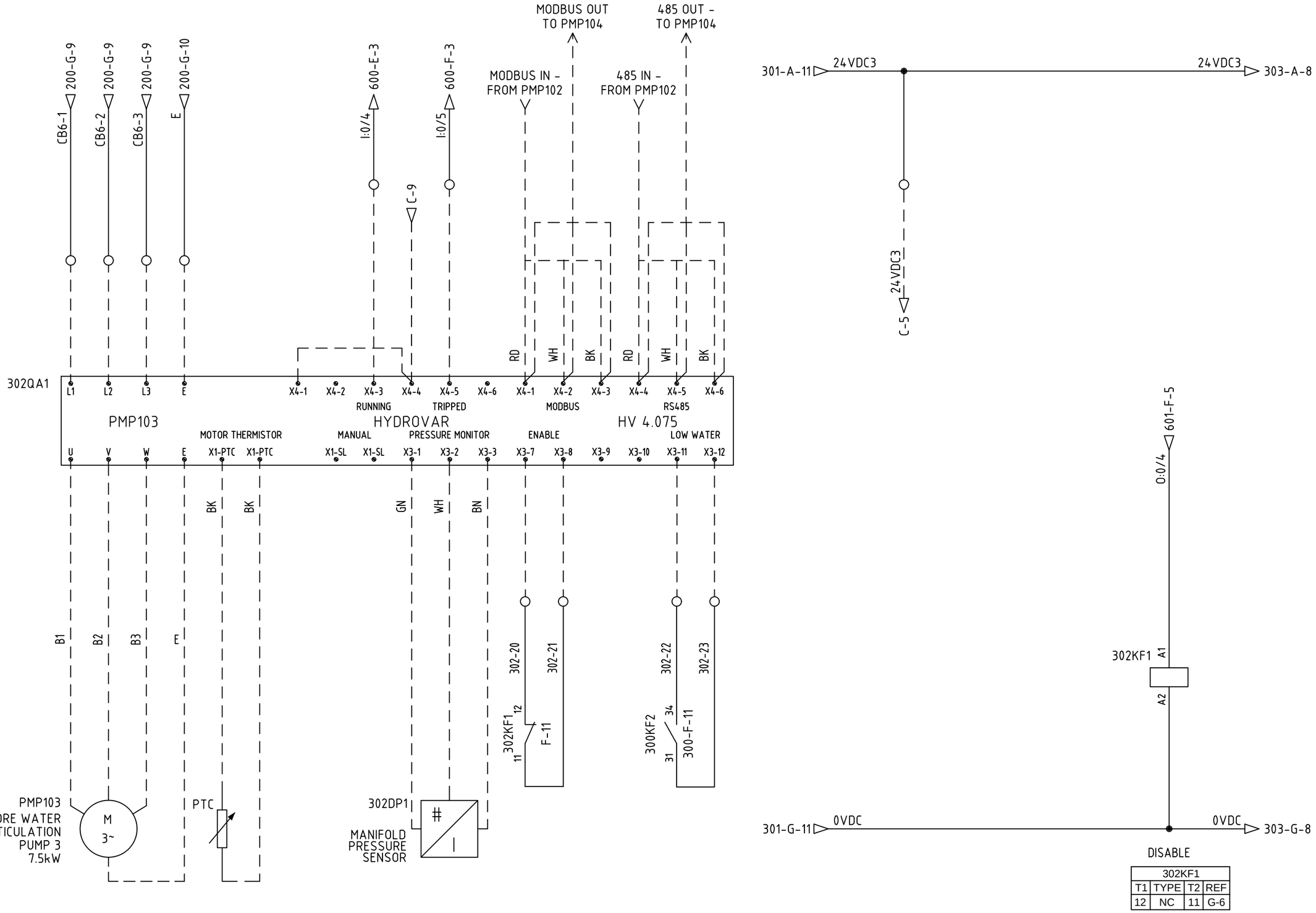
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CHECKED:	A BOX	DATE: 16/07/2016
DESIGN ENG:	M LAWSON	DATE: 4/07/2016
APPROVED:	T STOCKER	DATE:

PROJECT: BORE SYSTEM MASTER CONTROLLER

TITLE: ELECTRICAL DRAWING SET
RAW BORE WATER RETICULATION PUMP 2

CLIENT: UNSW FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
1606-E - 301	N.T.S.	1	1



302KF1			
T1	TYPE	T2	REF
12	NC	11	G-6

REVISION

REV:	DESC:	DATE:	DRN:	CHK:	APR:	PROJ. No.
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1	AS INSTALLED	22/12/16	ML	AB	TS	

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1606_302 PLOTTED ON: 2016-12-28

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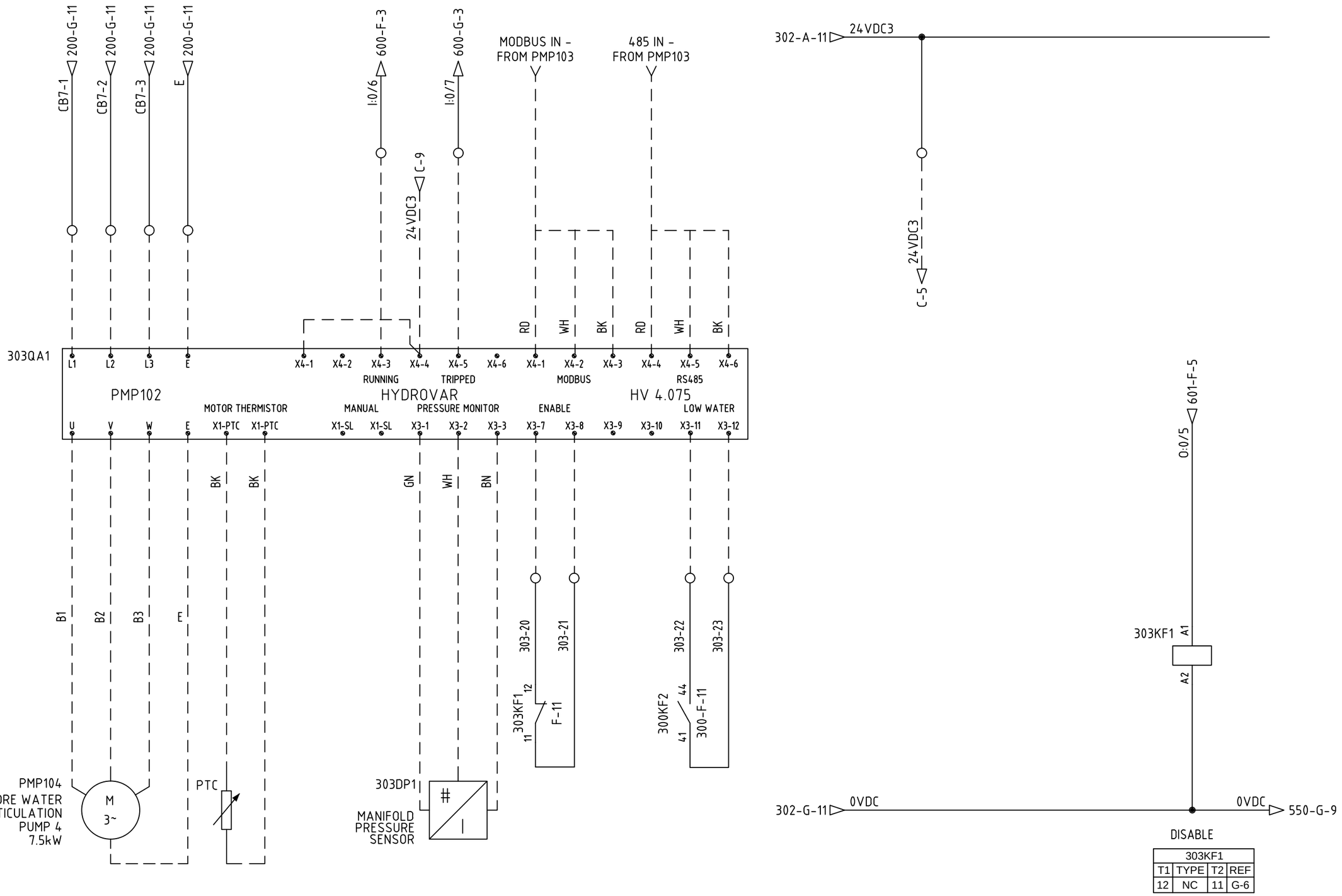
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CHECKED:	A BOX	DATE: 16/07/2016
DESIGN ENG:	M LAWSON	DATE: 4/07/2016
APPROVED:	T STOCKER	DATE:

PROJECT: BORE SYSTEM MASTER CONTROLLER

TITLE: ELECTRICAL DRAWING SET
RAW BORE WATER RETICULATION PUMP 3

CLIENT: UNSW FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
1606-E - 302	N.T.S.	1	1



303KF1			
T1	TYPE	T2	REF
12	NC	11	G-6

REVISION

REV:	DESC:	DATE:	DRN:	CHK:	APR:	PROJ. No.
A	DESIGN	15/07/2016	ML	AB	TS	1723
0	AS BUILT	1/08/16	ML	AB	TS	
1	AS INSTALLED	22/12/16	ML	AB	TS	

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www.unsw.edu.au

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1606_303 PLOTTED ON: 2016-12-28

CONTRACTOR IDENTIFICATION

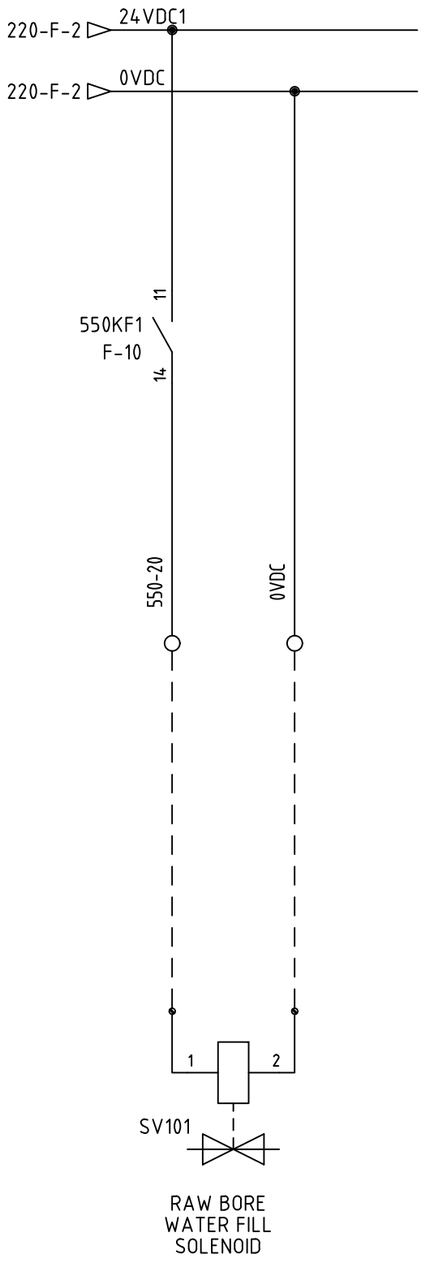
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CHECKED:	A BOX	16/07/2016
DESIGN ENG:	M LAWSON	4/07/2016
APPROVED:	T STOCKER	
DATE:		

PROJECT: BORE SYSTEM MASTER CONTROLLER

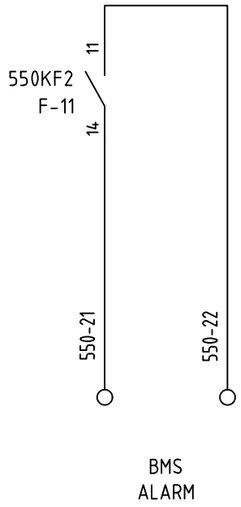
TITLE: ELECTRICAL DRAWING SET
RAW BORE WATER RETICULATION PUMP 4

CLIENT: UNSW FACILITIES MANAGEMENT

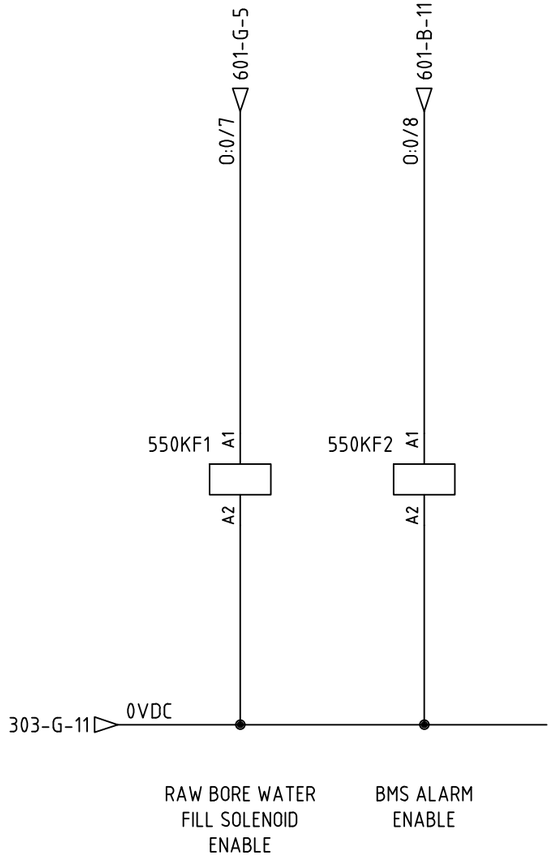
DWG No:	SCALE:	SHEET:	REV:
1606-E - 303	N.T.S.	1	1



RAW BORE WATER FILL SOLENOID



BMS ALARM



RAW BORE WATER FILL SOLENOID ENABLE

BMS ALARM ENABLE

REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	PROJ. No.
	A	DESIGN	15/07/2016	ML	AB	TS	1723
	0	AS BUILT	1/08/16	ML	AB	TS	
	1	AS INSTALLED	22/12/16	ML	AB	TS	

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1606_550 PLOTTED ON: 2016-12-28

CONTRACTOR IDENTIFICATION

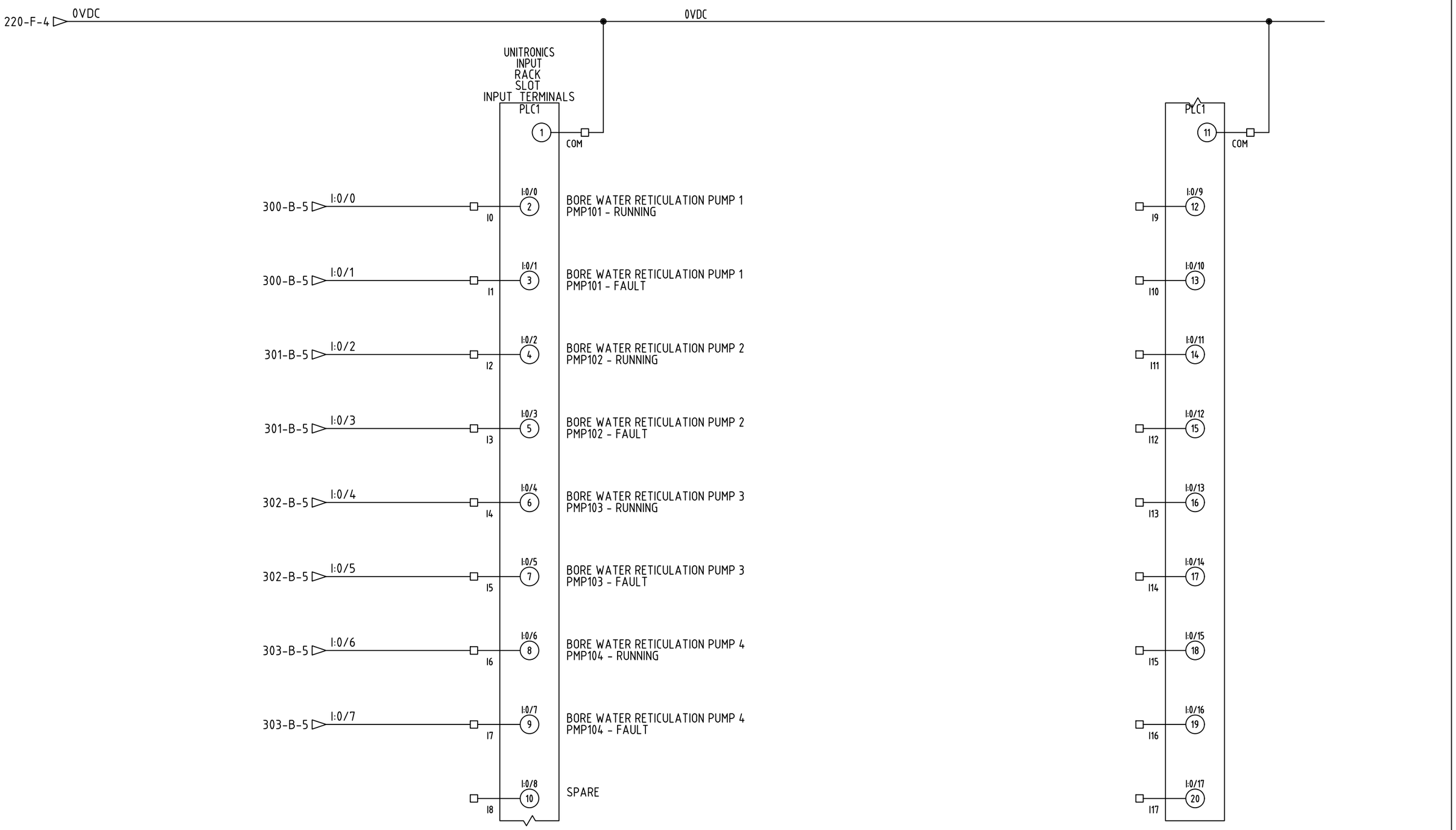
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CHECKED:	A BOX	16/07/2016
DESIGN ENG:	M LAWSON	4/07/2016
APPROVED:	T STOCKER	
DATE:		

PROJECT: BORE SYSTEM MASTER CONTROLLER

TITLE: ELECTRICAL DRAWING SET
BMS ALARMS

CLIENT: UNSW FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
1606-E - 550	N.T.S.	1	1



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	PROJ. No.
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	0	AS BUILT	1/08/16	ML	AB	TS	
	1	AS INSTALLED	22/12/16	ML	AB	TS	

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1606_600 PLOTTED ON: 2016-12-28

CONTRACTOR IDENTIFICATION

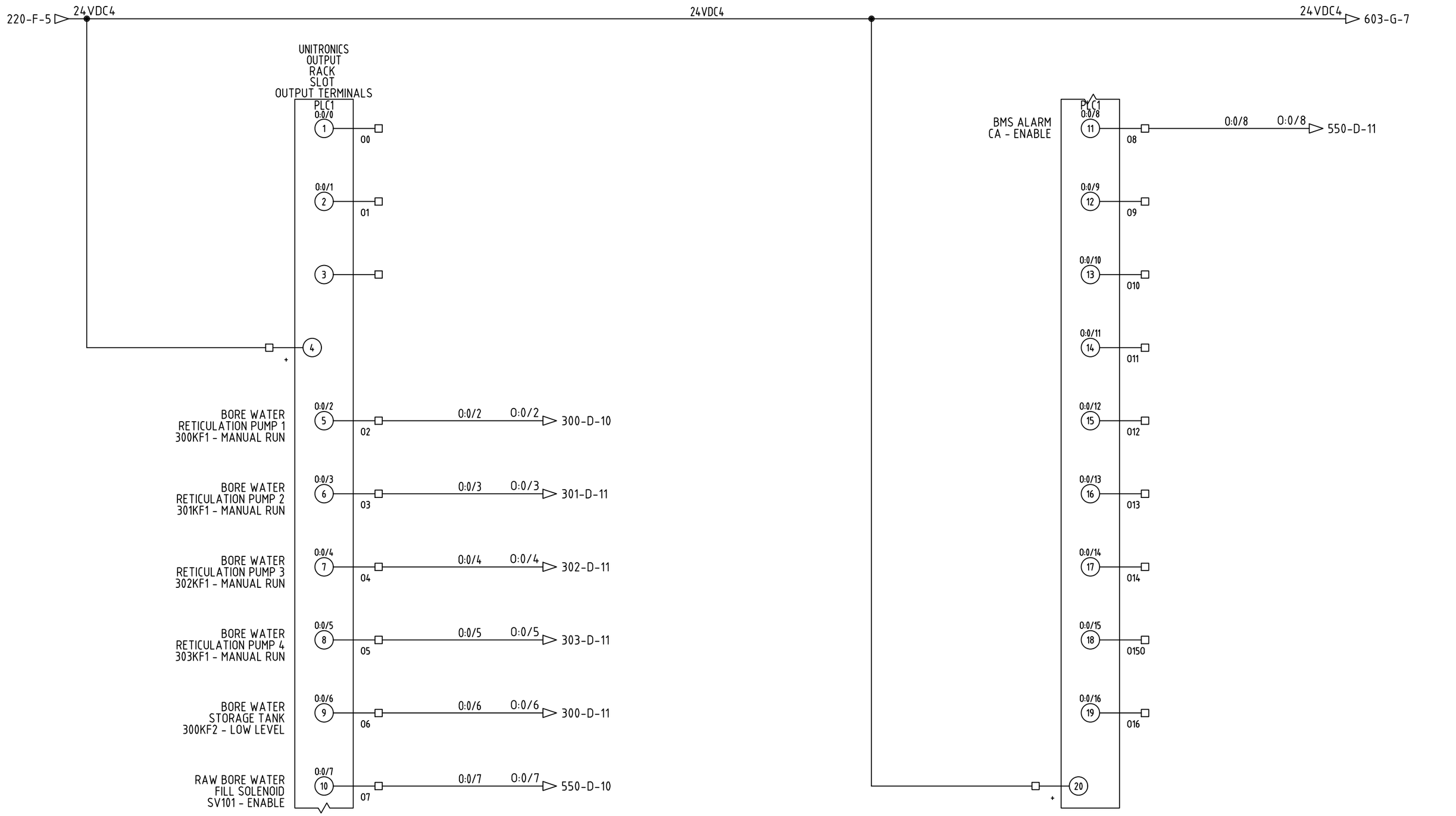
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DATE:	15/07/2016
CHECKED:	A BOX
DATE:	16/07/2016
DESIGN ENG:	M LAWSON
DATE:	4/07/2016
APPROVED:	T STOCKER
DATE:	

PROJECT: BORE SYSTEM MASTER CONTROLLER

TITLE: ELECTRICAL DRAWING SET
PLC - MAIN MODULE - DIGITAL IN

CLIENT: UNSW FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
1606-E - 600	N.T.S.	1	1



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	PROJ. No.
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	0	AS BUILT	1/08/16	ML	AB	TS	
	1	AS INSTALLED	22/12/16	ML	AB	TS	

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1606_601 PLOTTED ON: 2016-12-28

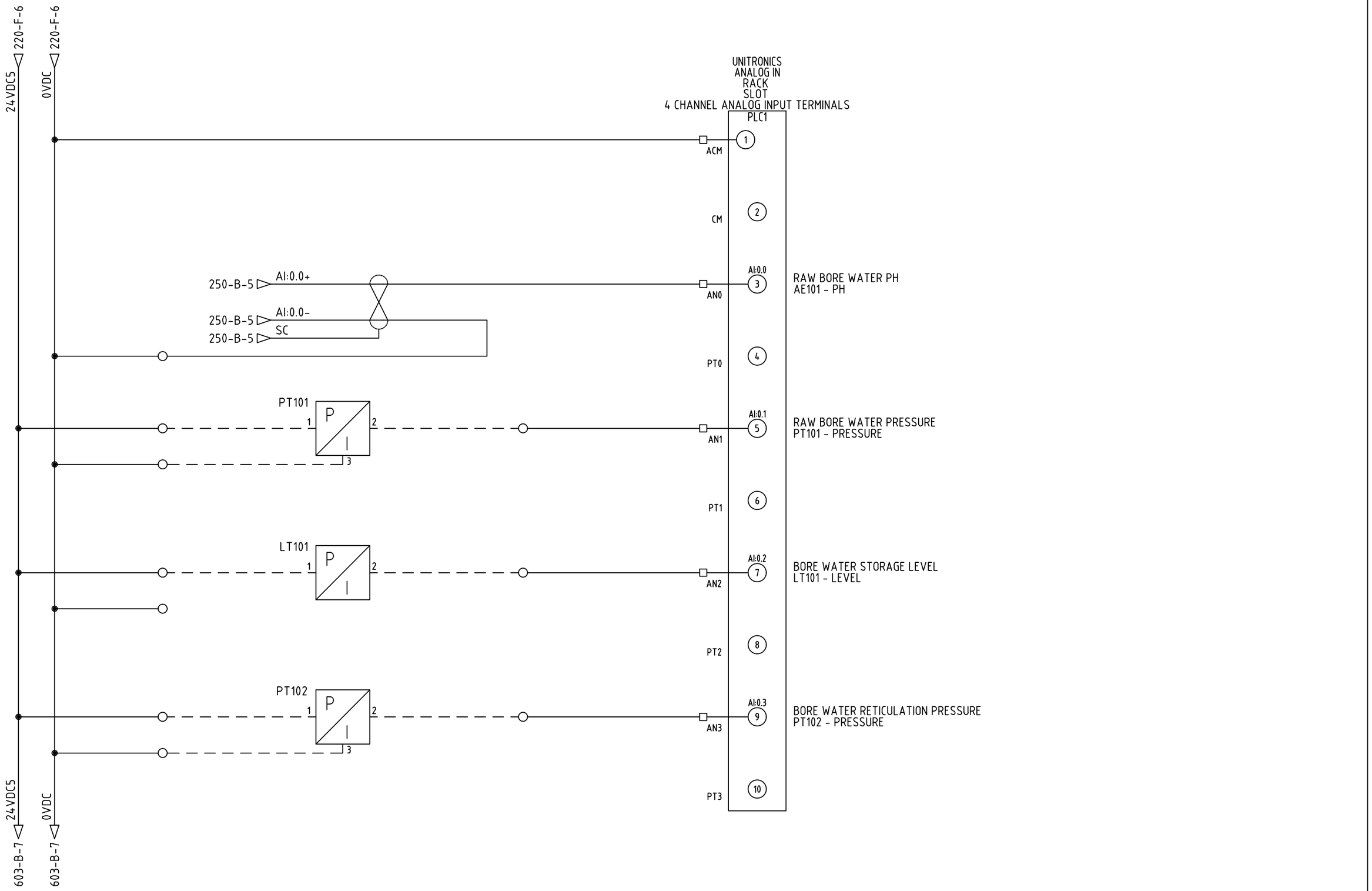
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DATE:	15/07/2016
CHECKED:	A BOX
DATE:	16/07/2016
DESIGN ENG:	M LAWSON
DATE:	4/07/2016
APPROVED:	T STOCKER
DATE:	

PROJECT:
BORE SYSTEM MASTER CONTROLLER
TITLE:
ELECTRICAL DRAWING SET
PLC - MAIN MODULE - DIGITAL OUT

CLIENT:
UNSW FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
1606-E - 601	N.T.S.	1	1



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	PROJ. No.
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	0	AS BUILT	1/08/16	ML	AB	TS	
	1	AS INSTALLED	22/12/16	ML	AB	TS	

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1606_602 PLOTTED ON: 2016-12-28

CONTRACTOR IDENTIFICATION

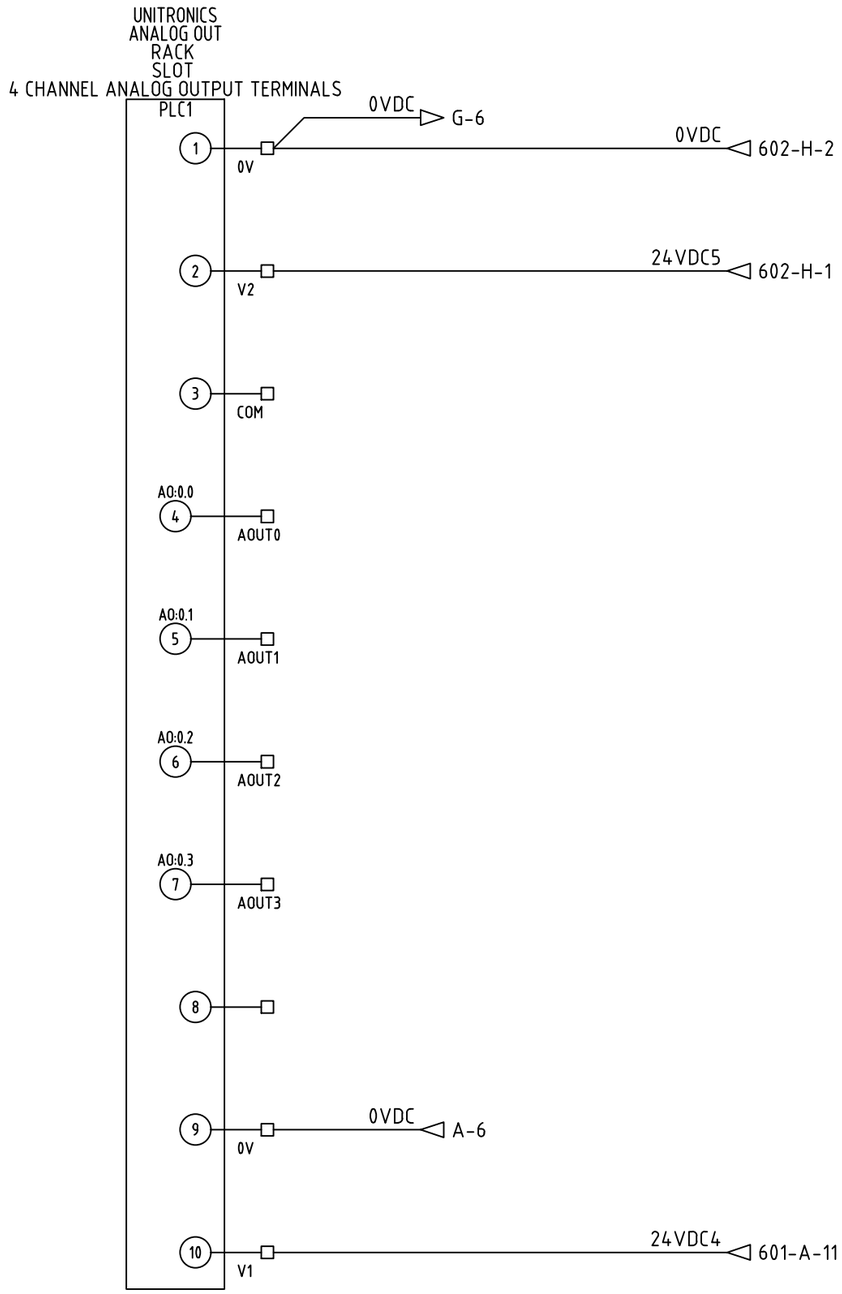
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DATE:	15/07/2016	
CHECKED:	A BOX	
DATE:	16/07/2016	
DESIGN ENG:	M LAWSON	
DATE:	4/07/2016	
APPROVED:	T STOCKER	
DATE:		

PROJECT: BORE SYSTEM MASTER CONTROLLER

TITLE: ELECTRICAL DRAWING SET
PLC - MAIN MODULE - ANALOG IN

CLIENT: UNSW FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
1606-E - 602	N.T.S.	1	1



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	PROJ. No.
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	0	AS BUILT	1/08/16	ML	AB	TS	
	1	AS INSTALLED	22/12/16	ML	AB	TS	

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1606_603 PLOTTED ON: 2016-12-28

CONTRACTOR IDENTIFICATION

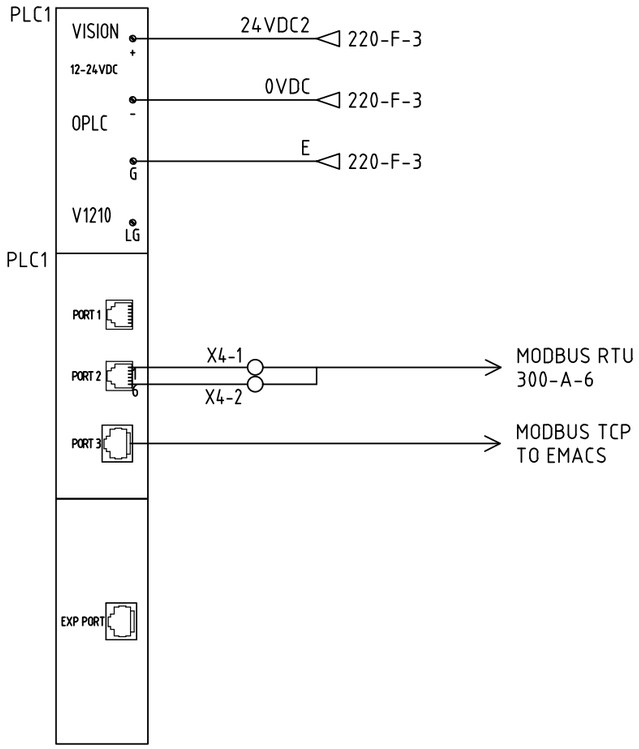
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DATE:	15/07/2016
CHECKED:	A BOX
DATE:	16/07/2016
DESIGN ENG:	M LAWSON
DATE:	4/07/2016
APPROVED:	T STOCKER
DATE:	

PROJECT: BORE SYSTEM MASTER CONTROLLER

TITLE: ELECTRICAL DRAWING SET
PLC - MAIN MODULE - ANALOG OUT

CLIENT: UNSW FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
1606-E - 603	N.T.S.	1	1



VLAN352 IP Address	149.171.165.015
Subnet Mask	255.255.254.0
Gateway	149.171.164.1
Data Port	257-C1-P2.24

REVISION

REV:	DESC:	DATE:	DRN:	CHK:	APR:	PROJ. No.
A	DESIGN	15/07/2016	ML	AB	TS	1723
0	AS BUILT	1/08/16	ML	AB	TS	
1	AS INSTALLED	22/12/16	ML	AB	TS	

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1606_700 PLOTTED ON: 2016-12-28

CONTRACTOR IDENTIFICATION

DRAWN: DATE:	M LAWSON 15/07/2016
CHECKED: DATE:	A BOX 16/07/2016
DESIGN ENG: DATE:	M LAWSON 4/07/2016
APPROVED: DATE:	T STOCKER

PROJECT:
BORE SYSTEM MASTER CONTROLLER
TITLE:
ELECTRICAL DRAWING SET
NETWORK CONNECTIONS

CLIENT:
UNSW FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
1606-E - 700	N.T.S.	1	1

THE UNIVERSITY OF
NEW SOUTH WALES



SPECIFICATION & SCOPE

FOR

TYREE ETB BUILDING
RAW BORE WATER
PLANTROOM MODIFICATIONS

PREPARED BY:
Trevor Stocker
UNSW FACILITIES MANAGEMENT
FM ENGINEERING
UNSW KENSINGTON
NSW 2052

Date: 23 May 2014

Issue: Tender

Table of Contents

1.0 PROJECT DESCRIPTION 2
2.0 SCOPE OF WORK 2
3.0 MINOR WORKS 2
4.0 GENERAL 3
5.0 STANDARDS AND REGULATIONS 3
6.0 ADDITIONAL REQUIREMENTS 3
7.0 SITE CONDITIONS 3
8.0 DAMAGES 3
9.0 ATTACHMENTS 4

1.0 PROJECT DESCRIPTION

The purpose of this brief is to describe the internal works required to be undertaken within the Tyree ETB raw bore water plant room. This works will form the second stage to the Tyree Rainwater/Bore water tank modifications.

The Tyree ETB raw bore water plant room is located within the basement level (refer to attachment) to the western end of the Tyree ETB building.

2.0 SCOPE OF WORK

Work to be undertaken shall comprise of the supply, delivery, installation, commissioning and defects liability of the following:

1. Demolition of existing pipework as nominated.
   The plumbing contractor shall demolish the existing inlet pipework supplying raw bore water into the storage reservoir in the basement of Tyree.

   Some items of plant shall be retained for re-installation, while other items like the motorised valve, orifice plate and the existing tank level controls (Multitrode) shall be removed and returned to UNSW.

   UNSW will arrange for the power to be disconnected from the existing Multitode panel so the panel can be removed and for the electrical/controls connections of the new equipment to be installed.

2. Pipe modifications
   Allow to reconfigure the inlet pipework in copper tube as documented. Supply and install a rate of flow/pressure reducing/solenoid control valve (refer to attached quote from Mack Valves), 50mm bypass, new water meter and a flanged spool piece (for future ration valve installation). Reinstall the existing dual butterfly/check valve removed as part of the demolition works.

   Connect to existing 100mm butterfly valves back into the tank. Cap off redundant 180mm tank inlets (2 off).

   Allow to insulate all new copper pipework with Thermotech 4Zero foil wrapped insulation for both condensation and noise reduction.

3. Commissioning
   Allow to commission all wet services including all pressure testing (to 1500kPa) and reinstatement of all wet services upon completion of the works.

4. Work By Others
   A ultrasonic tank level sensor was installed within the tank as part of the stage 1 (in-tank works). The controls for this sensor will be terminated within the plantroom (coiled) for connection by others.

   UNSW has engaged an electrical/controls contractor to install the panel and wiring associated with the ultrasonic tank level sensor, set up the outputs from the sensor and commission the operation of the tank filling/pump operation.

3.0 MINOR WORKS

- All noisy or disruptive work to be performed before 9:00am or after 9:00pm

- Ensure all works comply with WorkCover & WHS requirements. Refer also to UNSW WHS site induction manual.
- All work and materials needed to complete this project must be first quality and compliant with current Australian Standards requirements.
- Clean / tidy and restore work affected area to original or better appearance

4.0 GENERAL

The works above include the complete supply & installation of labour and materials required to complete the project in accordance with all relevant authorities' requirements and codes. Include all required permits, shutdown notices and certificates of compliance for work performed. All works to be completed in a tradesman like manner, installed plumb, maintaining the required pipe grade and sufficient pipe clips. UNSW reserves the right to reject unsatisfactory workmanship and is to be replaced without additional cost.

All shutdowns shall be coordinated with UNSW FM Engineering 5 working days prior to the shutdown being required.

5.0 STANDARDS AND REGULATIONS

All materials supplied and installed shall comply with Australian Standards relevant codes, rules and regulations of all the statuary authorities.

- NSW Plumbing & Drainage Code of Practice
- UNSW Design and Construction Requirements
- AS3500 National Plumbing and Drainage Code
- Workplace Health and Safety Act 2012

6.0 ADDITIONAL REQUIREMENTS

- Complete a site specific work method statement for this project and WH&S procedures to be submitted prior to commencement of work.
- These documents do not necessarily identify the full extent of items required to complete the works described. Diagrams are indicative only, the contractor is to familiarise themselves with the project to determine the most effective and least disruptive location of pipe work and equipment.
- Provide a lump sum tender price including all necessary allowances and fee's to complete this project.

7.0 SITE CONDITIONS

All UNSW site entry/parking and WH&S requirements are to be strictly adhered to, including the UNSW site induction of all employees prior to commencement of any work.

The contractor is advised to visit and inspect the site to acquaint him/her with all conditions that may or may not be described in this document prior to submitting a tender.

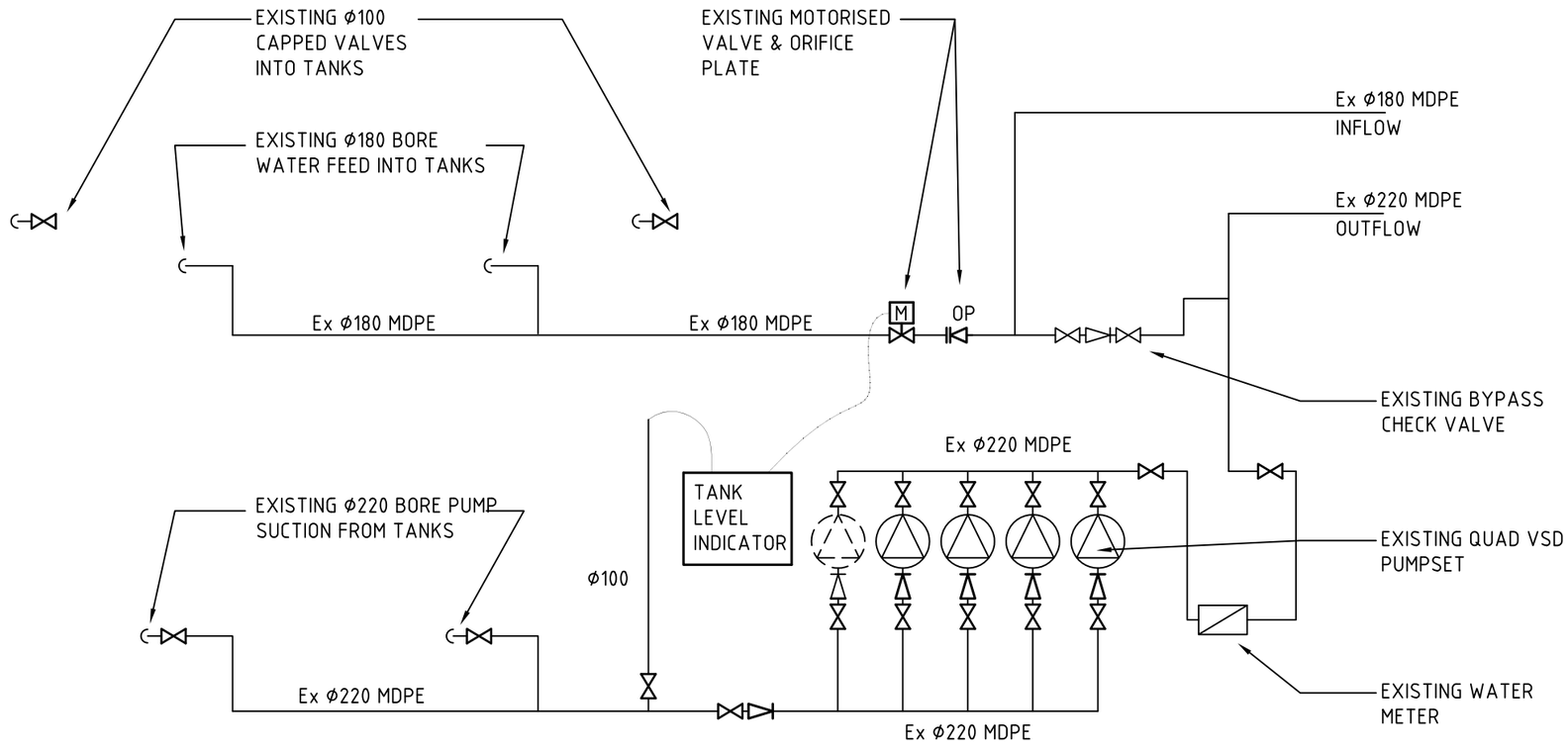
Site contact for Hydraulic/Plumbing Works Greg Fry (m: 0414 385 265)

8.0 DAMAGES

The contractor will be responsible for all damages done to buildings and to services by himself or his employees, whether such damage is done during the performance of the work or accidentally and, is to make good all such damage at his own expense.

9.0 ATTACHMENTS

1. Layout of existing tank and plant room
2. Existing plant room piping schematic
3. Proposed demolition plan\
4. Proposed plant room arrangements
5. Copy of the quote from Mack Valves re Rate of Flow/Pressure Reducing/Solenoid Control Valve



EXISTING ARRANGEMENT

©

REV.	DESCRIPTION	APP	DATE
A	Tender Issue	SG	26.5.14

DRAWING CHECK	
SIGNATURE	DATE
DRAWN	A3
T Stocker	../../..
CHECKED	SLG
VERIFIED	N/A

UNSW AUSTRALIA

FACILITIES MANAGEMENT ENGINEERING

CLIENT: FACILITIES FM ENGINEERING

TYREE ETB (H6)

PROJECT: LOWER CAMPUS BOREWATER RESERVIOR

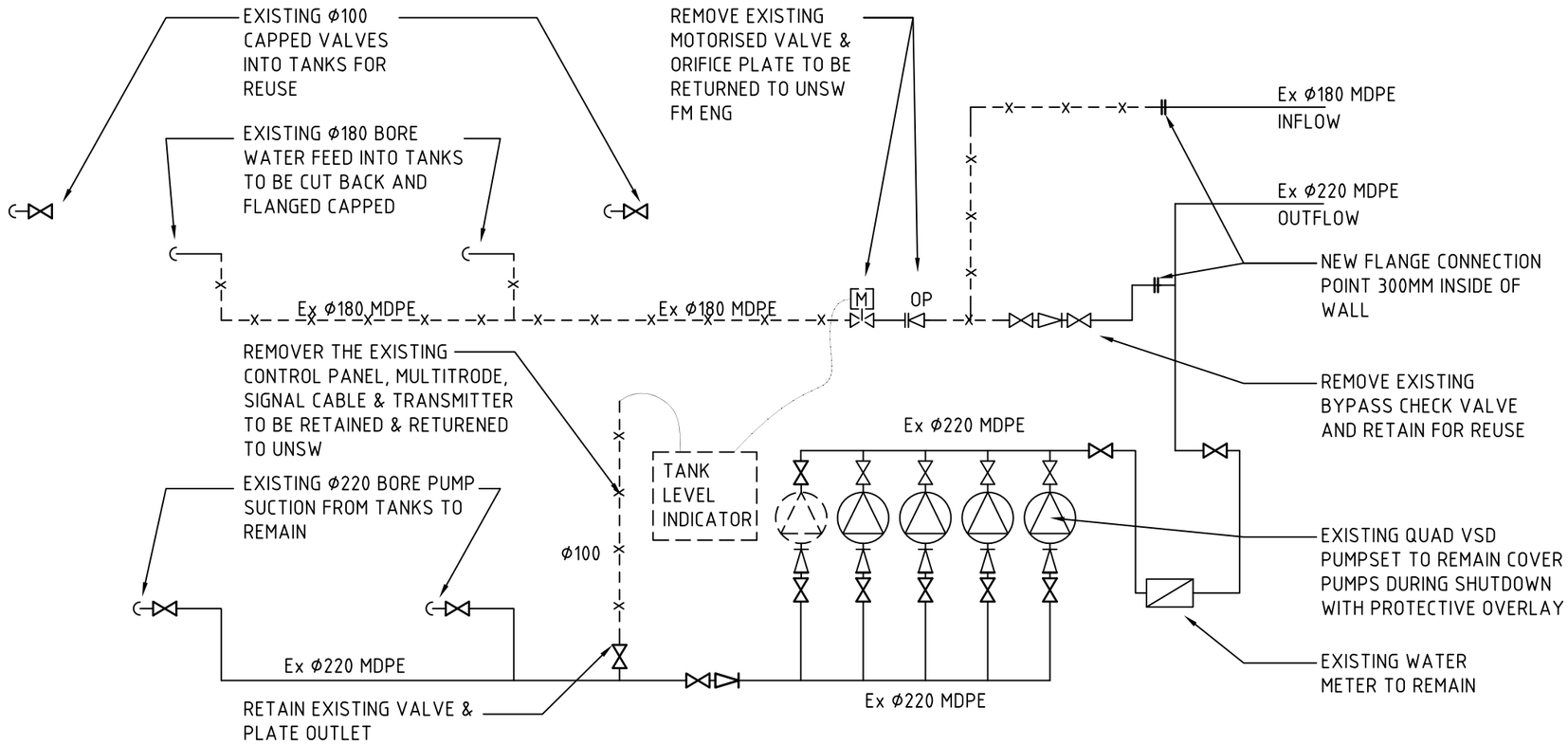
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SCALE. A3 0 10 20 30 40 50 @ A3

DATE: 22/05/2014

DRAWING No./ STATUS: H01 - TENDER

REV.: A



DEMOLITION LAYOUT

©

REV.	DESCRIPTION	APP	DATE
A	Tender Issue	SG	26.5.14

DRAWING CHECK	
SIGNATURE	DATE
DRAWN	A3
T Stocker	../../..
CHECKED	SLG
VERIFIED	N/A

FACILITIES MANAGEMENT ENGINEERING

CLIENT: FACILITIES FM ENGINEERING

BUILDING: TYREE ETB (H6)

PROJECT: LOWER CAMPUS BOREWATER RESERVIOR

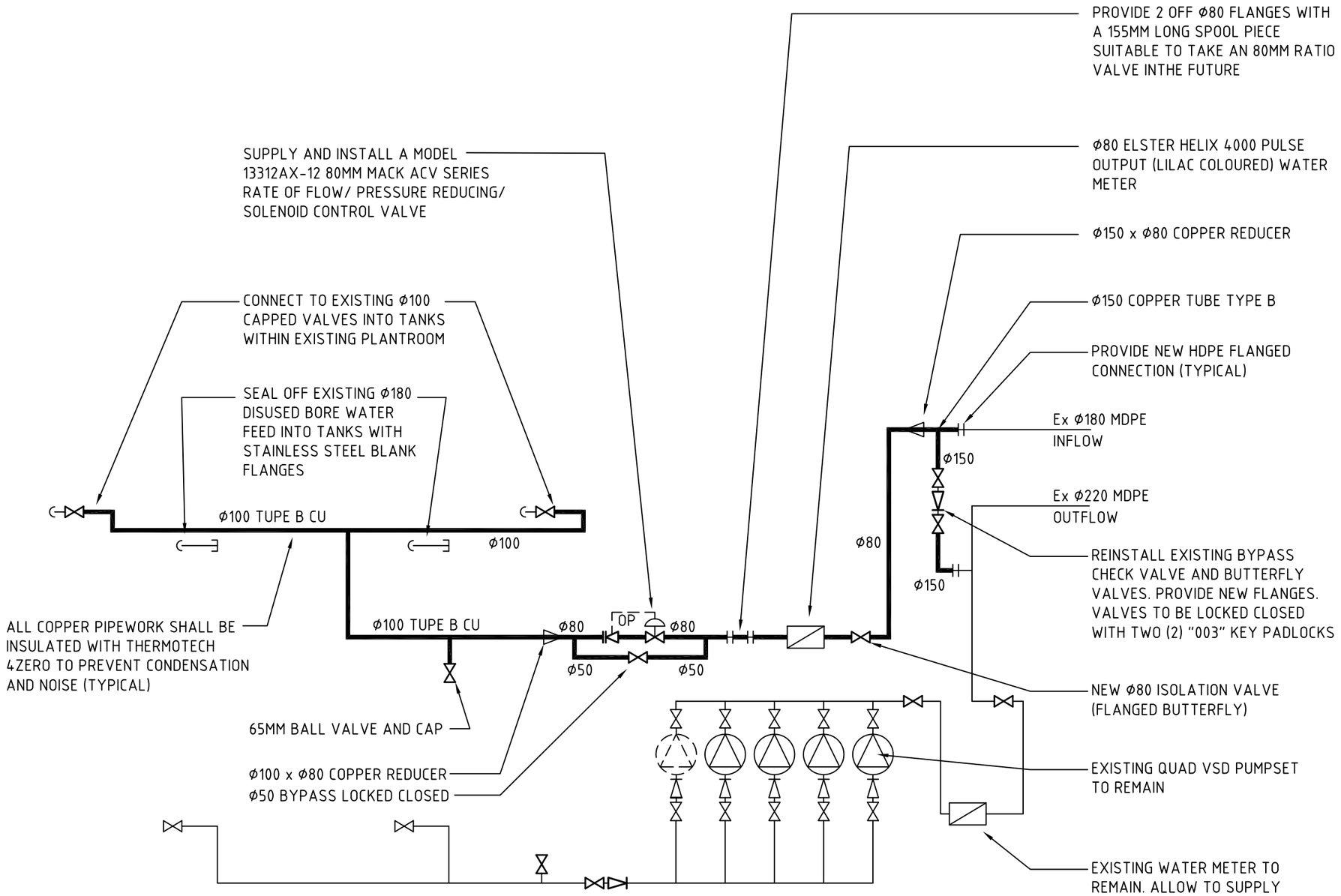
TITLE: DEMOLITION LAYOUT

SCALE. A3 (0 10 20 30 40 50) @ A3

DATE: 22/05/2014

DRAWING No.: H02 -TENDER

REV.: A



PROPOSED ARRANGEMENT

©

REV.	DESCRIPTION	APP	DATE
A	Tender Issue	SG	26.5.14

DRAWING CHECK	
SIGNATURE	DATE
DRAWN	A3
T Stocker	../../..
CHECKED	SLG
VERIFIED	N/A

UNSW AUSTRALIA

FACILITIES MANAGEMENT ENGINEERING

CLIENT: FACILITIES FM ENGINEERING

PROJECT: LOWER CAMPUS BOREWATER RESERVIOR

TYREE ETB (H6)

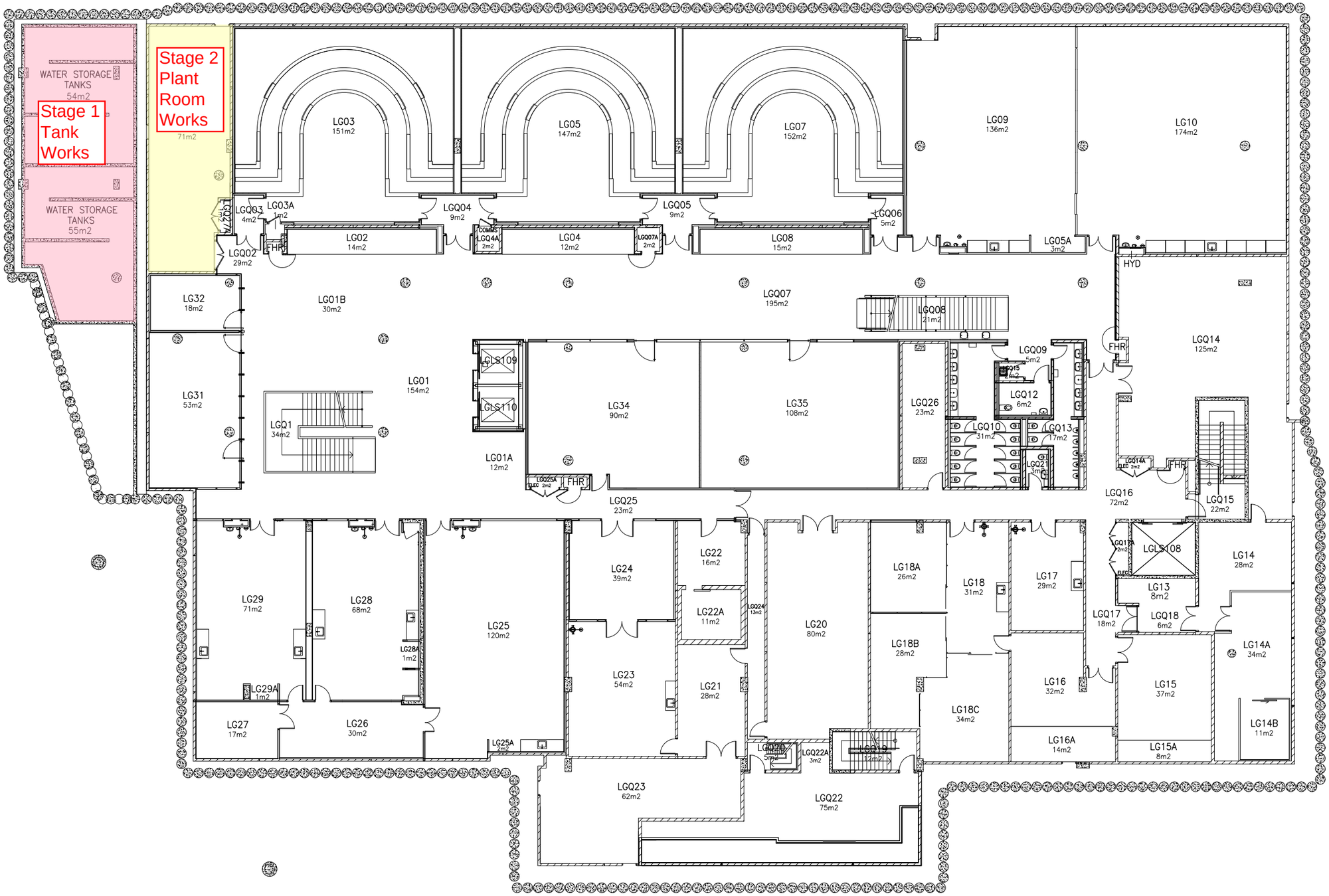
TITLE: PROPOSED PLANTROOM ARRANGEMENT

SCALE. A3 0 10 20 30 40 50 @ A3

DATE: 22/05/2014

DRAWING No.: H03 - TENDER

REV.: A



UNSW AUSTRALIA

Created: MAY 2011	Modified: MAR 2013	Building Name: TYREE ENERGY TECHNOLOGY	Building No: H6
Version: JJ	Approved: JJ	Level/Floor: LOWER GROUND	
Discipline: ARCHITECTURAL	Scale: A:250 @ A3	Title: FLOOR PLAN	Sheet No: 1 OF 8
Section: SPACE MANAGEMENT	CAD Reference: i:\... A-H6-LG.dwg	Drawing No: A-H6-LG	Revision: 004

MACK VALVES PTY LTD.
A B N 99 094 830 145

To: UNSW **Date:** 7-5-14

Fax: Phone: Email:

Attn: Trevor/Stephen **From:** Brian Kernahan

Ref: 610934 **No. of Pages:** 1/1 **(inc. this page)**

Proudly an Australian manufacturer

Terms: ***This quotation is subject to our Terms and Conditions of Sale, available upon request. Note that title to the goods will not pass until payment is received in full.***

Quoted prices exclude GST which will be applied at the rate of 10%

Delivery Period: approx 8 weeks

Point of Delivery: **FOT MELBOURNE**

Special Conditions:

	Valve Description & Size	Quantity	Price Each AUD
1	**Model 13312AX-12 80mm Mack ACV Series** **Rate of flow/ Pressure Reducing/ solenoid control valve** AS1830-T260 Cast iron main valve body, cover, **S/S disc retainer and top diaphragm washer**. **S/S main valve seat** and disc guide. 316 stainless steel stem, **S/S top cover bearing**. Neoprene nylon insertion diaphragm and nitrile disc. End connections flanged Class 250. Main valve piloted by: • **Bronze Pilot reducing valve - supply pressure 600kpa** Set reduced pressure 250kpa • Bronze pilot differential valve • Bronze strainer/ needle valve • **S/S fittings & pilot lines** • **S/S or Bronze solenoid pilot** (voltage TBA) (normally open or normally closed TBA) • **Internal epoxy coated main valve** • **S/S orifice plate 16 l/sec @ 100kpa delta P** • **s/s pilot valve isolation** • **S/S ball valve over ride open**. **Commissioning if required ex-works Penrith**	1	
2	Delivery if required by Mack Valves	1	

Please do not hesitate to contact me with any inquiry regarding this quote

Regards Brian Kernahan

Mack Valves P/L Unit 9, 9-11 Abel St Penrith. NSW 2750 PH. 0407286595 FAX. 4722 6144

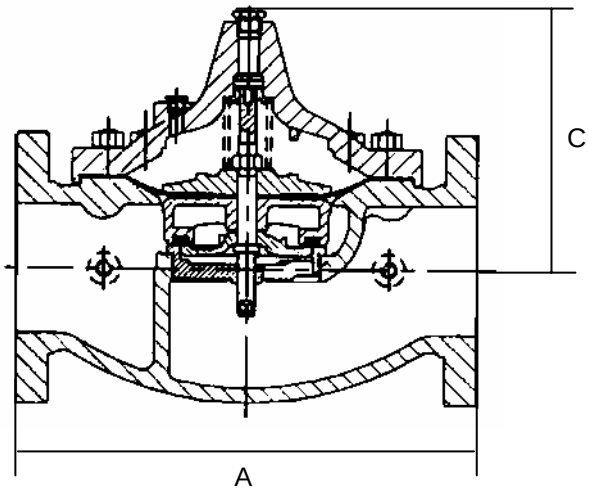
MACK RATE OF FLOW & PRESSURE REDUCING VALVE

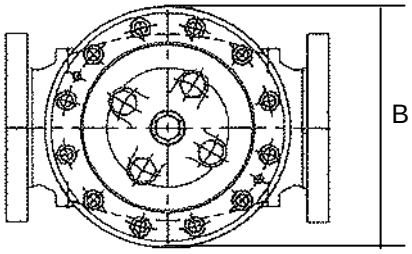
Model No. 13112A-12



TYPICAL FUNCTION & APPLICATION

- Maintains constant downstream pressure & flow rates.
- Actuated by the differential pressure.
- Accurate control.
- Rate of flow adjustment by varying a spring loading on a pilot valve control.
- Easily set to maintain maximum allowable flow rate.





DIMENSIONS														
VALVE SIZE (mm)		40F	50F	80F	80Y	100F	100YG	150F	150YG	200F	250F	300F	350F	400Y
Dimensions In mm	A	220	245	349	335	403	403	533	533	671	791	914	1000	1092
	B	143	168	235	225	292	292	405	405	508	604	707	831	940
	C	115	135	180	180	227	337	306	573	350	446	800	608	940
Dimensions In inches	A	8.66	9.63	13.75	13.00	15.88	15.88	21.00	21.00	26.41	31.13	36.00	39.38	43.00
	B	5.60	6.60	9.30	8.88	11.50	11.50	16.00	16.00	20.00	23.80	27.90	32.70	37.00
	C	4.50	5.30	7.10	7.10	8.90	13.30	12.10	22.60	13.80	17.60	31.50	24.00	37.00
Weight	(Kg)	16	21	53	53	92	92	162	162	245	359	530	728	1650
Volume of Cover Chamber	(L)	0.6	0.12	0.38	0.38	0.57	0.57	1.5	1.5	4.2	7.6	12	17	35

Y = Angle seated pattern with flanged end connection. YG = Angle seated pattern with rolled groove end connection. When size only quoted standard end connection shown is (F) flanged.

MACK RATE OF FLOW & PRESSURE REDUCING VALVE

Model No. 13112A-12

Sizes:	50	80	100	150	200	250	300	350	400mm
	2”	3”	4”	6”	8”	10”	12”	14”	16”

End type: Undrilled flanged connections. Drilling if required to be stipulated at time of order. Optional roll groove ends.

Pressure rating: Globe pattern 2070kPa Angle seat 1400kPa.
Contact Mack Valves for higher-pressure requirement.

Temperature range: Water 1ºC to 82ºC

Materials:

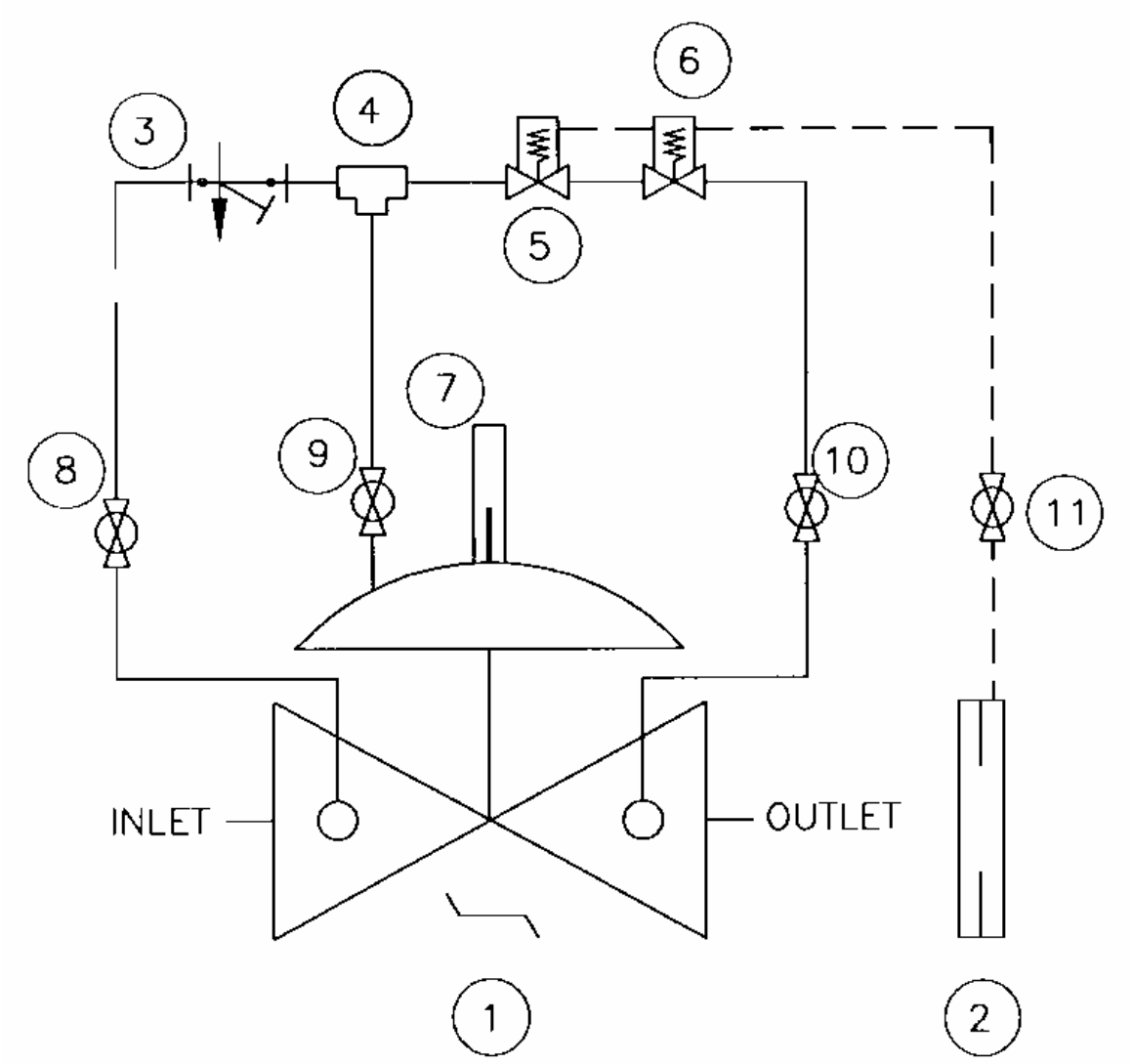
Main valve:	Cast Iron AS1830T260
Valve trim:	Bronze AS 1565-C83600A
	Stainless Steel AS 2074H6B
Pilot control:	Bronze AS 1565-C83600A
	Stainless Steel AS 2074H6B
Alternative rubber parts:	Nitrile / Neoprene / Viton

When ordering:
Supply the following:

- Pressure – minimum and maximum
- Range of control – minimum, normal and maximum flow rates
- Size and complete description of pipe used.
- Degree of accuracy required.
- If loss of head is critical, what is the maximum loss allowable?
- Fluid to be piped
- Send any written specifications available.

MACK RATE OF FLOW & PRESSURE REDUCING VALVE

Model No. 13112A-12

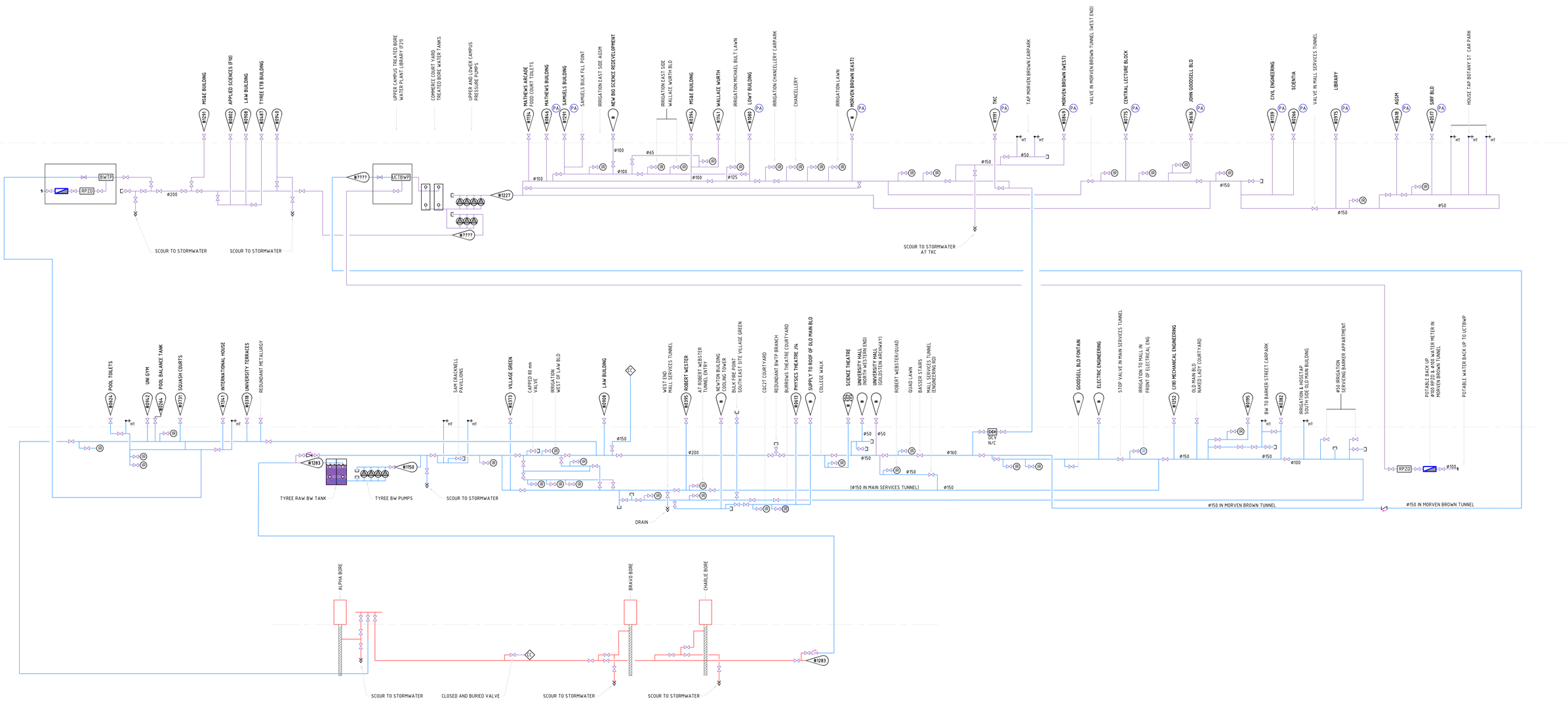


Item	Part No.	Title
1	13112A-22	Main valve
2	418	Orifice plate assembly
3	415-1	Strainer / needle valve
4	417	Ejector
5	410-1	Reducing valve
6	405-1	Differential control valve
7	420	Position indicator (optional)
8 – 10 incl.	5048-010	Ball valve fitted to 80mm valves & larger
11	5048-010	Ball valve supplied with all orifice plate assemblies

Appendix 8

UNSW Kensington Campus Bore Water Pipework Schematic and Plan.


Gate 1
Gate 2
Gate 3
Gate 4
Gate 5
Gate 7
Gate 8
Gate 9
Gate 10
Gate 11
Gate 12
Gate 13
Gate 14
Gate 15
LIGHT RAIL NEW ST STATION
ANZAC PARADE
High Street
Barker Street
Anzac Parade
Botany Street
Wellington Street
Dunkley Lane
Library Walk
Library Lawn
Physics Lawn
Roma Mitchell Lawn
Roma Mitchell Walk
Roma Mitchell Arch
Roma Mitchell Lane
Roma Mitchell Courtyard
Roma Mitchell Terrace
Roma Mitchell Steps
Roma Mitchell Ramp
Roma Mitchell Entrance
Roma Mitchell Exit
Roma Mitchell Gate
Roma Mitchell Fence
Roma Mitchell Wall
Roma Mitchell Path
Roma Mitchell Road
Roma Mitchell Bridge
Roma Mitchell Tunnel
Roma Mitchell Underpass
Roma Mitchell Overpass
Roma Mitchell Interchange
Roma Mitchell Roundabout
Roma Mitchell Intersection
Roma Mitchell Crossing
Roma Mitchell Footpath
Roma Mitchell Cycleway
Roma Mitchell Shared Path
Roma Mitchell Boardwalk
Roma Mitchell Deck
Roma Mitchell Platform
Roma Mitchell Concourse
Roma Mitchell Foyer
Roma Mitchell Lobby
Roma Mitchell Atrium
Roma Mitchell Courtyard
Roma Mitchell Garden
Roma Mitchell Lawn
Roma Mitchell Oval
Roma Mitchell Field
Roma Mitchell Court
Roma Mitchell Pool
Roma Mitchell Gym
Roma Mitchell Sports Centre
Roma Mitchell Aquatic Centre
Roma Mitchell Tennis Courts
Roma Mitchell Basketball Courts
Roma Mitchell Netball Courts
Roma Mitchell Soccer Field
Roma Mitchell Rugby Field
Roma Mitchell Cricket Oval
Roma Mitchell Athletics Track
Roma Mitchell Running Track
Roma Mitchell Cycling Track
Roma Mitchell Velodrome
Roma Mitchell Skate Park
Roma Mitchell BMX Track
Roma Mitchell Mountain Bike Trail
Roma Mitchell Hiking Trail
Roma Mitchell Nature Trail
Roma Mitchell Walking Trail
Roma Mitchell Jogging Track
Roma Mitchell Fitness Trail
Roma Mitchell Obstacle Course
Roma Mitchell Adventure Playground
Roma Mitchell Playground
Roma Mitchell Picnic Area
Roma Mitchell BBQ Area
Roma Mitchell Shelter
Roma Mitchell Gazebo
Roma Mitchell Pergola
Roma Mitchell Arbour
Roma Mitchell Trellis
Roma Mitchell Fountain
Roma Mitchell Statue
Roma Mitchell Monument
Roma Mitchell Memorial
Roma Mitchell Plaque
Roma Mitchell Sculpture
Roma Mitchell Art Installation
Roma Mitchell Public Art
Roma Mitchell Graffiti Wall
Roma Mitchell Mural
Roma Mitchell Signage
Roma Mitchell Wayfinding
Roma Mitchell Information Kiosk
Roma Mitchell Visitor Centre
Roma Mitchell Welcome Centre
Roma Mitchell Gift Shop
Roma Mitchell Cafe
Roma Mitchell Restaurant
Roma Mitchell Bar
Roma Mitchell Pub
Roma Mitchell Hotel
Roma Mitchell Accommodation
Roma Mitchell Residence
Roma Mitchell Dormitory
Roma Mitchell Apartment
Roma Mitchell Flat
Roma Mitchell House
Roma Mitchell Cottage
Roma Mitchell Villa
Roma Mitchell Mansion
Roma Mitchell Castle
Roma Mitchell Tower
Roma Mitchell Lighthouse
Roma Mitchell Observatory
Roma Mitchell Planetarium
Roma Mitchell Museum
Roma Mitchell Gallery
Roma Mitchell Theatre
Roma Mitchell Cinema
Roma Mitchell Auditorium
Roma Mitchell Concert Hall
Roma Mitchell Opera House
Roma Mitchell Ballet Studio
Roma Mitchell Dance Studio
Roma Mitchell Music Room
Roma Mitchell Practice Room
Roma Mitchell Recording Studio
Roma Mitchell Broadcasting Studio
Roma Mitchell Radio Station
Roma Mitchell TV Station
Roma Mitchell Newspaper Office
Roma Mitchell Publishing House
Roma Mitchell Bookstore
Roma Mitchell Library
Roma Mitchell Archive
Roma Mitchell Reading Room
Roma Mitchell Study Room
Roma Mitchell Lecture Theatre
Roma Mitchell Tutorial Room
Roma Mitchell Seminar Room
Roma Mitchell Conference Room
Roma Mitchell Meeting Room
Roma Mitchell Boardroom
Roma Mitchell Office
Roma Mitchell Staff Room
Roma Mitchell Common Room
Roma Mitchell Student Lounge
Roma Mitchell Student Union
Roma Mitchell Student Centre
Roma Mitchell Student Accommodation
Roma Mitchell Student Housing
Roma Mitchell Student Village
Roma Mitchell Student Residence
Roma Mitchell Student Dormitory
Roma Mitchell Student Apartment
Roma Mitchell Student Flat
Roma Mitchell Student House
Roma Mitchell Student Cottage
Roma Mitchell Student Villa
Roma Mitchell Student Mansion
Roma Mitchell Student Castle
Roma Mitchell Student Tower
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Roma Mitchell Student Music Room
Roma Mitchell Student Practice Room
Roma Mitchell Student Recording Studio
Roma Mitchell Student Broadcasting Studio
Roma Mitchell Student Radio Station
Roma Mitchell Student TV Station
Roma Mitchell Student Newspaper Office
Roma Mitchell Student Publishing House
Roma Mitchell Student Bookstore
Roma Mitchell Student Library
Roma Mitchell Student Archive
Roma Mitchell Student Reading Room
Roma Mitchell Student Study Room
Roma Mitchell Student Lecture Theatre
Roma Mitchell Student Tutorial Room
Roma Mitchell Student Seminar Room
Roma Mitchell Student Conference Room
Roma Mitchell Student Meeting Room
Roma Mitchell Student Boardroom
Roma Mitchell Student Office
Roma Mitchell Student Staff Room
Roma Mitchell Student



NOTES:

1. PRIOR TO USING THIS PLAN THE FACILITIES INFORMATION SERVICES MANAGER SHOULD BE CONTACTED FOR THE MOST RECENT REVISION.
2. SERVICES SHOWN OUTSIDE UNSW BOUNDARIES SHOULD BE VERIFIED BY "DIAL BEFORE YOU DIG" OR OTHER SERVICE SUPPLIERS.
3. ALL SERVICES SHOWN ARE TO BE FIELD VERIFIED PRIOR TO EXCAVATION.
4. DATUM FOR LEVELS: AUSTRALIAN HEIGHT DATUM

NOTE:
ALL INFORMATION SHOWN ON THIS PLAN IS DIAGRAMMATIC AND SHOULD BE FIELD VERIFIED PRIOR TO ANY WORKS.
DO NOT SCALE - SEE 1:200 PLANS FOR SERVICE LOCATIONS.
THIS DRAWING REMAINS THE PROPERTY OF THE UNIVERSITY OF NEW SOUTH WALES AND SHOULD NOT BE REPRODUCED WITHOUT THE APPROVAL OF THE INFORMATION SERVICES MANAGER.

No.	DATE	DRAWN	CHKD	AMENDMENT	No.	DATE	DRAWN	CHKD	AMENDMENT
A	JUN 2016	R.Delaytz	T.Stocker	Information Drawing					

SCALE
1:1000@A0
0 10 20 30 40 50 75
Metres
UNSW GRID

FACILITIES MANAGEMENT
UNSW AUSTRALIA

SITE SERVICES

UNSW - KENSINGTON CAMPUS
BORE WATER SCHEMATIC

CAD Reference	Drawing No.	Last Revision	Revision
TBA	FME-K-H006	JUN 2016	A

CAD Reference: C:\Users\trevo\Dropbox\EARLMAP ADMIN\23000 PROJECTS\23012 UNSW Bore Water Manual\Outputs\FME-K-H006-Kensington campus BW Sc

Appendix 9

Sodium Hydroxide (50%)
Material Safety Data Sheet (MSDS)

SECTION 1 - IDENTIFICATION: PRODUCT IDENTIFIER AND COMPANY INFORMATION

Product name	HydraBase® HE-2150
Product code	HE-2150
Product use	pH correction, water treatment
Company name	Hydroflux Utilities Pty Ltd Level 26, 44 Market Street SYDNEY NSW 2000 www.hydrofluxutilities.com.au e: info@hydrofluxutilities.com.au t: 61 2 9089 8833 f: 61 2 9089 8830
Emergency number	13 11 26 (Poison Information Hotline)

SECTION 2 - HAZARD IDENTIFICATION

HAZARDS

Hazard Class	Category*	Hazard Statement	Signal Word
Corrosive to metals	1	May be corrosive to metals	Warning
Acute toxicity, oral	4	Harmful if swallowed	Warning
Skin corrosion/irritation	1	Causes severe skin burns and eye damage	Danger
Serious eye damage/eye irritation	1	Causes serious eye damage	Danger

* Hazard categories can range from 1–5, with 1 being the highest rated hazard.

LABEL ELEMENTS

Pictogram



Signal word Danger

PRECAUTIONARY STATEMENTS - to accompany each hazard statement

Hazard Statement	Prevention	Response	Storage	Disposal
May be corrosive to metals	Keep only in original packaging.	Absorb spillage to prevent material damage.	Store in a corrosive resistant container.	-
Harmful if swallowed	Wash hands thoroughly after handling. Do not eat, drink or smoke when using this product.	IF SWALLOWED: Call a POISON CENTRE or doctor if you feel unwell. Rinse mouth.	-	Dispose of contents and container to an approved waste disposal plant.
Causes severe skin burns and eye damage	Do not breathe dusts or mists. Wash hands thoroughly after handling. Wear protective gloves, protective clothing and eye protection.	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water (or shower). Wash contaminated clothing before reuse. IF INHALED: Remove person to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTRE or doctor. Specific treatment: see Section 4 - First Aid Measures on this Safety Data Sheet. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do so. Continue rinsing.	Store locked up.	Dispose of contents and container to an approved waste disposal plant.
Causes serious eye damage	Wear eye protection and protective gloves.	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do so. Continue rinsing. Immediately call a POISON CENTRE or doctor.	-	-

SECTION 3 - COMPOSITION AND INFORMATION ON INGREDIENTS

DESCRIPTION: Sodium hydroxide solution.

INGREDIENTS

Chemical name	CAS No.	Proportion, %
Sodium hydroxide	1310-73-2	48–52
Water	7732-18-5	to 100

SECTION 4 - FIRST AID MEASURES

GENERAL ADVICE

- Take appropriate precautions to ensure your own health and safety before providing first aid.
- If a doctor or paramedic is consulted, provide them with this Safety Data Sheet.

SKIN

- Remove all contaminated clothing and footwear.
- With a clean cloth or paper towel, quickly blot or wipe away any excess product before flushing with water.
- Flush affected skin area with large amounts of running water. Use safety shower if available.
- If redness, irritation, swelling or blistering occurs, seek medical attention without delay.

EYE

- Immediately wash out affected eye and surrounding area with fresh running water.
- Ensure complete irrigation of the eye - keep eyelids apart and away from eye, move eyes up, down and to either side while irrigating.
- Continue irrigating for at least 15 minutes. If the eye area still feels irritated, or it feels as though it still contains grit or a foreign object, continue to irrigate.
- Seek medical attention without delay.

SWALLOWED

- *If swallowed do NOT induce vomiting.*
- If conscious, washout mouth and give water to drink.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
- *If reflexive vomiting occurs, rinse mouth and repeat administration of water.*
- If swallowed and patient begins to feel unwell, seek medical attention without delay.

INHALED

- Immediately remove patient to fresh air, lay patient down, keep warm and rested.
- This product is a strong alkali (pH > 14) and will be corrosive to the lung and air passage.
- If symptoms develop, seek medical advice.

NOTES TO DOCTOR OR PARAMEDIC

- This product is a strong alkali (pH > 14) and will cause serious skin, eye and lung damage.
- Treat symptomatically.

SECTION 5 - FIREFIGHTING MEASURES

FIRE HAZARD

- This product is not combustible.
- May produce flammable hydrogen gas in contact with some metals including aluminium.
- May decompose under fire conditions to produce corrosive and toxic fumes.

HAZCHEM CODE

- 2R

EXTINGUISHING MEDIA

- Water fog or fine water spray, foam, carbon dioxide, dry powder.

PRECAUTIONS FOR FIREFIGHTERS AND SPECIAL PROTECTIVE EQUIPMENT

- In case of fire, wear a liquid-tight chemical protective suit with breathing apparatus.
- Wear chemical resistant gloves and chemical resistant boots.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS

- Restrict access to area until clean-up operations are complete.
- Use personal protective equipment recommended in Section 8 of this Safety Data Sheet.
- Avoid contact with skin and eyes.
- Avoid walking through spilled product.
- Ventilate spill area if possible.

MINOR SPILLS

- Prevent further leakage or spillage if safe to do so.
- Contain spill with sand, soil or inert material.
- Do not let product enter drains or waterways.
- Clean up all spills immediately.
- Clean spill using a moist cloth or paper towel if the spill is dropwise; if the spill is larger then cover and absorb with sand, soil or inert material and shovel away.

MAJOR SPILLS

- Alert Fire Brigade and tell them the location and nature of hazard.
- Show this Safety Data Sheet to the Fire Crew in attendance.
- Contain and absorb spill with sand, soil or inert material.
- Prevent spillage from entering drains or water ways. Spilled product may pose a risk to the aquatic ecosystem if released. If contamination of drains or waterways occurs, advise Emergency Services.
- Use retention basins for storage and pH adjustment before discharge or disposal.

SECTION 7 - HANDLING AND STORAGE

HANDLING

- Eliminate personal contact. Do not get in eyes, on skin, or on clothing.
- Wear protective clothing recommended in Section 8 of this Safety Data Sheet when risk of exposure may occur.
- Avoid inhalation of vapours or mist.
- Use with adequate ventilation.
- Avoid generating splashes.
- Keep the containers tightly closed when not in use.
- Ensure all containers are labelled.
- Have emergency equipment (for fires, spills, etc.) readily available.
- Do not use incompatible material for product transfer or dosing equipment (see Section 10 - "Materials To Avoid" on this Safety Data Sheet).
- WARNING - to avoid violent reaction when diluting or mixing, always add this product in small quantities to a much larger quantity of water. NEVER add small quantities of water to this product.

STORAGE CONDITIONS

- Store in original container.
- Store the containers tightly closed.
- Store in a cool, dry, well-ventilated area - avoid storage in direct sunlight.
- Store separately from acids and oxidisers.
- Store away from incompatible materials (see Section 10 - "Materials To Avoid" on this Safety Data Sheet).
- Do not use incompatible material for bunding and containment (see Section 10 - "Materials To Avoid" on this Safety Data Sheet).

SECTION 8 - EXPOSURE CONTROLS AND PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE STANDARDS

The following table shows the workplace exposure standards for airborne contaminants (exposure standards).

The exposure standard for the component below is shown as if the component is 100% of the formulation (i.e. as if the component has not been diluted by being part of this product).

		mg/m³	
Component	CAS No.	TWA	STEL
Sodium hydroxide	1310-73-2	2	-

ENGINEERING MEASURES

- General ventilation is recommended.
- Use local exhaust ventilation if necessary to control vapours or mist.

EXPOSURE CONTROL MEASURES

- Wear personal protective clothing including gloves and safety glasses.
- Keep an eye wash fountain available.
- Where practicable, have a safety shower available.

PERSONAL PROTECTION

We recommend as a minimum precaution the use of tight-fitting safety goggles, protective gloves and work clothes protecting arms, legs and body as well as fully enclosed safety boots/gumboots.

Respiratory Protection

- Respiratory protection is not normally needed. If prolonged exposure may occur, use a full-face respirator with multi-purpose cartridge that protects against chemical mists and vapours.

Hand Protection

- Gloves made from Viton, polyvinyl chloride (PVC), natural rubber.

Skin Protection

- Standard protective clothing, splash apron and rubber boots.

Eye Protection

- Tight-fitting safety goggles.
- Use of a full-face shield is recommended.

Hygiene Recommendations

- Use good work and personal hygiene practices to avoid exposure.
- Always wash and clean yourself thoroughly after handling this and other chemicals.
- If clothing is contaminated, remove clothing and discard or launder. Launder contaminated clothing separately and before reuse.
- When handling this product never eat, drink or smoke.

ENVIRONMENTAL EXPOSURE CONTROL PRECAUTIONS

- Consider the provision of containment around storage vessels.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Form	Liquid
Appearance	Colourless to slight colour
Odour	Nil
pH	> 14 (1% solution)
Freezing point	12°C
Boiling point	> 140°C
Flash point	Not flammable
Explosive limits	Not flammable
Specific gravity	1.51–1.55
Solubility in water	Miscible (complete)
Viscosity	80 cP @ 20°C

SECTION 10 - STABILITY AND REACTIVITY

STABILITY

- Stable under normal conditions.
- Contact with acidic materials liberates heat.
- Contact with water liberates heat.

CONDITIONS TO AVOID

- Extremes of temperature.

MATERIALS TO AVOID

- Addition of water may result in localised heating and generate a violent reaction.
- Acidic material.
  - » Contact with acidic material generates a violent reaction, heat and/or toxic vapours.
- Oxidising material.
  - » Contact with strong oxidizers (e.g. chlorine, hypochlorites, peroxides, chromates, nitric acid, perchlorates, permanganates etc.) may generate heat, fires, explosions, and toxic vapours.
- Metals.
  - » Not compatible with some metals including galvanised metals, aluminium, tin, zinc, brass, bronze.
- Nylon.
  - » Not compatible with nylon. Do not use fittings, O-rings, gaskets, dosing lines or chemical bunding material made from or containing nylon.

HAZARDOUS DECOMPOSITION PRODUCTS

- May produce flammable hydrogen gas in contact with some metals including aluminium.

SECTION 11 - TOXICOLOGICAL INFORMATION

Acute toxicity*	LD_{50} Oral	rat	>300 mg/kg
	LD_{50} Dermal	rabbit	>2,000 mg/kg
	LC_{50} Inhalation	no information available	
Skin corrosion/irritation	Causes severe skin burns		
Serious eye damage/irritation	Causes serious eye damage		
Respiratory sensitisation	No information available		
Skin sensitisation	No information available		
Germ cell mutagenicity	No information available		
Carcinogenicity	Not listed as a human carcinogen (IARC)		
Reproductive toxicity	No information available		
STOT - single exposure	No information available		
STOT - repeated exposure	No information available		
Aspiration hazard	No information available		

* The acute toxicity data for this product has been derived by extrapolating those values for sodium hydroxide anhydrous (CAS No. 1310-73-2) as provided by the United States National Library of Medicine HSDB Database.

Acronyms and abbreviations

AICIS	Australian Industrial Chemicals Introduction Scheme.
AIIC	Australian Inventory of Industrial Chemicals.
BCF	Bioconcentration factor. The ratio of the chemical concentration in an aquatic organism (due to intake and retention by respiration only), to the concentration of the chemical in the surrounding water.
CAS No.	Chemical Abstracts Service registration number (sometimes referred to as CASRN).
cP	Centipoise (dynamic viscosity).
°C	Degrees Celsius.
EPG	Emergency Procedure Guide - Transport: Australian Standards AS 1678 (series).
GHS	Globally Harmonised System of Classification and Labelling of Chemicals (United Nations).
Hazchem code	Hazchem Emergency Action Code (also known as an Emergency Action Code or EAC). A British Fire Service code system to provide immediate action advice to emergency services when attending an incident involving dangerous goods.
HSDB	Hazardous Substance Data Bank, United States National Library of Medicine.
IARC	International Agency for Research on Cancer. An intergovernmental agency forming part of the World Health Organization of the United Nations.
LC_{50}	Lethal concentration, 50%. The concentration of material (in air or water) that will cause 50% of the test population to perish.
LD_{50}	Lethal dose, 50%. The quantity of material when administered all at once that will cause 50% of the test population to perish.
$\log(K_{ow})$	The logarithm of the octanol-water partition coefficient. The $\log(K_{ow})$ number is designed to represent the tendency of the chemical to partition itself between the organic phase (the fish) and the water phase in which the fish lives. Chemicals with $\log(K_{ow})$ values >4 are considered to bioaccumulate.
mg/kg	Milligrams per kilogram.
mg/m^3	Milligrams per cubic metre.
pH	A scale used to express the acidity or basicity of dilute water solutions. pH is defined as the negative logarithm of the hydronium ion (H_3O^+) activity in water-based solutions. Practical application of pH best suited to aqueous solutions with an ionic strength <0.1 moles/kilogram and a pH between 1–13.
Rev	Revision.
SDS	Safety Data Sheet.
STEL	Short term exposure limit. The 15-minute time-weighted average airborne concentration of the substance under consideration.
SUSMP	Standard for the Uniform Scheduling of Medicines and Poisons (Poisons Standard - Australia).
TWA	Time-weighted average. The 8-hour time-weighted average airborne concentration of the substance under consideration.
UN	United Nations (number). United Nations Committee of Experts on the Transport of Dangerous Goods.

The information contained in this Safety Data Sheet is based on our best present knowledge and experience. It is intended to convey information about the chemical health and safety hazards of our product for health and safety reasons only. The data is not a guarantee of specific properties of this product.

This product is to be used in applications consistent with our product literature.

Individuals handling this product should be informed of the recommended safety precautions and should have access to this information.

For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to ensure safe workplace operations.

SECTION 12 - ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION

- No information available.

PERSISTENCE AND DEGRADABILITY

- No information available.
- This product consists of inorganic compounds only.

BIOACCUMULATION POTENTIAL

- The potential to bioaccumulate is low. This is based on a estimated log K_{ow} value of -3.88 for sodium hydroxide which gives a calculated bioconcentration factor (BCF) of < 0.002.

MOBILITY IN SOIL

- No information available.
- This product is completely miscible in water.

SECTION 13 - DISPOSAL CONSIDERATIONS

- Dispose of in accordance with local, state and federal regulations.
- Dispose of wastes in an approved waste treatment plant in accordance with applicable regulations.
- Do not dispose of wastes in local sewer or with normal garbage.
- Do not reuse empty container for any purpose except to store this chemical.

SECTION 14 - TRANSPORT INFORMATION

Classified as a dangerous good - Australian Code for the Transport of Dangerous Goods by Road & Rail.

UN number	1824
Proper shipping name	SODIUM HYDROXIDE SOLUTION
Transport hazard class	8
Subsidiary hazard	-
Packing group number	II
Hazchem code	2R
EPG	8A1

SECTION 15 - REGULATORY INFORMATION

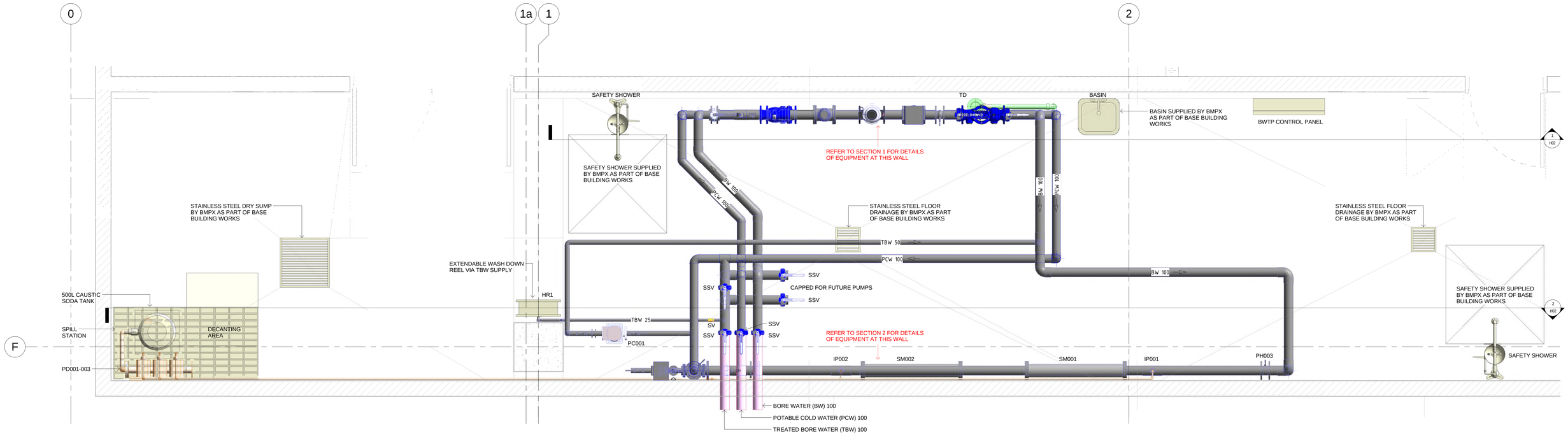
Safe Work Australia	»	This Safety Data Sheet (SDS) has been prepared in accordance with the Model Work Health and Safety Regulations 2021 (Safe Work Australia).
GHS	»	The hazards of this product (Section 2 of this SDS) are classified in accordance with the Globally Harmonised System of Classification and Labelling of Chemicals (GHS).
AICIS	»	All ingredients in this product comply as per the Australian Industrial Chemicals Introduction Scheme (AICIS).
AIIC	»	All ingredients in this product are either listed or are exempt from listing in the Australian Inventory of Industrial Chemicals (AIIC).
POISON Schedule	»	Schedule 6 - Poison. Substances with a moderate potential for causing harm, the extent of which can be reduced through the use of distinctive packaging with strong warnings and safety directions on the label.

SECTION 16 - OTHER RELEVANT INFORMATION

Revision date	17 February 2022
Revision number	6.8 (Minor update to Sections 12, 15 and 16)
Information sources	» Preparation of Safety Data Sheets for Hazardous Chemicals Code of Practice, July 2020 (Safe Work Australia). » Australian Code for the Transport of Dangerous Goods by Road & Rail, Edition 7.7. 2020. » Safety Data Sheets from our suppliers of raw material. » Poisons Standard June 2021 - Australian Government *Therapeutic Goods Act 1989*. » Model Work Health and Safety Regulations, January 2021 (Safe Work Australia). » Hazardous Substance Information System (Safe Work Australia). » Globally Harmonised System of Classification and Labelling of Chemicals (GHS) 7th Edition, United Nations 2017. » National Institutes of Health (NIH), United States Department of Health and Human Services (HHS). TOXNET (Toxicology Data Network) Hazardous Substance Data Bank (HSDB), United States National Library of Medicine (NLM). » Agents Classified by the *IARC Monographs*, Volumes 1–120. World Health Organization (WHO) International Agency for Research on Cancer (IARC). » EPI Suite V4.11 (2012). Estimation Programs Interface Suite™ for Microsoft® Windows. United States Environmental Protection Agency, Washington, DC, USA.

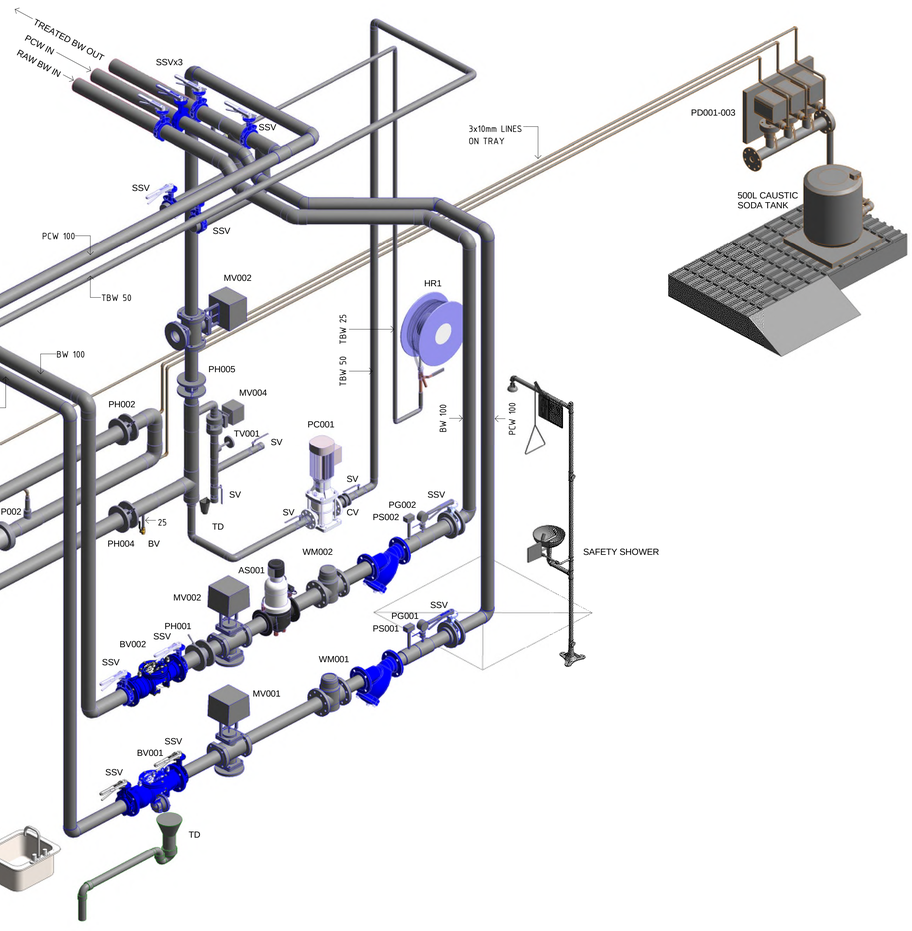
Appendix 10

E10 BWTP – Hilmer Building
Operation And Maintenance Manual



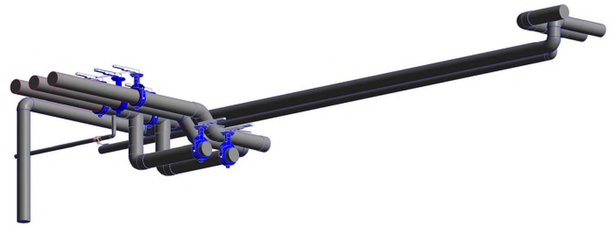
1 Plant Part Plan

SCALE 1 : 20



2 3D VISUALISATION

SCALE



3 3D H/L SV CONFIGURATION

SCALE

NOTES

PLOT STAMP DATE: 12/05/2014 7:14:36 PM

REV.	DESCRIPTION	DRN	APP.	DATE
0	ISSUED FOR TENDER	CK	TS	13.05.14
A	ISSUED FOR COORDINATION	CK	TS	01.05.14

DRAWING CHECK	SIGNATURE	DATE
DRAWN	TS	
DESIGNED		
CHECKED		
VERIFIED		

HYDRAULIC ENGINEER

Earlmap Pty Ltd
Hydraulic & Fire Consultants
PO Box 6129 UNSW SYDNEY 1466
ph: 0419 466 399

CLIENT
UNSW FM ENGINEERING

PROJECT
BORE WATER TREATMENT PLANT

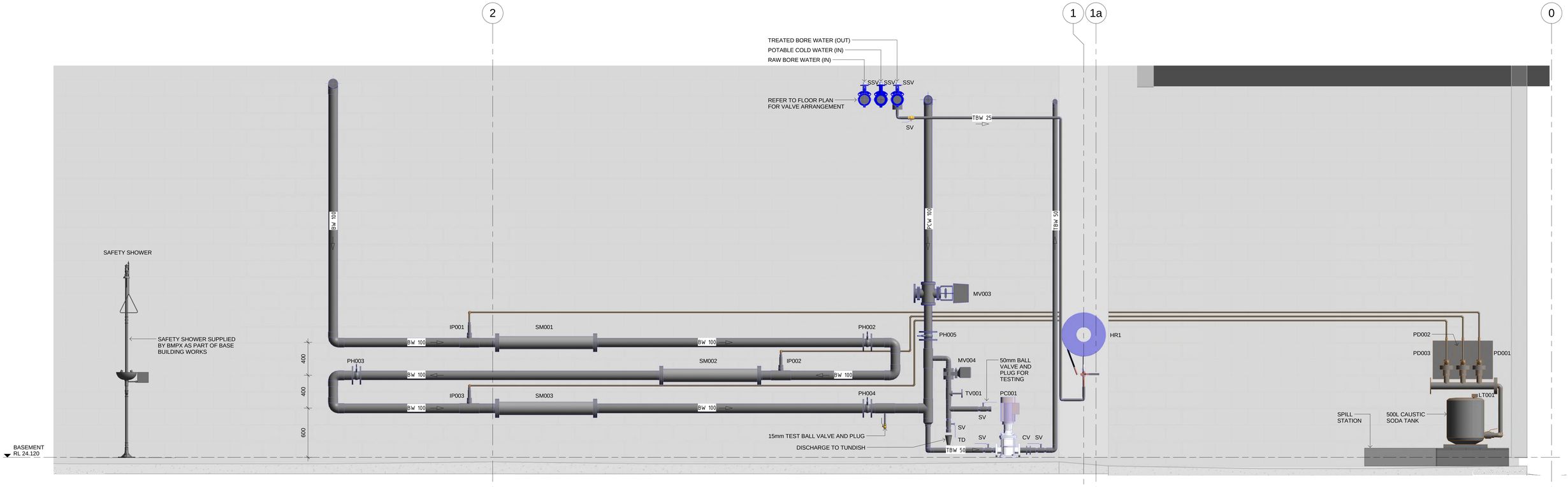
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PLANTROOM PLAN AND 3D VISUALISATION

BUILDING NAME
MATERIALS SCIENCE AND ENGINEERING BUILDING B1

SCALE
1 : 20 @ B1

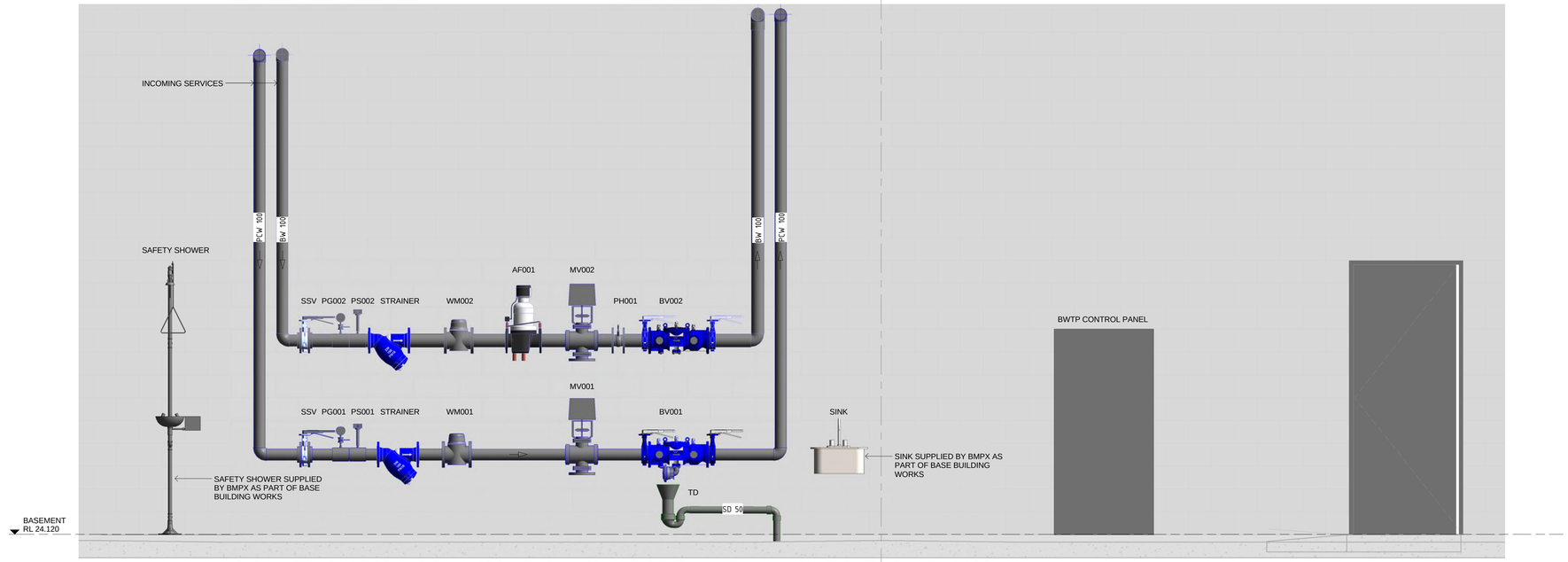
DRAWING No.
H01

REV.
0



2 SECTION 1

SCALE 1 : 20



1 SECTION 2

SCALE 1 : 20

NOTE: BRACKET AND FIXINGS NOT SHOWN FOR CLARITY

NOTES

PLOT STAMP DATE: 12/05/2014 7:14:55 PM

REV.	DESCRIPTION	DRN	APP.	DATE
0	ISSUED FOR TENDER	CK	TS	13.05.14
A	ISSUED FOR COORDINATION	CK	TS	01.05.14

DRAWING CHECK	SIGNATURE	DATE
DRAWN	TS	
DESIGNED		
CHECKED		
VERIFIED		

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PROJECT
BORE WATER TREATMENT PLANT

TITLE
PLANT SECTIONS

BUILDING NAME
MATERIALS SCIENCE AND ENGINEERING BUILDING B1

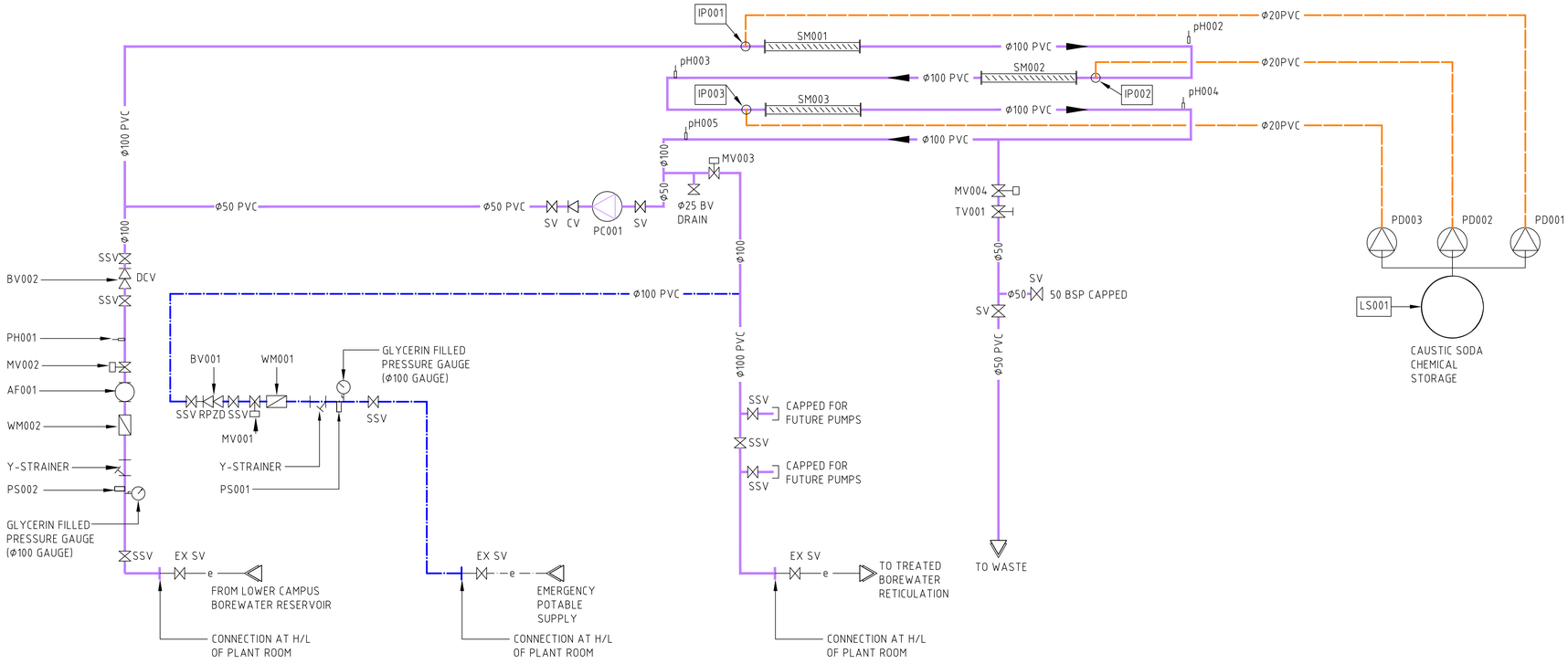
SCALE
1 : 20 @ B1

DRAWING No.
H02

REV.
0

Device Name	PID Reference	Model/Type/Duty	Supplier	Power (kW)
Caustic Dosing Pump	PD001-003	GALa0708PVT200	Prominent	240v
pH Monitors		DMTAW090P00E	Prominet	24vdc
pH Probe	pH001-005	S400-RT330-A33FF	Prominet	
Auto-Backwash Filter	AF001	Judo JPF Plus DN100 70M3/HR	Trevling	240v
Y Strainer	Y-Strainer	AAP VDI94 CI Epoxy Coated	AAP Industries	
Baulk Caustic Level Transmiter	LT001	Prosonic M FMU40	Endress+Hauser	24v
Digital Pressure Gauges	PS001-002	PG2454. 4-20ma 10bar	IFM	24v
CPVC Pipe		Corzan	Total Eden	
Actuated Butterfly Valves	MV001-004	Stainless	Alfa laval	24vdc
Recycle Pump	PC001	VSD + Hydrovar	Lowara	1kw3p.
Check Valve	CV	cpvc	Total Eden	50mm dia
Manual Butterfly Valves	SSV	cpvc	Total Eden	50mm dia
		Stainless	Alfa laval	100mm dia
Flow Meter	WM001-002	7ME6580-3TN14-2AA1 7ME6910-1AA30-1AA0	Siemens	
Static Mixer's	SM001-003	1500mm L,100DN with 20mm Side Injections 316SS	Fluid Solutions	
Baulk Caustic Tank		VIP 14,screwed cap,vent natural	Dex industrial Tanks	500ltr
Throttle Valve	TV001	SSGL 50	AAP Industries	50mm dia
Spill Station 20ltr Pales		Spill Pall E5750YE	Enware	
Spill Station 500ltr Drum		Spill Pall E5760YE	Enware	
Access Ramp			Enware	
Potable Water Backflow	BV001	RP03 RPZD	Tyco Flow Control	100mm dia
Bore Water Backflow	BV002	DC03 DVCA	Tyco Flow Control	100mm dia
Retractable hose reel - Refer to H01 for location	HR1	30m Auto Rewind Hose Reel	HOSELINK	20mm dia

EQUIPMENT SCHEDULE



P&ID - SCHEMATIC LAYOUT

INTENDED OPERATING CONDITIONS

RAW BORE WATER ENTERS THE SYSTEM FROM THE LOWER CAMPUS BORE WATER SUPPLY THROUGH A 100MM SUPPLY MAIN. THE WATER PASSES THROUGH A WATER METER (WM002), AUTO BACKWASH FILTER (AF001) AND MOTORISED VALVE (MV002), NORMALLY OPEN. THE PH OF THE RAW BORE WATER IS MEASURED AT PH PROBE (PH001) AND RECORDED EVERY 15MIN (FOR FUTURE REFERENCE). THE WATER THEN PASSES THROUGH A BACKFLOW PREVENTION DEVICE (BV002).

THE RAW BORE WATER CONTINUES AROUND THE TREATMENT LOOP WITH LIQUID CAUSTIC BEING DOSED INTO THE LINE AT INJECTION POINT (IP001), BEFORE THE STATIC MIXER (SM001). THE LIQUID CAUSTIC IS SUPPLIED FROM THE DOSING PUMP (PD001) AT A PREDETERMINED RATE WHICH IS REGULATED BY THE FLOW MEASURED (4-20MA OUTPUT) THROUGH THE WATER METER (WM002). THE DOSED WATER PASSES THROUGH THE INLINE STATIC MIXER (SM001).

PH PROBE (PH001) STOPS THE DOSING PUMP (PD001) IF PH IS GREATER THAN 6.2 IN ADDITION IT ALSO STOPS THE OTHER TWO DOSING PUMPS (PD002 & PD003) IF PH IS GREATER THAN PH7.20.

THE PH OF THE SEMI-TREATED BORE WATER IS MEASURED ON A CONTINUOUS BASIS AT THE PH PROBE (PH002) AND IF THE PH IS BETWEEN THE RANGES OF PH6.2 TO PH6.8 THE PROBE CONTROLLER SIGNALS THE DOSING PUMP (PD002) TO OPERATE AT A PREDETERMINED RATE. LIQUID CAUSTIC IS DOSED INTO THE LINE AT INJECTION POINT (IP002), BEFORE THE STATIC MIXER (SM002).

THE PH OF THE TREATED BORE WATER IS MEASURED ON A CONTINUOUS BASIS AT THE PH PROBE (PH003) AND IF THE PH IS BETWEEN THE RANGES OF PH6.8 TO PH7.2 THE PROBE CONTROLLER SIGNALS THE DOSING PUMP (PD003) TO OPERATE AT A PREDETERMINED RATE. LIQUID CAUSTIC IS DOSED INTO THE LINE AT INJECTION POINT (IP003), BEFORE THE STATIC MIXER (SM003).

THE MAIN FLOW OF THE TREATED BORE WATER PASSES PH PROBE (PH005) RECORDED FOR FUTURE REFERENCE AND THROUGH MOTORISED VALVE (MV003), NORMALLY OPEN, BEFORE DISCHARGING THROUGH THE 100MM PIPEWORK TO THE CAMPUS WIDE TREATED BORE WATER RETICULATION.

A 50MM BRANCH COMES OFF THE 100MM PIPE BETWEEN PH PROBES (PH004 & PH005). THIS BRANCH DIRECTS WATER THROUGH THE CIRCULATING PUMP (PC001) AND BACK INTO THE TREATMENT LOOP BETWEEN PH PROBES (PH001 & PH002). THE VSD CIRCULATING PUMP (PC001) OPERATES CONTINUOUSLY 24/7.

AUTOMATIC CHANGE OVER TO POTABLE WATER

IF EXISTING RAW BORE WATER SYSTEM SUPPLY PRESSURE (PS002) FALLS TO BELOW 350KPA FOR 10MIN OR MORE THEN THE MOTORISED VALVE (MV003) WOULD AUTOMATICALLY CLOSE, THE POTABLE MOTORISED VALVE (MV001) WOULD AUTOMATICALLY OPEN (AT THE SAME TIME). THE REMAINDER OF THE SYSTEM WOULD OPERATE AS DESCRIBED UNDER THE "INTENDED OPERATING CONDITIONS".

ONCE THE EXISTING RAW BORE WATER SYSTEM SUPPLY PRESSURE (PS002) RISES TO ABOVE 450KPA FOR 10MIN OR MORE THEN THE MOTORISED VALVE (MV003) WOULD AUTOMATICALLY OPEN, THE POTABLE MOTORISED VALVE (MV001) WOULD AUTOMATICALLY CLOSE AND THE SYSTEM WOULD OPERATE UNDER THE "INTENDED OPERATING CONDITIONS".

IF THE TREATED BORE WATER QUALITY AT PH PROBE (PH005) IS OUTSIDE THE PARAMETERS OF PH7.00 TO PH7.40 THEN THE MOTORISED VALVE (MV003) WOULD AUTOMATICALLY CLOSE, THE POTABLE MOTORISED VALVE (MV001) WOULD AUTOMATICALLY OPEN AND THE "DRAIN TO WASTE" SOLENOID (MV004) WOULD AUTOMATICALLY OPEN DISCHARGING AT A PRE-SET FLOW TO WASTE (APPROX. 1L/SEC). ONLY WHEN THE PH, MEASURED AT PROBE (PH005) IS WITHIN THE PARAMETERS OF PH7.00 TO PH7.40 FOR 10 MINUTES THEN THE MOTORISED VALVE (MV003) WOULD AUTOMATICALLY OPEN, THE POTABLE MOTORISED VALVE (MV001) WOULD AUTOMATICALLY CLOSE AND THE "DRAIN TO WASTE" SOLENOID (MV004) WOULD AUTOMATICALLY CLOSE. THE SYSTEM WOULD THEN OPERATE UNDER THE "INTENDED OPERATING CONDITIONS".

MANUAL OPERATION ON POTABLE WATER

IN THE EVENT THAT MANUAL OPERATION ON POTABLE WATER IS REQUIRED, A "MANUAL OVERRIDE" SWITCH LOCATED ON THE SYSTEM CONTROL PANEL WILL CLOSE THE MOTORISED VALVE (MV003), CLOSE MOTORISED VALVE (MV002), OPEN THE POTABLE MOTORISED VALVE (MV001) AND ISOLATE POWER TO PUMPS (PC001, PD001, PD002 AND PD003).
ON RETURN TO AUTOMATIC OPERATION (VIA RESET OF THE "MANUAL OVERRIDE" SWITCH), MOTORISED VALVE (MV002) NEEDS TO OPEN, POWER TO PUMPS (PC001, PD001, PD002 AND PD003) NEEDS TO BE TURNED ON AND THE "DRAIN TO WASTE" SOLENOID (MV004) WOULD NEED TO BE OPEN DISCHARGING AT A PRE-SET FLOW TO WASTE (APPROX. 1L/SEC). THE SYSTEM WOULD OPERATE IN THIS MODE FOR A PERIOD OF 10 MINUTES TO ALLOW THE SYSTEM TO ACHIEVE THE CORRECT DOSING LEVELS. UPON A PH READING OF PH7.00 TO PH7.40 AT PROBE (PH005) AND A PRESSURE READING OF 450KPA OR GREATER AT THE EXISTING RAW BORE WATER SYSTEM SUPPLY PRESSURE (PS002), THE MOTORISED VALVE (MV003) WOULD AUTOMATICALLY OPEN, THE POTABLE MOTORISED VALVE (MV001) WOULD AUTOMATICALLY CLOSE AND THE SYSTEM WOULD OPERATE UNDER THE "INTENDED OPERATING CONDITIONS".

ADDITIONAL CONTROLS

1. MOTORISED VALVE (MV003) CLOSES TO ISOLATE THE TREATMENT SYSTEM AND MOTORISED VALVE (MV001) OPENS TO SUPPLY POTABLE WATER WHEN PLANT SHUT-DOWN OCCURS DURING A POWER FAILURE.
2. THE POTABLE WATER SYSTEM SUPPLY PRESSURE (PS001) IS MEASURED AND RECORDED EVERY 15MIN FOR FUTURE REFERENCE. A REMOTE OUTPUT IS TO BE SUPPLIED TO THE UNSW EMACS SYSTEM (REFER TO NOTES BELOW).
3. OUTPUT SIGNAL FROM THE POTABLE WATER METER (WM001) IS CONTINUOUSLY RECORDED (PULSE OUTPUT) FOR FUTURE REFERENCE. A REMOTE OUTPUT IS TO BE SUPPLIED TO THE UNSW EMACS SYSTEM.
4. OUTPUT SIGNAL FROM THE RAW BORE WATER METER (WM002) IS CONTINUOUSLY RECORDED (PULSE OUTPUT) FOR FUTURE REFERENCE. A REMOTE OUTPUT IS TO BE SUPPLIED TO THE UNSW EMACS SYSTEM.
5. THE AUTO BACKWASH FILTER (AF001) OPERATES AUTOMATICALLY AND INDEPENDENTLY OF THE PLANT. POWER SUPPLIED FROM PLANT CONTROL CUBICLE WITH LOCAL ISOLATION AT THE FILTER.
6. CAUSTIC TANK LEVEL SENSOR (LT001) IS TO PROVIDE A LOW LEVEL ALARM, HIGH LEVEL ALARM AND ANALOGUE LEVEL INDICATION SIGNAL BACK TO THE PLANT CONTROL CUBICLE. IN THE EVENT OF A HIGH OR LOW LEVEL ALARM, A SIGNAL SHALL BE PROVIDED TO THE UNSW EMACS SYSTEM.

CONNECTION TO UNSW EMACS

THE NEW PLANT IS TO BE CONNECTED TO THE UNSW EMACS THROUGH A DATA CABLE INSTALLED WITHIN THE BWTP ROOM BY OTHERS. AS PART OF THESE WORKS GTHE CONTRACTOR IS TO CONFIRM THE OPERATIONAL FUNCTION OF THE DATA LINK. PING TEST THE LINK TO ESTABLISH THE REMOTE IP LOCATION WITHIN THE UNSW NETWORK. UNSW IT SHOULD BE CONTACTED WITH REGARDS TO THE NETWORK PROTOCOLS & IP MAPPING REFERENCES.

VSD PUMP DUTY

FINAL DUTY OF THE VSD PUMP TO BE DETERMINED DURING COMMISSIONING, BASED ON MAX-MIN RANGE.

PROPOSED TREATED BORE WATER PLANT - FUNCTIONAL DESCRIPTION

NOTES

PLOT STAMP DATE: 30/04/2014 9:42:15 PM

REV.	DESCRIPTION	DRN	APP.	DATE
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A	ISSUED FOR COORDINATION	CK	TS	01.05.14

DRAWING CHECK

	SIGNATURE	DATE
DRAWN	TS	
DESIGNED		
CHECKED		
VERIFIED		

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PROJECT
BORE WATER TREATMENT PLANT

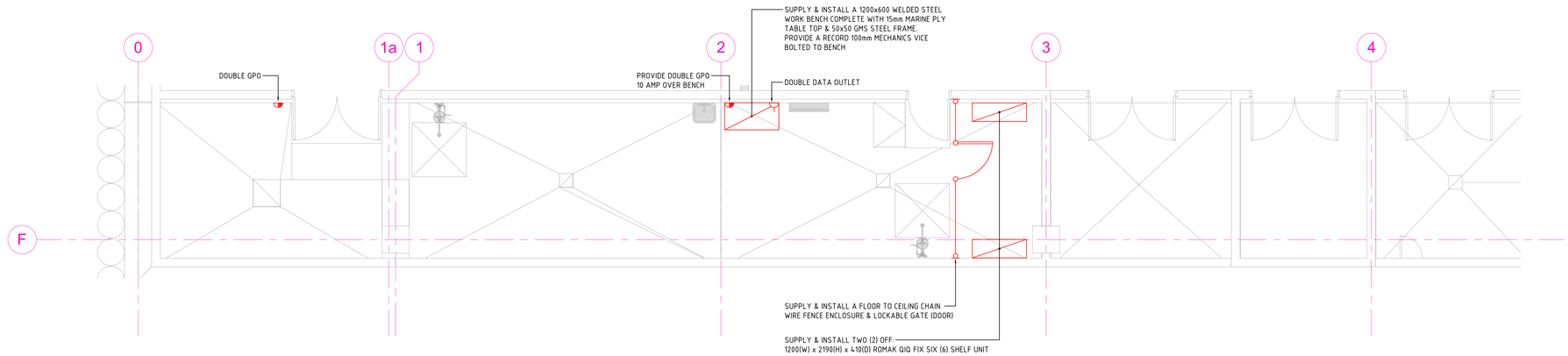
TITLE
BOREWATER TREATMENT PLANT
DATA AND SCHEMATIC

BUILDING NAME
MATERIALS SCIENCE AND ENGINEERING BUILDING B1

SCALE
AS NOTED @ B1

DRAWING No. H03

REV. 0



MISCELLANEOUS PLANTROOM FITOUT

NOTES

REV.	DESCRIPTION	DRN	APP.	DATE
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DRAWING CHECK	SIGNATURE	DATE
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DESIGNED		
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VERIFIED		

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PROJECT
BORE WATER TREATMENT PLANT

TITLE
MISCELLANEOUS PLANTROOM FITOUT

BUILDING NAME
MATERIALS SCIENCE AND ENGINEERING BUILDING B1

SCALE
1:50 @ B1

DRAWING No.
H04

REV.
0

Process Description

Refer to drawings H03, and MCC Circuit Diagrams UNSW LCBWTP REV2.

Overview

The plant has three operating modes. They are PLANT INHIBIT, BYPASS & AUTO.
When the plant is not in BYPASS or PLANT INHIBIT, it is in AUTO.
PLANT INHIBIT is the normal state for the plant to be in.
To reinstate the plant to operate, caustic has to be filled into the caustic storage tank.

PLANT INHIBIT Mode

In PLANT INHIBIT the plant is not operating as a treatment plant, all chemical has been removed from the caustic storage tank and the plant is in sleep mode.
The plant is remotely controlled from the Upper Campus Bore Water Treatment Plant (UCBWTP) and is available to provide potable water to the reticulation system only.
When the UCBWTP switches to RESERVOIR BYPASS it communicates with the LCBWTP to open the Potable Water Inlet Valve (MV001) to allow the lower campus treated bore water reticulation system to be supplied by potable water.
Once the UCBWTP return to either AUTO or BWTP BYPASS mode it communicates with the LCBWTP to close the Potable Water Inlet Valve (MV001).

AUTO Mode

The following points are descriptions are referred to as the normal operation.
The Raw Bore Water Inlet Valve, MV002, is opened to allow Raw Bore Water into the plant. The dosing pumps, PD001-003, are enabled as required, the circulating pump, PC001, is enabled and after 5 mins (HMI adjustable) of circulating, if all plant conditions are met, the Treated Bore Water Outlet valve, MV003, is opened and the Emergency Potable Water Inlet Valve, MV001, is shut.

Raw Bore Water

As raw (untreated) bore water enters the plant from the lower campus, the pressure and flow rate are monitored via PS002 and WM002 respectively. If PS002 drops below 350kPa, an alarm is raised and the plant diverts to emergency potable water (divert) until the pressure is above 450kPa.

The water then passes through an automatic backwash filter, AF001.

After leaving the filter, the water passes the “Raw Bore Water Inlet Valve”, MV002. Backflow from this point is then prevented by BV002.

The raw water pH is then measured by Raw Water pH instrument, pH001.

Treatment Point 1

The raw water is initially treated at IP001 with liquid caustic supplied from Dosing Pump 1, PD001. Dosing Pump 1 is flow paced based on WM002. The caustic and raw bore water is then mixed as it passes through an inline static mixer, SM001.

The semi-treated water pH is then measured by a second pH instrument, pH002. The pH must be above 6.9 (HMI adjustable), otherwise alarm.

Treatment Point 2

The semi-treated water is then treated at IP002 with liquid caustic supplied from Dosing Pump 2, PD002. Dosing Pump 2 is PID controlled based on the discharge pH.

Treatment Point 3

This has been removed.

Treated Bore Water

The main flow of Treated Bore Water is then measured by Treated Bore Water Outlet pH instrument, pH005. The pH is recorded every 5 seconds.

The pH must be between 6.4 and 8.2pH (HMI adjustable), otherwise alarm, divert and drain.

The treated water then passes through the Treated Bore Water Outlet valve, MV003.
MV003 is a motorised valve.

Drain to Waste

After pH005 a smaller line branches off the main flow.
This is the Drain to Waste line. This line passes through Drain to Waste Valve, MV004.

Recirculation Loop

Between pH004 and pH005 a smaller line branches off the main flow.
This recirculation loop passes through the Circulating Pump, PC001, and then back into the raw water line after pH001. When PC001 is running, flow is checked against Recirculation Flow Switch, FS001. If the plant is diverted to Potable Mains Water, or there is no flow for through WM001 for more than 1Hr, and the pH measured by pH001 is above 7.2pH, then PC001 cycles off for 15mins and on for 30mins respectively. Continuous running is reinstated regardless of the timers if either flow is detected by WM002 or the plant returns to Bore Water Treatment.

Emergency Potable Water

Potable mains water is the backup supply for the system. As potable mains water enters the plant, the pressure and flow are monitored via PS001 and WM001 respectively.

The potable mains water passes the “Potable Water Inlet Valve”, MV001 and enters the treated bore water main. MV001 is a motorised valve.

BYPASS Mode

In the event of a critical alarm, the plant is then required to divert to potable mains water. MV003 shuts whilst simultaneously MV001 opens. The critical alarm conditions are:

- pH instrument pH004 not healthy (instrument goes outside the 4-20mA range).
- pH instrument pH005 not healthy (instrument goes outside the 4-20mA range).
- LS001 low low level (caustic tank level).
- Instrument Failure, except WM001 and PS001
- Bore water supply pressure, PS002 <350kPa for more than 10 minutes.

If the system alarms and is required to divert to potable mains water and drain to waste, in the case of Low pH or High pH. The system will return to normal if the following conditions are met:

- pH005 6.4<pH>8.2 for more than 10 minutes (HMI adjustable).

Then MV003 shuts whilst simultaneously MV001 opens. MV004 also opens.
The system will return once the pH returns to within the setpoints.

Dosing Pumps

Dosing Pump 1, PD001, is controlled via 4-20mA from the PLC and is stopped and started via the PLC.

Dosing Pump 2, PD002, is controlled via 4-20mA from the PLC and is stopped and started via the PLC
Both dosing pumps draw from a common Caustic Tank. In the event that Caustic Level drops below the 5% both pumps must stop, the system therefore diverts and alarms.

Instruments

If pH001-005 probes fail, the plant alarms.
If LS001 fails or falls below the low low setpoint, the plant alarms and divert.
If PS001 fails or falls below the low setpoint, the plant must alarm.
If PS002 fails or falls below the low setpoint, the plant must alarm and divert.
If WM001 or WM002 fails or goes above setpoint high flow, the plant must alarm.

The following steps are outside the <u>normal operation</u>

<u>Manual Bypass – Divert to Potable Supply</u>

When the plant is diverted due to Manual Bypass then:
MV001 opens & MV003 closes.
The remainder of the system operates automatically, however manual control of all devices is possible.

Upon re-activation:
MV001 closes & MV003 opens, and all devices return to automatic.

<u>Emergency Stop</u>

The emergency stop (Estop) is Cat 3 rated. On activation (trip) of the Estop circuit the plant stop and goes into divert.

PD001-003 are turned off. PC001 is also stopped.

MV003 shuts whilst simultaneously MV001 opens. MV002 also closes.

On reset of the Estop the plant goes into drain for minimum 10mins. Once this timer has elapsed and all setpoints are met the plant returns to normal operation

UNSW EMACS

UNSW has a Modbus/TCP (IP) based overview system referred to as EMACS. A data cable link to the MCC will maintain the connection between the BWTP MCC and the EMACS.

All Alarms and instantaneous analogue values are made available for viewing on the EMACS.

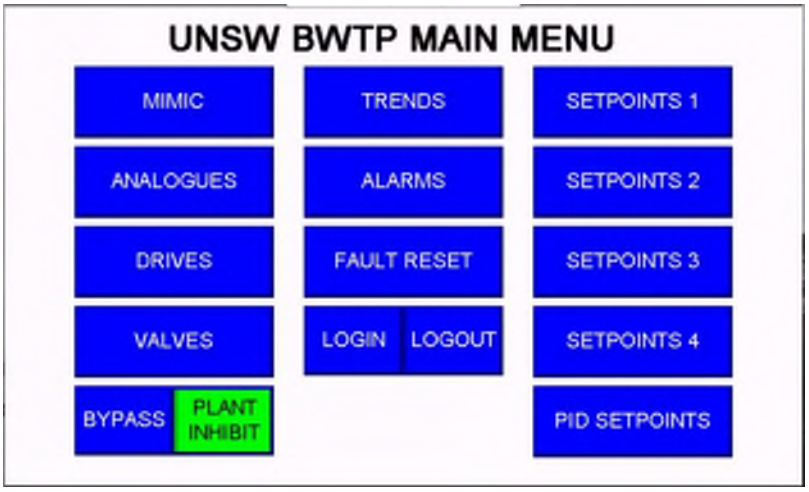
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HMI	128.94.38.94	255.255.255.0

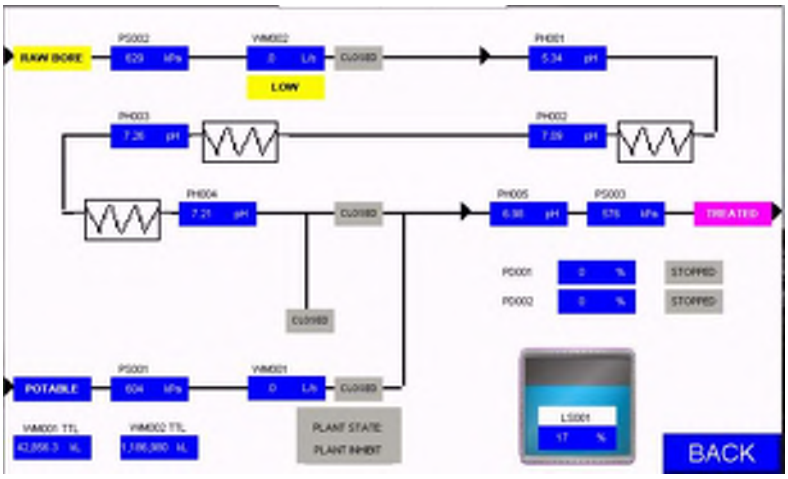
ALARMS LIST

LS001 ANALOGUE INPUT ERROR	MV003 DID NOT FULLY OPEN
PS001 ANALOGUE INPUT ERROR	MV004 DID NOT FULLY CLOSE
PS002 ANALOGUE INPUT ERROR	MV004 DID NOT FULLY OPEN
PH001 ANALOGUE INPUT ERROR	PC001 FAULTED
PH002 ANALOGUE INPUT ERROR	PD001 FAULTED
PH003 ANALOGUE INPUT ERROR	PD002 FAULTED
PH004 ANALOGUE INPUT ERROR	PD003 FAULTED
PH005 ANALOGUE INPUT ERROR	PH002 PH LOW
WM001 ANALOGUE INPUT ERROR	PH003 PH LOW
WM002 ANALOGUE INPUT ERROR	PH004 PH LOW
DISCHARGE OUT OF SPEC - DRAINING TO WASTE	PH005 PH LOW
LS001 CAUSTIC STORAGE TANK LEVEL HIGH	PH005 PH HIGH
LS001 CAUSTIC STORAGE AT REORDER LEVEL	PS001 POTABLE WATER PRESSURE LOW
LSS01 CAUSTIC STORAGE TANK LEVEL LOW	PS002 RAW BORE WATER PRESSURE LOW
MV001 DID NOT FULLY CLOSE	WM001 POTABLE WATER HIGH FLOW
MV001 DID NOT FULLY OPEN	WM002 RAW BORE WATER HIGH FLOW
MV002 DID NOT FULLY CLOSE	PLANT ESTOP ACTIVATED
MV002 DID NOT FULLY OPEN	RECIRCULATION LOOP LOW FLOW
MV003 DID NOT FULLY CLOSE	

HMI SCREEN SHOTS



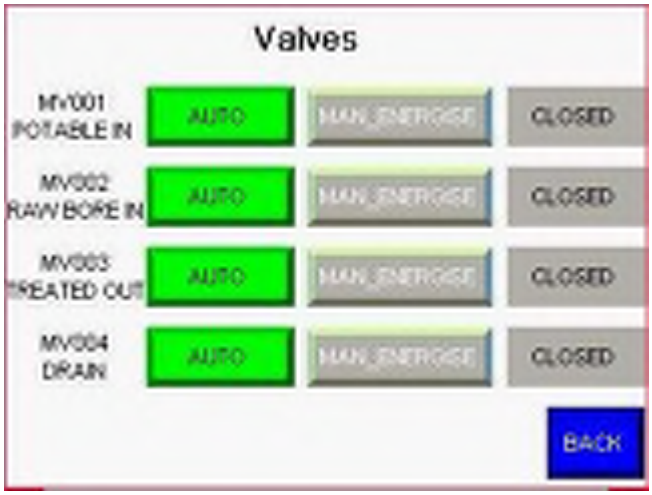
Home Screen



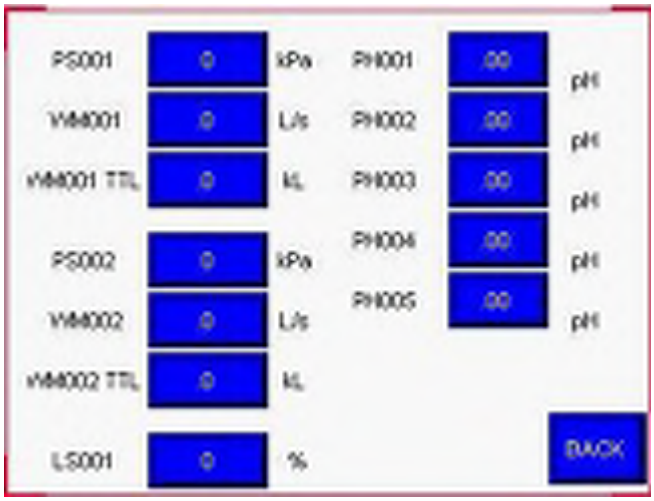
Mimic



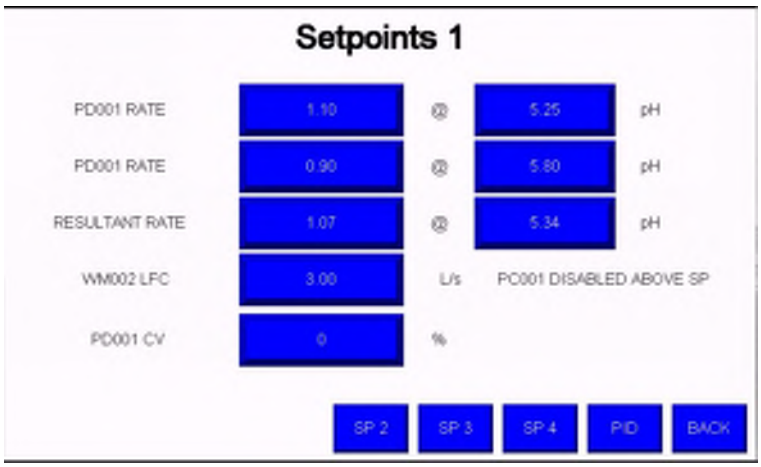
Drives Screen



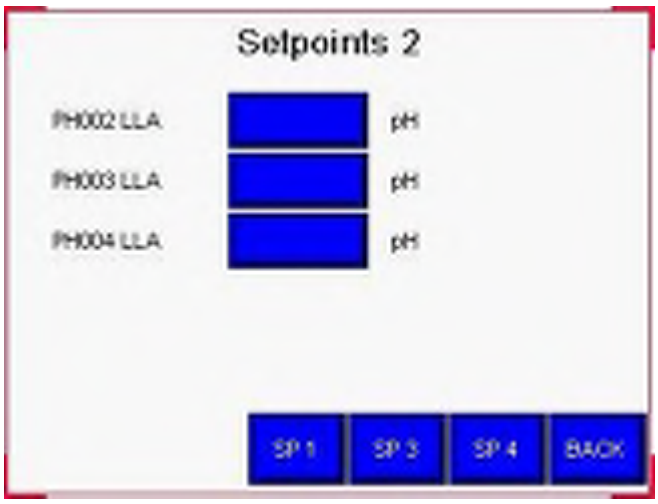
Valve Screen



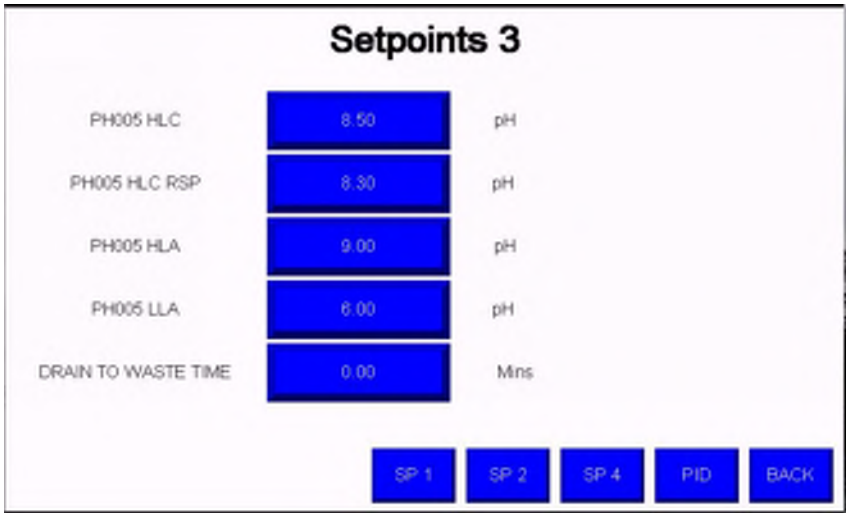
Analog Overview Screen



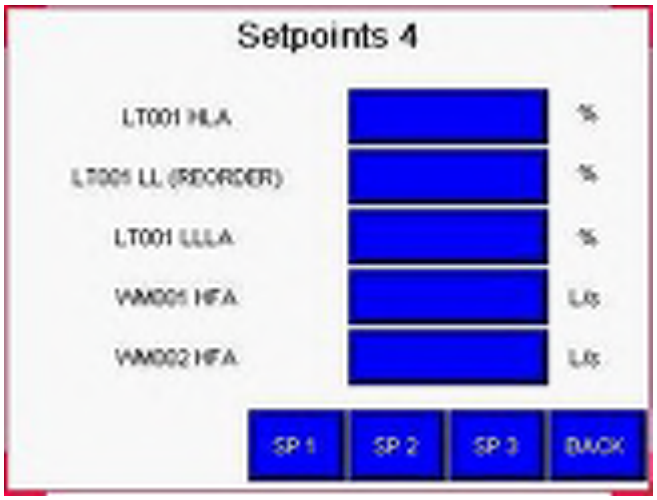
PD001 Dose Rate Setpoints – secure password protected



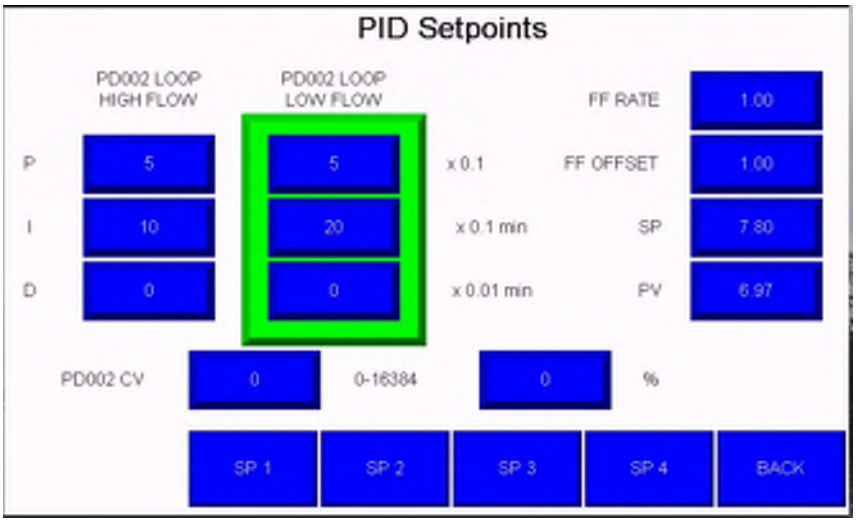
Low pH Alarm Setpoints – secure password protected



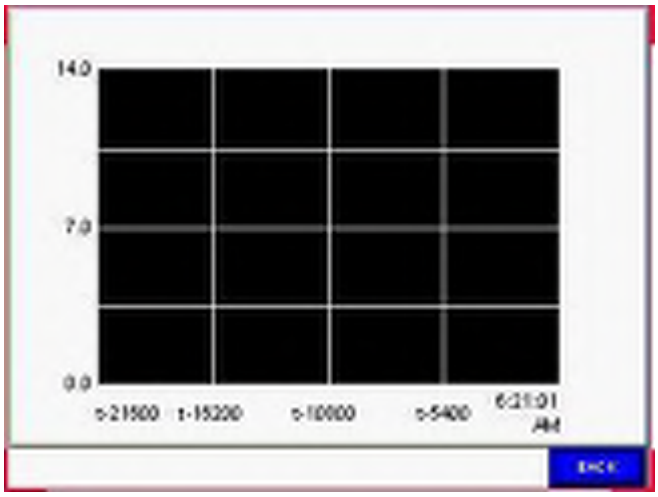
Discharge pH Alarm Setpoints – secure password protected



Caustic Tank and High Flow Setpoints – secure password protected



PID Setpoints



Trend Screen



Alarm History Screen

Process Description

Refer to drawings H03, and MCC Circuit Diagrams UNSW LCBWTP REV2.

Overview

The plant has three operating modes. They are PLANT INHIBIT, BYPASS & AUTO.
When the plant is not in BYPASS or PLANT INHIBIT, it is in AUTO.
PLANT INHIBIT is the normal state for the plant to be in.
To reinstate the plant to operate, caustic has to be filled into the caustic storage tank.

PLANT INHIBIT Mode

In PLANT INHIBIT the plant is not operating as a treatment plant, all chemical has been removed from the caustic storage tank and the plant is in sleep mode.
The plant is remotely controlled from the Upper Campus Bore Water Treatment Plant (UCBWTP) and is available to provide potable water to the reticulation system only.
When the UCBWTP switches to RESERVOIR BYPASS it communicates with the LCBWTP to open the Potable Water Inlet Valve (MV001) to allow the lower campus treated bore water reticulation system to be supplied by potable water.
Once the UCBWTP return to either AUTO or BWTP BYPASS mode it communicates with the LCBWTP to close the Potable Water Inlet Valve (MV001).

AUTO Mode

The following points are descriptions are referred to as the normal operation.
The Raw Bore Water Inlet Valve, MV002, is opened to allow Raw Bore Water into the plant. The dosing pumps, PD001-003, are enabled as required, the circulating pump, PC001, is enabled and after 5 mins (HMI adjustable) of circulating, if all plant conditions are met, the Treated Bore Water Outlet valve, MV003, is opened and the Emergency Potable Water Inlet Valve, MV001, is shut.

Raw Bore Water

As raw (untreated) bore water enters the plant from the lower campus, the pressure and flow rate are monitored via PS002 and WM002 respectively. If PS002 drops below 350kPa, an alarm is raised and the plant diverts to emergency potable water (divert) until the pressure is above 450kPa.

The water then passes through an automatic backwash filter, AF001.

After leaving the filter, the water passes the “Raw Bore Water Inlet Valve”, MV002. Backflow from this point is then prevented by BV002.

The raw water pH is then measured by Raw Water pH instrument, pH001.

Treatment Point 1

The raw water is initially treated at IP001 with liquid caustic supplied from Dosing Pump 1, PD001. Dosing Pump 1 is flow paced based on WM002. The caustic and raw bore water is then mixed as it passes through an inline static mixer, SM001.

The semi-treated water pH is then measured by a second pH instrument, pH002. The pH must be above 6.9 (HMI adjustable), otherwise alarm.

Treatment Point 2

The semi-treated water is then treated at IP002 with liquid caustic supplied from Dosing Pump 2, PD002. Dosing Pump 2 is PID controlled based on the discharge pH.

Treatment Point 3

This has been removed.

Treated Bore Water

The main flow of Treated Bore Water is then measured by Treated Bore Water Outlet pH instrument, pH005. The pH is recorded every 5 seconds.

The pH must be between 6.4 and 8.2pH (HMI adjustable), otherwise alarm, divert and drain.

The treated water then passes through the Treated Bore Water Outlet valve, MV003.
MV003 is a motorised valve.

Drain to Waste

After pH005 a smaller line branches off the main flow.
This is the Drain to Waste line. This line passes through Drain to Waste Valve, MV004.

Recirculation Loop

Between pH004 and pH005 a smaller line branches off the main flow.
This recirculation loop passes through the Circulating Pump, PC001, and then back into the raw water line after pH001. When PC001 is running, flow is checked against Recirculation Flow Switch, FS001. If the plant is diverted to Potable Mains Water, or there is no flow for through WM001 for more than 1Hr, and the pH measured by pH001 is above 7.2pH, then PC001 cycles off for 15mins and on for 30mins respectively. Continuous running is reinstated regardless of the timers if either flow is detected by WM002 or the plant returns to Bore Water Treatment.

Emergency Potable Water

Potable mains water is the backup supply for the system. As potable mains water enters the plant, the pressure and flow are monitored via PS001 and WM001 respectively.

The potable mains water passes the “Potable Water Inlet Valve”, MV001 and enters the treated bore water main. MV001 is a motorised valve.

BYPASS Mode

In the event of a critical alarm, the plant is then required to divert to potable mains water. MV003 shuts whilst simultaneously MV001 opens. The critical alarm conditions are:

- pH instrument pH004 not healthy (instrument goes outside the 4-20mA range).
- pH instrument pH005 not healthy (instrument goes outside the 4-20mA range).
- LS001 low low level (caustic tank level).
- Instrument Failure, except WM001 and PS001
- Bore water supply pressure, PS002 <350kPa for more than 10 minutes.

If the system alarms and is required to divert to potable mains water and drain to waste, in the case of Low pH or High pH. The system will return to normal if the following conditions are met:

- pH005 6.4<pH>8.2 for more than 10 minutes (HMI adjustable).

Then MV003 shuts whilst simultaneously MV001 opens. MV004 also opens.
The system will return once the pH returns to within the setpoints.

Dosing Pumps

Dosing Pump 1, PD001, is controlled via 4-20mA from the PLC and is stopped and started via the PLC.

Dosing Pump 2, PD002, is controlled via 4-20mA from the PLC and is stopped and started via the PLC
Both dosing pumps draw from a common Caustic Tank. In the event that Caustic Level drops below the 5% both pumps must stop, the system therefore diverts and alarms.

Instruments

If pH001-005 probes fail, the plant alarms.
If LS001 fails or falls below the low low setpoint, the plant alarms and divert.
If PS001 fails or falls below the low setpoint, the plant must alarm.
If PS002 fails or falls below the low setpoint, the plant must alarm and divert.
If WM001 or WM002 fails or goes above setpoint high flow, the plant must alarm.

The following steps are outside the <u>normal operation</u>

<u>Manual Bypass – Divert to Potable Supply</u>

When the plant is diverted due to Manual Bypass then:
MV001 opens & MV003 closes.
The remainder of the system operates automatically, however manual control of all devices is possible.

Upon re-activation:
MV001 closes & MV003 opens, and all devices return to automatic.

<u>Emergency Stop</u>

The emergency stop (Estop) is Cat 3 rated. On activation (trip) of the Estop circuit the plant stop and goes into divert.

PD001-003 are turned off. PC001 is also stopped.

MV003 shuts whilst simultaneously MV001 opens. MV002 also closes.

On reset of the Estop the plant goes into drain for minimum 10mins. Once this timer has elapsed and all setpoints are met the plant returns to normal operation

UNSW EMACS

UNSW has a Modbus/TCP (IP) based overview system referred to as EMACS. A data cable link to the MCC will maintain the connection between the BWTP MCC and the EMACS.

All Alarms and instantaneous analogue values are made available for viewing on the EMACS.

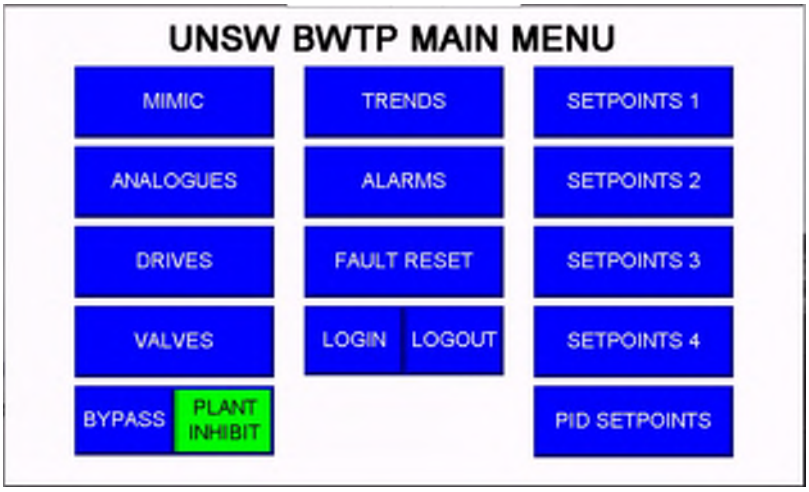
The IP and subnet addresses are as follows:

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PLC	128.94.38.93	255.255.255.0
HMI	128.94.38.94	255.255.255.0

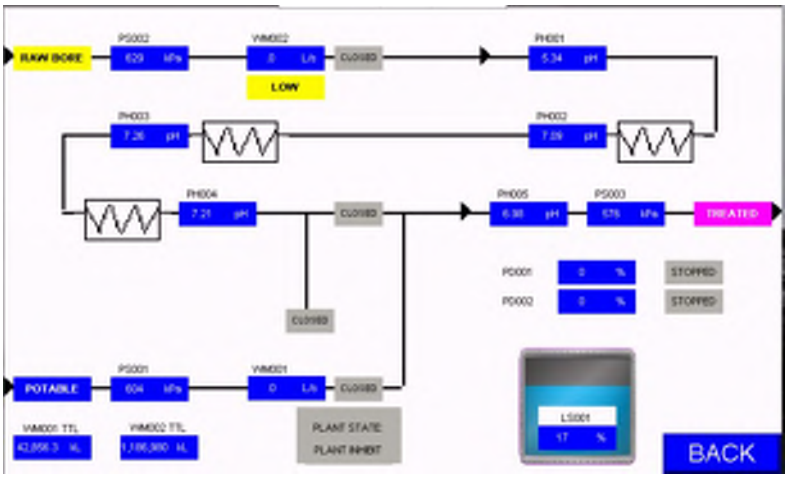
ALARMS LIST

LS001 ANALOGUE INPUT ERROR	MV003 DID NOT FULLY OPEN
PS001 ANALOGUE INPUT ERROR	MV004 DID NOT FULLY CLOSE
PS002 ANALOGUE INPUT ERROR	MV004 DID NOT FULLY OPEN
PH001 ANALOGUE INPUT ERROR	PC001 FAULTED
PH002 ANALOGUE INPUT ERROR	PD001 FAULTED
PH003 ANALOGUE INPUT ERROR	PD002 FAULTED
PH004 ANALOGUE INPUT ERROR	PD003 FAULTED
PH005 ANALOGUE INPUT ERROR	PH002 PH LOW
WM001 ANALOGUE INPUT ERROR	PH003 PH LOW
WM002 ANALOGUE INPUT ERROR	PH004 PH LOW
DISCHARGE OUT OF SPEC - DRAINING TO WASTE	PH005 PH LOW
LS001 CAUSTIC STORAGE TANK LEVEL HIGH	PH005 PH HIGH
LS001 CAUSTIC STORAGE AT REORDER LEVEL	PS001 POTABLE WATER PRESSURE LOW
LSS01 CAUSTIC STORAGE TANK LEVEL LOW	PS002 RAW BORE WATER PRESSURE LOW
MV001 DID NOT FULLY CLOSE	WM001 POTABLE WATER HIGH FLOW
MV001 DID NOT FULLY OPEN	WM002 RAW BORE WATER HIGH FLOW
MV002 DID NOT FULLY CLOSE	PLANT ESTOP ACTIVATED
MV002 DID NOT FULLY OPEN	RECIRCULATION LOOP LOW FLOW
MV003 DID NOT FULLY CLOSE	

HMI SCREEN SHOTS



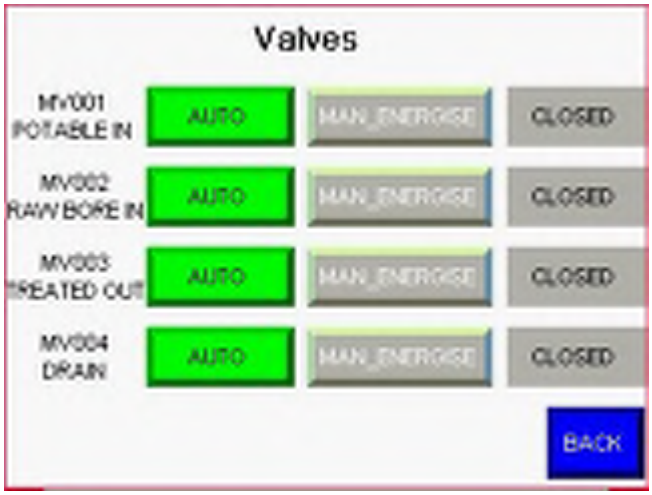
Home Screen



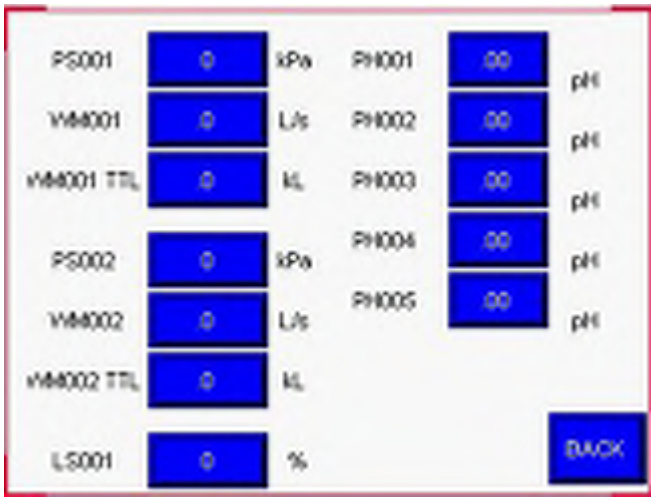
Mimic



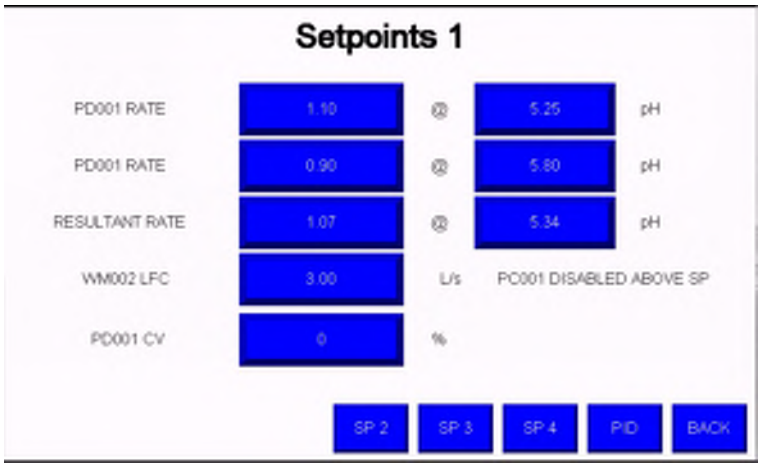
Drives Screen



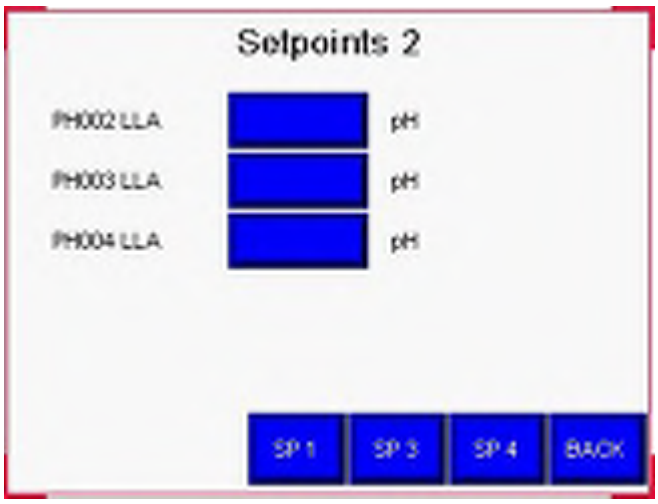
Valve Screen



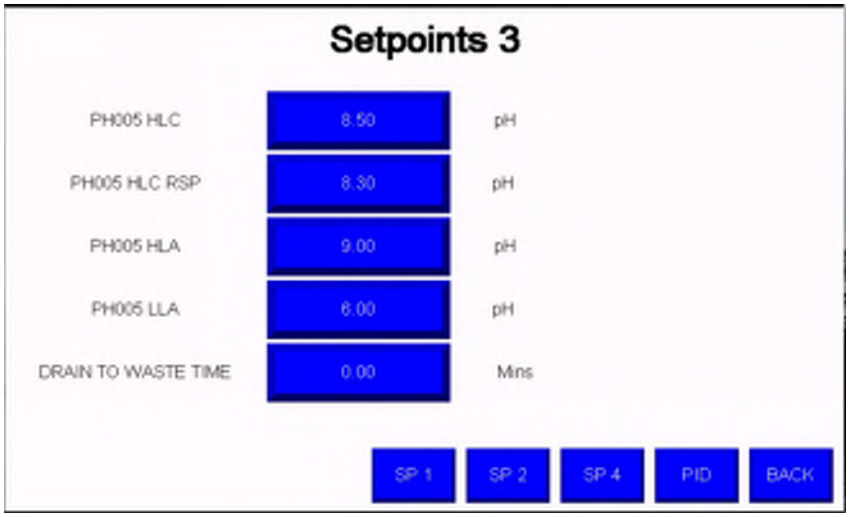
Analog Overview Screen



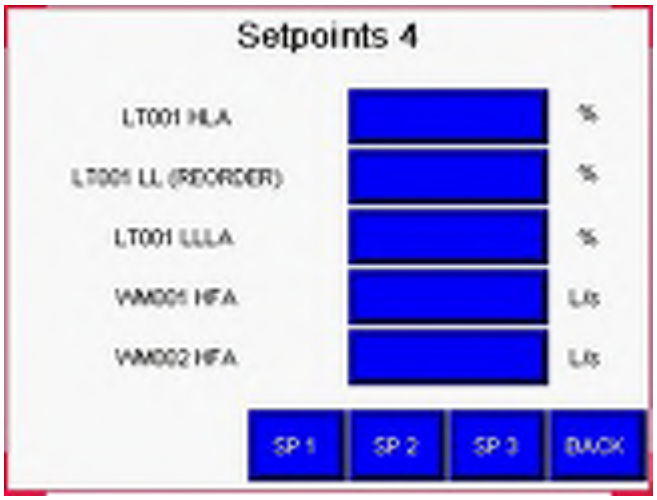
PD001 Dose Rate Setpoints – secure password protected



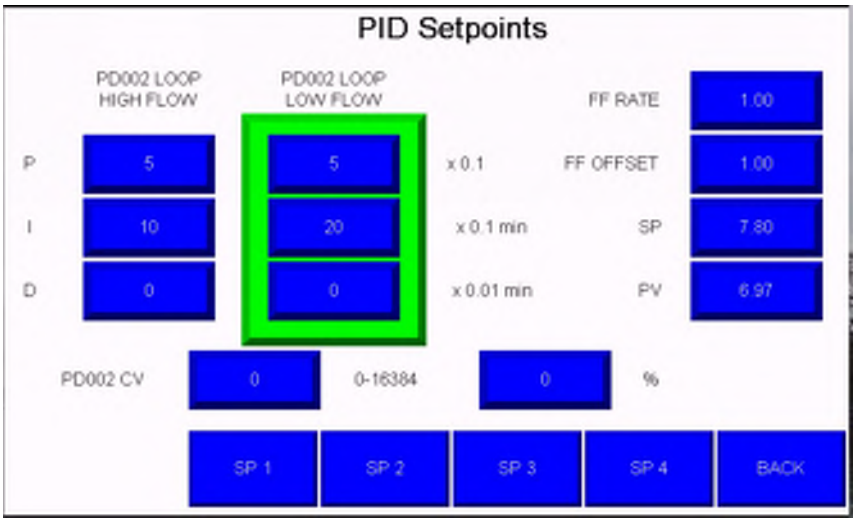
Low pH Alarm Setpoints – secure password protected



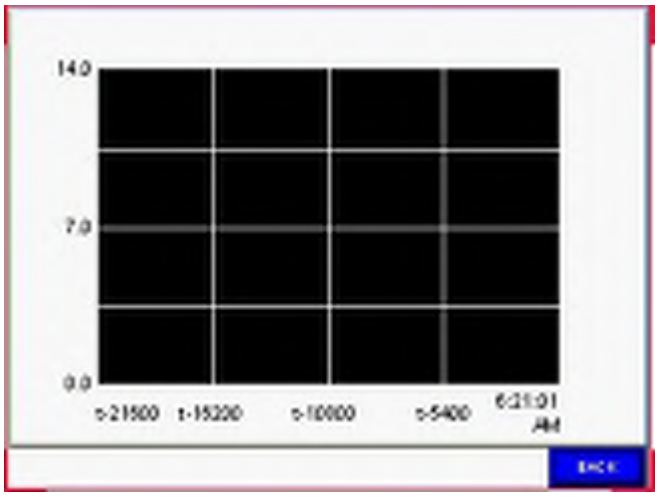
Discharge pH Alarm Setpoints – secure password protected



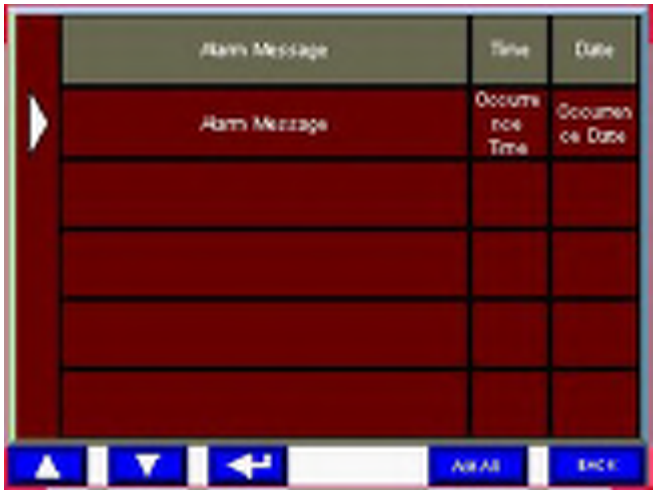
Caustic Tank and High Flow Setpoints – secure password protected



PID Setpoints



Trend Screen



Alarm History Screen

UNSW - FACILITIES MANAGEMENT

BORE WATER TREATMENT PLANT

ELECTRICAL DRAWINGS

REVISION

REV:	DESC:	DATE:	DRN:	CHK:	APR:	ORDER No.
A	DESIGN	28/05/14	ML	AB	TS	
0	AS BUILT	20/08/14	ML	AB	TS	
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2	VALVE WIRING MODIFICATION	1/05/21	ML	DL	DC	

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988_000 2021-05-01

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DATE:	28/05/2014
DESIGN ENG:	M LAWSON
DATE:	8/05/2014
APPROVED:	T STOCKER
DATE:	29/05/2014

PROJECT: BORE WATER TREATMENT PLANT

TITLE: ELECTRICAL DRAWING SET

COVER PAGE

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
988-E - 000	N.T.S.	1	2

ITEM	QTY	DESCRIPTION	MANUFACTURER	PART No.
1	1	1200H x 1000W x 300D 304 Stainless Steel Enclosure	Rittal	1019.600
2	1	MAIN/EMERGENCY SWITCH 63A	Schneider Electric	VCF3
3	1	SWITCHBOARD SURF 24MOD F/DIN	Schneider Electric	4CS24FD-WE
4	1	16amp 3 Pole C curve 6kA CB	Schneider Electric	A9F44316
5	1	16A RCBO 6kA 240V Single Pole	Schneider Electric	A9D61816
6	2	10amp 1 Pole C curve 6kA CB	Schneider Electric	A9F44110
7	1	6amp 1 Pole C curve 6kA CB	Schneider Electric	A9F44106
8	1	10amp 2 Pole C curve 6kA CB	Schneider Electric	A9F44210
9	1	SCREW CLAMP BASE 12A	Schneider Electric	LUB120
10	1	ADV CONTROL 1.25 to 5A 24VDC	Schneider Electric	LUCB05BL
11	2	3P CONTACTOR 6A AC3 2.2KW 24VDC COIL	Schneider Electric	LP1K0610BD
12	1	EMERGENCY STOP OP. HEAD 40MM DIA.	Schneider Electric	ZB5AS844
13	1	PUSHBUTTON OPERATOR HEAD BLUE	Schneider Electric	ZB5AA6
14	1	2 NC SCREW TERMINAL CONTACT BODY	Schneider Electric	ZB5AZ104
15	1	1 NO SCREW TERMINAL CONTACT BODY	Schneider Electric	ZB5AZ101
16	20	RLY W/PB+LED FPIN 2CO 8A 24VD	Finder	4652007424VDC
17	20	SKT FOR 46.52 RELAY	Finder	9702
18	1	Flashing Stobe Only 12/24VDC Red	Fulleon	BS10603
19	1	UE23-2MF2D3 SAFETY RELAY	Sick	UE23-2MF2D3
20	1	TRIO-UPS/1AC/24DC/ 5 Uninterruptible power supply	Phoenix Contact	2866611
21	1	QUINT-BAT/24DC/1.3AH Rechargeable battery module	Phoenix Contact	2320296
22	15	PIT 4 (4mm) Push-in Connection Terminal	Phoenix Contact	3211757
23	7	PIT 4 - (4mm) Ground Terminal	Phoenix Contact	3211766
24	4	Terminal end clamp	Phoenix Contact	080886
25	52	PIT 2.5 (2.5mm) Double Push-in Connection Terminal	Phoenix Contact	3210567
26	10	PITTB 2.5 (2.5mm) Double Push-in Connection Ground Terminal	Phoenix Contact	3210596
27	8	UK5-HESILED24 Fuse disconnect terminals 24V LED screw cage	Phoenix Contact	3004126
28	10	2A glass fuses	Bussmann	S500-2-R
29	1	Web managed, Redundant, 8 ports 10/100Base-T(X), DC12-36V	AutomationDirect	IES608A
30	1	1766-L32BXB MicroLogix 1400 PLC, 24V DC Power 20 IN 12 OUT	Allen-Bradley	1766-L32BXB
31	1	8 Output Solid-State 24V DC Source Output Module	Allen-Bradley	1762-OB8
32	3	4 Channel Analog Input Module	Allen-Bradley	1762-IF4
33	1	4-channel Analog Voltage/Current Output Module	Allen-Bradley	1762-OF4
34	1	PanelView C600, 6-inch color TFT display with touch screen	Allen-Bradley	2711C-T6T

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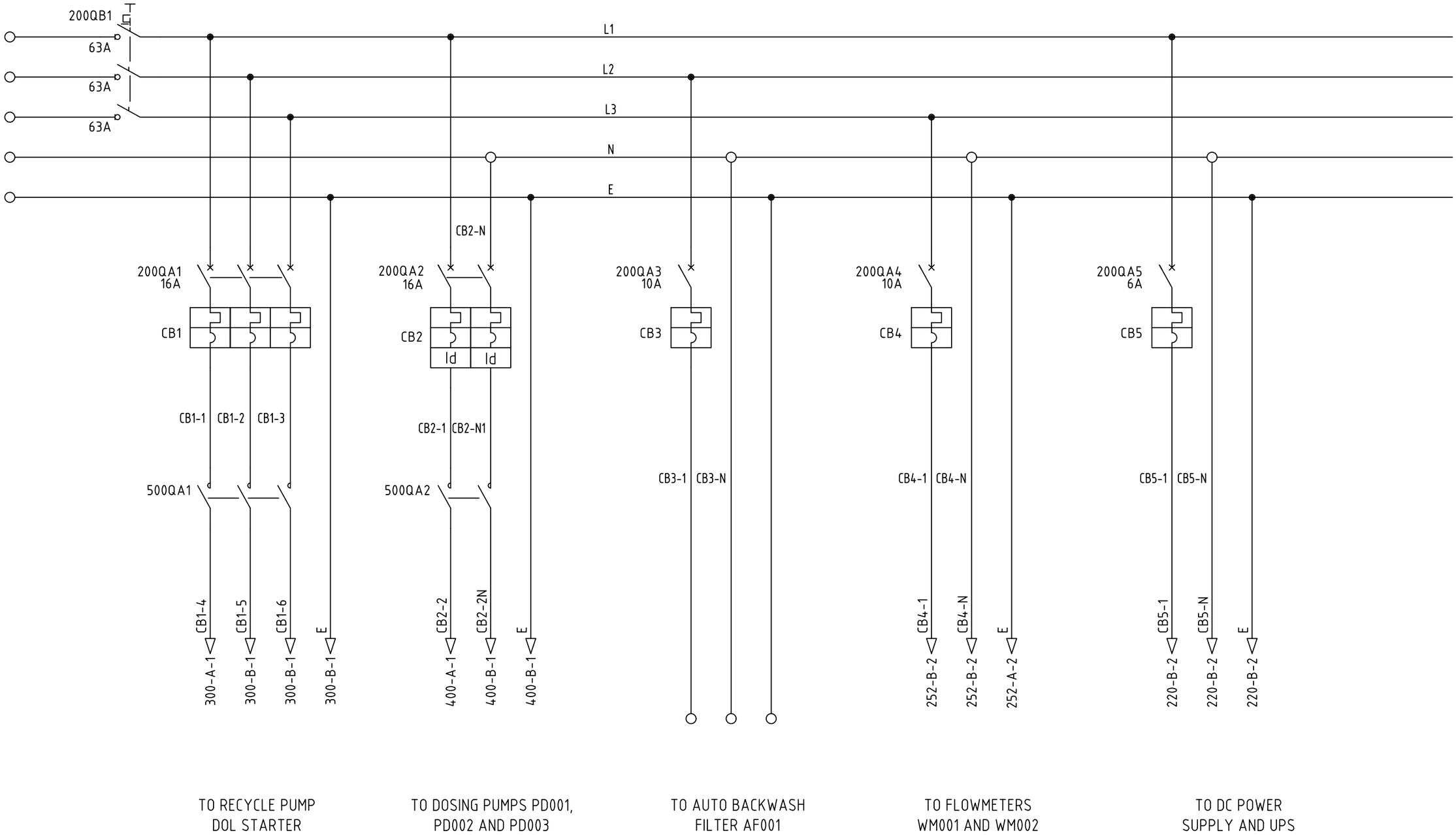
PROJECT: BORE WATER TREATMENT PLANT

TITLE: ELECTRICAL DRAWING SET

CONTROL PANEL BILL OF MATERIALS

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
988-E- 010	N.T.S.	2	2



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	ORDER No.
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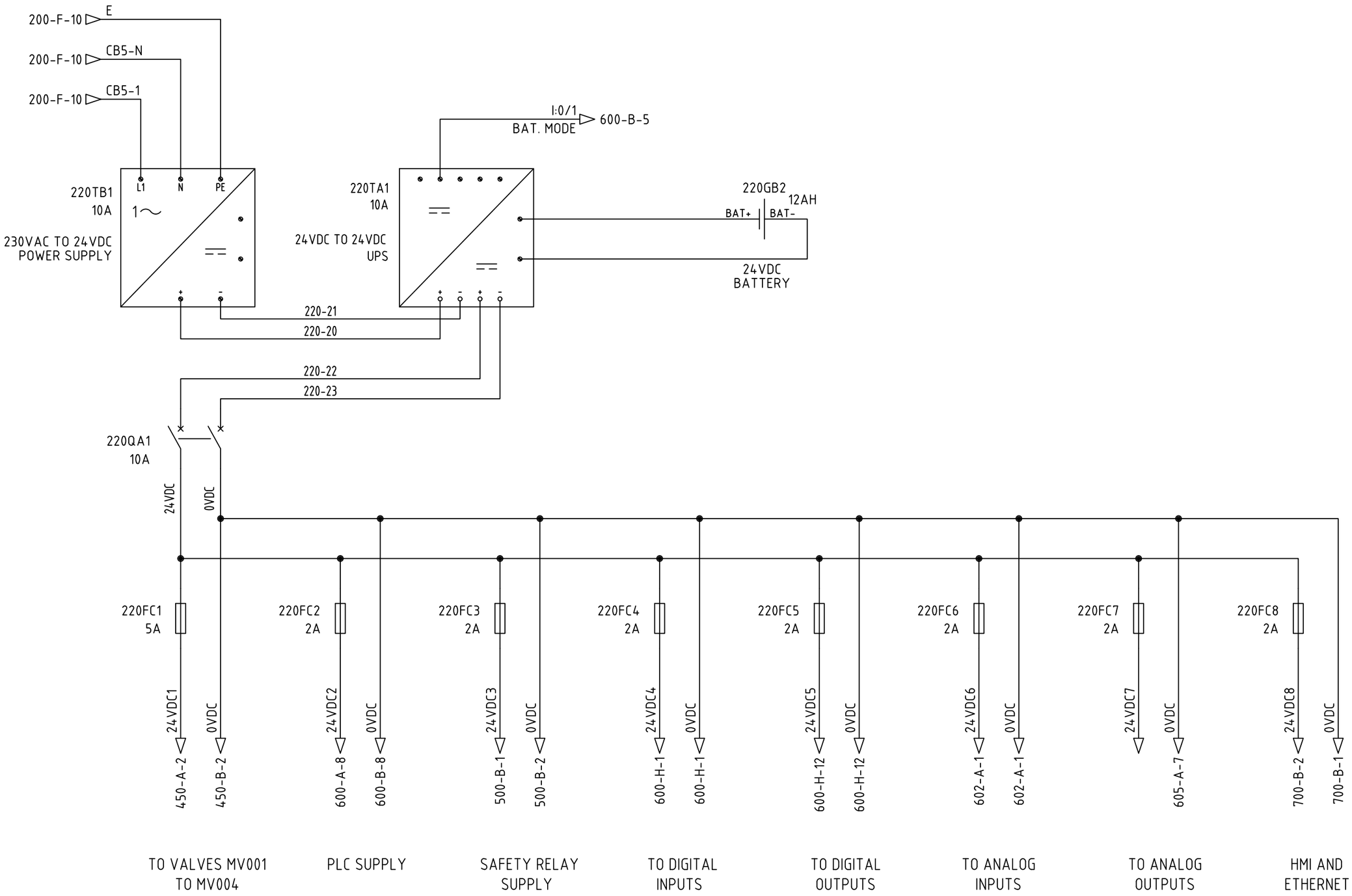
PROJECT: BORE WATER TREATMENT PLANT

TITLE: ELECTRICAL DRAWING SET

230/400 VAC DISTRIBUTION

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
988-E- 200	N.T.S.	3	2



REVISION

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2	VALVE WIRING MODIFICATION	1/05/21	ML	DL	DC	

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DATE:	29/05/2014	

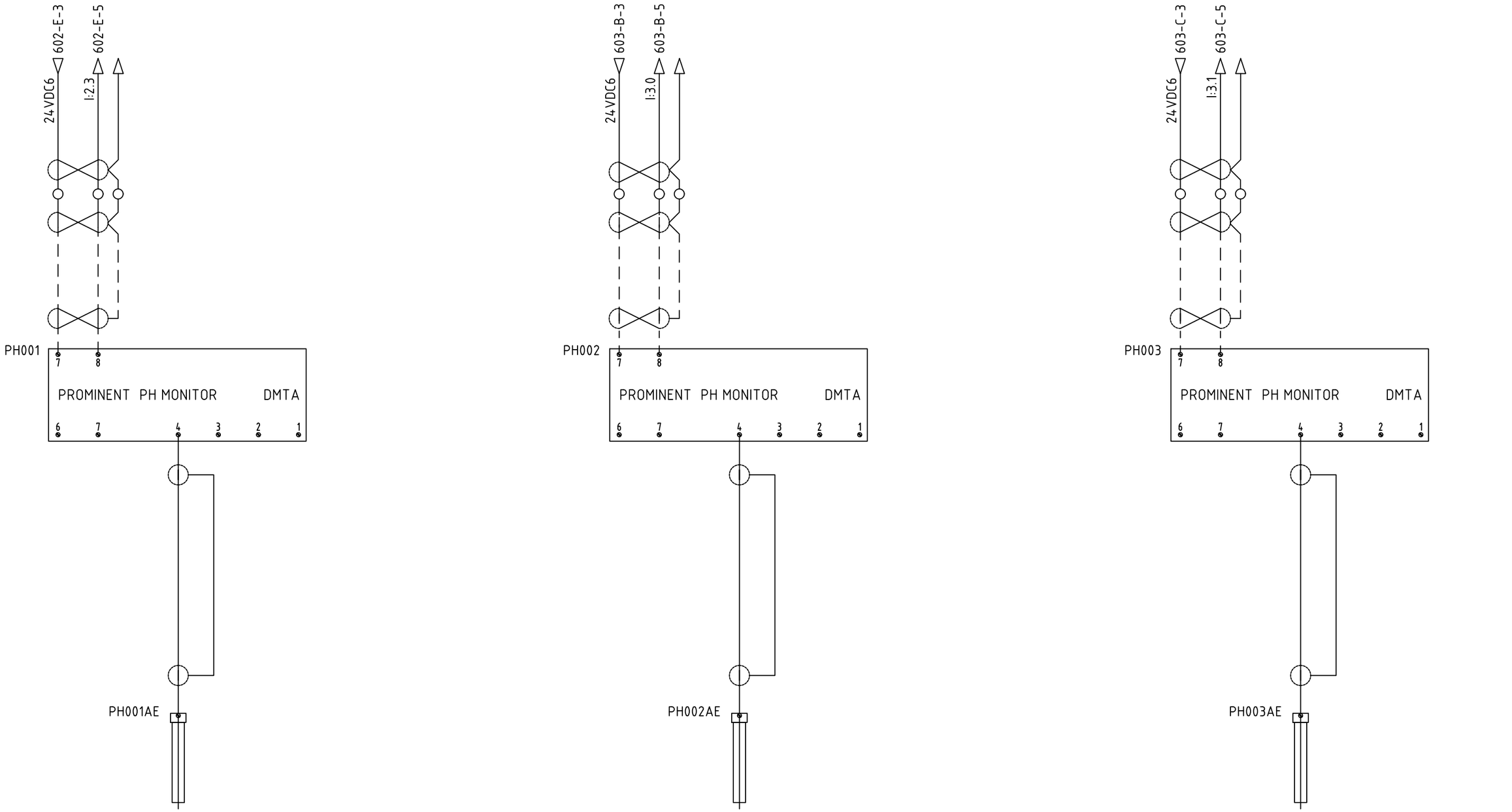
PROJECT: BORE WATER TREATMENT PLANT

TITLE: ELECTRICAL DRAWING SET

24VDC POWER SUPPLY AND DISTRIBUTION

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
988-E- 220	N.T.S.	4	2



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	ORDER No.
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DATE:	29/05/2014	

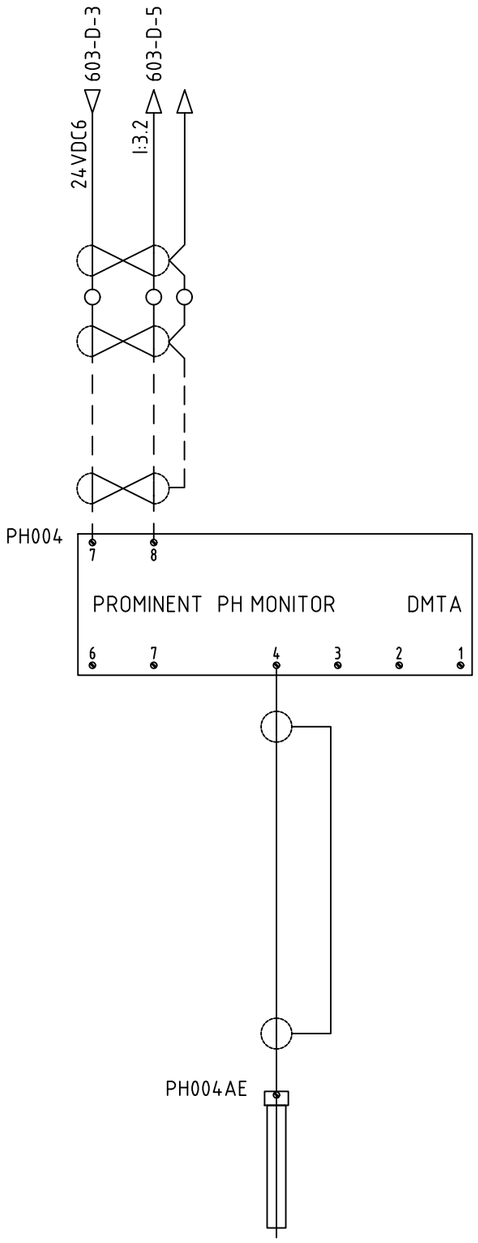
PROJECT: BORE WATER TREATMENT PLANT

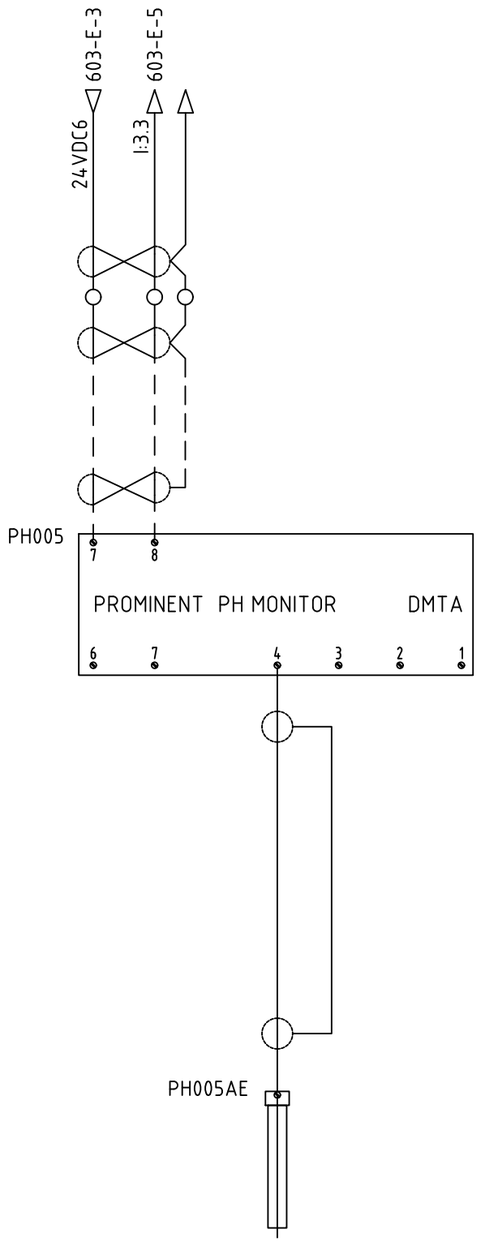
TITLE: ELECTRICAL DRAWING SET

pH ANALYSERS

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
988-E- 250	N.T.S.	5	2





REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	ORDER No.
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	0	AS BUILT	20/08/14	ML	AB	TS	
	1	ANALOGS ADDED	2/06/15	ML	AB	TS	
	2	VALVE WIRING MODIFICATION	1/05/21	ML	DL	DC	

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988_251 2021-05-01

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DATE:	8/05/2014
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DATE:	29/05/2014

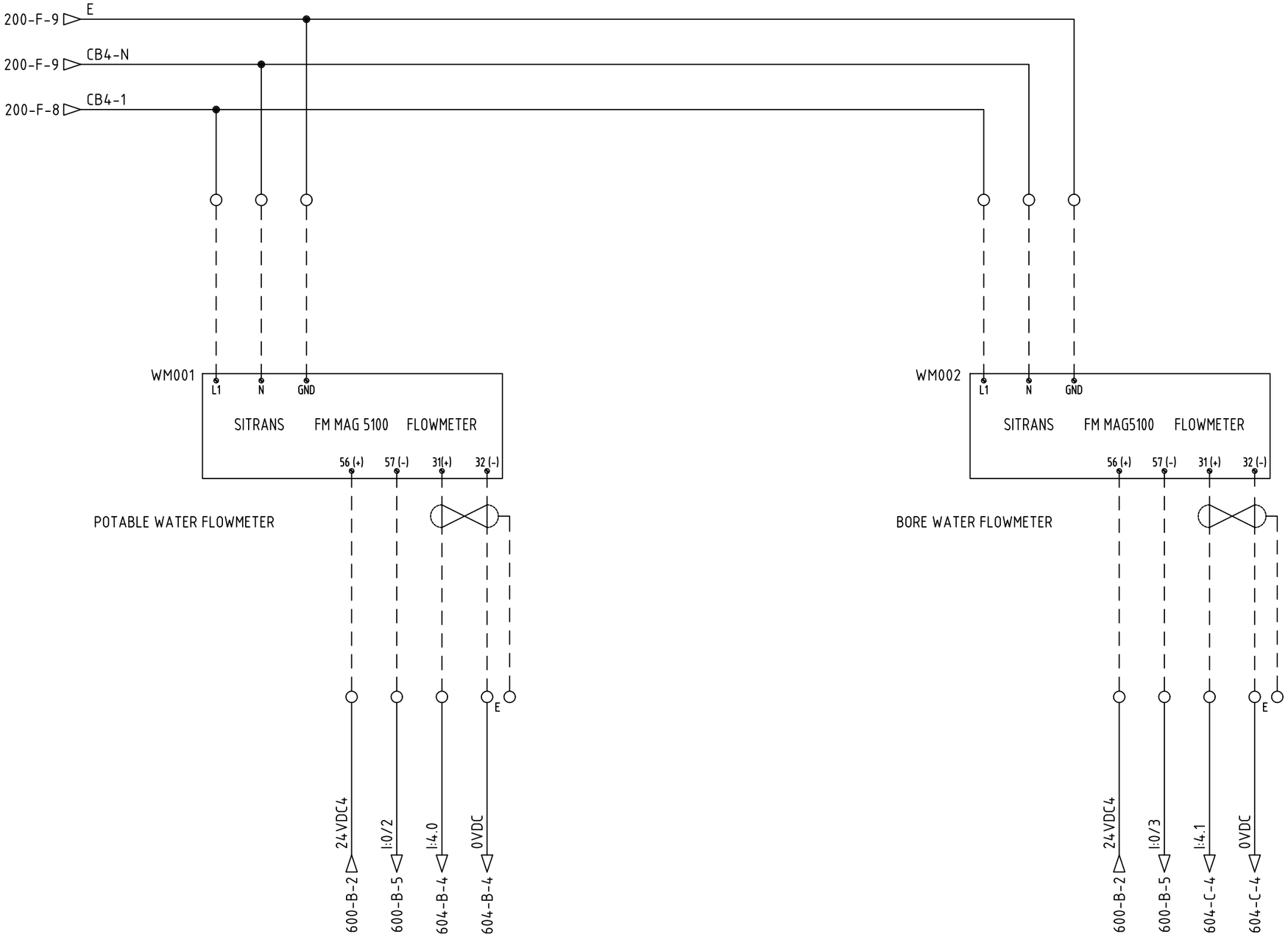
PROJECT: BORE WATER TREATMENT PLANT

TITLE: ELECTRICAL DRAWING SET

pH ANALYSERS

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
988-E- 251	N.T.S.	6	2



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	ORDER No.
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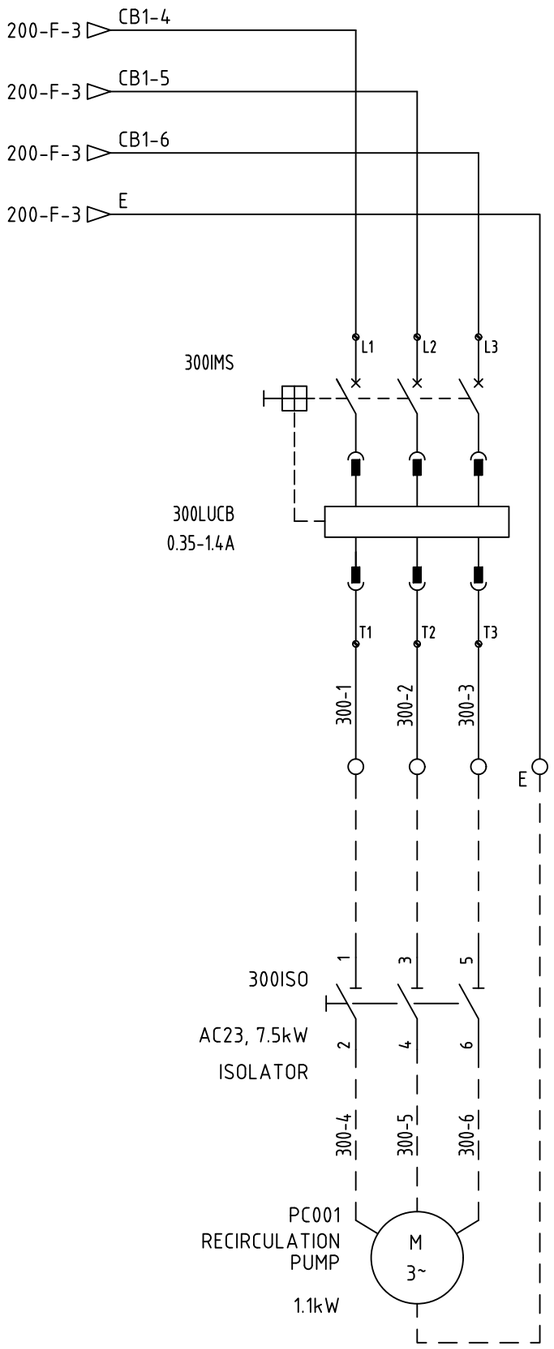
PROJECT: BORE WATER TREATMENT PLANT

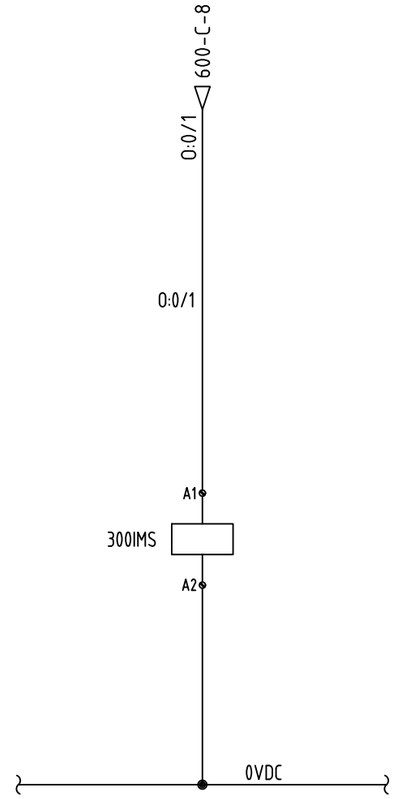
TITLE: ELECTRICAL DRAWING SET

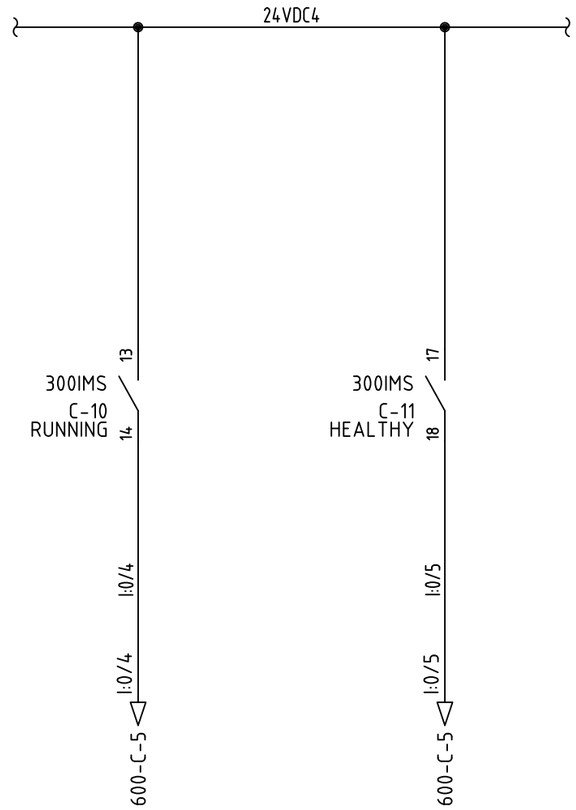
RAW AND POTABLE WATER FLOWMETERS

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
988-E- 252	N.T.S.	7	2







REVISION

REV:	DESC:	DATE:	DRN:	CHK:	APR:	ORDER No.
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DATE:	8/05/2014	
APPROVED:	T STOCKER	
DATE:	29/05/2014	

PROJECT: BORE WATER TREATMENT PLANT

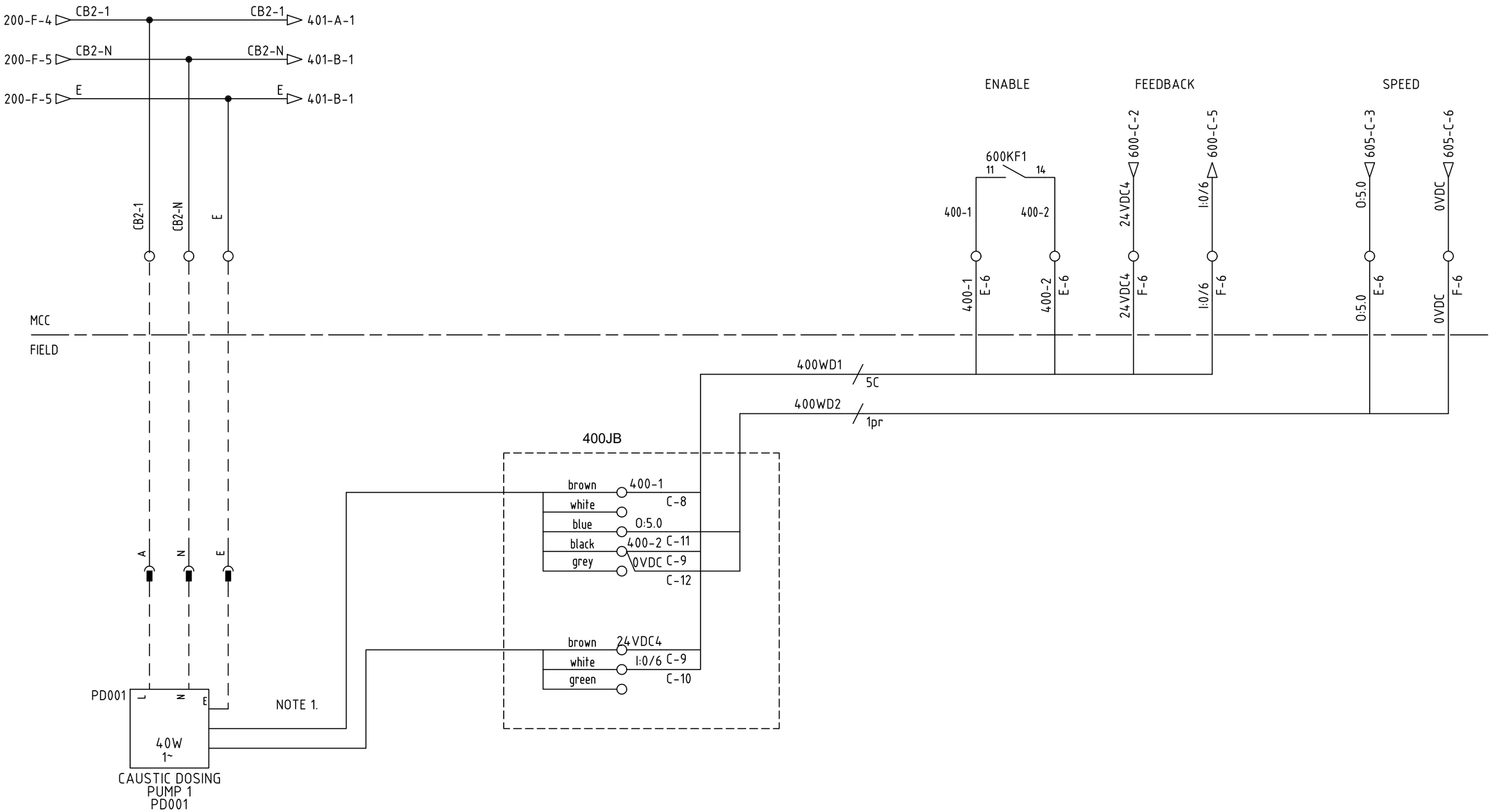
TITLE: ELECTRICAL DRAWING SET

RECIRCULATION PUMP - PC001

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
988-E- 300	N.T.S.	8	2

NOTES:
1) THE CABLES SHOWN ARE PROMINENT PROPRIETARY CABLES.



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	A	DESIGN	28/05/14	ML	AB	TS	
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	1	ANALOGS ADDED	2/06/15	ML	AB	TS	
	2	VALVE WIRING MODIFICATION	1/05/21	ML	DL	DC	

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DATE:	29/05/2014	

PROJECT: BORE WATER TREATMENT PLANT

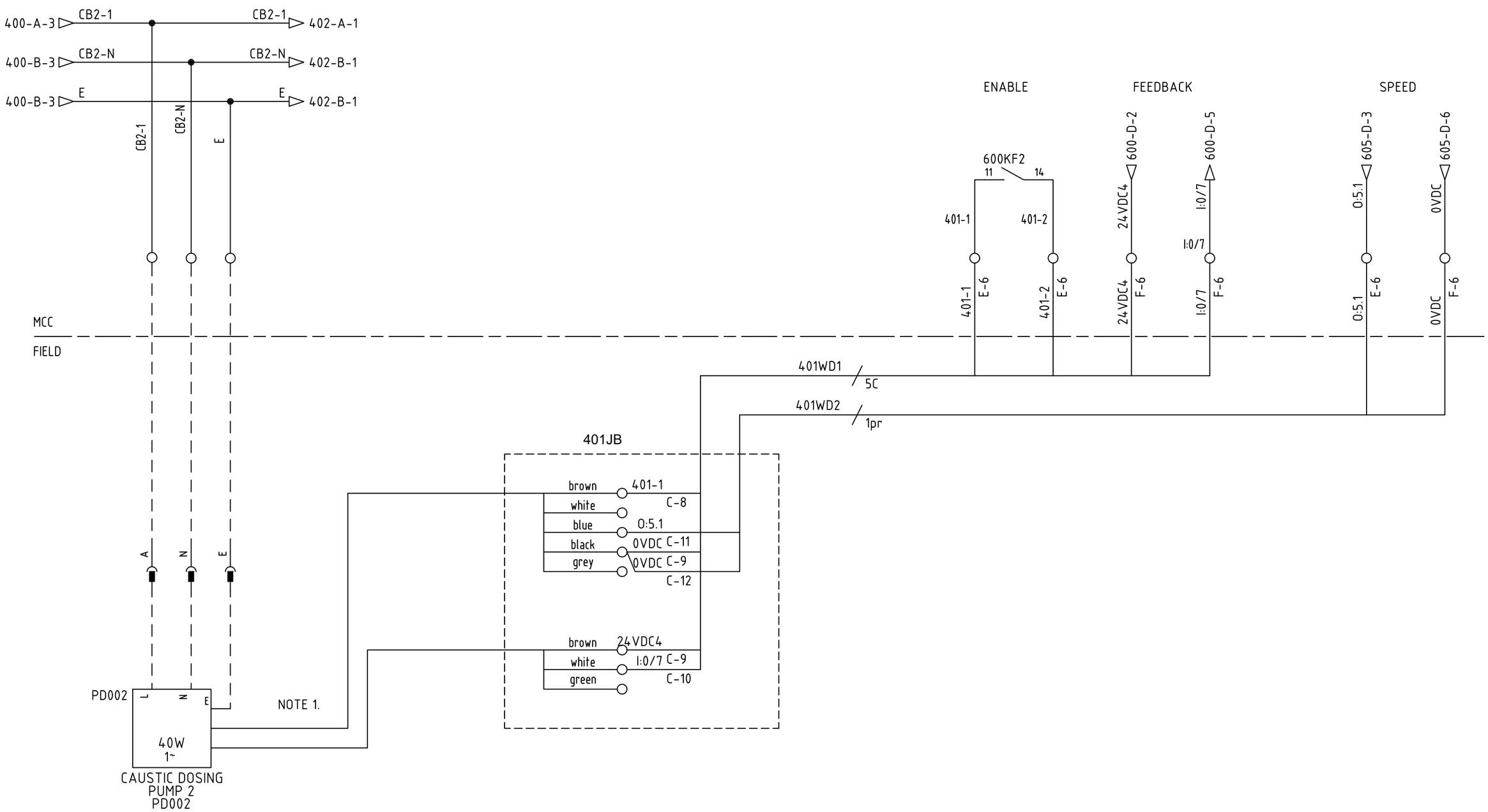
TITLE: ELECTRICAL DRAWING SET

DOSING PUMP 1 - PD001

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
988-E- 400	N.T.S.	9	2

NOTES:
1) THE CABLES SHOWN ARE PROMINENT PROPRIETARY CABLES.



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	A	DESIGN	28/05/14	ML	AB	TS	
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	2	VALVE WIRING MODIFICATION	1/05/21	ML	DL	DC	

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DATE:	29/05/2014	

PROJECT: BORE WATER TREATMENT PLANT

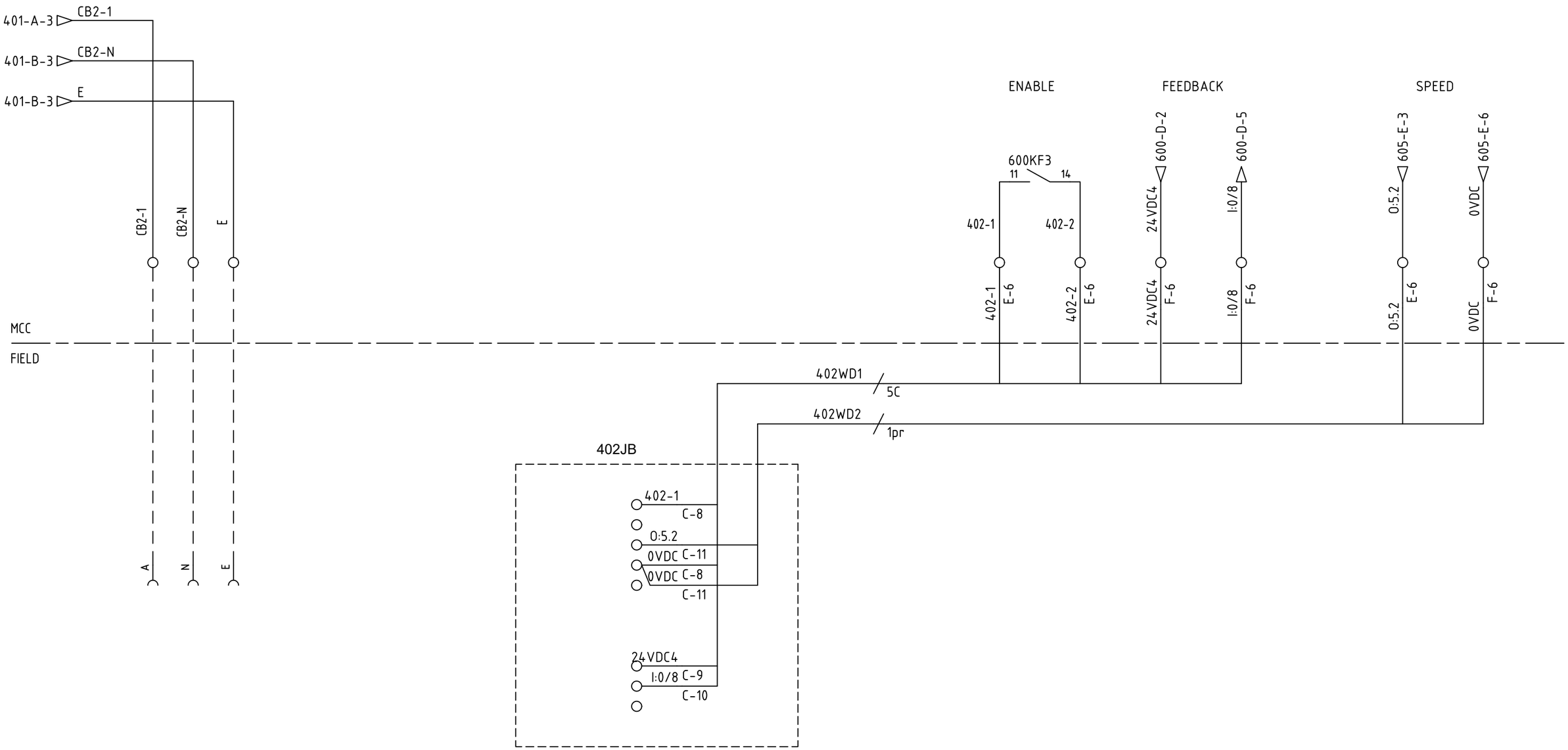
TITLE: ELECTRICAL DRAWING SET

DOSING PUMP 2 - PD002

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
988-E- 401	N.T.S.	10	2

NOTES:
1) THE CABLES SHOWN ARE PROMINENT PROPRIETARY CABLES.



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DATE:	8/05/2014	
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DATE:	29/05/2014	

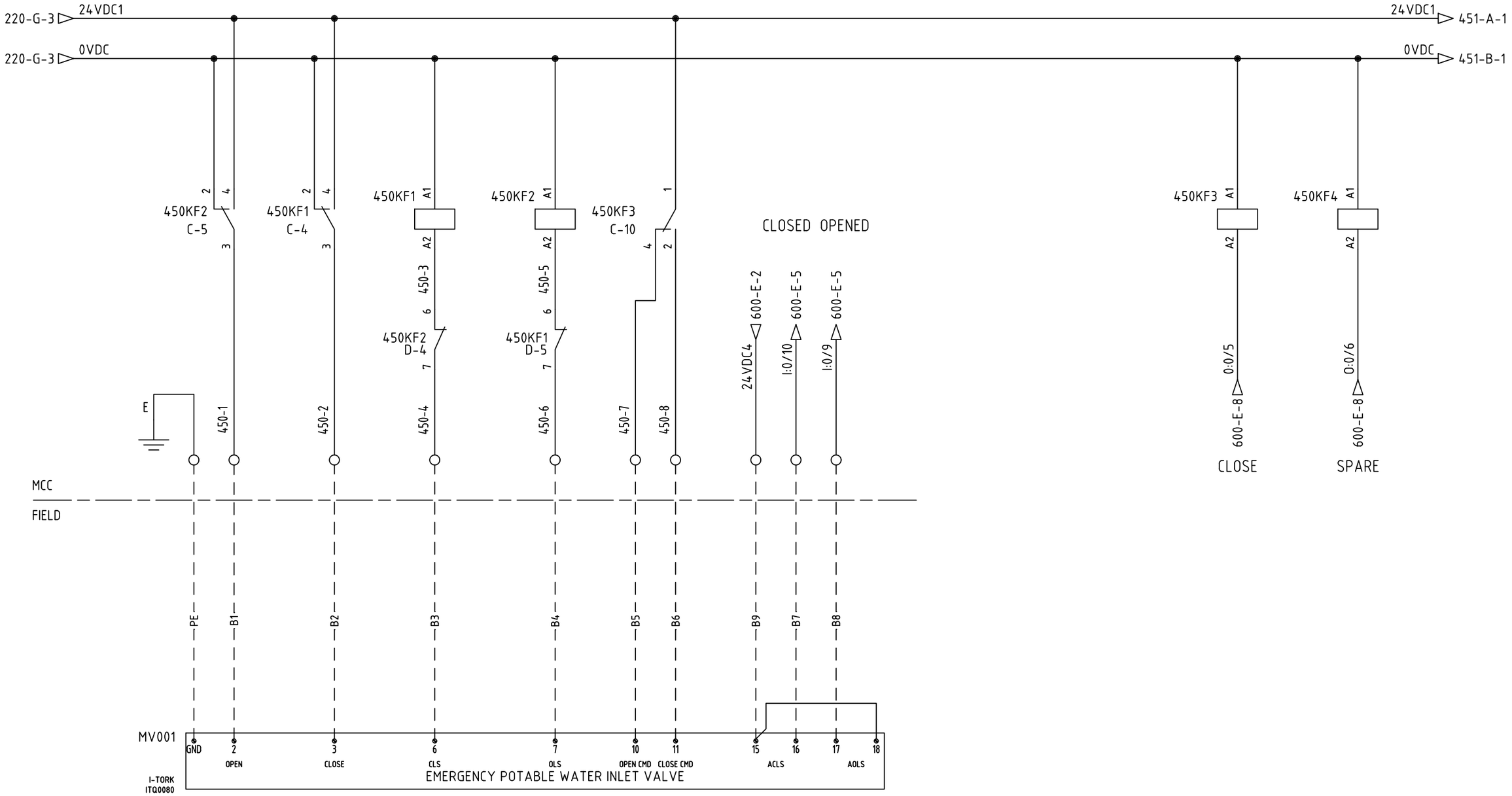
PROJECT: BORE WATER TREATMENT PLANT

TITLE: ELECTRICAL DRAWING SET

DOSING PUMP 3 - PD003

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
988-E- 402	N.T.S.	11	2



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	ORDER No.
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	1	ANALOGS ADDED	2/06/15	ML	AB	TS	
	2	VALVE WIRING MODIFICATION	1/05/21	ML	DL	DC	

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DATE:	8/05/2014	
APPROVED:	T STOCKER	
DATE:	29/05/2014	

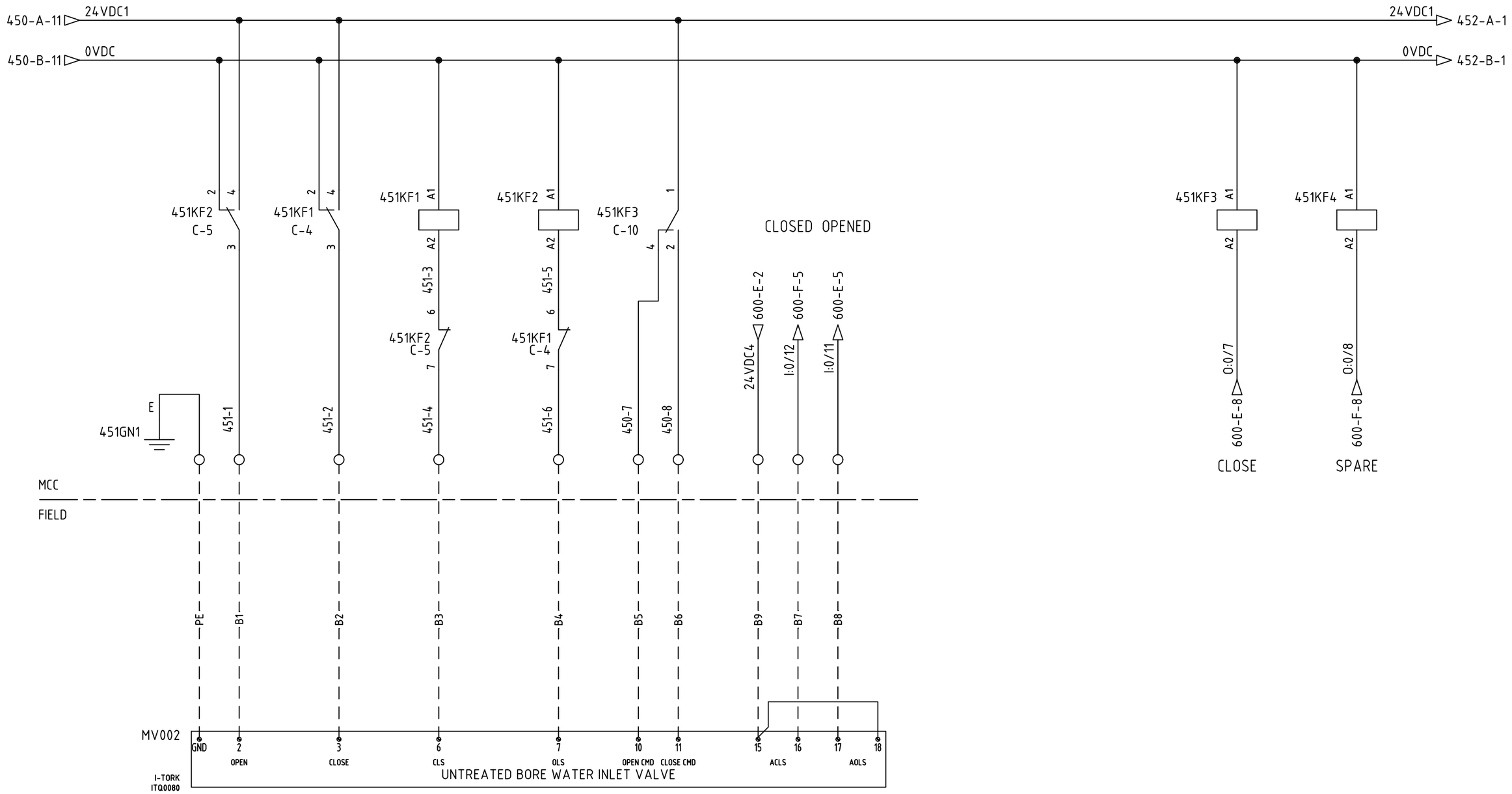
PROJECT: BORE WATER TREATMENT PLANT

TITLE: ELECTRICAL DRAWING SET

MOTORISED VALVE - MV001 POTABLE WATER IN

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
988-E- 450	N.T.S.	12	2



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	ORDER No.
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	1	ANALOGS ADDED	2/06/15	ML	AB	TS	
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DESIGN ENG:	M LAWSON	
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DATE:	29/05/2014	

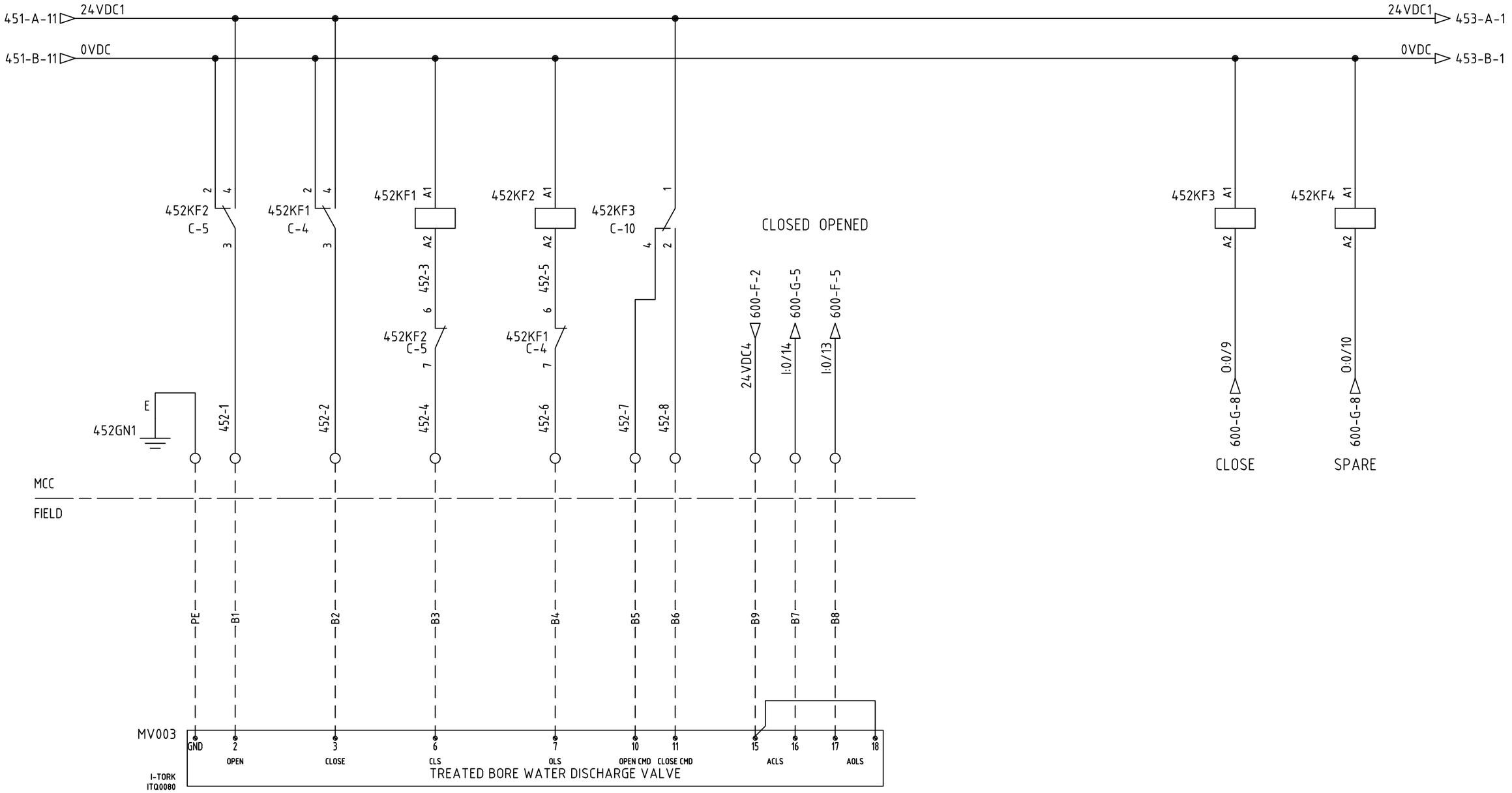
PROJECT: BORE WATER TREATMENT PLANT

TITLE: ELECTRICAL DRAWING SET

MOTORISED VALVE - MV002 UNTREATED BORE WATER IN

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
988-E- 451	N.T.S.	13	2



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	ORDER No.
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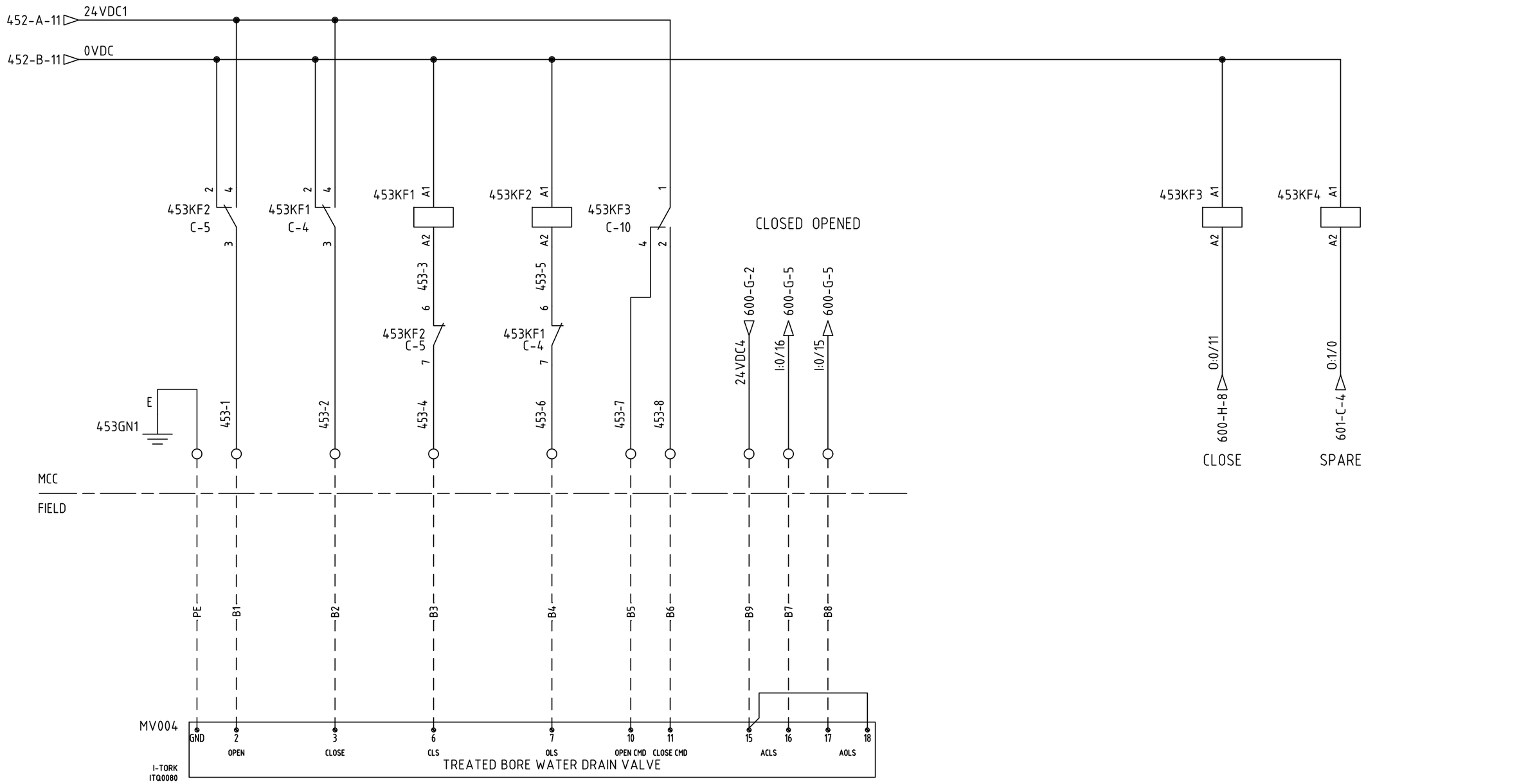
PROJECT: BORE WATER TREATMENT PLANT

TITLE: ELECTRICAL DRAWING SET

MOTORISED VALVE - MV003 TREATED BORE WATER OUT

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
988-E- 452	N.T.S.	14	2



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	ORDER No.
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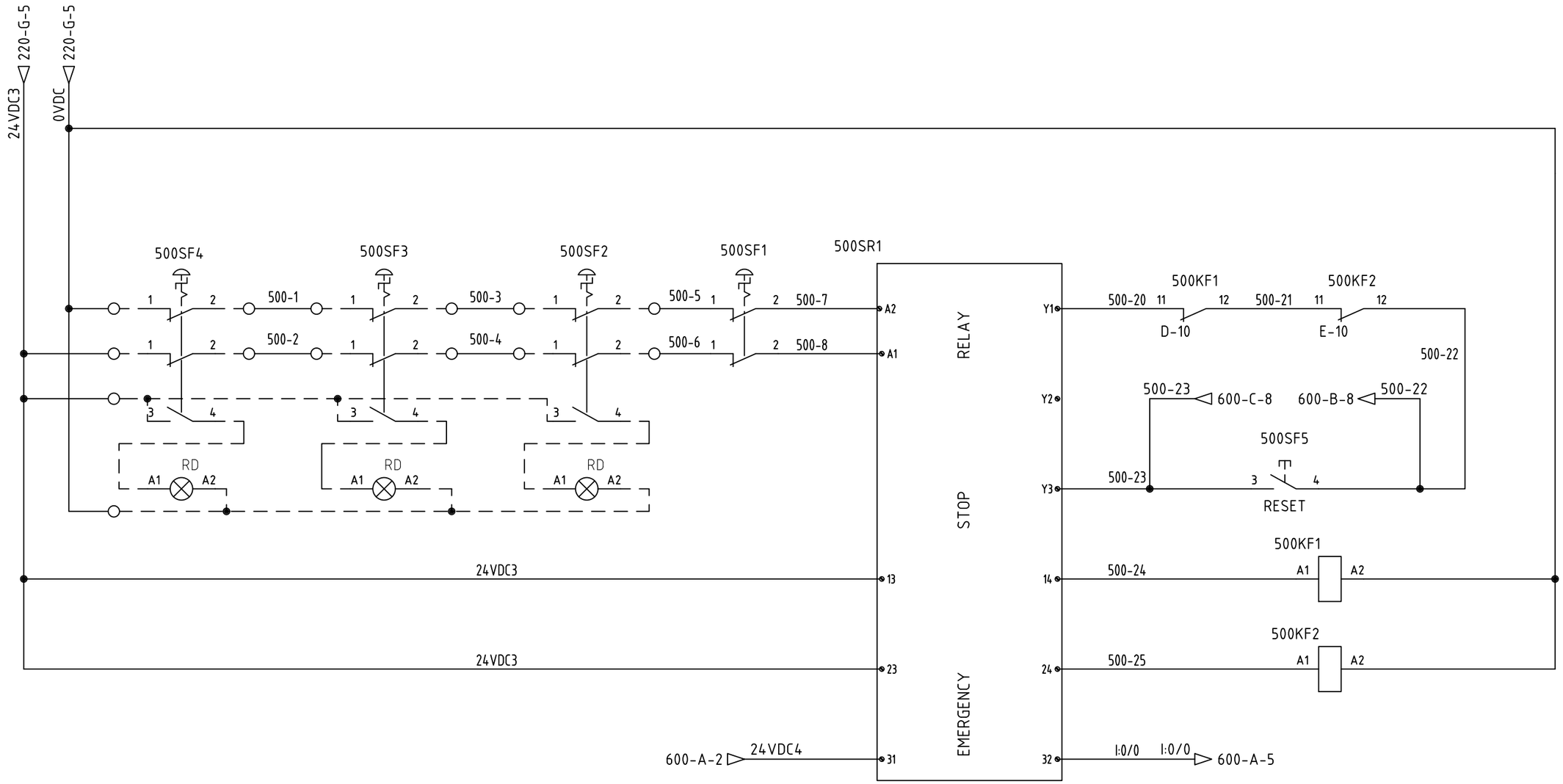
PROJECT: BORE WATER TREATMENT PLANT

TITLE: ELECTRICAL DRAWING SET

MOTORISED VALVE - MV004 TREATMENT LOOP TO DRAIN

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
988-E - 453	N.T.S.	15	2



REVISION	REV:	DESC:	DATE:	DRN:	CHK:	APR:	ORDER No.
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DATE:	29/05/2014	

PROJECT: BORE WATER TREATMENT PLANT

TITLE: ELECTRICAL DRAWING SET

PLANT EMERGENCY STOP CIRCUIT

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
988-E- 500	N.T.S.	16	2

1766-L32BXB
20 INPUTS, 12 OUTPUTS (AC/DC)
600PLC1

24VDC4	500-F-6	500-F-9	I:0/0	ESTOP TRIPPED	IN 0	L1+	24VDC2	220-G-4				
		220-B-6	I:0/1	BATTERY MODE	IN 1	L2-	0VDC	220-G-4				
24VDC4	252-G-3	252-G-4	I:0/2	WM001 PULSE	IN 2	GND						
24VDC4	252-G-8	252-G-9	I:0/3	WM002 PULSE	IN 3	DC 0	500-22	500-D-10				
					COM 1	OUT 0	ESTOP RESET	500-23	500-D-9			
		300-E-10	I:0/4	PC001 RUNNING	IN 4	DC 1						
		300-E-11	I:0/5	PC001 HEALTHY	IN 5	OUT 1	PC001 ENABLE	O:0/1	300-D-8			
24VDC4	400-C-9	400-C-10	I:0/6	PD001 HEALTHY	IN 6	DC 2						
24VDC4	401-C-9	401-C-10	I:0/7	PD002 HEALTHY	IN 7	OUT 2	PD001 ENABLE	O:0/2				
					COM 2	OUT 3	PD002 ENABLE	O:0/3				
24VDC4	402-C-9	402-C-10	I:0/8	PD003 HEALTHY	IN 8	OUT 4	PD003 ENABLE	O:0/4				
24VDC4	450-D-6	450-D-7	I:0/9	MV001 OPENED	IN 9	OUT 5	MV001 CLOSE	O:0/5	450-D-10			
		450-D-7	I:0/10	MV001 CLOSED	IN 10	OUT 6	SPARE	O:0/6	450-D-11			
24VDC4	451-D-6	451-D-7	I:0/11	MV002 OPENED	IN 11	OUT 7	MV002 OPEN	O:0/7	451-D-10			
					COM 3	COM 2						
		451-D-7	I:0/12	MV002 CLOSED	IN 12	DC 3						
24VDC4	452-D-6	452-D-7	I:0/13	MV003 OPENED	IN 13	OUT 8	SPARE	O:0/8	451-D-11			
		452-D-7	I:0/14	MV003 CLOSED	IN 14	DC 4						
24VDC4	453-D-6	453-D-7	I:0/15	MV004 OPENED	IN 15	OUT 9	MV003 OPEN	O:0/9	452-D-10			
		453-D-7	I:0/16	MV004 CLOSED	IN 16	DC 5						
24VDC4	FS001		I:0/17	RECIRC.LOOP FLOW	IN 17	OUT 10	SPARE	O:0/10	452-D-11			
0VDC					IN 18	OUT 11	MV004 OPEN	O:0/11	453-D-10			
					IN 19							

128.94.38.93

0VDC 601-B-6
24VDC5 601-B-1

600KF1 A1 A2
600KF2 A1 A2
600KF3 A1 A2

0VDC 24VDC5

0VDC 24VDC5

220-G-6 220-G-6

220-G-8 220-G-7

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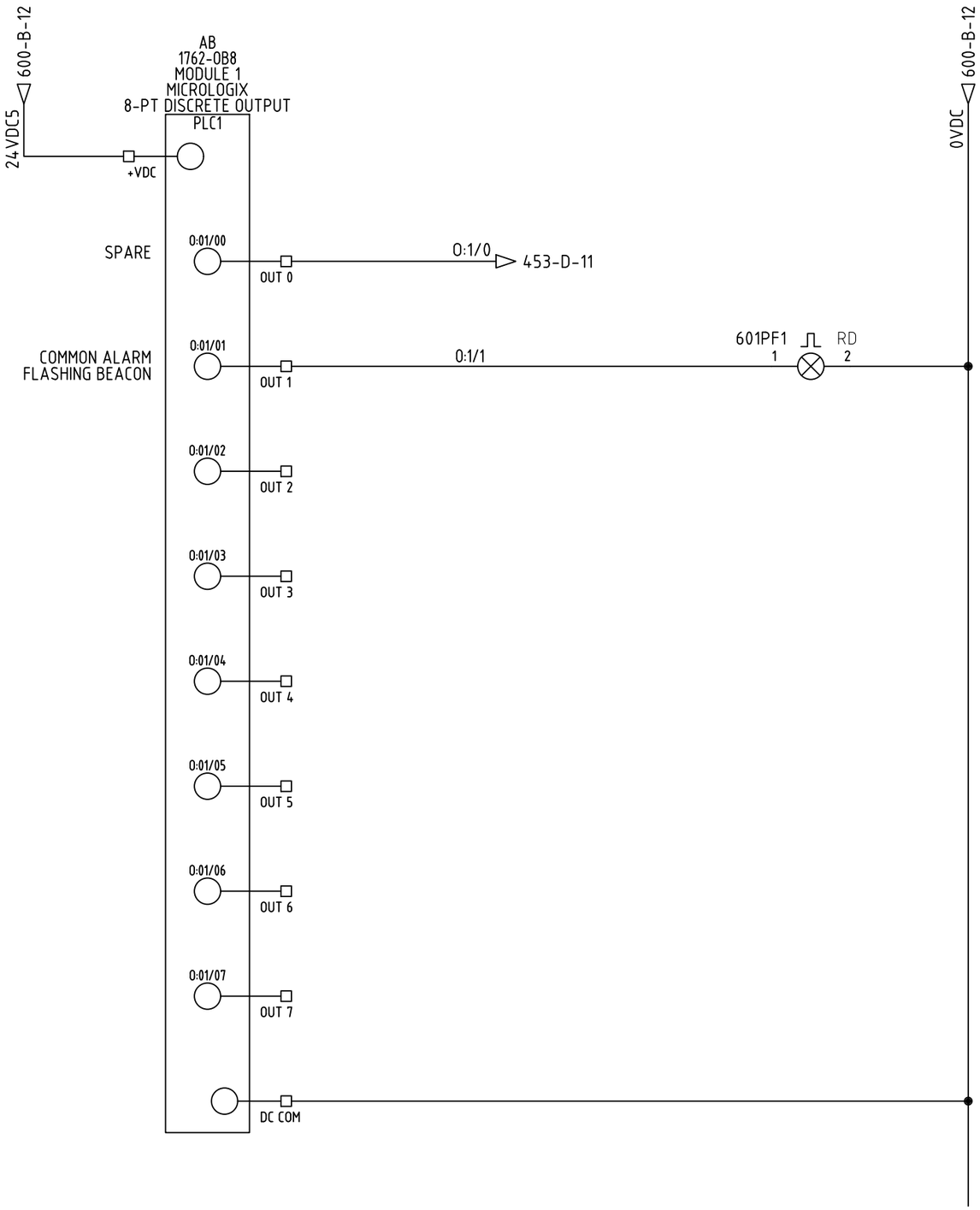
PROJECT: BORE WATER TREATMENT PLANT

TITLE: ELECTRICAL DRAWING SET

PLC BASE UNIT

CLIENT: UNSW - FACILITIES MANAGEMENT

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988-E- 600	N.T.S.	17	2



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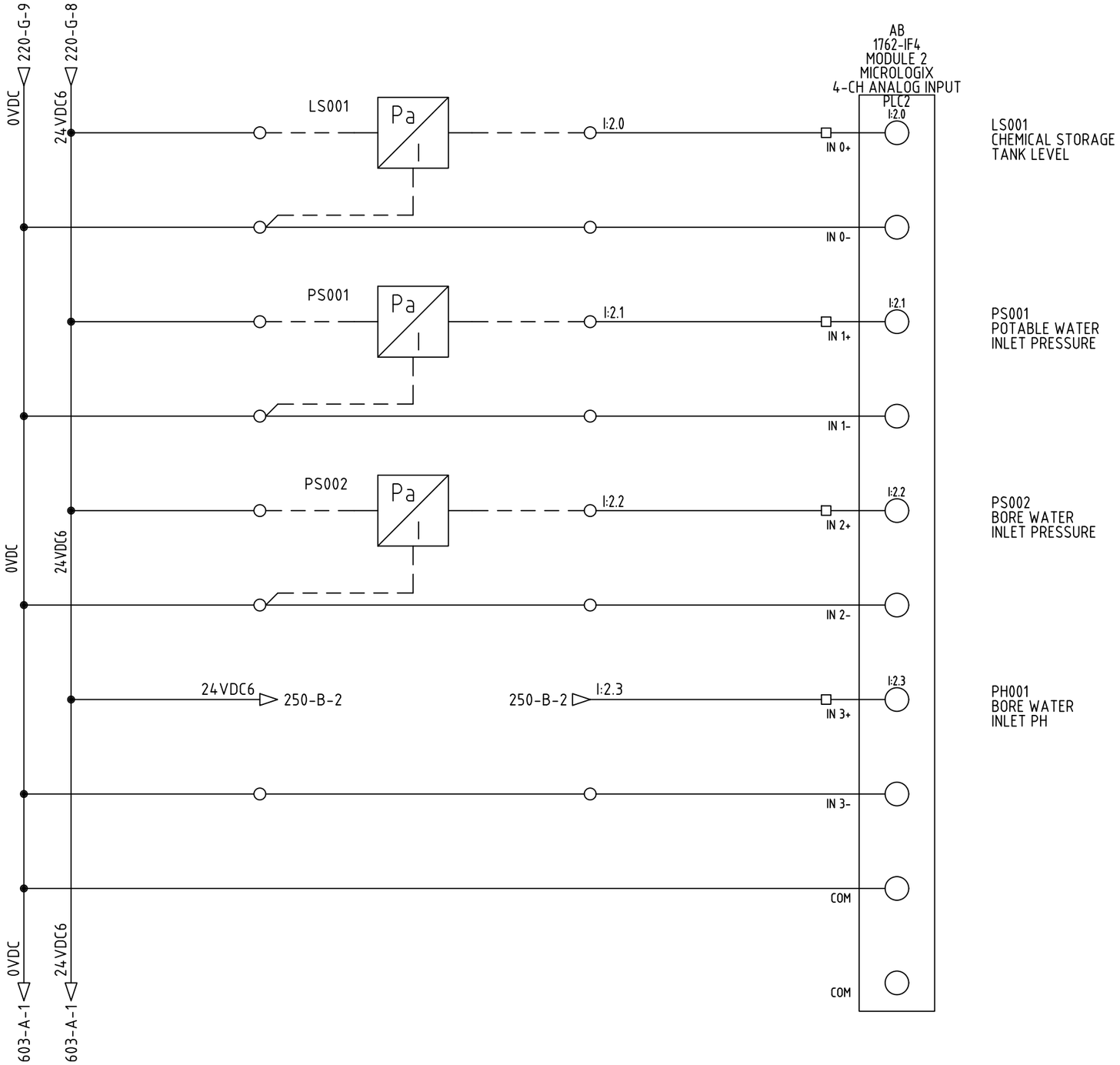
PROJECT: BORE WATER TREATMENT PLANT

TITLE: ELECTRICAL DRAWING SET

PLC EXPANSION MODULE 1

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DWG No:	SCALE:	SHEET:	REV:
988-E- 601	N.T.S.	18	2



LS001
CHEMICAL STORAGE
TANK LEVEL

PS001
POTABLE WATER
INLET PRESSURE

PS002
BORE WATER
INLET PRESSURE

PH001
BORE WATER
INLET PH

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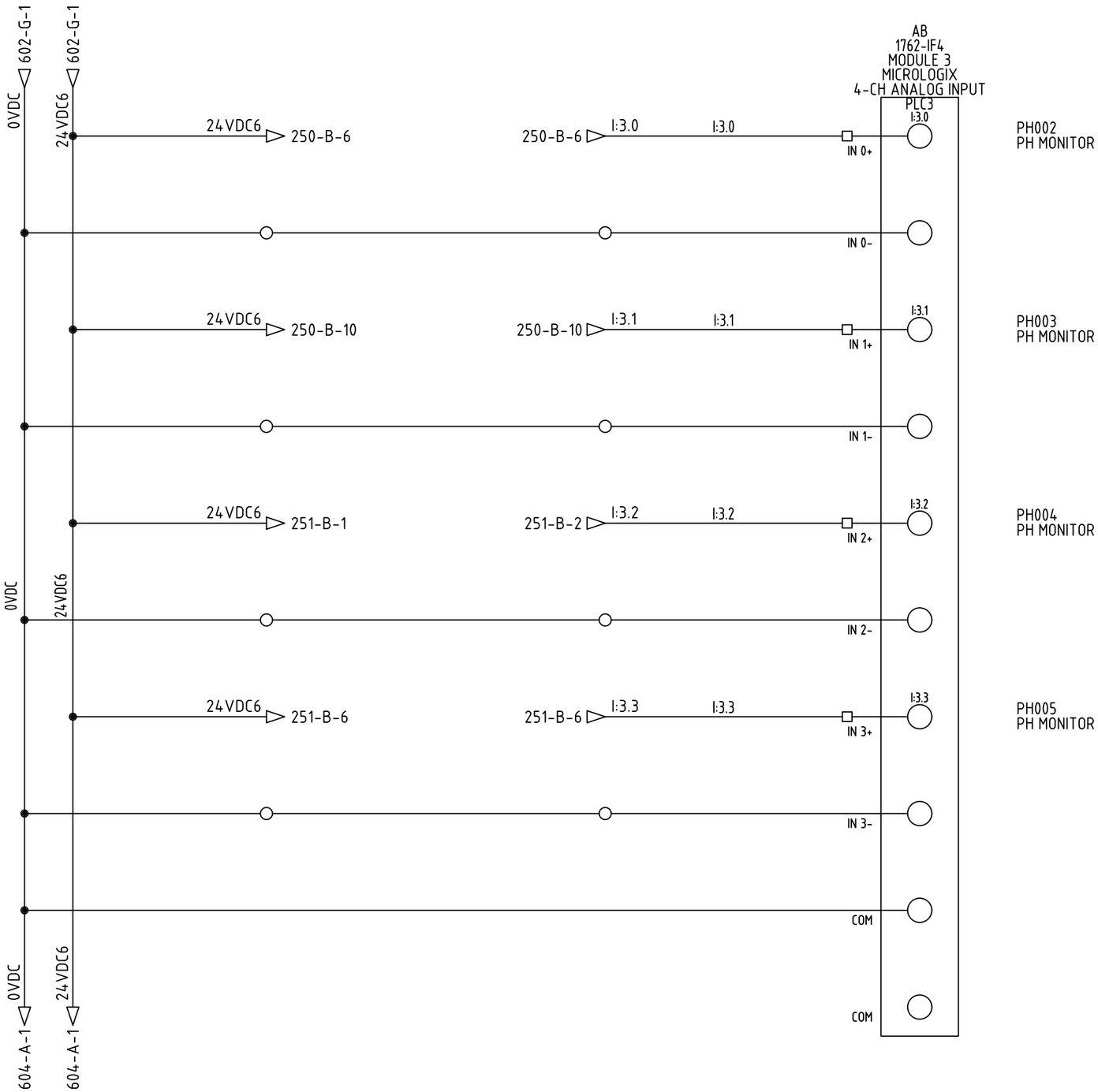
PROJECT: BORE WATER TREATMENT PLANT

TITLE: ELECTRICAL DRAWING SET

PLC EXPANSION MODULE 2

CLIENT: UNSW - FACILITIES MANAGEMENT

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988-E - 602	N.T.S.	19	2



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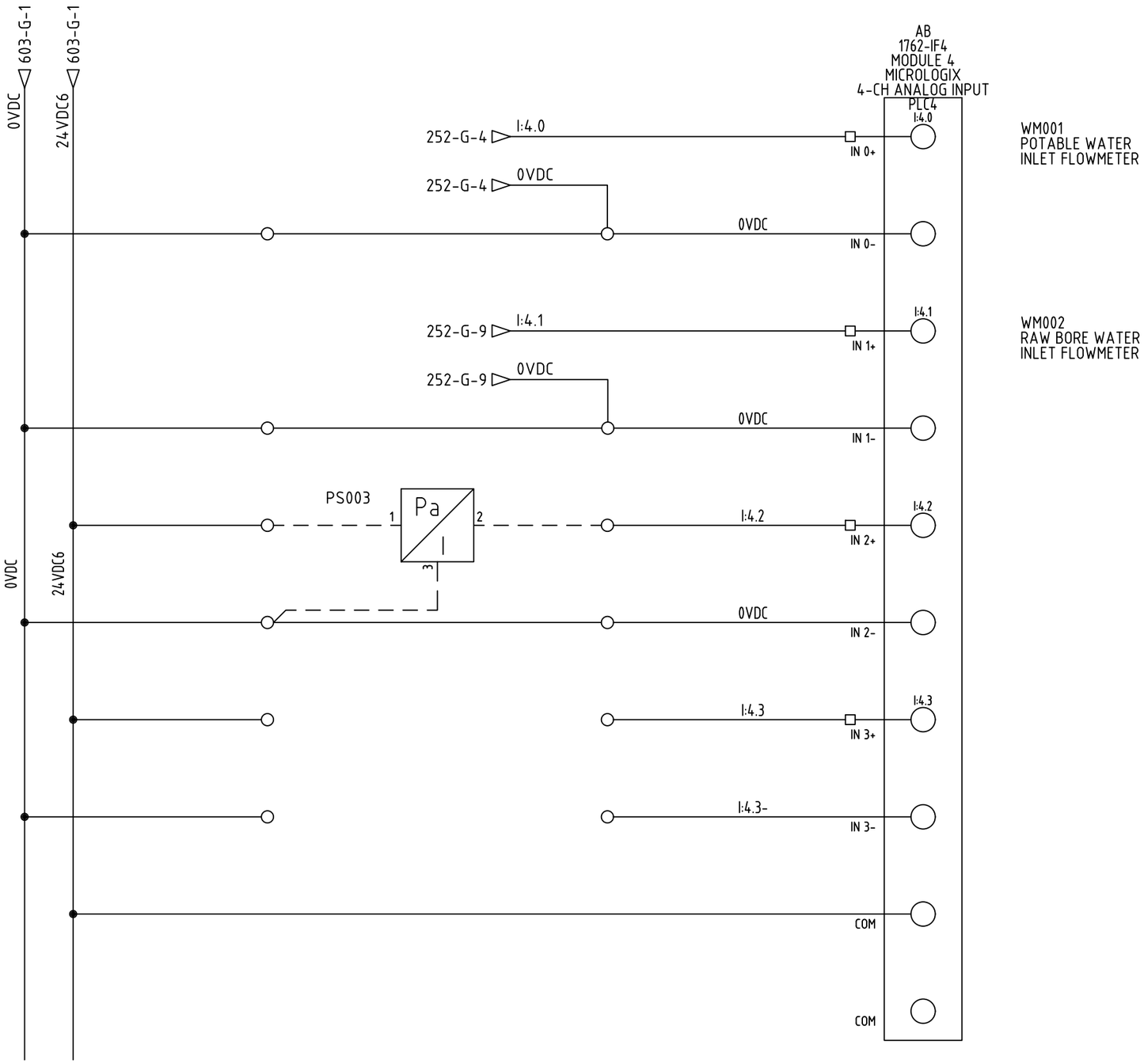
PROJECT: BORE WATER TREATMENT PLANT

TITLE: ELECTRICAL DRAWING SET

PLC EXPANSION MODULE 3

CLIENT: UNSW - FACILITIES MANAGEMENT

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988-E - 603	N.T.S.	20	2



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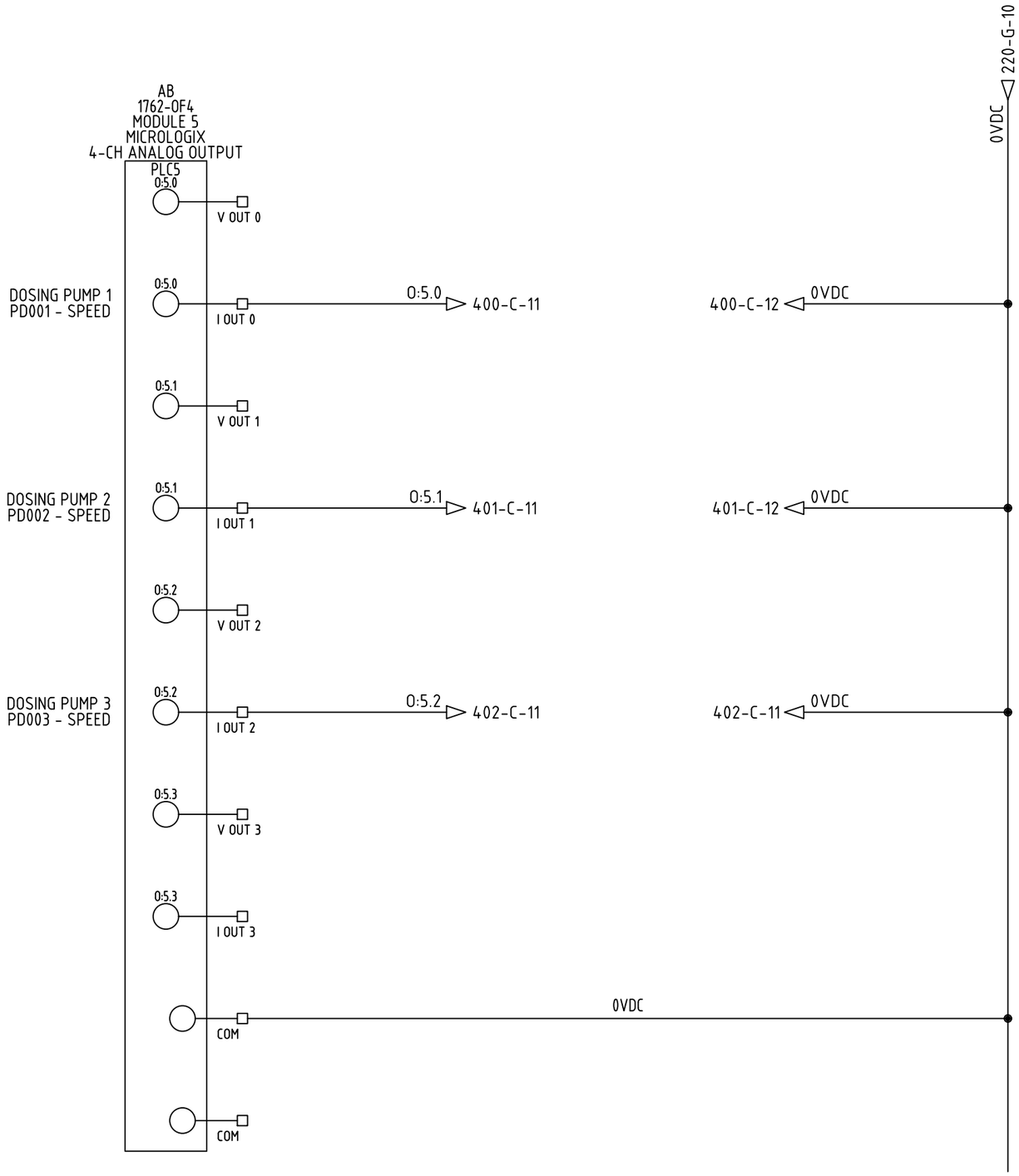
PROJECT: BORE WATER TREATMENT PLANT

TITLE: ELECTRICAL DRAWING SET

PLC EXPANSION MODULE 4

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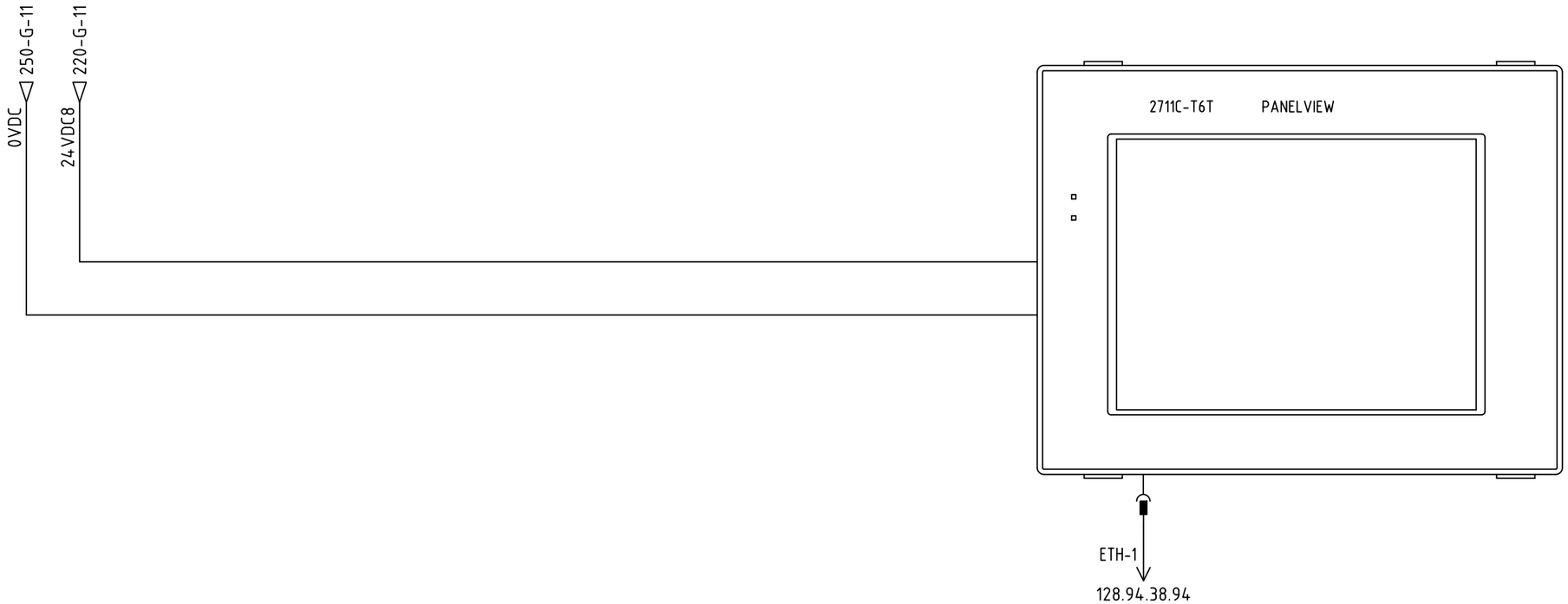
PROJECT: BORE WATER TREATMENT PLANT

TITLE: ELECTRICAL DRAWING SET

PLC EXPANSION MODULE 5

CLIENT: UNSW - FACILITIES MANAGEMENT

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988-E - 605	N.T.S.	22	2



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PROJECT: BORE WATER TREATMENT PLANT

TITLE: ELECTRICAL DRAWING SET

HMI AND ETHERNET CONNECTIONS

CLIENT: UNSW - FACILITIES MANAGEMENT

DWG No:	SCALE:	SHEET:	REV:
988-E - 700	N.T.S.	23	2

Appendix 11

F21 UCBWTP - Library Building
Operation And Maintenance Manual

UNSW
Upper Campus Bore Water Treatment Plant

1 Functional Description

1.1 Reference

Refer to the following documents regarding the descriptions below.

- BWTP_050_PID_REVB (piping and instrumentation diagram)
- BWTP_051_PID_REVB (piping and instrumentation diagram)
- UCBWTP Equipment list REVB (spreadsheet)

1.2 Overview

The proposed new treatment plant is based on the existing bore water treatment plant control technique. That is, two dosing control functions dosing into a single channel pipe system. The pipework has a length of 30 metres of 100mm CPVC tube, two dosing points, and five pH sampling points.
The first dosing system is flow paced and doses the untreated water with 50% sodium hydroxide at rate that is calculated on the combined calculation of the incoming water pH and flowrate. The second dosing control system is in the middle of the serpentine pipework and uses a PID function calculated on the discharge pH to control to a discharge setpoint.
The UCBWTP will incorporate all the ongoing improvements to the existing plant as well as modifications to improve the performance and reliability.
The plant consists of field instruments collecting the operational data, with dosing pumps, actuated, and modulating valves carrying out plant operation, and a programable logic controller (PLC) that assesses the operational data, and then actions plant operation on programmed parameters. To interface with the PLC, a touchscreen (HMI) is used to indicate plant operation and allow access to setpoints. The PLC collects data for use by the UNSW BMS system.

1.3 Objective

The objective for the Upper Campus Bore Water Treatment Plant (UCBWTP) is to fill the Treated Bore Water Tank (TBWT) with treated bore water. The UCBWTP will control the flowrate to maintain the level in the TBWT and will control the pH to maintain a close to neutral pH similar to mains potable water. Straining and Filtering of the water also occurs.
The plant has three operating modes, they are Reservoir Bypass; BWTP Bypass; and Normal Operation.
The following information sets out the plant control specifications, and how the plant will operate.

1.4 Local Control Panel Specification

1.4.1 MCC - MOTOR CONTROL CENTRE

Unless otherwise specified by the client, the Motor Control Centre (MCC) will be built to accommodate and control all the equipment in the equipment list. It will also comply with the following specifications:

1.4.1.1 Enclosure

- Stainless steel, IP55 wall mounted, bottom entry, and designed for indoor installation.

1.4.1.2 PLC, HMI, Comms

- Allen Bradley Compact Logix PLC
- Allen Bradly PanelView Plus7 HMI Screen, 10”
- Unmanaged Ethernet Switch
- Modbus RTU communication module
- Gateway

1.4.1.3 Emergency Stop Circuits

- The MCC is to be fitted with an emergency stop pushbutton to de-energise all equipment. A global reset switch is provided on the front of the MCC.
- The Chemical Fill Station emergency stop pushbutton will stop the fill operation only and can be reset from the fill station.

1.4.1.4 Uninterruptible Power Supply (UPS)

- Phoenix Contact 24VDC UPS backup capable of maintaining PLC and valve operation for 30 minutes after power loss.

1.4.1.5 Drawings

- Provide electrical drawings for the MCC & Remote Chemical Fill Control Panel including the following:
    - Single Line Drawings (SLD)
    - Network Drawings
    - Control Panel General Arrangement
    - Circuit Drawings

1.4.2 HMI - PROCESSOR INTERFACE REQUIREMENTS

Control and operating state of all equipment, as well as process and fault alarms will be via the HMI. This will include but not limited to:

1.4.2.1 Device Auto/Off/Manual

Unless continuously powered, all electrical equipment is to be controlled via virtual Auto/Off/Manual buttons on the HMI.

Auto - Functions as per the control philosophy, unless inhibited
Off - Will not run under any circumstance
Manual - Runs continuously regardless of process parameters or interlocks, unless inhibited

1.4.2.2 Device State Indication

- Mimic pages:
    - Actuated valves will show Open/Closed / Transitioning indication
    - For open, colour GREEN,
    - For closed, colour GREY,
    - For actuated valves, transitioning, colour YELLOW (where applicable)
-

1.4.2.3 Instrumentation Indication and Setup

- Mimic pages:
    - All instrumentation will show scaled instantaneous value for each parameter retrieved.
- Analogue Setup page:
    - All analogue instruments to have ENG Min and Max scaling and value simulation via HMI.
    - All pulse signals to have pulse/unit scaling via HMI. For example, flowmeter pulse: 100L/P for totaliser summation.
    - Process Values are adjustable as follows:
        - All pH values are adjustable to 2 decimal places (e.g.,7.50)
        - All level transmitters are adjustable to 0 decimal places.
        - All flow values are adjustable to 1 decimal place
        - All pressure values are adjustable to 1 decimal place.

1.4.2.4 Timers, Hysteresis and Filters

- Time units are adjustable to 0 decimal places (e.g.: 53seconds, 3mins) unless otherwise noted.
- Hysteresis on setpoint parameters is to be as follows, unless otherwise noted:

  - Level – 2%
  - pH – 0.2pH
  - Conductivity – 20 µS/cm
  - Flow – 0.5 m3/hr
  - Pressure – 0.1 bar
- Filters on analogue signals to be set to 3s.

1.4.2.5 Alarms

- Mimic page:
  - Alerts and alarms are to be provided as a pop-up banner on the HMI. The banner is not to obstruct or overlay content on a mimic page.
- Alarm List Page:
  - Historical alerts and alarms are to be summarised on an Alarm List page for acknowledgment and retained (i.e., not cleared).
  - Alarms can only be cleared from the log after the fault has been cleared and alarm acknowledged.
- Category Specification:
  - Non-critical: trigger the alarm beacon and raise alarm message on HMI
  - Critical: trigger the alarm beacon and raise alarm message on HMI.

1.4.2.6 Trend Pages

- General:
  - Trend pages are to be provided for all analogue instruments and other elements as noted. Pages accessible via the summary page only.
  - Trends to be line type, with X and Y grid lines at major intervals only, heading label, X and Y axis label.
  - Trends to be grouped based on Y axis scaling range with similar process variables and as noted within this document.
  - Trends time X axis scaling to be based on 24 hr intervals. Where skip forward or skip backward function provided function skips 12 hrs (1/2 scale).

1.4.2.7 Password Protection and Access Levels

- HMI access is to be segregated under the following accounts, with Level 1 highest privilege:
  - L1: Engineer: unrestricted access
  - L2: Operator: full access to all mimic, trend and alarm pages, operate devices, acknowledge and reset alarms, VIEW ONLY setup pages.
  - L3: Guest: VIEW only mimic, trend and alarm pages. No access to setup page or popup / device controls
- Each access level is to have password protection with the exception of the Guest access. The passwords are to be maintained per the project password register.

1.4.3 CHEMICAL FILL CONTROL PANEL

Unless otherwise specified by the client, the Control Panel (CP) will be built to the following specifications:

1.4.3.1 Enclosure

Stainless steel, IP55 wall mounted, bottom entry, and designed for outdoor installation

1.4.3.2 PLC, HMI, Comms

- Allen Bradley PanelView 800 HMI Terminal 4” with Ethernet.

1.4.3.3 Emergency Stop Circuits

- An emergency stop pushbutton hard wired to the MCC.

1.5 Operating Modes

1.5.1 Reservoir Bypass Mode

When in Reservoir Bypass mode, the UCBWTP and the TBWT are shut down as well as the Upper and Lower Campus Treated Bore Water Booster Pumps. Potable water is diverted into the Upper Campus reticulation system.
At the same time potable water is diverted into the lower campus reticulation system via Potable Water Backup Actuated Valve AV200 located in E10. There will be a remote-control panel at the valve location that will communicate with the UCBWTP PLC via an ethernet connection.
A Reservoir Bypass pushbutton will be located on the HMI.
This mode is used when pre-emptive diversion is needed (e.g.: building shutdown or tank maintenance).

- Display
  - Activate/deactivate pushbutton on HMI
- Conditions
  - Activated/deactivated by HMI input
  - Activated by electrical supply failure
  - Deactivated by return of supply
  - Activated by LT143 – (TBWT LEVEL) Low Low Level Alarm (YC143B)
- Control output to PLC.
  - inhibit 'BWTP Bypass'
  - Inhibit 'Auto Operation'
  - Inhibit PU146A, B, C & D (UPPER CAMPUS RETICULATION PUMP SET)
  - Inhibit PU160A, B & C, (LOWER CAMPUS RETICULATION PUMP SET)
  - Open AV124 (POTABLE WATER BACKUP ACTUATED VALVE – UC)
  - Open AV200 (POTABLE WATER BACKUP ACTUATED VALVE – LC)

1.5.2 BWTP Bypass Mode

When in BWTP Bypass mode, the BWTP shuts down and the TBWT maintains tank level using the potable water line to fill the tank. This mode can be used for maintenance, serviceability of the Bore Water Treatment Segment of the plant, or if the BWTP 'Auto Operation' is inhibited.
A BWTP Bypass pushbutton will be located on the HMI.

- Display
  - Activate/deactivate pushbutton on HMI
- Conditions
  - Activated/deactivated by HMI input
  - Activated/deactivated by LT113 – (NaOH STORAGE TANK LEVEL) Low Low Level Alarm (YC113A)
  - Activated/deactivated by PT112 (RAW BORE WATER PRESSURE) – Low Pressure Alarm (YC112)
  - Activated by AE105 – (POST DOSING PH PROBE) Low pH Alarm (YC105A)
  - Activated by AE107 – (POST DILUTION PH PROBE) Low pH Alarm (YC107A)
  - Activated by AE105 – (POST DOSING PH PROBE) High pH Alarm (YC105B)
  - Activated by AE107 – (POST DILUTION PH PROBE) High pH Alarm (YC107B)
  - Deactivated by 'FAULT RESET' Pushbutton
- Control output to PLC.
  - Inhibit 'Auto Operation'
  - Open AV121 (POTABLE WATER ACTUATED VALVE)
  - Enable MV119 (POTABLE WATER MODULATING VALVE)
  - Enable PU146A, B, C & D (UPPER CAMPUS RETICULATION PUMP SET)
  - Enable PU160A, B & C, (LOWER CAMPUS RETICULATION PUMP SET)

1.5.3 Auto Operation Mode

When the plant is not in 'BWTP Bypass' or 'Reservoir Bypass' it is in 'Automatic Operation' (Auto). The Raw Bore Water Actuated Valve, AV122, is opened to allow Raw Bore Water into the plant. The dosing pumps, DP125 and DP127, are enabled, if all plant conditions are met, the Treated Bore Water Outlet valve, AV123 is opened and the Potable Water Actuated Valve, AV121, is closed. Tank level is maintained by MV120.
If 'Automatic Operation' is inhibited, the plant reverts to 'BWTP Bypass'.

- Display
  - Plant 'FAULT RESET' pushbutton on HMI
- Conditions
  - Activated if not in 'Reservoir Bypass' mode, and
  - Activated when released from 'BWTP Bypass' mode
- Control output to PLC.
  - Disable MV119 (POTABLE WATER MODULATING VALVE)
  - Close AV121 (POTABLE WATER ACTUATED VALVE)
  - Enable PU146A, B, C & D (UPPER CAMPUS RETICULATION PUMP SET)
  - Enable PU160A, B & C, (LOWER CAMPUS RETICULATION PUMP SET)
  - Disable Dosing Alarms for 10 minutes (YC105A, YC107A, YC105B & YC107B)
  - Open AV122 (RAW BORE WATER ACTUATED VALVE)
  - Open AV123 (TREATED BORE WATER ACTUATED VALVE)
  - Enable MV120 (TREATED WATER MODULATING VALVE)
  - Enable DP125 (FLOW PACED DOSING PUMP)
  - Enable YC101 (FLOW PACED DOSING CONTROL LOOP)
  - Enable DP126 (PID DOSING PUMP)
  - Enable YC105 (PID DOSING CONTROL LOOP)

1.5.4 Chemical Fill Operation

The chemical fill operation will be controlled by the fill operator and the automatic control system.
The sodium hydroxide storage tank will be scaled to show volume in litres. The maximum amount of sodium hydroxide to be stored is 2,499 litres which is approximately 40 to 50 days capability.
Sodium hydroxide deliveries will be either 1,000 or 2,000 litre deliveries. The deliveries will be arranged so as not to exceed the maximum storage limit.
When the tank level measures less than 499 litres, the automated system will allow 2,000 litres to be decanted. if the tank volume is between 500 to 1,499 litres, then only 1,000 litres will be decanted. If the tank level is above 1,500 litres the decanting is prohibited.
The fill operation is controlled by the operator and the PLC. The fill station has a control panel to interface between the PLC and operator, and a single and three phase outlet which provides power for the truck decant pump to pump the chemical from the truck to the storage tank. The outlet is controlled by the PLC alone.
The operator can start and stop the pump via the outlet using the start/stop push buttons on the HMI any time during decant, but once the level approaches the pre-set volume of 2,499 litres, power to the outlet is cut to prevent over filling the tank.
A level indicator is provided to display the tank volume.
If the sodium hydroxide blind sump level switch (LS114) is operated, then the fill operation is stopped.

1.6 Item Descriptions

1.6.1 ATC100 - MULTI FUNCTION CONTROLLER 1

Standalone Controller

- Process Element: AE101-AE108
- 230VAC, output to PLC via Ethernet
- Alarm / Faults:
    - Instrument Alarm

1.6.2 AE101 - RAW BORE WATER PH PROBE

Inline pH sensor used for monitoring the pH of the raw bore water and for flow paced dosing. Connected via ATC100

- Scaling
    - ENG Min and Max scaling via HMI
- Display
    - Instantaneous values displayed on HMI
    - Trended on HMI
    - Value simulation via HMI
- Control output to PLC.
    - Input to flow paced dosing rate calculation (YC101)
- Alarm / Faults:
    - Instrument Alarm – Instrument out of range - Critical alarm
    - Low pH Alarm – Critical alarm
    - High pH Alarm – Critical alarm

1.6.3 AE102 - RAW BORE WATER CODUCTIVITY PROBE

Inline Conductivity sensor used for monitoring the conductivity of the raw bore water. Connected via ATC100

- Scaling
    - ENG Min and Max scaling via HMI
- Display
    - Instantaneous values displayed on HMI
    - Trended on HMI
    - Value simulation via HMI
- Alarm / Faults:
    - Instrument Alarm – Instrument out of range - Critical alarm
    - High Conductivity Alarm – Critical alarm

1.6.4 AE103 – POST STATIC MIXER 1 PH PROBE

Inline pH sensor used for monitoring the treated bore water dosing rate. Connected via ATC100

- Scaling
    - ENG Min and Max scaling via HMI
- Display
    - Instantaneous values displayed on HMI
    - Trended on HMI
    - Value simulation via HMI
- Control output to PLC
    - Input to flow paced dosing rate (YC103)
- Alarm / Faults:
    - Instrument Alarm – Instrument out of range - Critical alarm
    - Low pH Alarm – Critical alarm
    - High pH Alarm – Non-critical alarm

1.6.5 AE104 – POST STATIC MIXER 2 PH PROBE

Inline pH sensor used for monitoring the treated bore water dosing rate. Connected via ATC100

- Scaling
  - ENG Min and Max scaling via HMI
- Display
  - Instantaneous values displayed on HMI
  - Trended on HMI
  - Value simulation via HMI
- Alarm / Faults:
  - Instrument Alarm – Instrument out of range - Critical alarm
  - Low pH Alarm – Critical alarm
  - High pH Alarm – Non-critical alarm

1.6.6 AE105 – POST DOSING PH PROBE

Inline pH sensor used for monitoring the treated bore water and provide the process variable for PID dosing loop. Connected via ATC100.

- Scaling
  - ENG Min and Max scaling via HMI
- Display
  - Instantaneous values displayed on HMI
  - Trended on HMI
  - Value simulation via HMI
- Control output to PLC.
  - Process variable input to PID dosing rate calculation (YC105C). Interlock selectable - AE105 or AE107
- Alarm / Faults:
  - Instrument Alarm – Instrument out of range - Critical alarm
  - Low Low pH Alarm – Critical alarm
  - Low pH Alarm – Warning
  - High pH Alarm – Warning
  - High High pH Alarm – Critical alarm
  - Differential error with AE107 – Critical alarm

1.6.7 AE106 – POTABLE WATER CONDUCTIVITY PROBE

Inline Conductivity sensor used for monitoring the conductivity of the potable water. Connected viaATC100

- Scaling
  - ENG Min and Max scaling via HMI
- Display
  - Instantaneous values displayed on HMI
  - Trended on HMI
  - Value simulation via HMI
- Alarm / Faults:
  - Instrument Alarm – Instrument out of range - Critical alarm
  - High Conductivity Alarm – Critical alarm

1.6.8 AE107 – POST DILUTION MIX PH PROBE

Inline pH sensor used for monitoring the treated bore water and provide the process variable for PID dosing loop. Connected via ATC100.

- Scaling
  - ENG Min and Max scaling via HMI
- Display
  - Instantaneous values displayed on HMI
  - Trended on HMI
  - Value simulation via HMI
- Control output to PLC.
  - Process variable input to PID dosing rate calculation (YC105C). Interlock selectable - AE105 or AE107
- Alarm / Faults:
  - Instrument Alarm – Instrument out of range - Critical alarm
  - Low Low pH Alarm – Critical alarm
  - Low pH Alarm – Warning
  - High pH Alarm – Warning
  - High High pH Alarm – Critical alarm
  - Differential error with AE105 – Critical alarm

1.6.9 AE108 – POST DILUTION MIX CONDUCTIVITY PROBE

Inline Conductivity sensor used for monitoring the conductivity of the treated bore water. Connected via ATC100.

- Scaling
  - ENG Min and Max scaling via HMI
- Display
  - Instantaneous values displayed on HMI
  - Trended on HMI
  - Value simulation via HMI
- Alarm / Faults:
  - Instrument Alarm – Instrument out of range - Critical alarm
  - High Conductivity Alarm – Critical alarm

1.6.10 PT111 - POTABLE WATER INFEED PRESSURE TRANSMITTER

Externally mounted pressure transmitter. Loop power 24VDC 4-20mA output to PLC

- Scaling
  - ENG Min and Max scaling via HMI
- Display
  - Instantaneous Value displayed on HMI
  - Trended on HMI
  - Value simulation via HMI
- Alarm / Faults:
  - Instrument Alarm – Instrument out of range - Critical alarm
  - Low Pressure Alarm - Critical alarm
  - High Level Pressure Alarm – Critical alarm

1.6.11 PT112 - RAW BORE WATER PRESSURE TRANSMITTER

Externally mounted pressure transmitter. Loop power 24VDC 4-20mA output to PLC

- Scaling
  - ENG Min and Max scaling via HMI
- Display
  - Instantaneous Value displayed on HMI
  - Trended on HMI
  - Value simulation via HMI
- Control output to PLC
  - Input to BWTP bypass changeover (YC112)
- Alarm / Faults:
  - Instrument Alarm – Instrument out of range - Critical alarm
  - Low Pressure Alarm - Critical alarm
  - High Level Pressure Alarm – Critical alarm

1.6.12 LT113 - SODIUM HYDROXIDE TANK LEVEL TRANSMITTER

Externally mounted ultrasonic level transmitter. Loop power 24VDC 4-20mA output to PLC

- Scaling
  - ENG Min and Max scaling via HMI
  - Scaled in litres.
- Display
  - Instantaneous Value displayed on HMI
  - Trended on HMI
  - Value simulation via HMI
- Control output to PLC.
  - Inhibits chemical fill process when tank level reaches 1,499 litres
  - Inhibits DP125 and DP127 when Low Low Level (YC113A)
  - Inhibits ‘Automatic Operation’ when Low Low Level (YC113A)
- Alarm / Faults:
  - Instrument Alarm – Instrument out of range - Critical alarm
  - High High Level Alarm - Critical alarm
  - Low Level Alarm – Non-critical alarm (Caustic Re-order)
  - Low Low Level Alarm – Critical alarm

1.6.13 LS114 - SODIUM HYDROXIDE BLIND SUMP FLOAT SWITCH

24VDC Float Level Switch

- Display
  - Discrete Value displayed on HMI
  - Value simulation via HMI
- Switching Threshold adjusted locally
- Control
  - When float activates chemical fill is stopped (YC114)
- Alarms/Faults:
  - Active: High Level Active Alarm – Critical Alarm

1.6.14 LS115 - BORE WATER TREATMENT PLANT SUMP FLOAT SWITCH

24VDC Float Level Switch

- Display
  - Discrete Value displayed on HMI
  - Value simulation via HMI
- Switching Threshold adjusted locally
- Control
  - When float activates BWTP goes into 'BWTP bypass' (YC115)
- Alarms/Faults:
  - Active: High Level Active Alarm – Critical Alarm

1.6.15 FIT116 - POTABLE WATER FLOWMETER

In line flowmeter used for monitoring the potable water flow.

- Scaling
  - ENG Min and Max scaling via HMI
- Display
  - Instantaneous values displayed on HMI
  - Accumulated value displayed on HMI
  - Trended on HMI
  - Value simulation via HMI
- Control output to PLC.
  - Process variable for flowrate feedback when in 'BWTP Bypass'
- Alarm / Faults:
  - Instrument Alarm – critical alarm
  - Low Flow Alarm – critical alarm
  - High Flow Alarm – critical alarm

1.6.16 FIT117 - RAW BORE WATER FLOWMETER

In line flowmeter used for monitoring the raw bore water flow.

- Scaling
  - ENG Min and Max scaling via HMI
- Display
  - Instantaneous values displayed on HMI
  - Accumulated value displayed on HMI
  - Trended on HMI
  - Value simulation via HMI
- Control output to PLC.
  - Input to flow paced dosing rate calculation (YC101)
  - Process variable for flowrate feedback when in 'Automatic Operation'
- Alarm / Faults:
  - Instrument Alarm – Instrument out of range - Critical alarm
  - Low pH Alarm – Critical alarm
  - High pH Alarm – Critical alarm

1.6.17 MV119 - POTABLE WATER MODULATING CONTROL VALVE

Modulating control valve for flow rate control on potable water line.

- Display
  - Percentage open displayed on HMI
  - Auto/Off/Manual
  - Value simulation via HMI
- Control output to PLC.
  - PID controlled by LT143 (YC143A)
- Alarm / Faults:
  - Failed to open/failed to close
  - Position error

1.6.18 MV120 - TREATED WATER MODULATING CONTROL VALVE

Modulating control valve for flow rate control on raw bore water line.

- Display
  - Percentage open displayed on HMI
  - Auto/Off/Manual
  - Value simulation via HMI
- Control output to PLC.
  - Activated in 'Automatic Operation' mode
  - PID controlled by LT143 (YC143A)
- Alarm / Faults:
  - Failed to open/failed to close
  - Position error

1.6.19 AV121 - POTABLE WATER ACTUATED VALVE

Actuated valve used to control flow on potable water infeed line.

- Display
  - Auto/Off/Manual
  - Value simulation via HMI
- Control output to PLC.
  - Activated in 'BWTP Bypass' mode
- Alarm / Faults:
  - Failed to open/failed to close
  - Position error

1.6.20 AV122 - RAW BORE WATER INFEED ACTUATED VALVE

Actuated valve used to control flow on raw bore water infeed line.

- Display
  - Auto/Off/Manual
  - Value simulation via HMI
- Control output to PLC.
  - Activated in 'Auto Operation' mode
- Alarm / Faults:
  - Failed to open/failed to close
  - Position Error

1.6.21 AV123 - TREATED BORE WATER ACTUATED VALVE

Actuated valve used to control treated bore water outfeed line.

- Display
  - Auto/Off/Manual
  - Value simulation via HMI
- Control output to PLC.
  - Activated in 'Auto Operation' mode
- Alarm / Faults:
  - Failed to open/failed to close
  - Position Error

1.6.22 AV124 - POTABLE WATER BACKUP ACTUATED VALVE

Actuated valve used to control potable water backup line.

- Scaling
  - NIL
- Display
  - Auto/Off/Manual
  - Value simulation via HMI
- Control output to PLC.
  - Activated in 'Reservoir Bypass' mode
- Alarm / Faults:
  - Failed to open/failed to close
  - Position Error

1.6.23 AS160 - JUDO AUTO BACKWASH FILTER

Judo auto backwash filter used to filter out physical impurities.

1.6.24 DP125 - FLOW PACED DOSING PUMP

Flow paced dosing pump used to adjust water pH depending on flow rate of water.

- Display
  - Dose rate displayed on HMI
  - Auto/Off/Manual
- Control output to PLC.
  - Activated in 'Auto Operation' mode
  - Ratio controlled by AE101 & FIT117 (YC101)
  - Paused by AE103 (YC103)
- Alarm / Faults:
  - Pump Fault

1.6.25 DP127 - PID DOSING PUMP

PID dosing pump used to adjust pH depending on PID calculations.

- Display
  - Dose rate displayed on HMI
  - Auto/Off/Manual
- Control output to PLC.
  - Activated in 'Auto Operation' mode
  - PID controlled by AE105 or AE107 (YC105C)
  - Paused by AE105 or AE107 (YC105D OR YC107D)
  -
- Alarm / Faults:
  - Pump Fault

1.6.26 DX129 - REMOTE CHEMICAL FILL OUTLET

Chemical fill outlet used for chemical supply truck.

- Control output to PLC.
  - On/off control by local HMI
  - Off control by LT113 (YC113B) & LS114 (YC114)

1.6.27 SF130 - CHEMICAL FILL CONTROL PANEL

Chemical fill panel used by chemical supply operator to fill the Sodium Hydroxide Tank.

- Display
  - Local on/off control on HMI
  - Display of Sodium Hydroxide Tank Level
- Control output to PLC.
  - On/off selection of the fill outlet DX129
- Alarm / Faults:
  - Sodium Hydroxide Tank level High High alarm.

1.6.28 ATC140 - MULTI FUNCTION CONTROLLER 2

Standalone controller used to monitor and calibrate probes.

- Process Element: AE141 & AE142
- 230VAC, output to PLC via analog input

1.6.29 AE141 - UPPER CAMPUS TREATED BORE WATER RESERVOIR PH PROBE

Inline pH sensor used for monitoring the UCBWTP reservoir tank pH, connected to ATC140

- Scaling
  - ENG Min and Max scaling via HMI
- Display
  - Instantaneous values displayed on HMI
  - Trended on HMI
  - Value simulation via HMI
- Alarm / Faults:
  - Instrument Alarm – Instrument out of range – Critical alarm
  - Low pH Alarm – Critical Alarm
  - High pH Alarm – Critical Alarm

1.6.30 AE142 - UPPER CAMPUS TREATED BORE WATER RESERVOIR CONDUCTIVITY PROBE

Inline Conductivity sensor used for monitoring the conductivity of UCBWTP reservoir tank, connected via ATC140

- Scaling
  - ENG Min and Max scaling via HMI
- Display
  - Instantaneous values displayed on HMI
  - Trended on HM
  - Value simulation via HMI
- Alarm / Faults:
  - Instrument Alarm – Instrument out of range – Critical alarm
  - Low Conductivity Alarm – Critical alarm
  - High Conductivity Alarm – Critical alarm

1.6.31 LT143 - UPPER CAMPUS RESERVOIR LEVEL TRANSMITTER

Externally mounted ultrasonic level transmitter. Loop power 24VDC 4-20mA output to PLC

- Scaling
  - ENG Min and Max scaling via HMI
- Display
  - Instantaneous value displayed on HMI
  - Trended on HMI
  - Value simulation via HMI
- Control output to PLC.
  - PID control of MV119 or MV120 (YC143A)
  - Activates 'Reservoir Bypass' (YC143B)
  - Inhibits tank fill when tank level reaches LAH (YC143C)
- Alarm / Faults:
  - Instrument Alarm – instrument out of range alarm – Critical alarm
  - High level alarm – Critical alarm
  - Low level alarm – Critical alarm

1.6.32 LS144 - UPPER CAMPUS RETICULATION PUMP ROOM LEVEL FLOAT

24VDC Float Level Switch

- Display
  - Discrete value displayed on HMI
  - Value simulation via HMI
- Switching threshold adjusted locally
- Control output to PLC
  - Close all valves (YC144)
- Alarms/Faults:
  - Active: high level active alarm – critical alarm

1.6.33 PT145 - UPPER CAMPUS RETICULATION PUMPS PRESSURE TRANSMITTER

Externally mounted pressure transmitter. Loop power 24VDC 4-20mA output to PLC

- Scaling
  - ENG Min and Max scaling via HMI
- Display
  - Instantaneous value displayed via HMI
  - Trended on HMI
  - Value simulation via HMI
- Alarm / Faults:
  - Instrument fault – instrument out of range – critical alarm
  - Low pressure alarm – critical alarm

1.6.34 PU146 A-D - UPPER CAMPUS RETICULATION PUMP SET

Upper Campus reticulation pump set used to pump water from reservoir to upper campus locations.

- Display
  - Auto/Off/Manual
- Control output to PLC
  - On/off control (Modbus RTU)
  - Inhibited by 'Reservoir Bypass' (YC143B)
- Alarm / Faults:
  - Pump Fault Alarm – critical alarm
  - Low pressure fault – critical alarm

1.6.35 PU150 A-C – LOWER CAMPUS TREATED BORE WATER BOOSTER PUMPS

Lower campus reticulation pump set used to pump water from reservoir to lower campus locations.

- Display
  - Auto/Off/Manual
- Control output to PLC
  - On/off control (Modbus RTU)
  - Inhibited by 'Reservoir Bypass' (YC143B)
- Alarm / Faults:
  - Pump Fault Alarm – critical alarm
  - Low pressure fault – critical alarm

1.6.36 AV200 – POTABLE WATER BACKUP ACTUATED VALVE

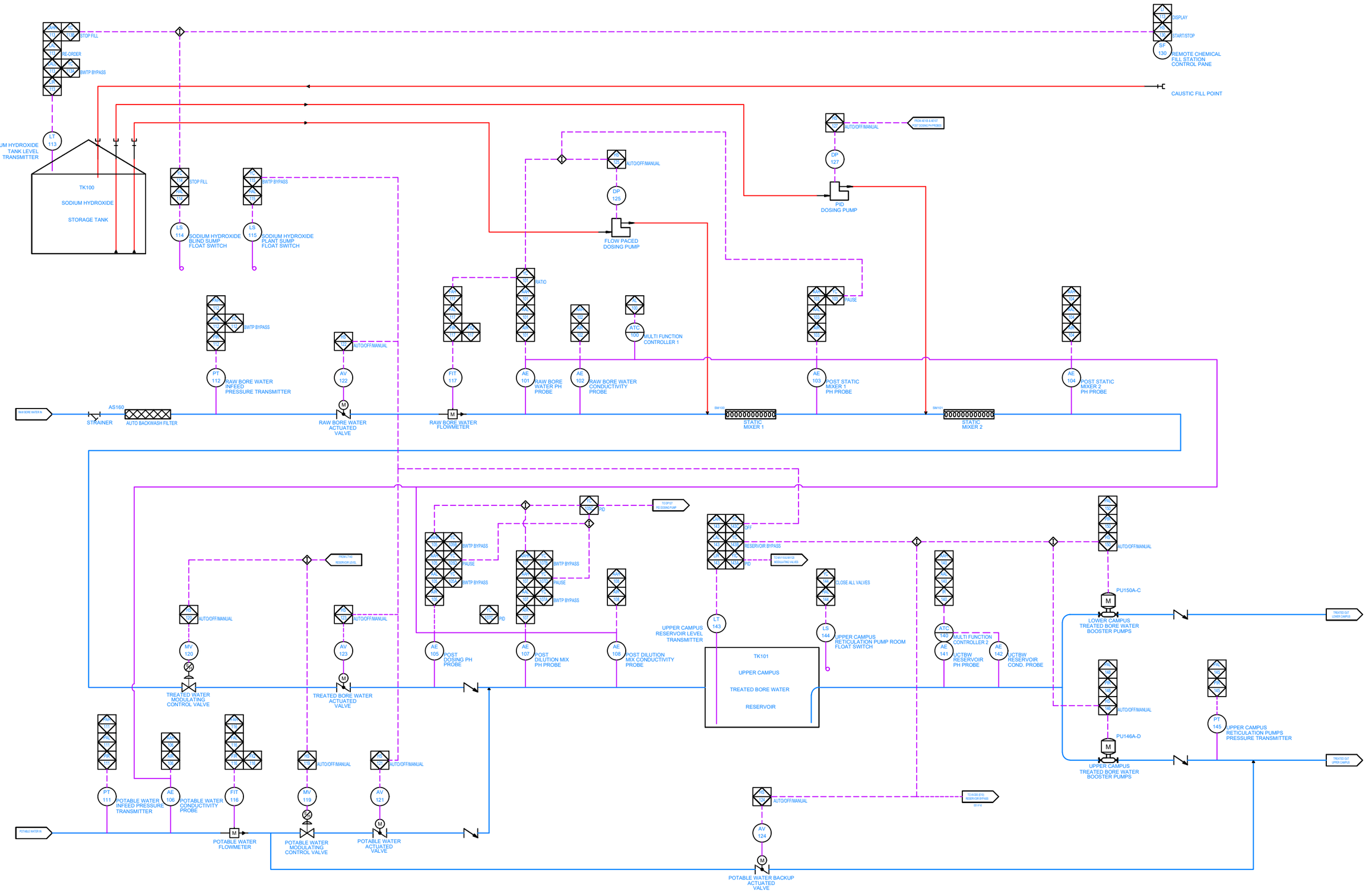
24VDC Actuated valve used to control flow on potable water backup line.

- Display
  - Auto/Off/Manual
- Control output to PLC
  - Activated by 'Reservoir Bypass' (YC143B)
- Alarm / Faults:
  - Failed to open / fail to close
  - Position Error

1.6.37 FIT201 – POTABLE WATER FLOWMETER

Inline flowmeter used for monitoring potable water flow

- Scaling
  - ENG Min and Max scaling via HMI
- Display
  - Instantaneous values displayed on HMI
  - Accumulated value displayed on HMI
  - Trended on HMI
  - Value simulation via HMI
- Alarms / Faults:
  - Instrument Fault – critical alarm
  - Low Flow Alarm – critical alarm
  - High Flow Alarm – critical alarm



REVISION						
B	4/08/2021	POST REVIEW UPDATES	M LAWSON	T STOCKER	4017	
A	25/06/21	PRELIMINARY DESIGN	M LAWSON	T STOCKER	4017	
REV	DATE	REVISION DESCRIPTION	BY	APP'D	JOB No.	

ELECTRICAL DESIGN AND CONTRACTORS
ABN 57 088 958 310
27 LAWSON ST, SANS SOUCI NSW 2219
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FILE No:BWTP__050 SECTION:PID SUB: PLOTTED: 21-08-04

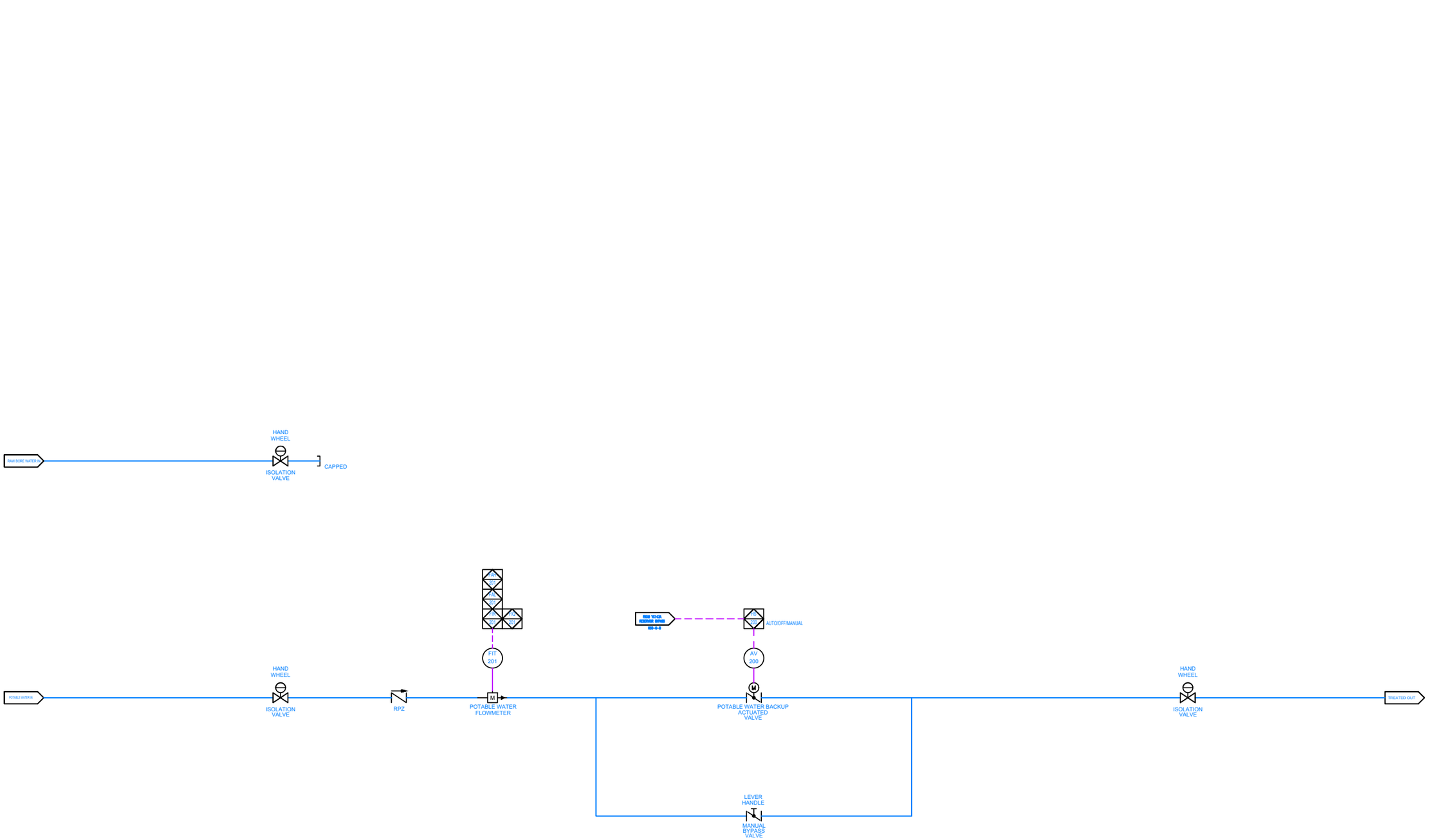
UPPER CAMPUS BORE WATER TREATMENT PLANT

ELECTRICAL DRAWING SET
PIPE & INSTRUMENT DRAWING
UPPER CAMPUS OVERVIEW

DRAWING STATUS: NOT FOR CONSTRUCTION

CLIENT:
UNSW - FACILITIES MANAGEMENT

DWG SET No:	SHEET No.	PAGE	SCALE	REV
UCBWTP	050	1OF 2	NTS	B



REVISION						
B	4/08/2021	POST REVIEW UPDATES	M LAWSON	T STOCKER	4017	
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REV	DATE	REVISION DESCRIPTION	BY	APP'D	JOB No.	

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FILE No:BWTP_051 SECTION:PID SUB: PLOTTED: 21-08-04

UPPER CAMPUS BORE WATER TREATMENT PLANT

ELECTRICAL DRAWING SET
PIPE & INSTRUMENT DRAWING
LOWER CAMPUS OVERVIEW

DRAWING STATUS: NOT FOR CONSTRUCTION

CLIENT:
UNSW - FACILITIES MANAGEMENT

DWG SET No:	SHEET No.	PAGE	SCALE	REV
UCBWTP	051	2 OF 2	NTS	B

SWITCHBOARD DETAIL

Client:	FACILITIES MANAGEMENT - UNSW
Project Name:	UPPER CAMPUS BORE WATER TREATMENT PLANT
Client Project Number:	UCTBWP
Job Number:	
Drawing Number:	
Customer Contact:	RUSSELL DRUCE
Order Date:	
Delivery Date:	

Construction:	STAINLESS STEEL - 304
Location:	INDOOR
Mounting:	WALL MOUNT
Colour:	NOT PAINTED
External IP Rating:	56
Internal Separation IP:	2X
Form of Separation:	3Bih
Access:	FRONT
Cable Entry:	BOTTOM
Phase:	3P+N+E
Supply Voltage:	400VAC
Maximum Demand:	
Current Rating:	32A
Prospective Short-circuit I_{cp}:	CUSTOMER PROVIDED
Rated Short-circuit I_{CW}:	
Conditional Short-circuit I_{CC}:	
Ambient Temperature:	40°C
Cooling Requirement:	
Width:	
Height:	
Depth:	

400/230V Distribution:	POLES
DOL Starters:	
VSD:	
Thermister:	
Control Voltage:	24VDC
Safety Category:	
PLC:	
HMI:	
Common Alarm:	
Air Box:	
Pullwire:	
Shearpin:	
Sampling Point:	
Network Drives:	
HyCONNECT:	
ENCLOSURE:	
CHASSIS:	
ESR:	
POWER SUPPLY:	
Minimum Cable Size:	1.5mm/power, 0.5mm/control
LV Colour Coding:	RD,WH,BU,BK,G/Y
ELV Colour Coding:	OR,VT (24VDC)
LOCATION:	F21-LGQ08

UPPER CAMPUS BORE WATER TREATMENT PLANT UCTBWP

Description	Setting	Checked (Initialled)
CHECKED BEFORE POWERING UP		
Switchboard FAT Section 1 (dead test) complete	YES	☐ _____
Switchboard FAT Section 2 (live test) complete	YES	☐ _____
CHECKED AT SOME STAGE		
SD card installed in HMI		☐ _____
Prosoft internal jumpers set	RS485	☐ _____
LULC033 Dip Switches set to correct addresses		☐ _____
HyConnect Sim card installed and setup		☐ _____
Terminal Bridging Bars are pushed in all the way		☐ _____
Check Circuit Breaker settings are correct		☐ _____
CHECKED PRIOR TO TURNING OFF POST SEQUENCE FAT		
Switchboard FAT Section 3 & 4 (Sequence functionality) complete		☐ _____
LULC033 Dip Switches set to correct addresses		☐ _____
VSDs Configured		☐ _____
VSD Safety Function Configured (if required)		☐ _____
OPL	ON	☐ _____
HMI project is copied to SD Card		☐ _____
CHECK ONCE POWERED OFF & LEAD DISCONNECTED		
Temporary Bridges Removed		☐ _____
Switchboard FAT Part 1 & 2 complete/scanned	YES	☐ _____
Switchboard Routine Verification complete/scanned	YES	☐ _____
Photos of panel on server		☐ _____
All core numbers and equipment labels installed		☐ _____
HyConnect antenna in panel		☐ _____
Common Alarm, Siren & Base in Panel		☐ _____
Bound set of Drawing in Panel		☐ _____
Any miscellaneous parcels added to panel		☐ _____
Air box sent in board?		☐ _____
Check bolts in Plinth have Nylock Nuts are fitted		☐ _____

Send Board

Item	P&ID Tag Name	Description	Starter	Rated Power (kW)	Voltage (VAC/VDC)	Nameplate Current (A)	Total Description	Comments	Manufacturer	Supplier	Part No.	Other Comments	
	ATC100	MULTI FUNCTION CONTROLLER 1	ETHERNET			230VAC	ATC100 - MULTI FUNCTION CONTROLLER 1		E+H		CM448-AAD8A21AABAA		=UPPER(C2)
	AE101	RAW BORE WATER PH PROBE	EI				AE101 - RAW BORE WATER PH PROBE		E+H		CPF81D-7LH11		
	AE102	RAW BORE WATER CONDUCTIVITY PROBE	EI				AE102 - RAW BORE WATER CONDUCTIVITY PROBE		E+H		CLS21D-C1E1		
	AE103	POST STATIC MIXER 1 PH PROBE	EI				AE103 - POST STATIC MIXER 1 PH PROBE		E+H		CPF81D-7LH11		
	AE104	POST STATIC MIXER 2 PH PROBE	EI				AE104 - POST STATIC MIXER 2 PH PROBE		E+H		CPF81D-7LH11		
	AE105	POST DOSING PH PROBE	EI				AE105 - POST DOSING PH PROBE		E+H		CPF81D-7LH11		
	AE106	POTABLE WATER CONDUCTIVITY PROBE	EI				AE106 - POTABLE WATER CONDUCTIVITY PROBE		E+H		CLS21D-C1E1		
	AE107	POST DILUTION MIX PH PROBE	EI				AE107 - POST DILUTION MIX PH PROBE		E+H		CPF81D-7LH11		
	AE108	POST DILUTION MIX CONDUCTIVITY PROBE	EI				AE108 - POST DILUTION MIX CONDUCTIVITY PROBE		E+H		CLS21D-C1E1		
	PT111	POTABLE WATER INFEED PRESSURE TRANSMITTER	AI			24VDC	PT111 - POTABLE WATER INFEED PRESSURE TRANSMITTER		IFM		PG2454		
	PT112	RAW BORE WATER PRESSURE TRANSMITTER	AI			24VDC	PT112 - RAW BORE WATER PRESSURE TRANSMITTER		IFM		PG2454		
	LT113	SODIUM HYDROXIDE TANK LEVEL TRANSMITTER	AI			24VDC	LT113 - SODIUM HYDROXIDE TANK LEVEL TRANSMITTER		E+H		FMU40		
	LS114	SODIUM HYDROXIDE BLIND SUMP FLOAT SWITCH	DI			24VDC	LS114 - SODIUM HYDROXIDE BLIND SUMP FLOAT SWITCH		MAC3				
	LS115	BORE WATER TREATMENT PLANT SUMP FLOAT SWITCH	DI			24VDC	LS115 - BORE WATER TREATMENT PLANT SUMP FLOAT SWITCH		MAC3				
	FIT116	POTABLE WATER FLOWMETER	AI,DI			24VDC	FIT116 - POTABLE WATER FLOWMETER		SIEMENS		SITRANS FM MAG 5100		
	FIT117	RAW BORE WATER FLOWMETER	AI,DI			24VDC	FIT117 - RAW BORE WATER FLOWMETER		SIEMENS		SITRANS FM MAG 5100		
	FIT201	POTABLE WATER FLOWMETER	AI,DI			24VDC	FIT201 - POTABLE WATER FLOWMETER		SIEMENS		SITRANS FM MAG 5100		
	MV119	POTABLE WATER MODULATING CONTROL VALVE	AI, AO, DI			24VDC	MV119 - POTABLE WATER MODULATING CONTROL VALVE		Process Systems		OM-1M		
	MV120	TREATED WATER MODULATING CONTROL VALVE	AI, AO, DI			24VDC	MV120 - TREATED WATER MODULATING CONTROL VALVE		Process Systems		OM-1M		
	AV121	POTABLE WATER ACTUATED VALVE	2XDI, DO			24VDC	AV121 - POTABLE WATER ACTUATED VALVE		Process Systems		OM-1		
	AV122	RAW BORE WATER ACTUATED VALVE	2XDI, DO			24VDC	AV122 - RAW BORE WATER ACTUATED VALVE		Process Systems		OM-1		
	AV123	TREATED BORE WATER ACTUATED VALVE	2XDI, DO			24VDC	AV123 - TREATED BORE WATER ACTUATED VALVE		Process Systems		OM-1		
	AV124	POTABLE WATER BACKUP ACTUATED VALVE	2XDI, DO			24VDC	AV124 - POTABLE WATER BACKUP ACTUATED VALVE		Process Systems		OM-1		
	DP125	FLOW PACED DOSING PUMP	CB, DO, AO			230VAC	DP125 - FLOW PACED DOSING PUMP		PROMINENT		GMXA1009PVT20000UCC0300ENPX		
	DP126	FUTURE FLOW PACED DOSING PUMP	CB, DO, AO			230VAC	DP126 - FUTURE FLOW PACED DOSING PUMP		PROMINENT		GMXA1009PVT20000UCC0300ENPX		
	DP127	PID DOSING PUMP	CB, DO, AO			230VAC	DP127 - PID DOSING PUMP		PROMINENT		GMXA1009PVT20000UCC0300ENPX		
	DP128	FUTURE PID DOSING PUMP	CB, DO, AO			230VAC	DP128 - FUTURE PID DOSING PUMP		PROMINENT		GMXA1009PVT20000UCC0300ENPX		
	DX129	REMOTE CHEMICAL FILL OUTLET	CB, QA			230/400VAC	DX129 - REMOTE CHEMICAL FILL OUTLET		NHP				
	SF130	REMOTE CHEMICAL FILL STATION CONTROL PANEL	DI, DO, AO			24VDC	SF130 - REMOTE CHEMICAL FILL STATION CONTROL PANEL		ECS				
	ATC140	MULTI FUNCTION CONTROLLER 2				230VAC	ATC140 - MULTI FUNCTION CONTROLLER 2		E+H		CM442-AAM2A1F010A		
	AE141	UPPER CAMPUS TREATED BORE WATER RESERVOIR PH PROBE	AI			24VDC	AE141 - UPPER CAMPUS TREATED BORE WATER RESERVOIR PH PROBE		E+H		CPF81D-7LH11		
	AE142	UPPER CAMPUS TREATED BORE WATER RESERVOIR CONDUCTIVITY	AI			24VDC	AE142 - UPPER CAMPUS TREATED BORE WATER RESERVOIR CONDUCTIVITY PROBE		E+H		CLS21D-C1E1		
	LT143	UPPER CAMPUS RESERVOIR LEVEL TRANSMITTER	AI			24VDC	LT143 - UPPER CAMPUS RESERVOIR LEVEL TRANSMITTER	EXISTING					
	LS144	UPPER CAMPUS RETICULATION PUMP ROOM HIGH LEVEL FLOAT	DI			24VDC	LS144 - UPPER CAMPUS RETICULATION PUMP ROOM HIGH LEVEL FLOAT		MAC3				
	PT145	UPPER CAMPUS RETICULATION PUMPS PRESSURE TRANSMITTER	AI			24VDC	PT145 - UPPER CAMPUS RETICULATION PUMPS PRESSURE TRANSMITTER	EXISTING	IFM		PG2454		
	PU146A-D	UPPER CAMPUS RETICULATION PUMP SET	MODBUS			24VDC	PU146A-D - UPPER CAMPUS RETICULATION PUMP SET		LOWARA		10SV05F022T		
	AS160	JUDO AUTO BACKWASH FILTER	CB			230VAC	AS160 - JUDO AUTO BACKWASH FILTER		PROFIMAT		JPF-AT DN 100		
	PU150A-C	LOWER CAMPUS RETICULATION PUMP SET	MODBUS				PU150A-C - LOWER CAMPUS RETICULATION PUMP SET				10SV05F022T		
	AV200	POTABLE WATER BACKUP ACTUATED VALVE	ETHERNET				AV200 - POTABLE WATER BACKUP ACTUATED VALVE						

MAIN SWIT	TYPE	RATING

CHASSIS	TYPE	RATING
	Acti 9	

CB	TYPE	RATING	
Acti 9	iC60N	7.5kA	ICW

POLE	CB No.	TYPE/RATING	CB CATALOG	TAG - MCC	CATALOG	DESCRIPTION - MCC	TAG - ITEM	DESCRIPTION - ITEM	DWG FRO	OTHER INFORMATION
1	1	C/6	A9F44106	220TB1	2903151	TRIO-PS-2G/1AC/24DC/20			220	24VDC POWER SUPPLY
2	2	RCBO/16	A9D11816	210XD1	4PSO10	MCC GPOS			210	
3	3	RCBO/16	A9D11816			PLANT ROOM GPOS				
4	4	RCBO/16	A9D11816			DOSING PUMPS			400	
5	5	RCBO/10	A9D11810			PH CONTROLLERS				
6	6	RCBO/10	A9D11810			JUDO FILTER				AS160
7	7									
8	8									
9	9									
10										
11	10	C/16	A9F44316			CHEMICAL FILL GPO				
12										
13										
14	11	RCD	A9V51363			CHEMICAL FILL GPO				
15										
16										
17										
18										
19										
20										
21										
22										

FUSE	CIRCUIT	DESCRIPTION	FUSE RATING	NOTES		
F1	24VDC1	SAFETY CIRCUIT	2	500SR1	PSR-SCP-24DC/MXF1/4X1/2X2/B	2 ZONES
F2	24VDC2	PLC	2	PLC1	1769-L27ERM-QBFC1B	
F3	24VDC3	INPUTS	2			
F4	24VDC4	OUTPUTS	2			
F5	24VDC5	ANALOGS	2			
F6	24VDC6	SPARE	2	700GF1		
F7	24VDC7	HMI	2	700SF1		
F8	24VDC8	ETHERNET SWITCH	2	701TF1		
F9	24VDC9	SOLENOIDS	2	0.25A ea SOLENOID		
F10	24VDC10	SOLENOIDS	2			
F11	24VDC11	INSTRUMENTS	2			
F12	24VDC12	INSTRUMENTS	2			
F13	24VDC13		2			
F14	24VDC14		2			
F15	24VDC15		2			
F16	24VDC16		2			
F17	24VDC17		2			
F18	24VDC18		2			
F19	24VDC19		2			
F20	24VDC20		2			

TAG	POLE	COIL	SWITCHING	NOTES	EQUIP CATALOG	OTHER INFORMATION
350KF1	1	24VDC	24VDC	VSD ENABLE	2903361	RIF-0-RPT-24DC/ 1
350KF2	4	24VDC	24VDC	VSD RESET	2903308	RIF-2-RPT-LDP-24DC/4X21
350KF3	2	24VDC	24VDC	SHEARPIN	LT4706BS	ELECTRONIC OVER CURRENT RELAY
350KF4	1	24VDC	24VDC	SHEAR-PIN RESET	2903361	RIF-0-RPT-24DC/ 1
400KF1	2	24VDC	240VAC	DOSING PUMP	2903334	RIF-1-RPT-LDP-24DC/2X21
401KF1	2	24VDC	240VAC	DOSING PUMP	2903334	RIF-1-RPT-LDP-24DC/2X21
450KF1	1	24VDC	24VDC	SOLENOIDS	2903361	RIF-0-RPT-24DC/ 1
450KF2	1	24VDC	24VDC	SOLENOIDS	2903361	RIF-0-RPT-24DC/ 1
450KF3	1	24VDC	24VDC	SOLENOIDS	2903361	RIF-0-RPT-24DC/ 1
450KF4	1	24VDC	24VDC	SOLENOIDS	2903361	RIF-0-RPT-24DC/ 1
451KF1	1	24VDC	24VDC	SOLENOIDS	2903361	RIF-0-RPT-24DC/ 1
451KF2	1	24VDC	24VDC	SOLENOIDS	2903361	RIF-0-RPT-24DC/ 1
451KF3	1	24VDC	24VDC	SOLENOIDS	2903361	RIF-0-RPT-24DC/ 1
451KF4	1	24VDC	24VDC	SOLENOIDS	2903361	RIF-0-RPT-24DC/ 1
452KF1	1	24VDC	24VDC	SOLENOIDS	2903361	RIF-0-RPT-24DC/ 1
452KF2	1	24VDC	24VDC	SOLENOIDS	2903361	RIF-0-RPT-24DC/ 1
453KF1	1	24VDC	24VDC	SOLENOIDS	2903361	RIF-0-RPT-24DC/ 1
453KF2	1	24VDC	24VDC	SOLENOIDS	2903361	RIF-0-RPT-24DC/ 1
454KF1	1	24VDC	24VDC	SOLENOIDS	2903361	RIF-0-RPT-24DC/ 1
454KF2	1	24VDC	24VDC	SOLENOIDS	2903361	RIF-0-RPT-24DC/ 1
500SR1	3	24VDC	24VDC	ESTOP	2900509	PSR-SCP- 24UC/ESAM4/3X1/1X2/B
500KF1	1	24VDC	24VDC	RESET		
500QA1	5	24VDC	24VDC	SAFETY CONTACTOR	LC1D**BL	3P CONT **A AC3 ?KW 1NO 1NC 24VDC COIL
500QA2	5	24VDC	24VDC	SAFETY CONTACTOR	LC1D**BL	3P CONT **A AC3 ?KW 1NO 1NC 24VDC COIL
550KF1	2	24VDC	24VDC	COMMON ALARM	2903334	RIF-1-RPT-LDP-24DC/2X21
550KF2	2	24VDC	24VDC	COMMON ALARM	2903334	RIF-1-RPT-LDP-24DC/2X21
550KF3	2	24VDC	24VDC	COMMON ALARM	2903334	RIF-1-RPT-LDP-24DC/2X21
700KF1	1	24VDC	24VDC	SMS1	2903361	RIF-0-RPT-24DC/ 1
700KF2	1	24VDC	24VDC	SMS2	2903361	RIF-0-RPT-24DC/ 1

PLC:							
0	1769-L24ER-QBFC1B	16	16	4	2	8	ETHIP
1	1769-IQ16	16	0	0	0	0	
2	1769-IF16C	0	0	16	0	0	
3	1769-OF8C	0	0	0	8	0	
4	MVI69-MCM	0	0	0	0	64	
5							
6							
7							
	TOTAL:	32	16	20	10	72	
	REMAINING:	12	5	8	3	64	
	SPARE CAPACITY:	38%	31%	40%	30%		
	Required:	20 DI	11 DO	12 AI	7 AO	8 Net	

Tag	Item	Descriptor	Y/N	Address	Y/N	Address	Y/N	Address	Y/N	Address	Y/N	Address	Element
ATC100	MULTI FUNCTION CONTROLLER 1	ETHERNET									1		
PT111	POTABLE WATER INFEED PRESSURE TRANSMITTER	AI					1						
PT112	RAW BORE WATER PRESSURE TRANSMITTER	AI					1						
LT113	SODIUM HYDROXIDE TANK LEVEL	AI					1						
LS114	SODIUM HYDROXIDE BLIND SUMP FLOAT SWITCH	DI	1										
LS115	BORE WATER TREATMENT PLANT SUMP FLOAT SWITCH	DI	1										
FIT116	POTABLE WATER FLOWMETER	AI,DI	1				1						
FIT117	RAW BORE WATER FLOWMETER	AI,DI	1				1						
FIT201	POTABLE WATER FLOWMETER	AI,DI	1				1						
MV119	POTABLE WATER MODULATING CONTROL VALVE	AI, AO, DI	1				1		1				
MV120	TREATED WATER MODULATING CONTROL VALVE	AI, AO, DI	1				1		1				
AV121	POTABLE WATER ACTUATED VALVE	2XDI, DO	2		1								
AV122	RAW BORE WATER ACTUATED VALVE	2XDI, DO	2		1								
AV123	TREATED BORE WATER ACTUATED VALVE	2XDI, DO	2		1								
AV124	POTABLE WATER BACKUP ACTUATED VALVE	2XDI, DO	2		1								
DP125	FLOW PACED DOSING PUMP	CB, DO, AO			1				1				
DP126	FUTURE FLOW PACED DOSING PUMP	CB, DO, AO			1				1				
DP127	PID DOSING PUMP	CB, DO, AO			1				1				
DP128	FUTURE PID DOSING PUMP	CB, DO, AO			1				1				
DX129	REMOTE CHEMICAL FILL OUTLET	CB, QA											
SF130	REMOTE CHEMICAL FILL STATION CONTROL PANEL	2XDI, DO, AO	2		1				1				
ATC140	MULTI FUNCTION CONTROLLER 2												
AE141	UPPER CAMPUS TREATED BORE WATER RESERVOIR PH PROBE	AI					1						
AE142	UPPER CAMPUS TREATED BORE WATER RESERVOIR CONDUCTIVITY PROBE	AI					1						
LT143	UPPER CAMPUS RESERVOIR LEVEL TRANSMITTER	AI					1						
LS144	UPPER CAMPUS RETICULATION PUMP ROOM HIGH LEVEL FLOAT	DI	1										
PT145	UPPER CAMPUS RETICULATION PUMPS PRESSURE TRANSMITTER	AI					1						
PU146	UPPER CAMPUS RETICULATION PUMP SET	MODBUS									4		
PU150	PUMP SET TO LOWER CAMPUS	MODBUS									3		
	EMERGENCY STOP		2		1								
	COMMON ALARM				1								

TAG	DESCRIPTION	ACTION	ALL	BREAK	DESCRIPTION A	DESCRIPTION B	DESCRIPTION C	ADDRESS	NOTES	DWG
500SR1	ELECTRONIC SAFETY RELAY ZONE 1	TRIPPED	ELECTRONIC SAFETY RELAY ZONE 1	18	ELECTRONIC SAFETY	RELAY ZONE 1	500SR1 - TRIPPED	I:1/0	1769-L24ER-QBFC1B	
500SR1	ELECTRONIC SAFETY RELAY ZONE 2	TRIPPED	ELECTRONIC SAFETY RELAY ZONE 2	18	ELECTRONIC SAFETY	RELAY ZONE 2	500SR1 - TRIPPED	I:1/1		
AV121	POTABLE WATER ACTUATED VALVE	OPEN	POTABLE WATER ACTUATED VALVE	14	POTABLE WATER	ACTUATED VALVE	AV121 - OPEN	I:1/2		
AV121	POTABLE WATER ACTUATED VALVE	CLOSED	POTABLE WATER ACTUATED VALVE	14	POTABLE WATER	ACTUATED VALVE	AV121 - CLOSED	I:1/3		
AV122	RAW BORE WATER ACTUATED VALVE	OPEN	RAW BORE WATER ACTUATED VALVE	15	RAW BORE WATER	ACTUATED VALVE	AV122 - OPEN	I:1/4		
AV122	RAW BORE WATER ACTUATED VALVE	CLOSED	RAW BORE WATER ACTUATED VALVE	15	RAW BORE WATER	ACTUATED VALVE	AV122 - CLOSED	I:1/5		
AV123	TREATED BORE WATER ACTUATED VALVE	OPEN	TREATED BORE WATER ACTUATED VALVE	19	TREATED BORE WATER	ACTUATED VALVE	AV123 - OPEN	I:1/6		
AV123	TREATED BORE WATER ACTUATED VALVE	CLOSED	TREATED BORE WATER ACTUATED VALVE	19	TREATED BORE WATER	ACTUATED VALVE	AV123 - CLOSED	I:1/7		
AV124	POTABLE WATER BACKUP ACTUATED VALVE	OPEN	POTABLE WATER BACKUP ACTUATED VALVE	21	POTABLE WATER BACKUP	ACTUATED VALVE	AV124 - OPEN	I:1/8		
AV124	POTABLE WATER BACKUP ACTUATED VALVE	CLOSED	POTABLE WATER BACKUP ACTUATED VALVE	21	POTABLE WATER BACKUP	ACTUATED VALVE	AV124 - CLOSED	I:1/9		
							SPARE	I:1/10		
							SPARE	I:1/11		
							SPARE	I:1/12		
							SPARE	I:1/13		
							SPARE	I:1/14		
							SPARE	I:1/15		
500KF1	ELECTRONIC SAFETY RELAY	RESET	ELECTRONIC SAFETY RELAY	11	ELECTRONIC	SAFETY RELAY	500KF1 - RESET	O:1/0	1769-L24ER-QBFC1B	
550KF2	COMMON ALARM LAMP	LAMP	COMMON ALARM LAMP	13	COMMON ALARM	LAMP	550KF2 - LAMP	O:1/1		
AV121	POTABLE WATER ACTUATED VALVE	ENABLE	POTABLE WATER ACTUATED VALVE	14	POTABLE WATER	ACTUATED VALVE	AV121 - ENABLE	O:1/2		
AV122	RAW BORE WATER ACTUATED VALVE	ENABLE	RAW BORE WATER ACTUATED VALVE	15	RAW BORE WATER	ACTUATED VALVE	AV122 - ENABLE	O:1/3		
AV123	TREATED BORE WATER ACTUATED VALVE	ENABLE	TREATED BORE WATER ACTUATED VALVE	19	TREATED BORE WATER	ACTUATED VALVE	AV123 - ENABLE	O:1/4		
AV124	POTABLE WATER BACKUP ACTUATED VALVE	ENABLE	POTABLE WATER BACKUP ACTUATED VALVE		POTABLE WATER	BACKUP VALVE	AV124 - ENABLE	O:1/5		
SF130	REMOTE CHEMICAL FILL STATION CONTROL PANEL	ENABLE	REMOTE CHEMICAL FILL STATION CONTROL PANEL		REMOTE	CHEMICAL FILL	SF130 - ENABLE	O:1/6		
DP125	FLOW PACED DOSING PUMP	ENABLE	FLOW PACED DOSING PUMP		FLOW PACED	DOSING PUMP	DP125 - ENABLE	O:1/7		
DP126	FUTURE FLOW PACED DOSING PUMP	ENABLE	FUTURE FLOW PACED DOSING PUMP		FUTURE PID	DOSING PUMP	DP126 - ENABLE	O:1/8		
DP127	PID DOSING PUMP	ENABLE	PID DOSING PUMP		PID DOSING	DOSING PUMP	DP127 - ENABLE	O:1/9		
DP128	FUTURE PID DOSING PUMP	ENABLE	FUTURE PID DOSING PUMP	11	FUTURE PID	DOSING PUMP	DP128 - ENABLE	O:1/10		
							SPARE	O:1/11		
							SPARE	O:1/12		
							SPARE	O:1/13		
							SPARE	O:1/14		
							SPARE	O:1/15		
PT111	POTABLE WATER INFEED PRESSURE TRANSMITTER	PRESSURE	POTABLE WATER INFEED PRESSURE TRANSMITTER	21	POTABLE WATER INFEED	PRESSURE TRANSMITTER	PT111 - PRESSURE	AI:2.0	1769-L24ER-QBFC1B	
PT112	RAW BORE WATER PRESSURE TRANSMITTER	PRESSURE	RAW BORE WATER PRESSURE TRANSMITTER	24	RAW BORE WATER PRESSURE	TRANSMITTER	PT112 - PRESSURE	AI:2.1		
LT113	SODIUM HYDROXIDE TANK LEVEL	LEVEL	SODIUM HYDROXIDE TANK LEVEL	17	SODIUM HYDROXIDE	TANK LEVEL	LT113 - LEVEL	AI:2.2		
SF130	REMOTE CHEMICAL FILL STATION CONTROL PANEL	LEVEL	REMOTE CHEMICAL FILL STATION CONTROL PANEL	21	REMOTE CHEMICAL FILL	STATION CONTROL PANE	SF130 - LEVEL	AI:2.3		
MV119	POTABLE WATER MODULATING CONTROL VALVE	POSITION	POTABLE WATER MODULATING CONTROL VALVE	25	POTABLE WATER MODULATING	CONTROL VALVE	MV119 - POSITION	AO:2.0		
MV120	TREATED WATER MODULATING CONTROL VALVE	POSITION	TREATED WATER MODULATING CONTROL VALVE	25	TREATED WATER MODULATING	CONTROL VALVE	MV120 - POSITION	AO:2.1		
LS114	SODIUM HYDROXIDE BLIND SUMP FLOAT SWITCH	ENABLE	SODIUM HYDROXIDE BLIND SUMP FLOAT SWITCH	23	SODIUM HYDROXIDE BLIND	SUMP FLOAT SWITCH	LS114 - ENABLE	I:4/0	1769-IQ16	
LS115	BORE WATER TREATMENT PLANT SUMP FLOAT SWITCH	ENABLE	BORE WATER TREATMENT PLANT SUMP FLOAT SWITCH	27	BORE WATER TREATMENT PLANT	SUMP FLOAT SWITCH	LS115 - ENABLE	I:4/1		
LS144	UPPER CAMPUS RETICULATION PUMP ROOM HIGH LEVEL FLOAT	ENABLE	UPPER CAMPUS RETICULATION PUMP ROOM HIGH LEVEL FLOAT	26	UPPER CAMPUS RETICULATION	PUMP ROOM HIGH LEVEL	LS144 - ENABLE	I:4/2		
FIT116	POTABLE WATER FLOWMETER	PULSE	POTABLE WATER FLOWMETER	14	POTABLE WATER	FLOWMETER	FIT116 - PULSE	I:4/3		
FIT117	RAW BORE WATER FLOWMETER	PULSE	RAW BORE WATER FLOWMETER	15	RAW BORE WATER	FLOWMETER	FIT117 - PULSE	I:4/4		
FIT201	POTABLE WATER FLOWMETER	PULSE	POTABLE WATER FLOWMETER	14	POTABLE WATER	FLOWMETER	FIT201 - PULSE	I:4/5		
							SPARE	I:4/6		
							SPARE	I:4/7		
							SPARE	I:4/8		
							SPARE	I:4/9		
							SPARE	I:4/10		
							SPARE	I:4/11		
							SPARE	I:4/12		
							SPARE	I:4/13		
							SPARE	I:4/14		
							SPARE	I:4/15		
FIT116	POTABLE WATER FLOWMETER	FLOW	POTABLE WATER FLOWMETER	14	POTABLE WATER	FLOWMETER	FIT116 - FLOW	AI:6.0	1769-IF16C	
FIT117	RAW BORE WATER FLOWMETER	FLOW	RAW BORE WATER FLOWMETER	15	RAW BORE WATER	FLOWMETER	FIT117 - FLOW	AI:6.1		
FIT201	POTABLE WATER FLOWMETER	FLOW	POTABLE WATER FLOWMETER	14	POTABLE WATER	FLOWMETER	FIT201 - FLOW	AI:6.2		
MV119	POTABLE WATER MODULATING CONTROL VALVE	FEEDBACK	POTABLE WATER MODULATING CONTROL VALVE	25	POTABLE WATER MODULATING	CONTROL VALVE	MV119 - FEEDBACK	AI:6.3		
MV120	TREATED WATER MODULATING CONTROL VALVE	FEEDBACK	TREATED WATER MODULATING CONTROL VALVE	25	TREATED WATER MODULATING	CONTROL VALVE	MV120 - FEEDBACK	AI:6.4		
AE141	UPPER CAMPUS TREATED BORE WATER RESERVOIR PH PROBE	PH	UPPER CAMPUS TREATED BORE WATER RESERVOIR PH PROBE	26	UPPER CAMPUS TREATED BORE	WATER RESERVOIR PH P	AE141 - PH	AI:6.5		
AE142	UPPER CAMPUS TREATED BORE WATER RESERVOIR CONDUCTIVITY PROBE	CONDUCTIVITY	UPPER CAMPUS TREATED BORE WATER RESERVOIR CONDUCTIVITY PROBE	32	UPPER CAMPUS TREATED BORE WATER	RESERVOIR CONDUCTIVI	AE142 - CONDUCTIVITY	AI:6.6		
LT143	UPPER CAMPUS RESERVOIR LEVEL TRANSMITTER	PRESSURE	UPPER CAMPUS RESERVOIR LEVEL TRANSMITTER	23	UPPER CAMPUS RESERVOIR	LEVEL TRANSMITTER	LT143 - PRESSURE	AI:6.7		
PT145	UPPER CAMPUS RETICULATION PUMPS PRESSURE TRANSMITTER	PRESSURE	UPPER CAMPUS RETICULATION PUMPS PRESSURE TRANSMITTER	26	UPPER CAMPUS RETICULATION	PUMPS PRESSURE TRANS	PT145 - PRESSURE	AI:6.8		
							SPARE	AI:6.9		
							SPARE	AI:6.10		
							SPARE	AI:6.11		
							SPARE	AI:6.12		
							SPARE	AI:6.13		
							SPARE	AI:6.14		
							SPARE	AI:6.15		
DP125	FLOW PACED DOSING PUMP	SPEED	FLOW PACED DOSING PUMP	11	FLOW PACED	DOSING PUMP	DP125 - SPEED	AO:7.0	1769-OF8C	
DP126	FUTURE FLOW PACED DOSING PUMP	SPEED	FUTURE FLOW PACED DOSING PUMP	18	FUTURE FLOW PACED	DOSING PUMP	DP126 - SPEED	AO:7.1		
DP127	PID DOSING PUMP	SPEED	PID DOSING PUMP	11	PID DOSING	PUMP	DP127 - SPEED	AO:7.2		
DP128	FUTURE PID DOSING PUMP	SPEED	FUTURE PID DOSING PUMP	11	FUTURE PID	DOSING PUMP	DP128 - SPEED	AO:7.3		
							SPARE	AO:7.4		
							SPARE	AO:7.5		
							SPARE	AO:7.6		
							SPARE	AO:7.7		

FILE	TITLE 1	TITLE 2	TITLE 3	PROJCODE(%P)	INST. CODE(%I)	LOC. CODE(%L)	SHT (%S)	DWG (%D)	SECTION (%A)	SUB-SECTION (%B)
BWTP_000	COVER SHEET		ELECTRICAL DRAWING SET	BWTP	BWP	MCC		000	INF	
BWTP_001	MCC EXTERNAL LAYOUT	GENERAL ARRANGEMENT	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		001	GA	
BWTP_002	MCC INTERNAL LAYOUT	GENERAL ARRANGEMENT	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		002	GA	
BWTP_050	UPPER CAMPUS OVERVIEW	PIPE & INSTRUMENT DRAWING	ELECTRICAL DRAWING SET	BWTP				050	PID	
BWTP_051	LOWER CAMPUS OVERVIEW	PIPE & INSTRUMENT DRAWING	ELECTRICAL DRAWING SET	BWTP				051	PID	
BWTP_100	SYMBOLS LEGEND	SINGLE LINE DRAWING	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		100	SLD	
BWTP_101	400/230V AC DISTRIBUTION	SINGLE LINE DRAWING	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		101	SLD	
BWTP_102	400/230V AC DISTRIBUTION DOL	SINGLE LINE DRAWING	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		102	SLD	
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BWTP_200	CIRCUIT BREAKERS	400/230V AC DISTRIBUTION	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		200	DST	
BWTP_201	CIRCUIT BREAKERS	400/230V AC DISTRIBUTION	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		201	DST	
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_										
BWTP_220	24VDC POWER SUPPLY & FUSES	24V DC DISTRIBUTION	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		220	DST	
BWTP_221	24VDC POWER SUPPLY & FUSES	24V DC DISTRIBUTION	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		221	DST	
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BWTP_250		ANALYSERS & INSTRUMENTS	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		250	INST	
BWTP_251		ANALYSERS & INSTRUMENTS	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		251	INST	
BWTP_252		ANALYSERS & INSTRUMENTS	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		252	INST	
BWTP_253		ANALYSERS & INSTRUMENTS	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		253	INST	
BWTP_254		ANALYSERS & INSTRUMENTS	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		254	INST	
BWTP_255		ANALYSERS & INSTRUMENTS	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		255	INST	
BWTP_256		ANALYSERS & INSTRUMENTS	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		256	INST	
BWTP_260		ANALYSERS & INSTRUMENTS	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		260	INST	
BWTP_261		ANALYSERS & INSTRUMENTS	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		261	INST	
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BWTP_300		DIRECT ON LINE DRIVES	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		300	DOL	
BWTP_301		DIRECT ON LINE DRIVES	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		301	DOL	
BWTP_302		DIRECT ON LINE DRIVES	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		302	DOL	
BWTP_303		DIRECT ON LINE DRIVES	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		303	DOL	
BWTP_304		DIRECT ON LINE DRIVES	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		304	DOL	
BWTP_305		DIRECT ON LINE DRIVES	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		305	DOL	
BWTP_306		DIRECT ON LINE DRIVES	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		306	DOL	
BWTP_307		DIRECT ON LINE DRIVES	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		307	DOL	
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BWTP_350		VARIABLE SPEED DRIVES	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		350	VSD	
BWTP_351		VARIABLE SPEED DRIVES	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		351	VSD	
BWTP_352		VARIABLE SPEED DRIVES	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		352	VSD	
BWTP_353		VARIABLE SPEED DRIVES	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		353	VSD	
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BWTP_400		DOSING PUMPS	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		400	DP	
BWTP_401		DOSING PUMPS	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		401	DP	
BWTP_402		DOSING PUMPS	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		402	DP	
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BWTP_450		ACTUATED VALVES	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		450	VLV	
BWTP_451		ACTUATED VALVES	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		451	VLV	
BWTP_452		ACTUATED VALVES	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		452	VLV	
BWTP_453		ACTUATED VALVES	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		453	VLV	
BWTP_454		ACTUATED VALVES	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		454	VLV	
_										
BWTP_500	SAFETY CONTROLLER & ESTOPS	EMERGENCY STOP & SAFETY	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		500	ESR	
BWTP_501	DAF PULLWIRES	EMERGENCY STOP & SAFETY	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		501	ESR	
BWTP_502	SAFETY CONTACTORS	EMERGENCY STOP & SAFETY	ELECTRICAL DRAWING SET	BWTP	BWP	MCC		502	ESR	
BWTP_550	COMMON ALARM	SIGNALLING	ELECTRICAL DRAWING SET	BWTP	WTP	MCC		550	ALM	
_										
BWTP_600	PROCESSOR AND POWER SUPPLY	PLC CIRCUIT DRAWINGS	ELECTRICAL DRAWING SET	BWTP	WTP	MCC		600	PLC	MAIN MODULE - INPUTS
BWTP_601	MODULE 1 - DIGITAL INPUTS	PLC CIRCUIT DRAWINGS	ELECTRICAL DRAWING SET	BWTP	WTP	MCC		601	PLC	MAIN MODULE - OUTPUTS
BWTP_602	MODULE 1 - DIGITAL INPUTS	PLC CIRCUIT DRAWINGS	ELECTRICAL DRAWING SET	BWTP	WTP	MCC		602	PLC	MAIN MODULE - ANALOGS
BWTP_603	MODULE 2 - DIGITAL INPUTS	PLC CIRCUIT DRAWINGS	ELECTRICAL DRAWING SET	BWTP	WTP	MCC		603	PLC	
BWTP_604	MODULE 2 - DIGITAL INPUTS	PLC CIRCUIT DRAWINGS	ELECTRICAL DRAWING SET	BWTP	WTP	MCC		604	PLC	
BWTP_605	MODULE 3 - DIGITAL OUTPUTS	PLC CIRCUIT DRAWINGS	ELECTRICAL DRAWING SET	BWTP	WTP	MCC		605	PLC	
BWTP_606	MODULE 3 - DIGITAL OUTPUTS	PLC CIRCUIT DRAWINGS	ELECTRICAL DRAWING SET	BWTP	WTP	MCC		606	PLC	
BWTP_607	MODULE 4 - ANALOG INPUTS	PLC CIRCUIT DRAWINGS	ELECTRICAL DRAWING SET	BWTP	WTP	MCC		607	PLC	
BWTP_608	MODULE 5 - ANALOG INPUTS	PLC CIRCUIT DRAWINGS	ELECTRICAL DRAWING SET	BWTP	WTP	MCC		608	PLC	
BWTP_609	MODULE 6 - ANALOG OUTPUTS	PLC CIRCUIT DRAWINGS	ELECTRICAL DRAWING SET	BWTP	WTP	MCC		609	PLC	
_										
BWTP_700	HMI & 4G ROUTER	CONTROL INTERFACE DEVICES	ELECTRICAL DRAWING SET	BWTP	WTP	MCC		700	HMI	
BWTP_701	ETHERNET SWITCH & NETWORK	CONTROL INTERFACE DEVICES	ELECTRICAL DRAWING SET	BWTP	WTP	MCC		701	COMS	

PROJECT NAME	UPPER CAMPUS BORE WATER TREATMENT PLANT
PROJECT NUMBER	UCTBWP
CLIENT	UNSW - FACILITIES MANAGEMENT
ISSUE STATUS	NOT FOR CONSTRUCTION
REVISION	B
SCALE	NTS
REVISION 1	A
DESCRIPTIONS 1	PRELIMINARY DESIGN
CLIENT ENGINEER 1	T STOCKER
DRAWN BY 1	M LAWSON
ECS JOB NUMBER 1	4017
DRAWN DATE 1	25/06/21
REVISION 2	B
DESCRIPTIONS 2	POST REVIEW UPDATES
CLIENT ENGINEER 2	T STOCKER
DRAWN BY 2	M LAWSON
ECS JOB NUMBER 2	4017
DRAWN DATE 2	4/08/2021
REVISION 3	
DESCRIPTIONS 3	
CLIENT ENGINEER 3	
DRAWN BY 3	
ECS JOB NUMBER 3	
DRAWN DATE 3	
REVISION 4	
DESCRIPTIONS 4	
CLIENT ENGINEER 4	
DRAWN BY 4	
ECS JOB NUMBER 4	
DRAWN DATE 4	
REVISION 5	
DESCRIPTIONS 5	
CLIENT ENGINEER 5	
DRAWN BY 5	
ECS JOB NUMBER 5	
DRAWN DATE 5	
REVISION 6	
DESCRIPTIONS 6	
CLIENT ENGINEER 6	
DRAWN BY 6	
ECS JOB NUMBER 6	
DRAWN DATE 6	
REVISION 7	
DESCRIPTIONS 7	
CLIENT ENGINEER 7	
DRAWN BY 7	
ECS JOB NUMBER 7	
DRAWN DATE 7	

Address	Item	Item
192.168.0.1	GATEWAY	
192.168.0.2	PLC	
192.168.0.3	HMI	
192.168.0.4	MODBUS	
192.168.0.5	CM44/AUX	
192.168.0.6	CM44/AUX	
192.168.0.7	CM44/AUX	
192.168.0.8	CM44/AUX	
192.168.0.9	CM44/AUX	
192.168.0.10	VSD	
192.168.0.11	VSD	
192.168.0.12	VSD	
192.168.0.13	VSD	
192.168.0.14	VSD	
192.168.0.15	VSD	
192.168.0.16		
192.168.0.17		
192.168.0.18		
192.168.0.19		
192.168.0.20		
192.168.0.21		
192.168.0.22		
192.168.0.23		
192.168.0.24		
192.168.0.25		
192.168.0.100	WIFI/NETWORK	
192.168.0.101	WIFI/NETWORK	
192.168.0.102	WIFI/NETWORK	
192.168.0.103	WIFI/NETWORK	
192.168.0.104	WIFI/NETWORK	
192.168.0.105	WIFI/NETWORK	

AS/NZS 3000:2007 - Table C2

Load Group	Instruction	Reference	Description	Watts or Amps	Amount	Total	A Phase	B Phase	C Phase	Comments
A. Lighting other than in load group F	Full connected load - discharge in Watts (pf 0.85)			0	0	0.00	0.00	0.00	0.00	
B. (i) Socket-outlets not exceeding 10 A.	First outlet - 1000 W			1000	0	0.00	0.00	0.00	0.00	
	Remaining outlets - 750 W each			750	0	0.00	0.00	0.00	0.00	
B. (ii) Socket-outlets not exceeding 10 A in airconditioned portions of building.	First outlet - 1000 W			1000	0	0.00	0.00	0.00	0.00	
	Remaining outlets - 100 W each			100	0	0.00	0.00	0.00	0.00	
B. (iii) Socket-outlets exceeding 10 A	Largest outlet - 100% full load in Amps			0	0	0.00	0.00	0.00	0.00	
	Remaining outlets - 75% full load in Amps			0	0	0.00	0.00	0.00	0.00	
				0	0	0.00	0.00	0.00	0.00	
				0	0	0.00	0.00	0.00	0.00	
C. Appliances for cooking, heating and cooling. Instantaneous water heaters.	Largest appliance - 100% full load in kW			0	0	0.00	0.00	0.00	0.00	
	Remaining appliance - 75% full load in kW			0	0	0.00	0.00	0.00	0.00	
				0	0	0.00	0.00	0.00	0.00	
D. Motors (use current lookup table)	Largest motor - 100% full load in Amps			0	0	0.00	0.00	0.00	0.00	
	Next largest motor - 75% full load in Amps			0	0	0.00	0.00	0.00	0.00	
	Remaining motors - 50% full load in Amps			0	0	0.00	0.00	0.00	0.00	
				0	0	0.00	0.00	0.00	0.00	
				0	0	0.00	0.00	0.00	0.00	
				0	0	0.00	0.00	0.00	0.00	
				0	0	0.00	0.00	0.00	0.00	
				0	0	0.00	0.00	0.00	0.00	
				0	0	0.00	0.00	0.00	0.00	
				0	0	0.00	0.00	0.00	0.00	
K. Other equipment not covered by load groups above.	By Assessment in Amps			0	0	0.00	0.00	0.00	0.00	
					Maxium Demand Totals:		0.00	0.00	0.00	
					Adjusted Totals:					

MOTOR RATING	APPROX. F.L.C. AT LINE VOLTAGE	
kW	240V ac	415V ac
0.1	0.6	0.4
0.12	0.9	0.5
0.18	1.2	0.7
0.25	1.5	0.9
0.37	2.3	1.3
0.56	2.8	1.6
0.75	3.2	1.8
1.1	4.5	2.6
1.5	5.8	3.4
2.2	8.7	5
3	11	6.5
3.7	13	8
4	14	8
5.5	19	11
7.5	25	15
9.3	32	18
10	34	20
11	37	22
15	50	28
18	62	36
22	70	39
30	91	52
37	119	69
45	136	79
55	166	96
75	219	125
90	269	156
110	325	189
130	389	224
150	440	255

PLC	DI	DO	AI	AO	CONNECTION	NETWORK	PLC Model	Max Expansion
ML1400 L32BXBA	20	12	4	2		ETHIP	1762	8
Micro820 2080-LC20-20QWB	8	7	4	1		ETHIP	2080	
CLOGIX L30ER					16	ETHIP	1769	8
CLOGIX L33ER					32	ETHIP	1769	16
1769-L24ER-QBFC1B	16	16	4	2	8	ETHIP	1769	4
1734-AENT						S7 ETH	1734	63
S7-1211C	8	6	2	0		S7 ETH	S712	2
S7-1212C	8	6	2	0		S7 ETH	S712	2
S7-1214C	14	10	2	0		S7 ETH	S712	8
S7-1215C	14	10	2	2		S7 ETH	S712	8
S7-1515 CPU					32	S7 ETH	S715	63
S7315-2PN/DP						S7 ETH + D	S73	8

HMI	SIZE	RESOLUTION
2711R-T4T (PanelView800 4")	4"	480x272
2711R-T7T (PanelView800 7")	7"	800x480
2711R-T10T (PanelView800 10")	10"	800x600
2711P-T7C21D8S (PVP7 Std 7")	7"	640x480
2711P-T10C21D8S (PVP7 Std 10")	10"	800x600
2711P-T12W21D8S (PVP7 Std 12"W)	12" Wide	1280x800
2711P-T7C22D9P (PVP7 Perf 7")	7"	640x480
2711P-T10C22D9P (PVP7 Perf 10")	10"	800x600
2711P-T12W22D9P (PVP7 Perf 12"W)	12" Wide	1280x800
6AV2124-0GC01-0AX0 (TP700)	7" Wide	800x480
6AV2124-0JC01-0AX0 (TP900)	9" Wide	800x480
6AV2124-0MC01-0AX0 (TP1200)	12" Wide	1280x800

I/O	DI	DO	AI	AO	NET
1762-IQ16	16				
1762-OB16		16			
1762-IQ8	8				
1762-OB8		8			
1762-IF4			4		
1762-OF4				4	
1762-IF2OF2			2	2	
1762-IQ8OW6	8	6			
1762SC-IF8U			8		
1762SC-OF8				8	

I/O	DI	DO	AI	AO	NET
1769-IQ32	32				
1769-OB32		32			
1769-IQ16	16				
1769-OB16		16			
1769-IF16C			16		
1769-OF8C				8	
1769-IF8			8		
1769-IF4			4		
1769-OF4				4	
MVI69E-MBS					64
MVI69-MCM					64

NAME	PHONE
ANDREW DE	0419 845 559
CHRIS HALL	0467 444 290
PETER WALTI	0448 181 035
RYAN DAVIS	0450 924 652
LUIS BASTOS	0456 709 580
SEAN COLE-H	0418 987 646
MITCH HASTI	0457 991 911
JOHN CARRO	0419 009 481
CHRIS HALEY	0413 939 815
DECLAN CRE/	0468 773 926
DANIEL TSIV(	0427 684 329
DARREN PRI	0417 475 114
DURAID BAY/	0499 330 377
ZACH JERLA	0455 779 987
JOHN KOUM(	0487 374 346
DAVID SKELT	0447 597 755
MATTHEW R(	0428 446 286
PAUL COBBIN	0437 773 780
BEN AZARME	0452 531 352

I/O	DI	DO	AI	AO	NET
1734-IB4	4				
1734-IB8	8				
1734-OB4		4			
1734-OB8		8			
1734-IE8C			8		
1734-OE2C				2	

I/O	DI	DO	AI	AO	NET
8DI - 6ES7221-1BF32-0XB0	8				
16DI - 6ES7221-1BH32-0XB0	16				
8DO - 6ES7222-1BF32-0XB0		8			
16DO - 6ES7222-1BH32-0XB0		16			
4AI - 6ES7231-4HD32-0XB0			4		
8AI - 6ES7231-4HF32-0XB0			8		
2AO - 6ES7232-4HB32-0XB0				2	
4AO - 6ES7232-4HD32-0XB0				4	

Project Name UPPER CAMPUS BORE WATER TREATMENT PLANT UCBWTP

Project Number XXXXX

		Product Selection			
Device Tag	**Device Name**	**Model/Type**	**Supplier**	**Voltage**	**Comments**
MCC	MOTOR CONTROL CENTRE		ECS	230/400	
HMI	PROCESSOR INTERFACE	PVP 7 10" STANDARD	NHP	24 VDC	
DP125	FLOW PACED DOSING PUMP	GAMMA X	Prominent	230 VAC	
DP127	PID DOSING PUMP	GAMMA X	Prominent	230 VAC	
ATC100	MULTI FUNCTION CONTROLLER 1	LIQUILINE CM448	Endress+Hauser	230 VAC	
AE101	RAW BORE WATER PH PROBE	Orbipac CPF81D	Endress+Hauser		
AE103	POST STATIC MIXER 1 PH PROBE	Orbipac CPF81D	Endress+Hauser		
AE104	POST STATIC MIXER 2 PH PROBE	Orbipac CPF81D	Endress+Hauser		
AE105	POST DOSING PH PROBE	Orbipac CPF81D	Endress+Hauser		
AE107	POST DILUTION MIX PH PROBE	Orbipac CPF81D	Endress+Hauser		
AE102	RAW BORE WATER CONDUCTIVITY PROBE	Condumax CLS21D	Endress+Hauser		
AE106	POTABLE WATER CONDUCTIVITY PROBE	Condumax CLS21D	Endress+Hauser		
AE108	POST DILUTION MIX CONDUCTIVITY PROBE	Condumax CLS21D	Endress+Hauser		
ATC140	MULTI FUNCTION CONTROLLER 2	LIQUILINE CM442	Endress+Hauser	230 VAC	
AE141	UCTBW RESERVOIR PH PROBE	Orbipac CPF81D	Endress+Hauser		
AE142	UCTBW RESERVOIR CONDUCTIVITY PROBE	Condumax CLS21D	Endress+Hauser		
AS160	AUTO-BACKWASH FILTER	Judo JPF Plus DN100 70M3/HR	Trevling	230 VAC	
LT113	SODIUM HYDROXIDE TANK LEVEL TRANSMITTER	Prosonic M FMU40	Endress+Hauser	24 VDC	
PT111	POTABLE WATER INFEED PRESSURE TRANSMITTER	PG2454	IFM	24 VDC	
PT112	RAW BORE WATER INFEED PRESSURE TRANSMITTER	PG2455	IFM	24 VDC	
PT145	UCBWTP RETICULATION PUMPS PRESSURE TRANSMITTER	PG2456	IFM	24 VDC	
FIT116	POTABLE WATER FLOWMETER	SITRANS F M MAG 5100 W DN150 + MAG 5000, IP67	Siemens	230 VAC	
FIT117	RAW BORE WATER FLOWMETER	SITRANS F M MAG 5100 W DN150 + MAG 5000, IP67	Siemens	230 VAC	
FIT201	POTABLE WATER FLOWMETER	SITRANS F M MAG 5100 W DN150 + MAG 5000, IP67	Siemens	230 VAC	
LS114	SODIUM HYDROXIDE BLIND SUMP FLOAT SWITCH	MAC3	Various	24 VDC	
LS115	SODIUM HYDROXIDE PLANT SUMP FLOAT SWITCH	MAC3	Various	24 VDC	
LS144	UPPER CAMPUS RETICULATION PUMP ROOM FLOAT SWITCH	MAC3	Various	24 VDC	
MV119	POTABLE WATER MODULATING CONTROL VALVE	OM-1M	Process Systems	24 VDC	
MV120	TREATED WATER MODULATING CONTROL VALVE	OM-1M	Process Systems	24 VDC	
AV121	POTABLE WATER ACTUATED VALVE	OM-1	Process Systems	24 VDC	
AV122	RAW BORE WATER ACTUATED VALVE	OM-1	Process Systems	24 VDC	
AV123	TREATED BORE WATER ACTUATED VALVE	OM-1	Process Systems	24 VDC	
AV124	POTABLE WATER BACKUP ACTUATED VALVE UC	OM-1	Process Systems	24 VDC	
AV200	POTABLE WATER BACKUP ACTUATED VALVE LC	OM-1	Process Systems	24 VDC	
SF130	CHEMICAL FILL CONTROL PANEL		ECS	24 VDC	
DX129	REMOTE CHEMICAL FILL OUTLET	ISOC520PG	NHP	230/400 VAC	
LT143	UPPER CAMPUS RESERVOIR LEVEL TRANSMITTER		VEGABAR	24 VDC	EXISTING
PU146A-D	UPPER CAMPUS TREATED BORE WATER BOOSTER PUMPS	10SV05F022T	LOWARA	400VAC	EXISTING
PU150A-C	LOWER CAMPUS TREATED BORE WATER BOOSTER PUMPS	10SV05F022T	LOWARA	400VAC	

Appendix 12

Upper Campus Reservoirs (Commerce Courtyard)

COMMERCE

COURTYARD

Tank level control cable

Borewater Retention Tank (100,000 litre) (Underground)

Borewater Retention Tank (100,000 litre) (Underground)

Lighting–Stairs

Meter

Tank level control valve

Hatch cover

Planter boxes

Line valve & solenoid valve

Tap (Upper level)

Signal cable –Borewater

Line of wall at courtyard level

Column

BW PUMP

Wall

Planter

Hatch cover

Supply to garden beds in wall rece and planter boxes

PLANT ROOM UNDER

Approximate Line of

Lighting

Plantroom Pump–Out

U\G OIL TANK

SERVICE DUCT

15 ø Cu & PVC

32 ø Cu

Sign

Control (Irrigati

Hot water

Cu (A/G)

(Buried ?)

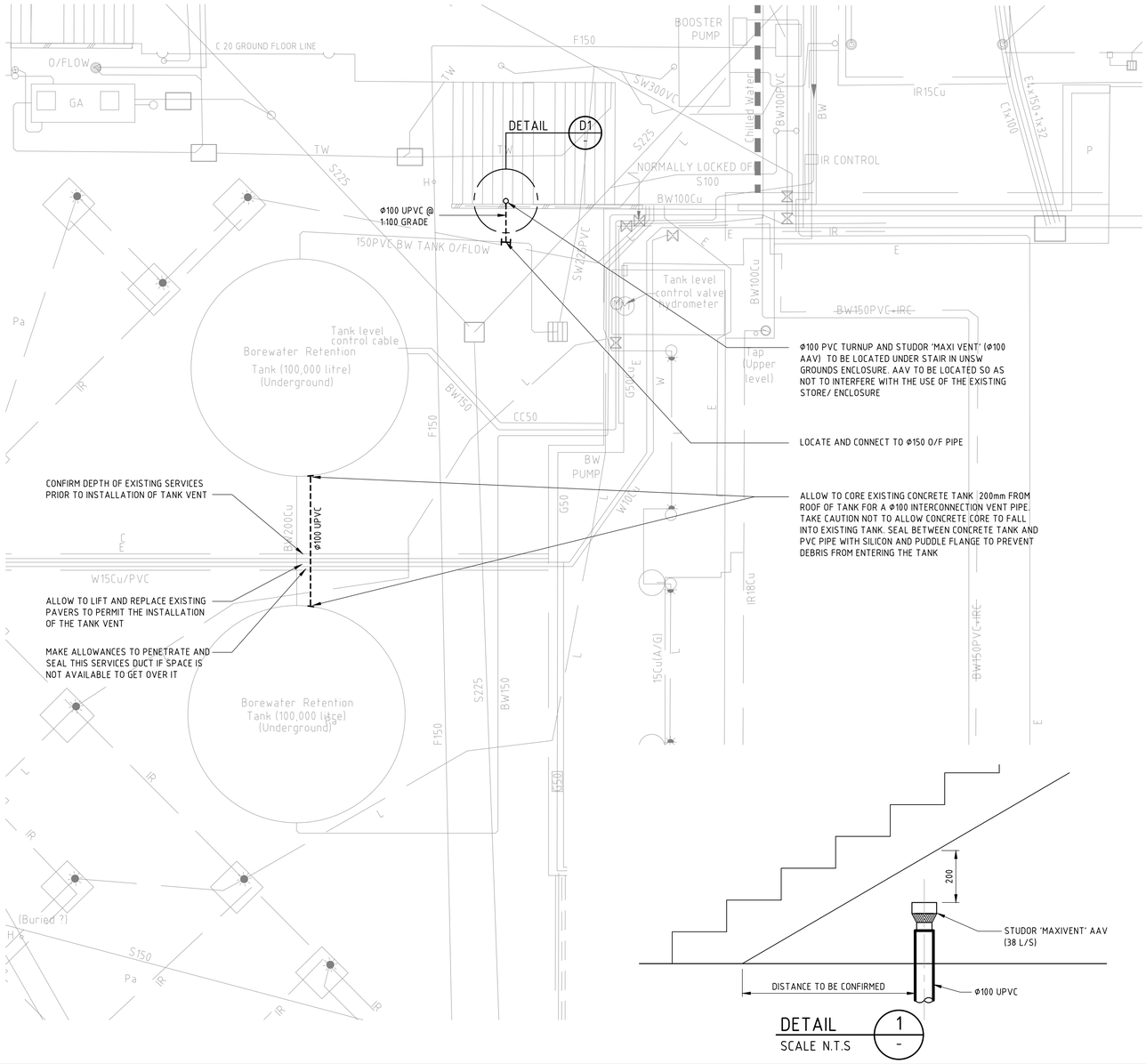
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UNSW KENSINGTON CAMPUS

PROPOSED VENTING OF BOREWATER TANKS

HYDRAULIC SERVICES

SCIENTISTS ENGINEERS MANAGERS & FACILITATORS



STANDARD NOTES

1. EXISTING SERVICES HAVE BEEN PLOTTED FROM SUPPLIED DATA THE SUPERINTENDENT DOES NOT GUARANTEE THEIR ACCURACY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ESTABLISH THE LOCATION OF ALL EXISTING SERVICES PRIOR TO COMMENCING WORK. CLEARANCES SHALL BE OBTAINED FROM UNSW FM ENGINEERING.
2. UPON SIGNING THE CONTRACT, THE CONTRACTOR IS DEEMED TO HAVE VISITED SITE AND FAMILIARISED THEMSELVES WITH THE SITE, THE LOCATIONS & SIZES OF ALL EXISTING SERVICES AND THE EXTENT OF WORKS REQUIRED TO PROVIDE A COMPLETE, WORKING AND SERVICEABLE INSTALLATION BASED ON THE DRAWINGS, SPECIFICATIONS AND SITE CONSTRAINTS. VARIATIONS DUE TO OBVIOUS SITE CONSTRAINTS WILL NOT BE APPROVED.
3. WHERE NEW WORK ABUTS EXISTING THE CONTRACTOR SHALL ENSURE THAT A SMOOTH EVEN PROFILE, FREE FROM ABRUPT CHANGES IS OBTAINED.
4. BEFORE COMMENCING ANY INGROUND WORKS AS SHOWN ON THESE DRAWINGS. THE CONTRACTOR IS TO OBTAIN EXISTING SERVICE DETAILS FROM UNSW FACILITIES DEPARTMENT. FOLLOWING EXCAVATION AND INSTALLATION OF INGROUND SERVICES AND PRIOR TO BACK FILLING, THE CONTRACTOR IS TO NOTIFY THE UNSW FACILITIES FOR RECORDING LOCATION OF SERVICES. NON-COMPLIANCE WITH THIS REQUIREMENT MAY RESULT IN PIPELINES BEING EXPOSED AT THE EXPENSE OF THE CONTRACTOR.
5. ANY DAMAGE TO SERVICES DURING CONSTRUCTION SHALL REPAIRED IMMEDIATELY AT THE CONTRACTORS OWN EXPENSE.
6. NEW MATERIALS, QUALIFIED AND EXPERIENCED TRADESMEN AND QUALITY WORKMANSHIP SHALL BE USED IN ALL INSTANCES.
7. PROVIDE THE UNSW WITH A MINIMUM OF FIVE (5) WORKING DAYS WRITTEN NOTIFICATION OF ANY SHUT DOWN OF ANY SERVICES REQUIRED. PROVIDE WRITTEN APPROVAL TO THE SUPERINTENDANT PRIOR TO SHUTTING DOWN ANY SERVICES.
8. THE CONTRACTOR IS TO UNDERTAKE INVESTIGATIONS TO DETERMINE THE EXACT LOCATION OF ALL EXISTING SERVICES AND THE EFFECTS OF TERMINATION, RELOCATION, SHUT OFF ETC. WILL HAVE ON THE UNIVERSITY. PROVIDE THE SUPERINTENDANT WITH A SCHEDULE OF (POSSIBLE) EFFECTS, RAMIFICATIONS OF PROPOSED WORKS PRIOR TO THE COMMENCEMENT OF ANY WORKS.
9. THE CONTRACTOR IS RESPONSIBLE FOR THE CO-ORDINATION OF ALL EXISTING AND PROPOSED PIPEWORK WITH ALL OTHER TRADES TO ENSURE, THE INSTALLATION OF ALL PIPEWORK, THE TERMINATION / CAP OFF / RELOCATION OF SERVICES ETC. IS ACHIEVABLE AROUND EXISTING STRUCTURE, PROPOSED SERVICES AND THE OPERATIONAL REQUIREMENTS OF UNSW.
10. THESE DRAWINGS HAVE BEEN PREPARED TO PROVIDE FOR A SCOPE OF WORKS ONLY. THE CONTRACTOR SHALL MEASURE, COUNT OR OTHERWISE QUANTIFY THE PIPE, ANCILLARIES AND BRACKET QUANTITIES (REQUIRED TO COMPLETE THE WORKS) ON-SITE PRIOR TO SUBMITTING THEIR TENDER OFFER.
11. ALLOW FOR ALL OUT OF HOURS OR OUT OF SEQUENCE WORKS TO FACILITATE THE CONSTRUCTIONAL STAGING AND TO LIMIT DISRUPTION TO THE NORMAL OPERATION OF THE UNIVERSITY.
12. EXCAVATION - EXCAVATE IN STRAIGHT LINES AND GRADES TO FACILITATE FUTURE LOCATION OF BURIEDSERVICES. WHERE IN PAVEMENT, SAW CUT BITUMEN AND CONCRETE PRIOR TO EXCAVATING. WHERE OVER EXCAVATION OCCURS, BACKFILL WITH SELECTED EXCAVATED OR IMPORTED MATERIAL TO REQUIRED LEVELS IN 150MM LAYERS COMPACTED TO 95% MODIFIED DRY DENSITY. REMOVE ALL SPOIL FROM THE UNSW SITE AS THE WORK PROCEEDS USING SKIPS OR TRUCKS AS THE WORK REQUIRES. PROVIDE TIMBERING AND SHORING AS REQUIRED TO PROTECT WORKERS AND ADJACENT STRUCTURES AND REMOVE PRIOR TO COMPLETION WHERE POSSIBLE.
13. BEDDING - ALL SERVICES EXCEPT SEWER AND SUBSOIL SHALL BE BEDDED ON 50MM THICK COMPACTED SAND. SEWER & SUBSOIL BEDDING TO SUIT SITE CONDITIONS.
14. UNDERGROUND PIPELINE MARKERS - MARK SURFACE TO INDICATE SERVICE BELOW. BURY WARNING TAPES IN THE TRENCH 200MM ABOVE THE PIPELINE TO IDENTIFY THE SERVICE BELOW. WHERE THE SERVICE IS NON-METALLIC, PROVIDE A TAPE INCORPORATING LOCATING WIRE.
15. SOIL AND WATER MANAGEMENT - SOIL AND WATER MANAGEMENT SHALL ADHERE TO BEST PRACTICE AT ALL TIMES ACROSS ALL CAMPUSES. KENSINGTON CAMPUS IS A CATCHMENT AREA FOR AQUIFER RECHARGE, AS MOST RAINWATER AND STORMWATER IS CAPTURED AND RECYCLED FOR SITE AND BUILDING NON-POTABLE WATER REQUIREMENTS VIA THE UNIVERSITY'S BORE FIELD. THE HYDRAULIC CONTRACTOR IS REQUIRED TO PREPARE A DETAILED SITE-SPECIFIC SOIL AND WATER MANAGEMENT PLAN FOR THE WORKS, COMPLYING WITH THE DETAILED REQUIREMENTS OF RANDWICK CITY COUNCIL. THE PLAN SHALL TREAT CAMPUS ROADWAYS AS THOUGH THEY ARE COUNCIL PUBLIC ROADS FOR THE PURPOSE OF MANAGING SOIL AND WATER.
16. BACKFILLING - WHERE REQUIRED, ALL SERVICES EXCEPT SEWER AND SUBSOIL, SHALL BE BACKFILLED AND OVER LAID TO 75MM ABOVE PIPE SOCKET WITH APPROVED GRANULAR FILL. COMPLETE BACKFILLING WITH APPROVED EXCAVATED MATERIAL. CHARGE OR PRESSURISE ALL HYDRAULIC SERVICES DURING BACKFILLING OPERATIONS. COMPACT SIDE SUPPORT AND BACKFILLING IN 225MM THICK LAYERS USING MECHANICAL COMPACTION EQUIPMENT. MAINTAIN MOISTURE CONTENT TO ACHIEVE OPTIMUM COMPACTION. NOTE: PROVIDE 48 HOURS' NOTICE PRIOR TO BACKFILLING TO THE UNSW SURVEY DRAFTSPERSON VIA THE PROJECT OFFICER TO VIEW, RECORD AND DOCUMENT ALL NEW AND EXPOSED UNDERGROUND SERVICES.
17. BACKFILLING UNDER PAVEMENTS AND FLOORS - BACKFILL WITH APPROVED GRANULAR MATERIAL IN 225MM THICK LAYERS AND COMPACT USING VIBRATING MECHANICAL COMPACTION EQUIPMENT TO 95% MAXIMUM MODIFIED DRY DENSITY OR TO MATCH SURROUNDING GROUND. SPECIFIED COMPACTION MUST BY VERIFIED BY COMPACTION TESTS PERFORMED BY A NATA REGISTERED TESTING AGENT AND AT THE CONTRACTOR'S EXPENSE. SHOULD COMPACTION FAIL ANY TEST, BACKFILL SHALL BE REMOVED DOWN TO WITHIN 225MM OF THE TOP OF THE SURFACE AND COMPACTION AND BACKFILLING RECOMMENCED WITH TESTS TAKEN AT FREQUENT INTERVALS. THE NUMBER AND FREQUENCY OF TESTS SHALL BE DETERMINED IN CONJUNCTION WITH ENGINEERING SERVICES AND SHALL BE DEPENDENT ON SIZE OF EXCAVATION, QUALITY OF EXISTING PAVEMENT AND FUTURE PAVEMENT UPGRADING WORKS.
18. RESTORATION - RESTORE ALL SURFACES TO THEIR ORIGINAL CONDITION, USING MATERIALS MATCHING MATERIALS AS FOUND. BITUMEN, CONCRETE AND BRICK PAVED SURFACES SHALL BE RESTORED BY A UNSW APPROVED CONTRACTOR EXPERIENCED IN THE RELEVANT PAVEMENT RESTORATION. THIS WORK SHALL BE INCLUDED IN THE CONTRACT DOCUMENTS.
19. PROVIDE ALL REQUIRED TRAFFIC MANAGEMENT, 2m HIGH SITE FENCING, SIGNAGE, FLASHING LIGHTS ETC. TO ENSURE OPEN TRENCHES COMPLY WITH WORKCOVER & OH&S REQUIREMENTS. TRENCHES SHALL BE BACK FILLED EACH DAY AT COMPLETION OF WORK UNLESS OTHERWISE AGREED BY UNSW PERSONNEL. REFER ALSO TO UNSW OHS SITE INDUCTION MANUAL AS SUPPLIED WITH CONTRACT DOCUMENTS.
20. ALL CONTRACTORS, SUB-CONTRACTORS AND THEIR EMPLOYEES WILL BE SITE INDUCTED TO UNSW PRIOR TO COMMENCEMENT OF WORKS
21. THE CONTRACTOR IS TO NOMINATE A SQUARE-METER VARIATION RATE FOR THE REMOVAL AND RESTORATION OF CONCRETE UNDER THE PAVERS IN THEIR TENDER OFFER.

REV.	DESCRIPTION	DRN	CHK	APP.	DATE
0	ISSUE FOR TENDER	AP	TS		20.03.12

DRAWING CHECK	SIGNATURE	DATE
DRAWN	AP	23.2.12
DESIGNED	TS	23.2.12
CHECKED		
CLIENT		

CO-ORDINATION CHECK	SIGNATURE	DATE
STRUCT.		
MECH.		
ELECT.		
HYDR./CIVIL		
FIRE/ENV.		

CLIENT: UNSW THE UNIVERSITY OF NEW SOUTH WALES SINGAPORE • SYDNEY • CANBERRA

SCIENTISTS ENGINEERS MANAGERS & FACILITATORS
Website: www.semf.com.au
ACN 117 492 814 ABN 24 117 492 814

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Tel: (+61 2) 9957 1112
Fax: (+61 2) 9957 4815

Offices Located:
Brisbane, Canberra, Gladstone, Hobart, Launceston, Melbourne and Sydney

PROJECT: COMMERCE COURTYARD BORE WATER TANKS UNSW KENSINGTON CAMPUS

TITLE: HYDRAULIC SERVICES PROPOSED VENTING OF BOREWATER TANKS

2000 0 2000 4000 6000

A1

STATUS: TENDER ISSUE
NOT TO BE USED FOR CONSTRUCTION

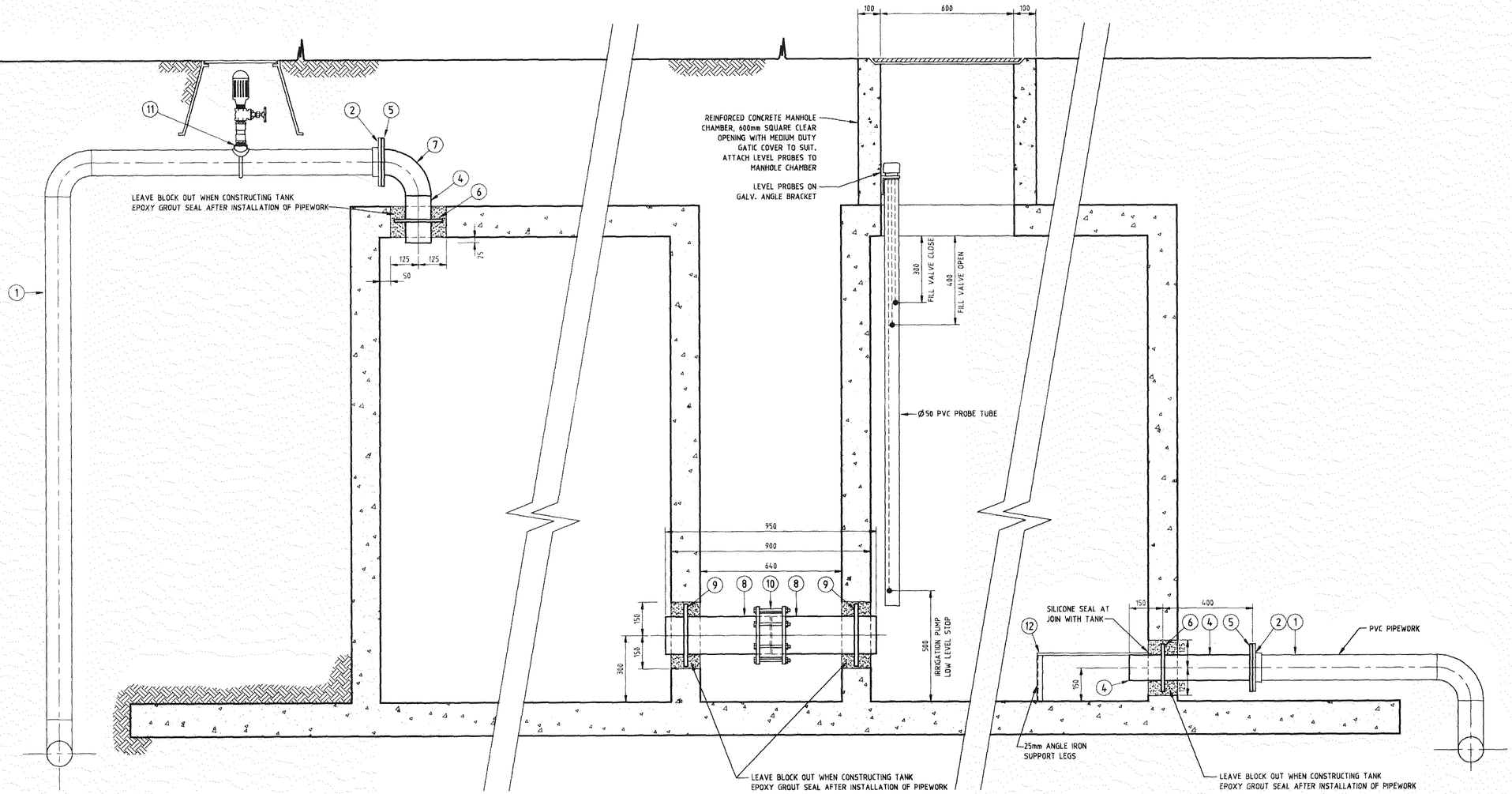
SCALE @ A1: 1:100 DIMENSIONS IN: MILLIMETRES

DRAWING No.: 2305.065-H01

REV.: 0

KCO-0423

7573



B SECTION
SCALE 1:10

1. Ø100 CLASS 12 PVC PIPEWORK
2. Ø100 PVC FLANGE
3. Ø150 CLASS 6 PVC PIPEWORK
4. Ø100 STD WT STEEL PIPE
5. Ø100 STEEL TABLE "E" FLANGE
6. Ø100 STEEL PUDDLE FLANGE
7. Ø100 x 90° BUTTWELD STEEL ELBOW
8. Ø150 STD WT STEEL PIPE
9. Ø150 STEEL PUDDLE FLANGE
10. Ø150 MILNE COUPLING
11. Ø25 BRONZE TAPPING SADDLE, Ø25 BRONZE GATE VALVE, Ø25 BERMAD AIR RELEASE VALVE
12. ANTI VORTEX PLATE, 500x500x5mm, CURVED TO SUIT TANK WALL, SILICONE SEAL AT JOINT WITH TANK, 25mm ANGLE SUPPORT LEGS

007573

REV No.	DATE	REVISION	DWN	CKD	ISSUED
0	16/12/94	ISSUED FOR TENDER	CB		16/12

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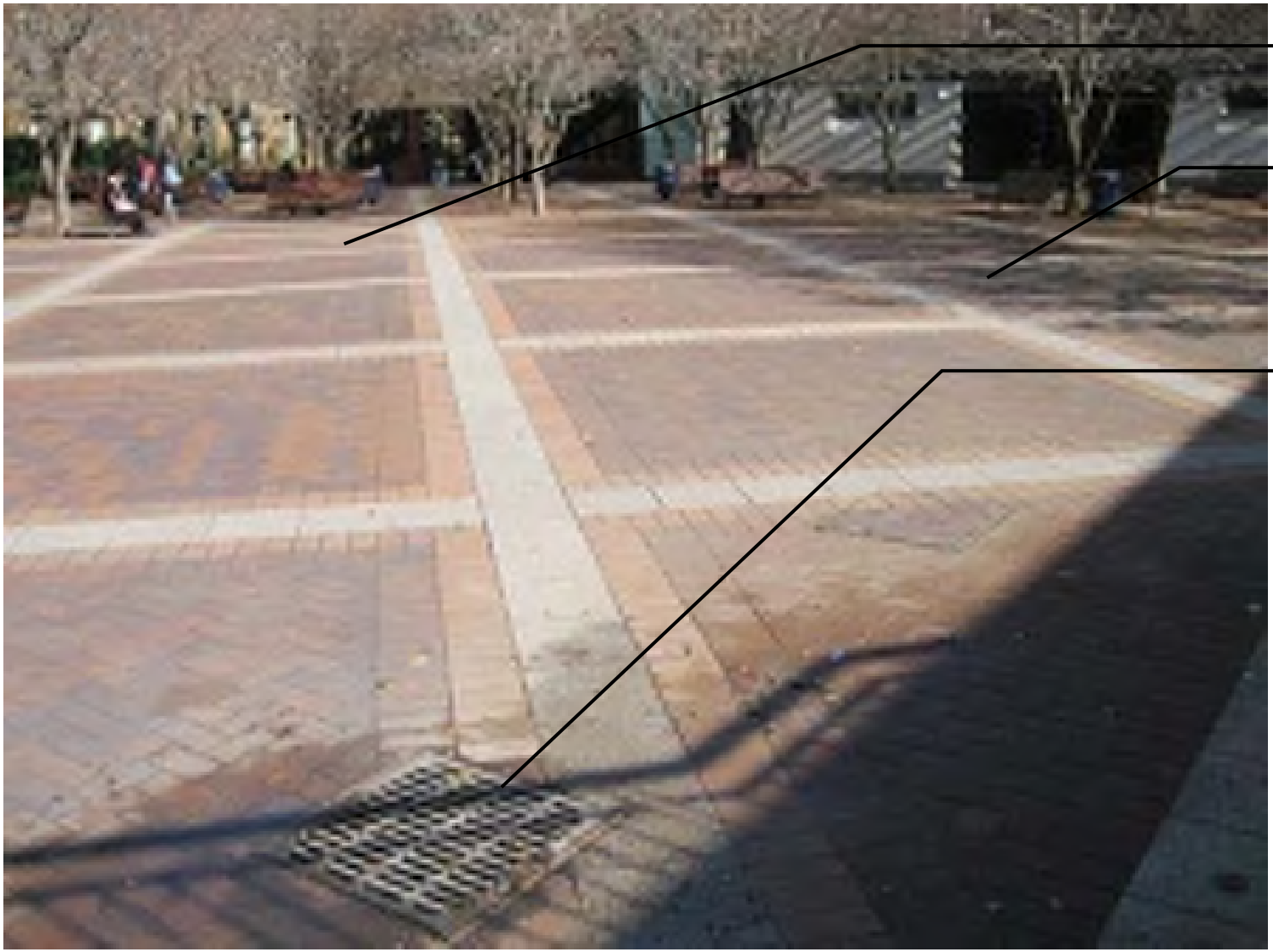
The arrangement and general details as shown on this drawing are essentially diagrammatic and must be applied to the circumstances as found on site.

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IRRIGATION & WATER RESOURCE CONSULTANTS
A.C.N. 009 184 583
PERTH ADELAIDE SYDNEY

DRAWN: C. BAUER
DATE: 5 DEC 94
CHECKED:
APPRV'D FOR CONST:
FIRST ISSUED ON: 16/12/94

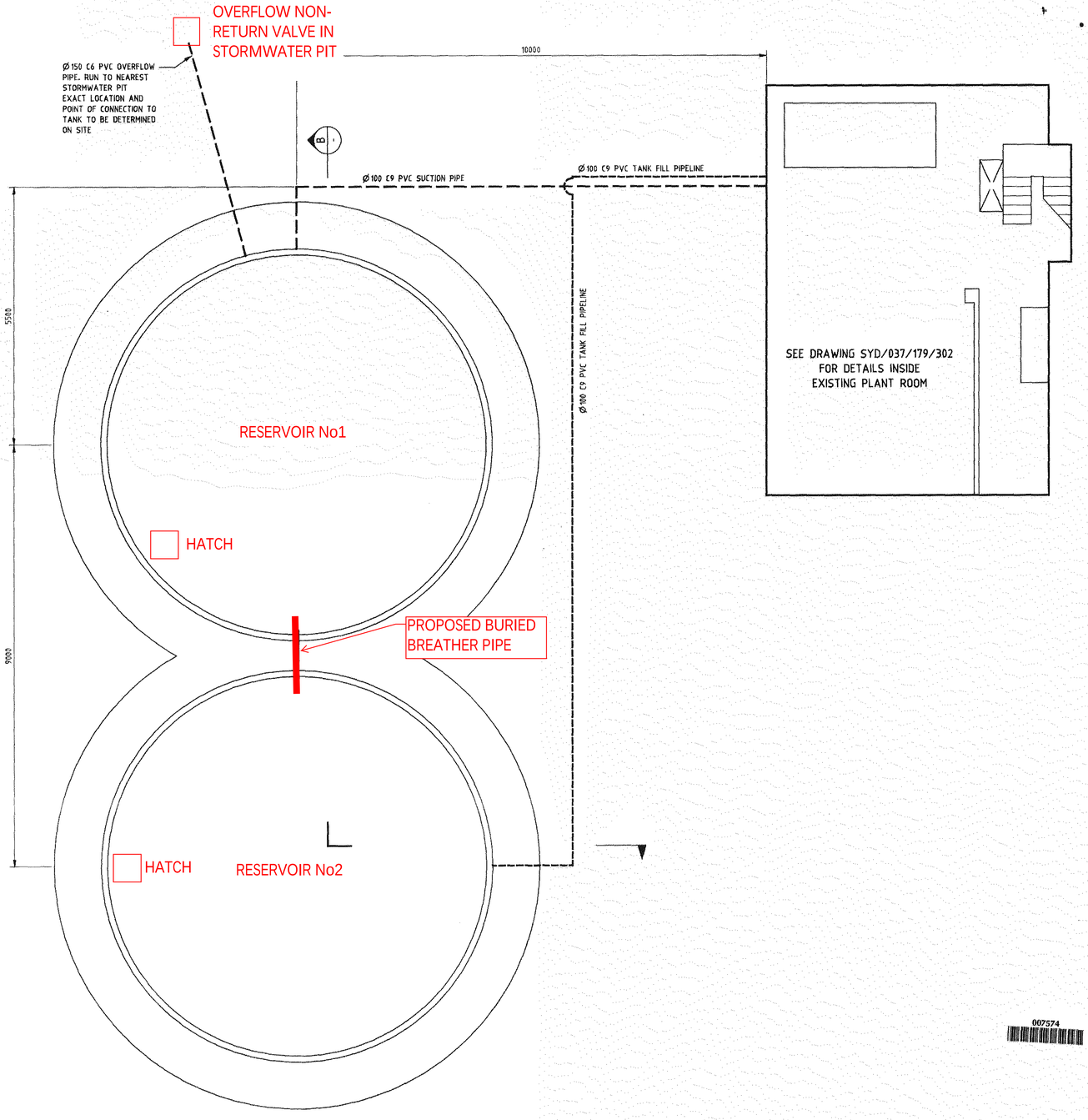
CLIENT: UNIVERSITY OF NEW SOUTH WALES
PROJECT: PROPOSED BOOSTER PUMP/TANK ARRANGEMENT TANKS SECTIONAL VIEW
SCALE: 1:10
DRAWING No.: SYD/037/179/304
SHEET 4 OF 4

KCO



UPPER CAMPUS RESERVOIRS LOCATED BELOW COMMERCE COURTYARD PAVEMENT

KCO-0420



007574

REV No.	DATE	REVISION	DWN	CKD	ISSUED
0	16/12/94	ISSUED FOR TENDER	CJB		14/12

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IRRIGATION & WATER RESOURCE CONSULTANTS
A.C.N. 009 184 083
PERTH ADELAIDE SYDNEY

DRAWN:	C. BAUER
DATE:	5 DEC 94
CHECKED:	
APPRV'D FOR CONST:	
FIRST ISSUED ON:	16/12/94
CLIENT:	UNIVERSITY OF NEW SOUTH WALES
PROJECT:	PROPOSED BOOSTER PUMP/TANK ARRANGEMENT SITE LAYOUT
SCALE:	1:50
DRAWING No.:	SYD/037/179/301
SHEET	1 OF 4

7574

KCO

Appendix 13

UCBWTP Future Water Softening Plant

INDUSTRIAL HI-FLO®50 WATER SOFTENER

More



The Culligan Hi-Flo® 50

Industrial Water Softener

Industries Served

Apartments
Assisted living facilities
Cafeterias
Casinos
Corporate campuses
Educational facilities
Food service
Government
Grocery
Health clubs
Hotel/hospitality
Institutions
Laundry
Manufacturing facilities
Theme parks
Travel centers
Vehicle wash

Key Product Features

- Single or Multiple Tank Configurations – Hardness removal capacities up to 2,000,000 grains per tank. Continuous flow rates up to 240 gpm per tank.
- Culligan's GBE Electronic Controller – More control over your equipment with programming and monitoring capabilities typically found in more expensive PLC controls. A variety of add-on options for advanced instrumentation and communication let you easily customize the system to meet your exact needs.
- Regeneration initiation by choice or combination of time clock, meter or Aqua-Sensor® inputs.
- Side-Mounted Valve Harness – Guided perimeter designed diaphragm valves are smooth operating and free of water hammer. All valve parts are easily accessible in the design for ease of service.
- Corrosion resistant tanks – Made of low carbon steel with epoxy interior lining and finish coat painted exterior.

Culligan®

better water. pure and simple.™

INDUSTRIAL HI-FLO®50 WATER SOFTENER

Applications and Benefits

- Educational Facilities—Boiler and cooling tower make-up water for scale reduction and improved energy costs.
- Restaurants—For dishwashing, cleaning material savings, scale reduction.
- RO/DI Pretreatment
- Car washes—Quality results, detergent and water heating savings, scale reduction.
- Apartment buildings, assisted living facilities and hotels—Quality water for laundry, dishwashers, boilers.
- Industry—For process and make-up water, boiler and cooling system pretreatment, general housekeeping.
- Office buildings—For heating plant pretreatment, tenant convenience, general housekeeping.

Model Descriptions

Model	Resin Qty. (Ft^3/L)	Pipe Size (in/mm)	Flow Rates (GPM/LPM)		Tank Size (in/mm)	
			Continuous*	Peak**	Resin Tank	Brine Tank***
HS-1203	40	3	150	230	48 x 60	48 x 60
	1133	76.2	567.8	870.6	1,219 x 1,524	1,219 x 1,524
HS-1503	50	3	160	230	54 x 60	48 x 60
	1416	76.2	605.6	870.6	1,372 x 1,524	1,219 x 1,524
HS-1504	50	4	190	320	54 x 60	48 x 60
	1416	101.6	719.2	1211.2	1,372 x 1,524	1,219 x 1,524
HS-2004	67	4	240	400	60 x 60	60 x 60
	1897	101.6	908.4	1514	1,524 x 1,524	1,524 x 1,524

*Flow rate at a 17 psi pressure loss.
**Flow rate at a 15 psi pressure loss.
***Dimensions are diameter by tank height.
****Per Softener Tank

Flow rates shown are per tank.
Low flow channeling (flow rates less than 0.5 gallons per minute per cubic foot of resin) may cause hardness leakage into effluent.

Progressive Flow Patent # US 5,060,167
US 5,351,199

Options

- Corrosion resistant brine system construction for long life.
- Skid Mounted – fully pre-piped and wired systems for single point field utility connection of inlet, outlet, drain and power supply.
- Patented Progressive Flow – Culligan's GBE Control can monitor flow demands bringing additional softening tanks on-line or offline as flows increase or decrease.
- ASME Code Tanks
- Brine Reclaim – reduces operating costs by recycling a portion of the regeneration water.
- Patented Aqua-Sensor® Control – initiates regeneration only when needed based upon water hardness. Automatically adjusts to changes in raw water hardness and water consumption.
- Flow Measuring Devices – are available for volume based regeneration initiation.
- Gauge Packages – pressure gauges provided for mounting at the inlet and outlet connection.

Warranty

Culligan's Hi-Flo 50 water softeners are backed by a limited 1-year warranty against defects in material, workmanship and corrosion. In addition, softener tanks are warranted for a period of 5 years.*

*See printed warranty for details. Culligan will provide a copy of the warranty upon request.



System Specifications

Pressure:	30–120 psig 210–830 kPa
Power:	120 VAC/24 VAC[1] 50/60 Hz
Temperature:	40–120°F 4-49°C
Turbidity, max[2].:	5 NTU
Chlorine, max[2].:	1 mg/L
Iron, max.:	5 mg/L

[1]120 Volt/24 Volt CUL/UL listed Transformer Included.
[2]See media specification for details.
The contaminants or other substances removed or reduced by this water treatment device are not necessarily in your water.

Culligan®

better water. pure and simple.™

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www.culligancommercial.com
www.culliganindustrial.com

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Moore Wallace Part No. 34743 Printed 10/08

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Hi-Flo® 50

Automatic Water Softeners

Specifications and Operating Data

Single Tank Models	Exchange Capacity[1] @ Salt Dosage			Service Flow Rates[2]		Pipe Size	Resin Qty	Softener Tank Size	Brine Tank Size[3]	Approx. Ship. Weight
	Minimum	Standard	Maximum	Peak Flow @ DP	Cont. Flow @ DP					
	gr @ lb	gr @ lb	gr @ lb	gpm	gpm	in.	ft³	in	in	lb
	g @ kg	g @ kg	g @ kg	lpm	lpm	in.	L	mm	mm	kg
HS-1203	800,000/240	1,000,000/400	1,200,000/600	230 @ 15	150 @ 8	3	40	48 x 60	48 x 60	5800
	51,840/109	64,800/181	77,760/272	870.6 @ 103.4	567.8 @ 55.2	3	1133	1,219 x 1,524	1,219 x 1,524	2631
HS-1503	1,000,000/300	1,250,000/500	1,500,000/750	230 @ 14	160 @ 7	3	50	54 x 60	48 x 60	7400
	64,800/136	81,000/227	97,200/340	870.6 @ 96.5	605.6 @ 48.3	3	1416	1,372 x 1,524	1,219 x 1,524	3357
HS-1504	1,000,000/300	1,250,000/500	1,500,000/750	320 @ 15	190 @ 6	4	50	54 x 60	48 x 60	7800
	64,800/136	81,000/227	97,200/340	1211.2 @ 103.4	719.2 @ 41.4	4	1416	1,372 x 1,524	1,219 x 1,524	3538
HS-2004	1,340,000/402	1,675,000/670	2,000,000/1005	400 @ 18	240 @ 7	4	67	60 x 60	60 x 60	9600
	86,832/182	108,540/304	129,600/456	1514 @ 124.1	908.4 @ 48.3	4	1897	1,524 x 1,524	1,524 x 1,524	4355

[1] Exchange capacities based on treating water containing 10 grains per gallon (171 mg/l) of hardness (expressed as calcium carbonate), free of color, oil, turbidity and at a service flow rate of approximately 50 percent of the peak flow rate. These are nominal capacities and will vary with influent water characteristics, water temperature and other factors.

[2] Operation of a softener at peak flow rate for extended periods of time may result in a slight reduction of softening capacity. This is due to premature hardness breakthrough. Flows shown are gpm @ psi loss (m³/hr @ kPa).

[3] Brine system shown is optional. Multiple sizes are available. Size shown is size most often selected for the system.

NOTE: Operational, maintenance and replacement requirements are essential for this product to perform as advertised. Specifications shown are for single models. Also available in multiple tank configurations.

Revised 11/08
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1-800-Culligan

Commercial/Industrial Systems
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Limited WARRANTY

Culligan® Hi-Flo® 22 Series, Hi-Flo® 3 Series, Hi-Flo® 3e Series, Soft-Minder Plus, Hi-Flo® 42 Series, CSM Series and Hi-Flo® 50 Series

You have just purchased one of the finest water conditioners made. As an expression of our confidence in Culligan International Company products, this product is warranted to the original end-user, when installed in accordance with Culligan specifications, against defects in material and workmanship from the date of original installation, as follows:

For a period of ONE YEAR	**The entire conditioner.**
For a period of TWO YEARS	**The control valve internal parts. The brine valve and its component parts. The salt storage container internal components.**
For a period of THREE YEARS	**The control valve body, but excluding its internal parts. Brass body valves only.**
For a period of FIVE YEARS	**The control valve body, excluding internal parts.** **The fiberglass wound container(s), if so equipped*.** **The salt storage container(s), if so equipped.** **The epoxy-lined steel conditioner tank(s), if so equipped.**

* The tank must be protected by a vacuum breaker device as described in the unit's operating manual. Damage to the tank caused by vacuum is not covered by this warranty. The unit must be used in operating conditions that conform to Culligan's recommended design guidelines. This warranty will not apply if the unit has been modified, repaired or altered by someone not authorized by Culligan.

If a part described above is found defective within the specified period, you should notify your independently operated Culligan dealer and arrange a time during normal business hours for the dealer to inspect the water conditioner on your premises. Any part found defective within the terms of this warranty will be repaired or replaced by the dealer. You pay only freight from our factory and local dealer charges.

We are not responsible for damage caused by accident, fire, flood, freezing, Act of God, misuse, misapplication, neglect, oxidizing agents (such as chlorine, ozone, chloramines and other related components), alteration, installation or operation contrary to our printed instructions, or by the use of accessories or components which do not meet Culligan specifications, is not covered by this warranty. Refer to the specifications section in the Installation and Operating manual for application parameters.

Our product performance specifications are furnished with each water conditioning unit. TO THE EXTENT PERMITTED BY LAW, CULLIGAN DISCLAIMS ALL IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE; TO THE EXTENT REQUIRED BY LAW, ANY SUCH IMPLIED WARRANTIES ARE LIMITED IN DURATION TO THE ONE-YEAR PERIOD SPECIFIED ABOVE FOR THE ENTIRE CONDITIONER. As a manufacturer, we do not know the characteristics of your water supply or the purpose for which you are purchasing this product. The quality of water supplies may vary seasonally or over a period of time, and your water usage rate may vary as well. Water characteristics can also differ considerably if this product is moved to a new location. For these reasons, we assume no liability for the determination of the proper equipment necessary to meet your requirements, and we do not authorize others to assume such obligations for us. Further, we assume no liability and extend no warranties, express or implied, for the use of this product with a nonpotable water source or a water source which does not meet the conditions for use described in the installation and operation manual(s) that accompany the equipment. OUR OBLIGATIONS UNDER THIS WARRANTY ARE LIMITED TO THE REPAIR OR REPLACEMENT OF THE FAILED PARTS OF THE WATER CONDITIONER, AND WE ASSUME NO LIABILITY WHATSOEVER FOR DIRECT, INDIRECT, INCIDENTAL, CONSEQUENTIAL, SPECIAL, GENERAL, OR OTHER DAMAGES.

Some states do not allow the exclusion of implied warranties or limitations on how long an implied warranty lasts, so the above limitation may not apply to you. Similarly, some states do not allow the exclusion of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. Consult your telephone directory for your local independently operated Culligan dealer, or write Culligan International Company for warranty and service information.

CULLIGAN INTERNATIONAL COMPANY
9399 W. Higgins Road
Rosemont, Illinois 60018

PN 01016557

Printed in U.S.A.

NOTES:

(1) ITEMS SHOWN IN BROKEN LINES TO BE FURNISHED BY OTHERS.

(2) ALL DIMENSIONS ARE ± 1 INCH (25mm) AND SUBJECT TO CHANGE WITHOUT NOTICE.

(3) UNIONS SHOULD BE LOCATED ON INLET AND OUTLET CONNECTIONS OF HARNESS TO FACILITATE SERVICING.

(4) THE USE OF DISSIMILAR METALS IN A PIPING SYSTEM IS NOT RECOMMENDED. WHERE DISSIMILAR METALS MUST BE CONNECTED IN A WATER SYSTEM. THE USE OF NONCONDUCTIVE (DIELECTRIC) FITTINGS MAY REDUCE GALVANIC CORROSION.

(5) AN ELECTRICAL OUTLET SHOULD BE PROVIDED WITHIN FIVE FEET OF THE EQUIPMENT LOCATION.

(6) ALLOW A MINIMUM OF 24 INCHES ABOVE SOFTENER FOR FILLING.

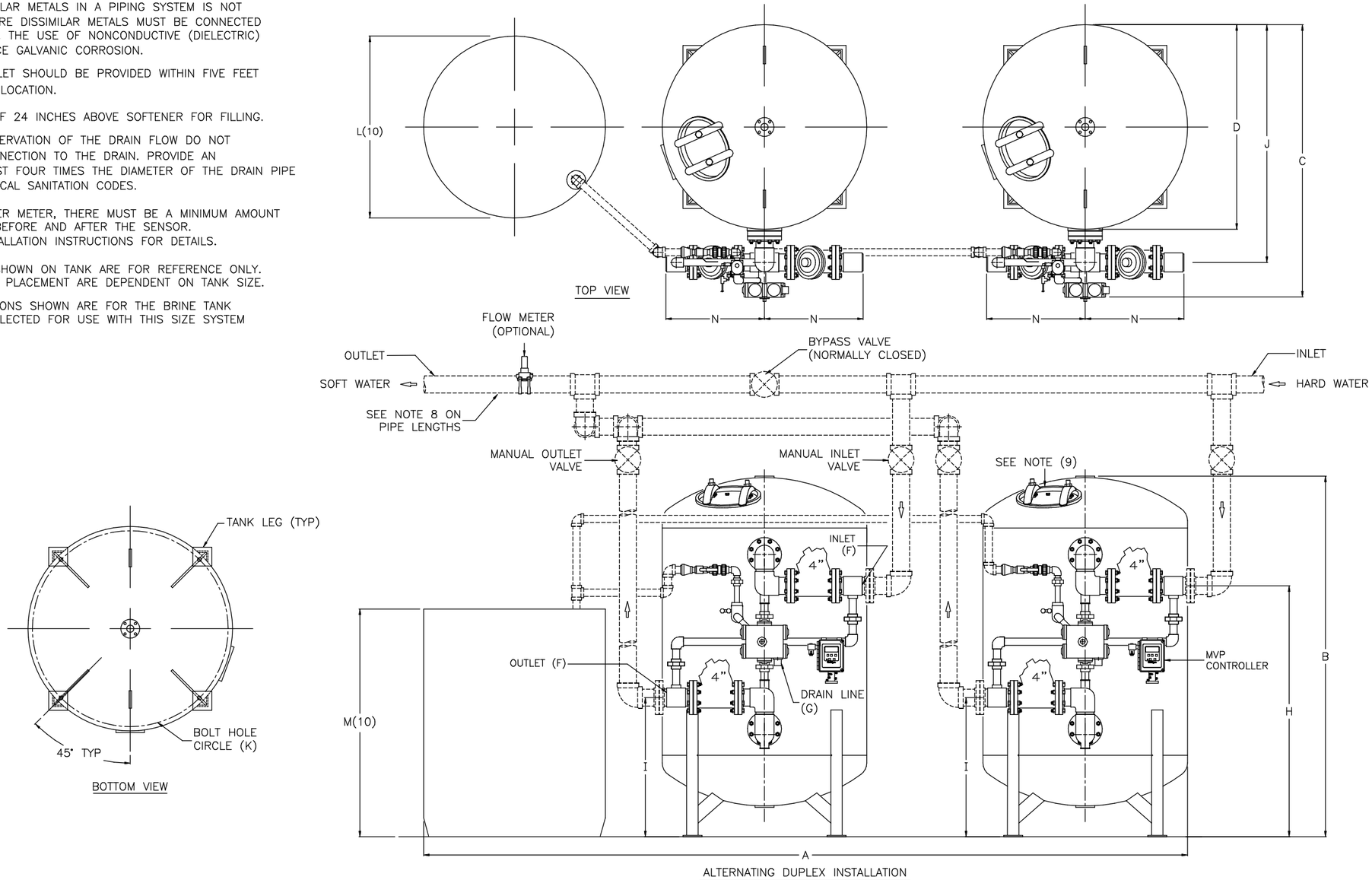
(7) TO PERMIT THE OBSERVATION OF THE DRAIN FLOW DO NOT MAKE A DIRECT CONNECTION TO THE DRAIN. PROVIDE AN AIR GAP OF AT LEAST FOUR TIMES THE DIAMETER OF THE DRAIN PIPE OR CONFORM TO LOCAL SANITATION CODES.

(8) WHEN USING A WATER METER, THERE MUST BE A MINIMUM AMOUNT OF STRAIGHT PIPE BEFORE AND AFTER THE SENSOR. REFER TO THE INSTALLATION INSTRUCTIONS FOR DETAILS.

(9) ACCESS OPENINGS SHOWN ON TANK ARE FOR REFERENCE ONLY. QUANTITY, TYPE AND PLACEMENT ARE DEPENDENT ON TANK SIZE.

(10) BRINE TANK DIMENSIONS SHOWN ARE FOR THE BRINE TANK MOST COMMONLY SELECTED FOR USE WITH THIS SIZE SYSTEM

	DIMENSIONS (INCHES)														UNIT DATA PER TANK							
MODEL	WIDTH A	HEIGHT B	DEPTH C	TANK DIA. D	SIDE–SHELL E	INLET/OUTLET PIPE SIZES F	DRAIN SIZE G	FLOOR TO INLET H	FLOOR TO OUTLET I	BACK TO INLET/OUTLET J	BOLT HOLE CIRCLE K	BRINE TANK DIA. L(10)	BRINE TANK HEIGHT M(10)	INLET/ OUTLET OFFSET N	MAX. CAPACITY KGR @ SALT DOSAGE	RESIN VOLUME ft³	CONTINUOUS FLOW gpm @ psi drop	PEAK FLOW gpm @ psi drop	DRAIN FLOW gpm	MIN. DRAIN PIPE SIZE IN.	DUPLEX OPER. WT. lbs.	DUPLEX SHIP. WT. lbs.
HS–1504	180	96	73	54	60	4.0	1.5	66.0	37.0	62.0	51.7	48	60	26	1500 @ 750	50	190 @ 6	320 @ 15	70	2.0	29500	15400
HS–2004	204	98	78	60	60	4.0	1.5	67.0	38.0	67.0	57.63	60	60	26	2000 @ 1005	67	240 @ 7	400 @ 18	90	2.0	37800	18900



Hi-Flo 50 - 4"

CAD File: Hi-Flo 50 Softener DA 4in.dwg

DO NOT SCALE DRAWING TOLERANCES: ±1/8" UNLESS OTHERWISE NOTED				
Let.	Change	By	App	Date

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NORTHBROOK, ILLINOIS

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NAME: HI–FLO® 50 SOFTENERS MODELS 1504–2004 TECHNICAL DATA SHEET

DETAILED BY:	APP. BY:	SHEET
KMR 8/28/03		1 OF 1
REF. NO.	PART NO. S50_4_2A	

Appendix 14

TREATED & RAW BORE WATER pH MEASUREMENT O&M

KENSINGTON CAMPUS
TREATED & RAW BORE WATER
pH MEASUREMENT

Overview

As part of the ongoing bore water upgrade some extra data collection points have been added so they can be displayed on the BMS (Building Management System). The data is being collected from four additional areas and include bore water pH, bore supply pressure, bore water supply pressure (post booster pumps), treated bore water pH and pressure as well as pump-set fault and running information.

All the data is collected via four PLCs (Programmable Logic Controllers) that are being used as RTUs (Remote Terminal Unit) to convert the digital and analog signals to data, that can then be used and displayed by the BMS.

The communication method used is Modbus TCP/IP, which is the Modbus protocol over a TCP interface through Ethernet. The PLCs communicate via the BMS VLAN.

All four PLCs are the same and work in the same way. Detail of each

Tyree H6

At the Tyree we collect the following information:

- Bore Water pH
- Bore Pumps Supply Pressure
- Lower Campus Bore Water Booster Pumps Pressure
- Bore Water Storage Tank Level
- Bore Water Booster Pumps Status



Figure 1 - H6 LGQ027 Tyree Bore Water Control

The Tyree Bore Water Control collects the following information:

Item	Description	Variable Name	Data Type	Modbus Address	Modbus Address Used
Pumps Running	Bore Water Supply Pumps	_IO_EM_DI_04	Bool	100001	100001
Pumps Faulted	Bore Water Supply Pumps	_IO_EM_DI_05	Bool	100002	100002
Bore Water pH	Bore Pumps Supply pH	Bore_Water_pH	Real	300001	300001 - 300002
Bore Pressure	Bore Supply Pressure	Bore_Pumps_Pressure	Real	300003	300003 - 300004
Booster Pumps Pressure	Lower Campus Bore Water Booster Pumps Pressure	Booster_Pumps_Pressure	Real	300005	300005 - 300006
Tank Level	Reservoir Tank Level	Tank_Level	Real	300007	300007 - 300008

Table 1 - Tyree Modbus Data Address Information

Building Code	Sub System Desc.	Equipment Desc.	Item Location	Make	Model	Controller Name	VLAN352 IP Address	Subnet Mask	Gateway
H6	Bore Water Control - Modbus	High Level Interface - Bore Water Control - Modbus	LGQ027	Allen-Bradley	2080-LC20-20QBB	TYREE	149.171.165.015	255.255.254.0	149.171.164.1

Table 2 - Tyree Modbus IP Information

Law Building F8

At the Law Building we collect the following information:

- Treated Bore Water pH, post the Bore Water Treatment Plant
- Bore Water Booster Pumps Pressure



Figure 2 - F8 BQ03 Law Building Bore Water Control

The Law Building Bore Water Control collects the following information:

Item	Description	Variable Name	Data Type	Modbus Address	Modbus Address Used
Treated Bore Water pH	Treated Bore Water pH	Bore_Water_pH	Real	300001	300001 - 300002
Booster Pumps Pressure	Lower Campus Bore Water Booster Pumps Pressure	Booster_Pumps_Pressure	Real	300005	300005 - 300006

Table 3 – Law Building Modbus Data Address Information

Building Code	Sub System Desc.	Equipment Desc.	Item Location	Make	Model	Controller Name	VLAN352 IP Address	Subnet Mask	Gateway
F8	Bore Water Control - Modbus	High Level Interface - Bore Water Control - Modbus	BQ03	Allen-Bradley	2080-LC20-20QBB	Law_Building	149.171.165.016	255.255.254.0	149.171.164.1

Table 4 – Law Building Modbus IP Information

Upper Campus UCBWTP

At the Upper Campus Bore Water Booster Plant we collect the following information:

- Treated Bore Water pH, post the Bore Water Treatment Plant
- Bore Water Booster Pumps Pressure
- Upper Campus Booster Pumps Pressure
- Upper Campus Water Storage Tank Level
- Upper Campus Booster Pumps Status



Figure 3 - UCBWTP Upper Campus Bore Water Control

The Law Building Bore Water Control collects the following information:

Item	Description	Variable Name	Data Type	Modbus Address	Modbus Address Used
Pumps Running	Bore Water Supply Pumps	_IO_EM_DI_04	Bool	100001	100001
Pumps Faulted	Bore Water Supply Pumps	_IO_EM_DI_05	Bool	100002	100002
Treated Bore Water pH	Treated Bore Water pH	Bore_Water_pH	Real	300001	300001 - 300002
Bore Pumps Pressure	Bore Pumps Supply Pressure	Bore_Pumps_Pressure	Real	300003	300003 - 300004
Booster Pumps Pressure	Upper Campus Bore Water Booster Pumps Pressure	Booster_Pumps_Pressure	Real	300005	300005 - 300006
Tank Level	Reservoir Tank Level	Tank_Level	Real	300007	300007 - 300008

Table 5 – Upper Campus Modbus Data Address Information

Building Code	Sub System Desc.	Equipment Desc.	Item Location	Make	Model	Controller Name	VLAN352 IP Address	Subnet Mask	Gateway
F UCBWTP	Bore Water Control - Modbus	High Level Interface - Bore Water Control - Modbus	LGQ1	Allen-Bradley	2080-LC20-20QBB	UCBWTP	149.171.165.017	255.255.254.0	149.171.164.1

Table ~~6~~6~~2~~ – Upper Campus Modbus IP Information

Mall Services Tunnel MST

At the MST Bore Water Booster Plant we collect the following information:

- Treated Bore Water pH, post the Bore Water Treatment Plant
- Bore Water Booster Pumps Pressure



Figure 4 - MST Mall Services Tunnel Bore Water Control

The Law Building Bore Water Control collects the following information:

Item	Description	Variable Name	Data Type	Modbus Address	Modbus Address Used
Bore Pumps Pressure	Lower Campus Bore Water Booster Pumps Pressure	Bore_Pumps_Pressure	Real	300003	300003 - 300004

Table 7 – Mall Services Tunnel Modbus Data Address Information

Building Code	Sub System Desc.	Equipment Desc.	Item Location	Make	Model	Controller Name	VLAN352 IP Address	Subnet Mask	Gateway
MST	Bore Water Control - Modbus	High Level Interface - Bore Water Control - Modbus	MST	Allen-Bradley	2080-LC20-20QBB	UCBWTP	149.171.165.019	255.255.254.0	149.171.164.1

Table 8 – Mall Services Tunnel Modbus IP Information