HydroWHIZ® MULTIPUMP CONTROLLER

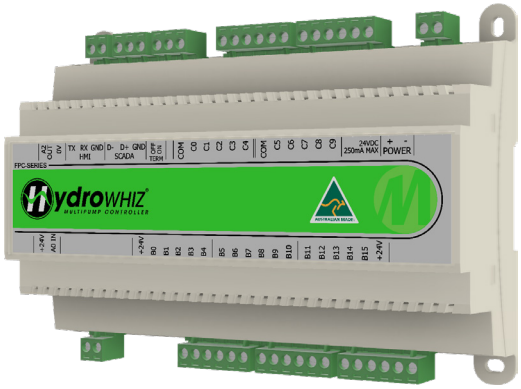
MATelec® AUSTRALIA

OPERATION MANUAL

HydroWHIZ Pump Controllers - DOL & Soft Start

V1.5

Single Phase - FPC-63X41 (1-6 Pumps)
Three Phase - FPC-63X43 (1-6 Pumps)



CONTENTS

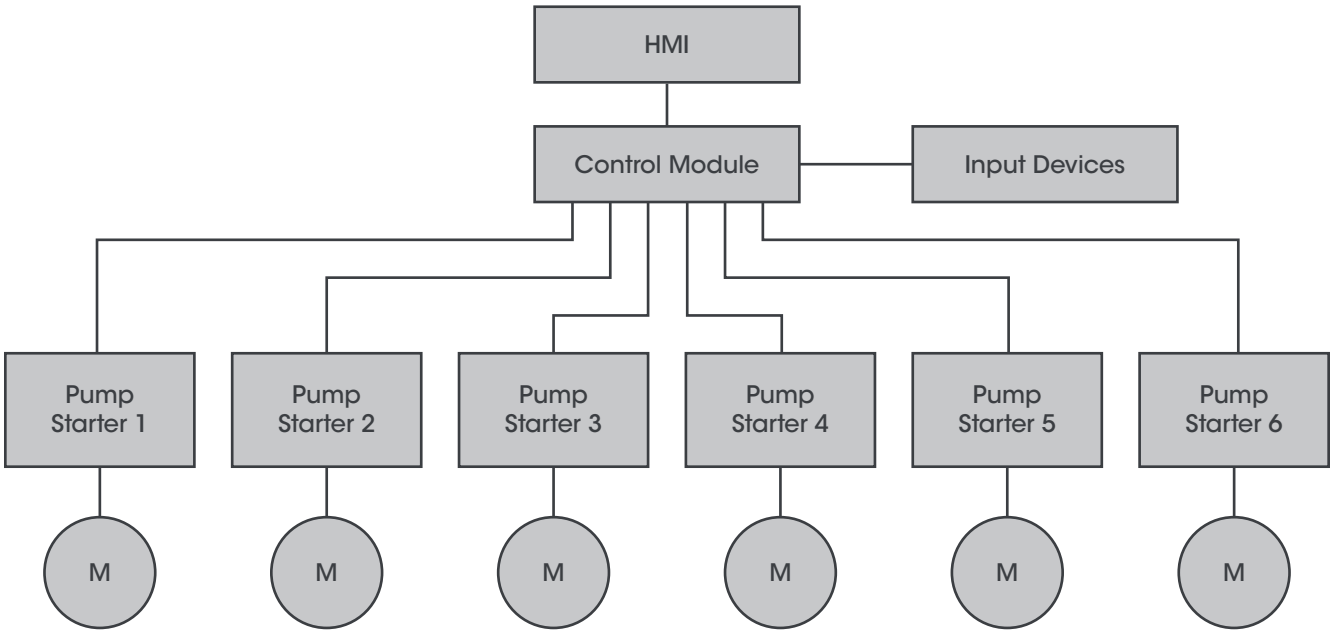
INTRODUCTION

The HydroWHIZ Controller has been designed with ease of use at the core of the system design. Building on the wealth of the pump control features in the Advanced controller, the HydroWHIZ brings these features into a new age with a color touch screen interface and a streamlined setup process. In a world where information is power the HydroWHIZ has extensive time and date stamped alarms, logged data, trend graphs and diagnostic pages to provide the user with all the information required for optimisation and preventative maintenance. Featuring the flexibility of level, pressure and temperature system modes with a wide range of functions and protections, the HydroWHIZ controller is ideal for a wide range of applications including water transfer, stormwater and sewage pump out, pressure boosting, hot water circulation and chiller supply, to name a few.

This Operation Manual applies to the HydroWHIZ DOL (Direct On Line) and Soft Start versions, and the BMS, SMS (ME-Link), CS (Current Sensing) and RMC (Rain/Mains Changeover) variations to these. For specific setup instructions for each version, see the relevant Quick Start Guide. For more information on the ME-Link Module found in the SMS variation, see the ME-Link Operation Manual.

OVERALL SOLUTION

Electrically, the HydroWHIZ Controller is comprised of three main components: The control module, the pump starters (for 1-6 pumps) and the Human Machine Interface (HMI). The following diagram depicts the basic layout:



SAFETY

This control panel has been designed and built for applications that are Commercial and/or Industrial in nature, operation, function and location. If the control panel is to be used in Domestic/Residential applications, where specific Wiring Rules in respect of 'electrical supply' protection may apply, it is the responsibility of the installing electrician to ensure compliance with relevant standards.

- Prior to installation, ensure power supply is isolated.
- Power supply must be circuit breaker protected (qualified electrician to determine appropriate amp rating).
- Electrical connection to the panel must be carried out in accordance with the following pages.
- Additions or modifications to the control panel are not permitted and will void warranty.
- The controller is not intended for use by children or infirm persons without supervision.
- Repairs to the controller must only be carried out by a suitably qualified electrician.

This manual makes use of the following symbols to indicate warnings that must be paid specific attention to:

Damage to equipment or personal harm may occur if this instruction is not followed

Electrical risk (electrocution hazard) may occur if this instruction is not followed

FUNCTIONS & FAULT PROTECTION - GENERAL

MULTI PUMP CONTROL

The HydroWHIZ controller can control up to 6 pumps in any number of Duty/Duty assist/Standby configurations. In the setup the number of pumps connected is set by *number of pumps*. The number of duty assist pumps, that is the maximum number of pumps running at one time, is set by *pump limit*.

SYSTEM TYPES & CONTROL DIRECTION

The HydroWHIZ controller has the ability to operate three system types: Level, Pressure & Temperature control. In each of these types the controller can operate in either direction; filling or emptying a tank in level mode, raising or lowering pressure in pressure mode and cooling or heating in temperature mode. This flexibility makes the HydroWHIZ controller suitable for a wide range of applications, including pressurised water supply, water transfer, stormwater and sewerage pump out, hot water circulation and chiller supply, to name a few. The functions and protections specific to each system type are explained on the following pages.

DUTY SHARING & ALTERNATION

The duty pump will alternate after the *duty change period* entered in the setup, to the pump with the least run hours. When duty alternates, the original duty pump will remain on for 10 seconds while the new duty pump is starting to ensure a bumpless transfer. Duty will also alternate after the system wakes up from sleep, or if a pump is shut down due to a fault.

SYSTEM ENABLE INPUT

In addition to the digital inputs used for pump control and low/high protection, the HydroWHIZ controller features a System Enable input which is used to enable and disable the system in auto mode. This could be controlled by auxiliary sensors from tanks, irrigation systems or BMS systems, for example.
In Level Fill mode, this input can be used for supply tank low level protection, shutting down the system when the supply tank, if in use, runs out of water. In Level Empty mode this input can be used for destination tank high level protection, shutting down the system when the destination tank, if in use, is full. These features are ideal for transfer pumping applications.

MANUAL MODE

An individual pump can be put in manual in both the auto and manual system modes. To put a pump into manual touch on the pump to access the pump's screen, make sure it is enabled and press the manual toggle to enable manual operation.
If the system is in auto mode, the pump will run in manual if there are no system lockout faults. If the system is put into manual mode all the system protections are overridden, allowing the pumps to run manually. After 10 minutes in this mode the system will revert back to the auto mode.

BMS & SCADA

The HydroWHIZ controller features a single digital volt free output for common fault and a single analog 0-10Vdc output that mirrors the analog input feedback signal. The BMS variation features additional volt free outputs for power on, high level, individual pump run and individual pump fault as standard, see 'HydroWHIZ BMS Variation' on page 40 for more information. For more advanced interface ability, the HydroWHIZ features Serial RS485 connections for communicating with SCADA systems over Modbus RTU protocol, providing full remote monitoring and control of the system.

PROTECTION MODES

There are many different protection triggers which can be used for alarm or pump protection. Most of these protections are setup with auto reset triggers which will reset the protection function once the auto reset conditions have been met. Below are the most common modes which can be chosen.

- **Alarm -** Once the trigger condition has been met an alarm will be activated and a time and date stamp added the fault history when it occurred. This mode will not stop the pumps from running.
- **Lockout** - Once the trigger condition has been met an alarm will be activated and a time and date stamp added the fault history when it occurred. In addition to the alarm all the pumps will be stopped and locked out of operation until a manual or auto reset has occurred.
- **Inhibit** - Instead of activating an alarm there are times when the pumps need to be stopped or paused until a trigger condition is removed. In these cases an alarm is not necessary. In 'inhibit' mode all the pumps will be stopped but no alarm will be activated. Once the auto reset condition has been met the pumps will resume normal system operation. To view which trigger is inhibiting the system when 'Inhibit' is displayed on the system state go to the Alarms screen and it will show the active trigger. The inhibit condition will not log as a fault in the alarm history.

These protection modes apply to high and low level, pressure and temperature protection, and pump cycle protection, which are explained on the following pages.

PUMP ANTI-SEIZE PROTECTION

For systems that have extensive pump idle times the anti-seize feature will run a pump for 5 seconds if it pump has not run for 7 days. Every pump has an individual pump idle timer to ensure each pump is prevented from seizing. This timer counts in any system state, but will only run the pumps in the following modes: Sleep, off, disabled or inhibit. If system is in the 'auto running' state the controller will wait until the system goes to sleep before running any pumps that have reached their anti-seize timer. This feature can be enabled or disabled in the setup.

PUMP CYCLE PROTECTION

If the system has a faulty non-return valve or similar fault where it can fail to maintain pressure, a lot of energy can be wasted due to continual pump starting and stopping (cycling). If the system goes to sleep but wakes up within 5 seconds 10 times within an hour, the pump cycle fault will be activated. This protection can be set to alarm, lockout or inhibit in the setup.

MAX RUN PROTECTION

The max run protection protects the system when pumps run continuously without stopping, as would occur in the event of a burst pipe. If the *Max run fault protection* is set to 'Alarm' and a pump is running continuously for the *Max run fault delay* a pump fault will be activated. If set to 'Pump', the pump will be inhibited. After a random delay between 30 seconds and 10 minutes, the controller will restart the pump. If the pump runs for less than the *Max run fault delay*, the fault will be reset. If the fault condition is met again, however, the pump will be inhibited again. After 5 consecutive failed restart attempts a pump lockout will occur. If the *Max run fault protection* is set to 'System' and all available pumps are running continuously for the *Max run fault delay,* the system will be inhibited. After a random delay between 30 seconds and 10 minutes, the controller will restart the system. If not all the available pumps run for a period of 60 seconds, the fault will be reset. If the fault condition continues to be met, however, the system will be inhibited again. After 5 consecutive failed restart attempts a system lockout will occur.

NO FLOW PROTECTION

A flow switch may be connected to the low level alarm input, instead of a float switch, to provide no flow protection. If a pump is running but there is no flow in the system for 30 seconds, the *no flow protection* will be activated. If the *no flow protection* is set to 'Alarm', an alarm only will occur. If set to 'Pump' the pump will be inhibited and another pump brought into operation. If set to 'System' the whole system will be inhibited. After 30 minutes, the controller will attempt to restart the inhibited pump or system. If flow is achieved for period of 30 seconds, the fault will be reset. If the pump or system is still unable to achieve flow, however, it will be inhibited again. After 5 consecutive failed restart attempts, a pump or system lockout will occur and the fault will require manual reset.

ANALOG FAULT PROTECTION

If the analog input is in use and the feedback signal drops below 3mA for 2 seconds, the A0 input fault will be triggered and the system will lockout, shutting down all the pumps. If the fault condition is removed the A0 input fault will automatically reset and the system will resume normal operation.

THERMAL OVERLOAD PROTECTION

Each individual pump controlled has its own thermal overload protection to protect the motor from excessive current draw. See 'Thermal Overload Data' on page 18 for more information.

SOFT STARTER PROTECTION (SOFT START VERSION)

Each pump has its own soft starter, slowly increasing voltage to the motor during startup to lower inrush current, control starting torque and reduce mechanical shocks to the system. Deceleration time can also be added to slowly ramp down pumps if required. See 'Soft Starter Data' on page 20 for more information on setting up the Soft Starter.

THERMAL SWITCH PROTECTION

In addition to thermal overload or soft starter protection, three phase panels have inputs for thermal switch connections for each pump which will protect the pump motor from damage due to overheating. Both the thermal overload fault and thermal switch protections will trigger a pump fault on the HMI screen.

FUNCTIONS & FAULT PROTECTION - LEVEL CONTROL

CONTROL DIRECTIONS

In level operation there are two modes, 'fill' and 'empty', which work opposite to one other. 'Empty' will increase the number of pumps running as the level rises to keep a tank empty whereas 'fill' will increase the pumps running as the level falls to try and fill the tank.

SENSOR CONTROL

In the 'Level' *System type*, the HydroWHIZ can be controlled by float switches, a 4-20mA hydrostatic level transducer or both, submerged in a tank or pit. The float inputs are always enabled so if they are not required leave them as open contacts, except for the low level when in empty mode or high level when in fill mode, which will need to be bridged out. These inputs are setup as fail safes in the event of other digital input or analog sensor failures. **Note -** The analog input is unavailable on the CS variation of the HydroWHIZ, as it is already used for pump current sensing.

WAKEUP & SLEEP

As the level in the tank rises or falls (depending on the *control direction)* and the duty start float switch closes and/or the analog *wakeup level step* from the *setpoint stop level* is reached, the duty pump will start, after a 1 second delay. Once the water level returns to the analog *setpoint stop level*, and/or the duty stop float switch closes, the controller will stop the duty pump and go to sleep, after the *sleep delay* period entered in the setup.

PUMP STAGING & DESTAGING

Additional pumps will be staged into operation to assist the duty pump after the standby start digital input close and/or each analog *standby start level step* from the *wakeup level step* is reached. There is a 3 second staggered start delay between multiple DOL pumps starting to prevent excessive current draw and reduce water surge. The *pump limit* will limit the number of standby pumps that can be used to assist the duty pump, keeping additional pumps available only on a pump fault.
Pumps will be destaged as the previous pump start input opens and/or the analog level returns past each previous *standby start level step*, or in the case of the 1st standby pump, when the duty start float opens and/or the analog *wakeup level step* from the *setpoint stop level* is reached. This delayed pump stopping results in less pump cycling and smoother level control operation. There is a 1 second staggered stop delay between multiple DOL pumps stopping to prevent excessive current draw and reduce water hammer.

MAINTAIN MINIMUM LEVEL

If the *system type* is set to 'level' and *control direction* to 'empty', the duty pump will start if the digital duty stop input is closed and/or the analog level is above the *setpoint* for a period of 4 hours, but the pumps have not run due to the level not reaching the duty start input or the analog *wakeup level step*. This helps to maintain the minimum level in the tank.

MAINS TANK TOP UP VALVE CONTROL

For systems requiring a backup water supply in addition to the primary supply, the tank top up function can be used to maintain a minimum water level in the storage tank, ensuring no loss of water supply. In such instances, a normally closed valve can be controlled to open and close based on set levels in the storage tank. This feature can be enabled in the level setup by turning the *top up valve enable* setting on, if the level analog is enabled. The turn on and turn off levels are set via the *top up on threshold* and t*op up off threshold* respectively. The off level must be set higher than the on level for this function to operate correctly. **Note -** The valve output is not included as standard, available upon request (not available on the CS variation however, as the analog input is used for current sensing, not a level transducer).

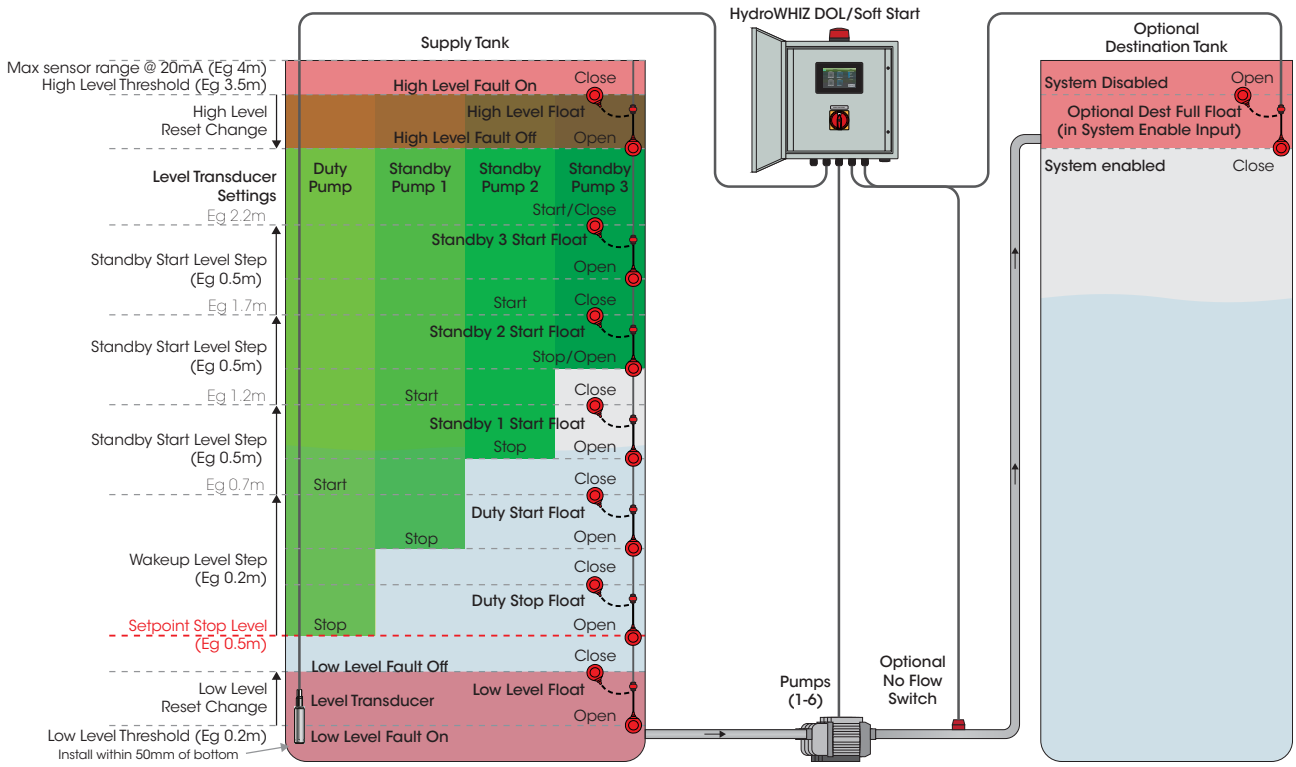
HIGH LEVEL PROTECTION

The high level fault is triggered 3 seconds after the high level input opens (fill *control direction*) or closes (empty *control direction*), and/or the analog *high level threshold* is reached. It automatically resets 3 seconds after the high level input closes (fill *control direction*) or opens (empty *control direction*), and/or the analog value drops 0.2m below the *high level threshold*. This protection can be set to alarm, lockout or inhibit in the setup.

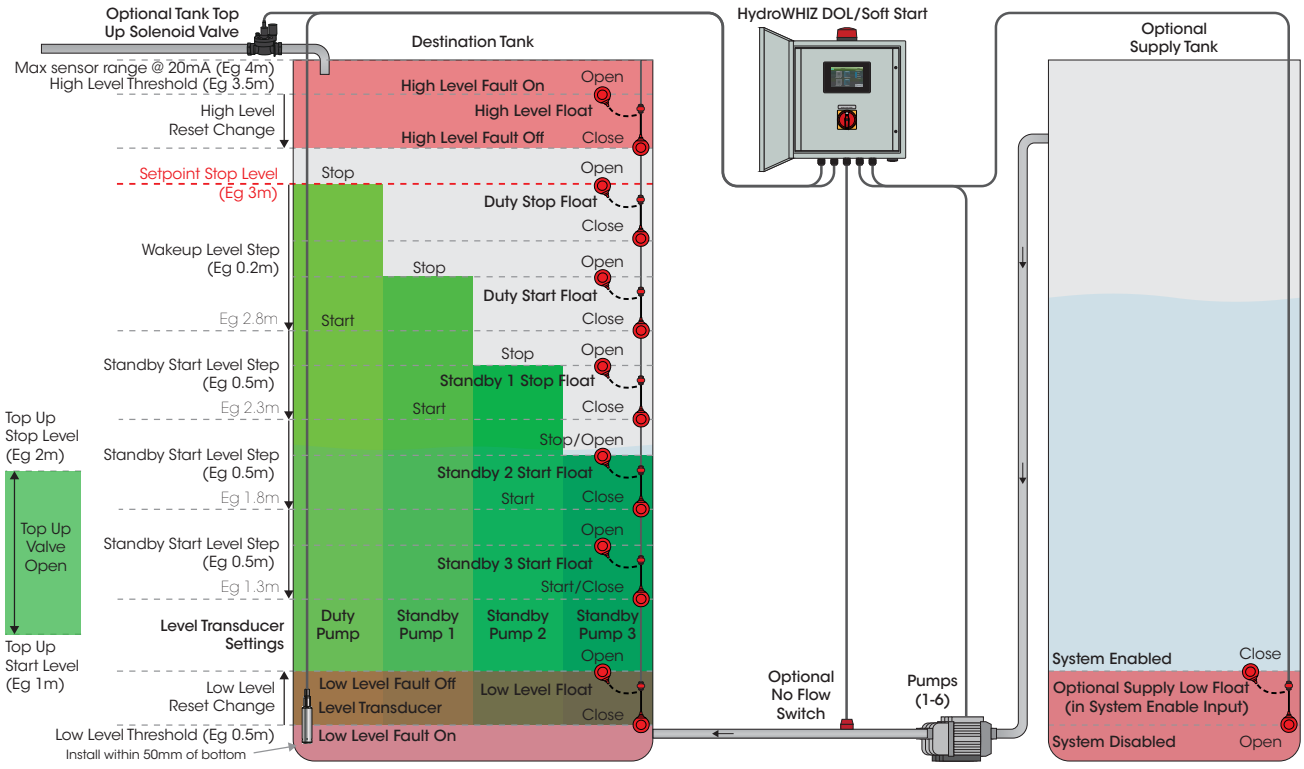
LOW LEVEL PROTECTION

The low level fault is triggered 3 seconds after the low level input opens (empty *control direction*) or closes (fill *control direction*), and/or the analog *low level threshold* is reached. The low level fault is automatically reset 3 seconds after the low level input closes (empty *control direction*) or opens (fill *control direction*), and/or the analog value rises 0.2m above the *low level threshold*. This protection can be set to alarm, lockout or inhibit in the setup.

LEVEL EMPTY APPLICATION DIAGRAM



LEVEL FILL APPLICATION DIAGRAM



Note:

- These diagrams show the connection options and settings for a HydroWHIZ controller configured to control 4 pumps (max is 6). The number of pump start inputs varies based on the number of pumps that the controller is built to control.
- Typically the pump starting and stopping would be controlled by either the analog or digital input, not both. Backup high and low digital inputs are commonly used in conjunction with analog input, however.

FUNCTIONS & FAULT PROTECTION - PRESSURE CONTROL

SENSOR CONTROL

In the 'pressure' *System type*, the HydroWHIZ can be controlled by pressure switches, a 4-20mA pipe mounted pressure transducer or both. The pressure switch inputs are always enabled so if they are not required then leave them as open contacts, except for high pressure, which needs to be bridged. The high pressure input is setup as a fail safe in the event of other digital input or analog sensor failures. This allows the pressure switches to work with the analog sensor for control or just for low and high pressure protection. **Note -** The analog input is unavailable on the CS variation of the HydroWHIZ, as it is already used for pump current sensing.

WAKEUP & SLEEP

As the system pressure falls and the duty pump pressure switch closes, and/or the analog *wakeup pressure drop* from *setpoint* is reached, the duty pump will start, after a 1 second delay. Once the water level returns to the analog *setpoint* and/or the duty pump pressure switch opens, the controller will stop the duty pump and go to sleep, after the *sleep delay* period entered in the setup.

PUMP STAGING & DESTAGING

Additional pumps will be staged into operation to assist the duty pump after the standby start digital inputs close and/or each analog *DOL standby start pressure step* from the *wakeup pressure drop* is reached. There is a 3 second staggered start delay between multiple DOL pumps starting to prevent excessive current draw and reduce water surge. The *pump limit* will limit the number of standby pumps that can be used to assist the duty pump, keeping additional pumps available only on a pump fault.
Pumps will be destaged from operation as each pump's pressure switch input opens and/or as the analog value returns past each previous *DOL standby start pressure step, or in the case of the 1st standby pump,* when the *wakeup pressure drop* from the *setpoint* is reached. There is a 1 second staggered stop delay between multiple DOL pumps stopping to prevent excessive current draw and reduce water hammer.

MAINS WATER BYPASS VALVE CONTROL

For systems supplying water from a storage tank, a normally open solenoid valve can be used to supply water when the pumping system is out of water or in a fault condition. This is enabled through the pressure setup by turning on the *mains bypass valve enable.* **Note -** This function is available upon request. The RMC variation features the valve output as standard, see 'HydroWHIZ RMC Variation' on page 42 for more information.

JACKING PUMP CONTROL

For situations where one pump is smaller than the other pumps to suit lower flow rates, the *jacking pump* can be enabled in the setup. In this mode the jacking pump will always be the first to wake from sleep. If the jacking pump can't keep up with demand one of the main pumps will start and the jacking pump will turn off after 10 seconds, to ensure a smooth transition. When the main pumps are no longer required, the jacking pump will start and the last main pump running will switch off after 5 seconds. If the jacking pump is also not required to run the system will go to sleep and await the next wakeup signal.

HIGH PRESSURE PROTECTION

The high pressure fault is triggered 3 seconds after the high pressure input opens and/or the analog *high pressure threshold* is reached. It automatically resets 20 seconds after the high pressure input closes and/or the analog value drops 50kPa below the *high pressure threshold.* This protection can be set to alarm, lockout or inhibit in the setup.

LOW PRESSURE PROTECTION

The low pressure fault is triggered 30 seconds after the low pressure (duty stop) input closes and/or the analog *low pressure threshold* is reached. The low pressure fault is automatically reset 60 seconds after the low pressure (duty stop) input opens and/or the analog value rises 50kPa above the *low pressure threshold.* This protection can be set to alarm, lockout or inhibit in the setup. The inhibit mode for the low pressure fault features automatic restart attempts, as explained below.

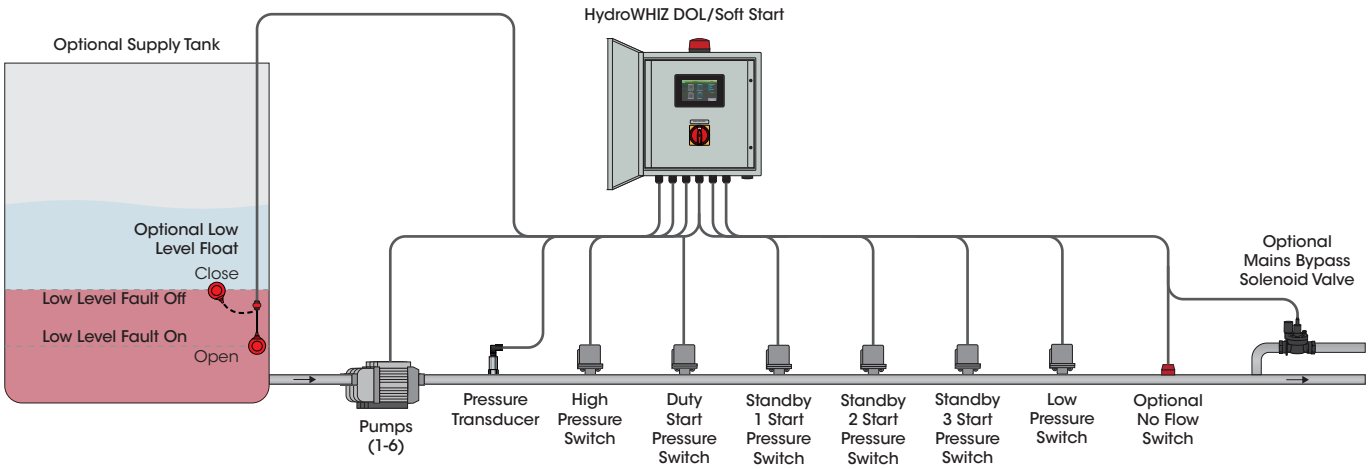
LOW PRESSURE AUTO RESTART

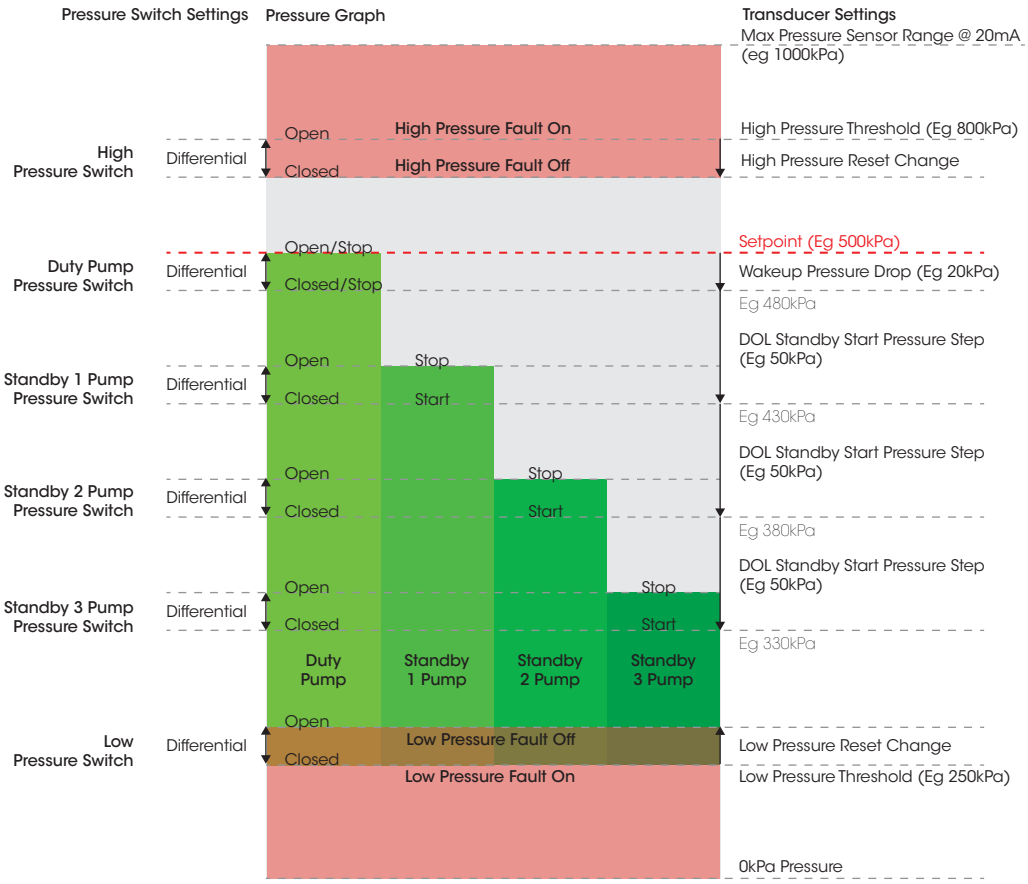
If the *Low pressure protection* is set to 'Inhibit', the controller will automatically attempt to restart the system even if the reset conditions are not met. This allows the system to try to run a pump and re-pressurise the system after a low pressure event without user intervention. 60 seconds after the system being inhibited due to a low pressure fault, the controller will attempt to restart a pump and build pressure. If the pressure rises 50kPa above the analog *low pressure threshold* and/or the low pressure (duty stop) input opens for 60 seconds, the fault will be reset and the system will resume normal operation. If the low pressure fault condition continues, however, the system will be inhibited again. After 5 consecutive failed restart attempts, the system will be locked out and the fault will require manual reset.

LOW LEVEL PROTECTION

In the Pressure *system type,* the low level input may be used for a low level float switch in a supply tank, shutting down the pumps when this input opens to prevent them from running when there is no water available.

PRESSURE BOOST APPLICATION DIAGRAM





Note:

- This diagram show the connection options and settings for a HydroWHIZ controller configured to control 4 pumps (max is 6). The number of pump start inputs varies based on the number of pumps that the controller is built to control.
- Typically the pump starting and stopping would be controlled by either the analog or digital input, not both. Backup high and low digital inputs are commonly used in conjunction with analog input, however.

FUNCTIONS & FAULT PROTECTION - TEMPERATURE CONTROL

CONTROL DIRECTIONS

In the Temperature *System type*, there are two modes, 'heat' and 'cool', which work opposite to one other. 'Cool' will start pumps as the temperature rises to maintain a low temperature whereas 'heat' will start pumps as temperature falls to try and maintain a high temperature. **Note -** The analog input is unavailable on the CS variation of the HydroWHIZ, as it is already used for pump current sensing.

SENSOR CONTROL

In the Temperature *System type*, the HydroWHIZ can be controlled by thermostats, a 4-20mA temperature transducer or both. Temperature inputs are always enabled so if not required leave them as open contacts except for high temperature in the heat mode and low temperature in the cool mode, which need to be bridged. These inputs are setup as fail safes in the event of other digital input or analog sensor failures.

WAKEUP & SLEEP

As the temperature rises or falls, depending on the *control direction,* and the duty pump thermostat closes and/or the analog *wakeup temperature step* from *setpoint* is reached, the duty pump will start, after a 1 second delay. Once the water level returns to the analog *setpoint*, and/or the duty pump thermostat closes, the controller will stop the duty pump and go to sleep, after the *sleep delay* period entered in the setup, if the *sleep mode* is set to 'Setpoint based'. If the *sleep mode* is set to 'None', however, the duty pump will always remain running to circulate water, and will alternate every *duty change period*.

PUMP STAGING & DESTAGING

Additional pumps will be staged into operation to assist the duty pump after the standby start digital inputs close and/or each analog *standby start temp step* from the *wakeup temperature step* is reached. There is a 3 second staggered start delay between multiple DOL pumps starting to prevent excessive current draw and reduce water surge. The *pump limit* will limit the number of standby pumps that can be used to assist the duty pump, keeping additional pumps available only on a pump fault.
Pumps will be destaged as each pump's thermostat input opens and/or the analog value returns past each previous *standby start temp step,* or in the case of the 1st standby pump, when the *wakeup temperature step* from the *setpoint* is reached. There is a 1 second staggered stop delay between multiple DOL pumps stopping to prevent excessive current draw and reduce water hammer.

HIGH TEMPERATURE PROTECTION

The high temperature fault is triggered 3 seconds after the high temperature input opens *(heat control direction)* and/or the analog *high temperature threshold* is reached. It automatically resets 3 seconds after the high temperature input closes (heat *control direction*) or the analog value drops 2.0°C below the *high temperature threshold.* This protection can be set to alarm, lockout or inhibit in the setup.

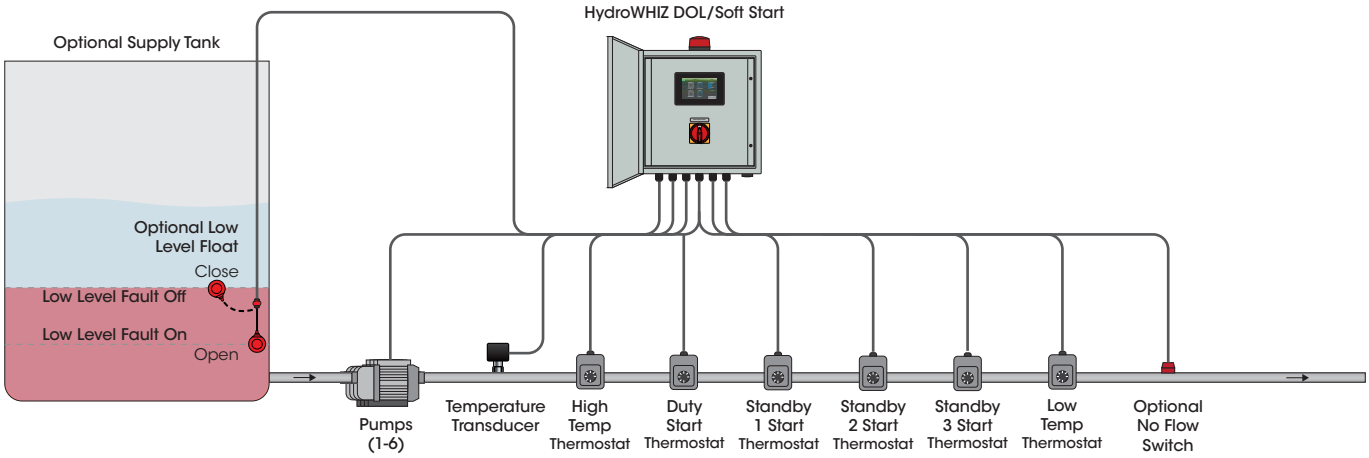
LOW TEMPERATURE PROTECTION

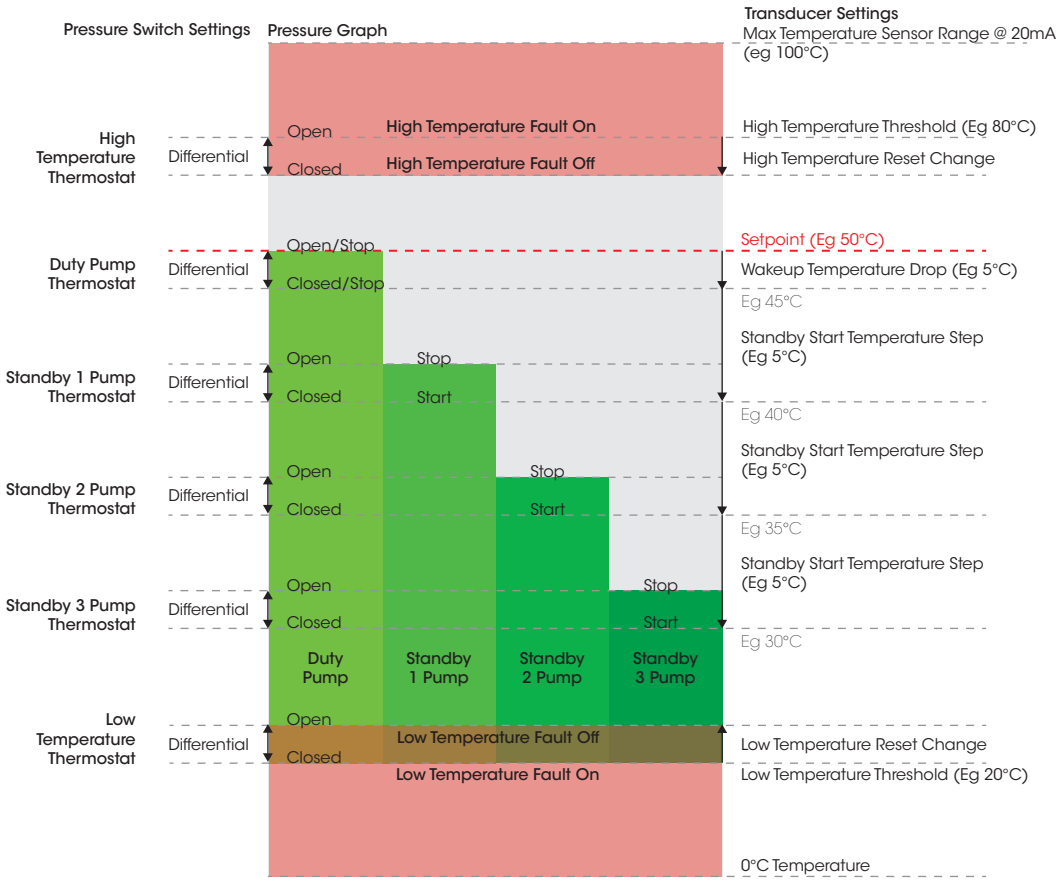
The low temperature fault is triggered 3 seconds after the low temperature (duty stop) input closes *(heat control direction)* and/or the analog *low temperature threshold* is reached. The low pressure fault is automatically reset 3 seconds after the low temperature (duty stop) input opens *(heat control direction)* and/or the analog value rises 2.0°C above the *low temperature threshold.* This protection can be set to alarm, lockout or inhibit in the setup.

LOW LEVEL PROTECTION

In the Temperature *System type*, the low level input may be used for a low level float switch in a supply tank, shutting down the pumps when this input opens to prevent them from running when there is no water available.

TEMPERATURE HEAT APPLICATION DIAGRAM





Note:

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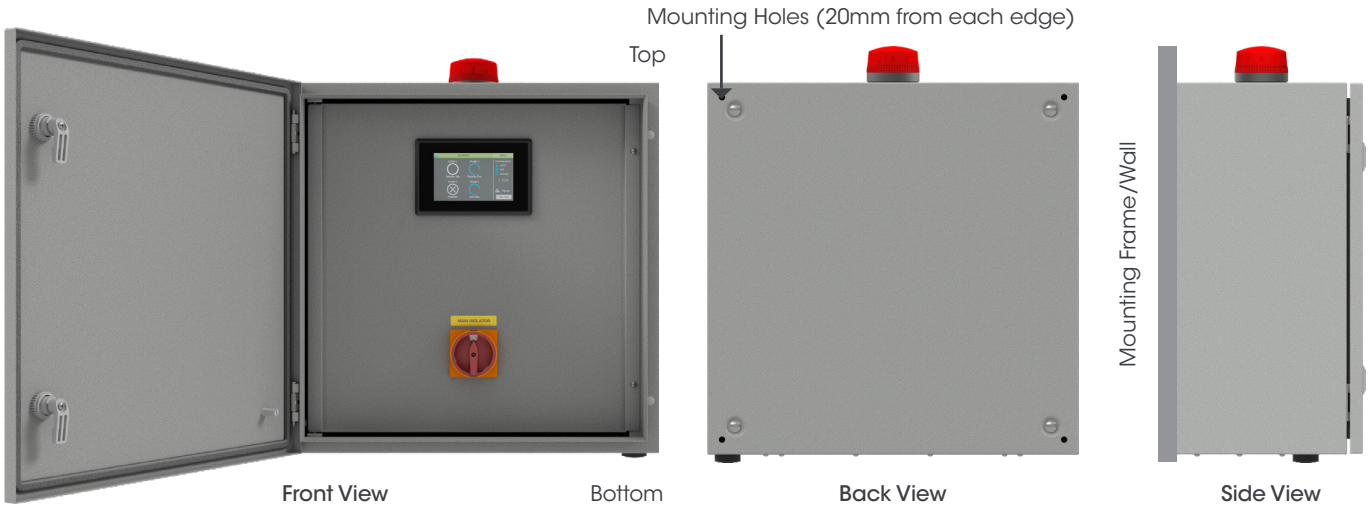
- Typically the pump starting and stopping would be controlled by either the analog or digital input, not both. Backup high and low digital inputs are commonly used in conjunction with analog input, however.

INSTALLATION

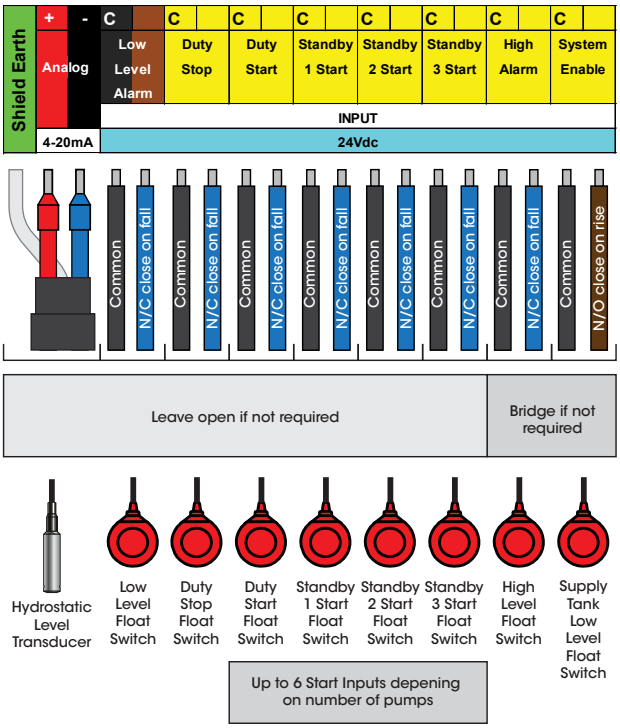
- Controller enclosure must be mounted in a vertical position.
- Ensure mounting method does not compromise enclosure weatherproof rating.
- Ensure access to main isolator is not restricted.
- Ensure cables/conduits entering the panel have mechanical protection and that the penetrations are sealed and do not compromise the weatherproof rating of the enclosure.
- If required, install buzzer through hole on underside of enclosure and tighten lock ring.



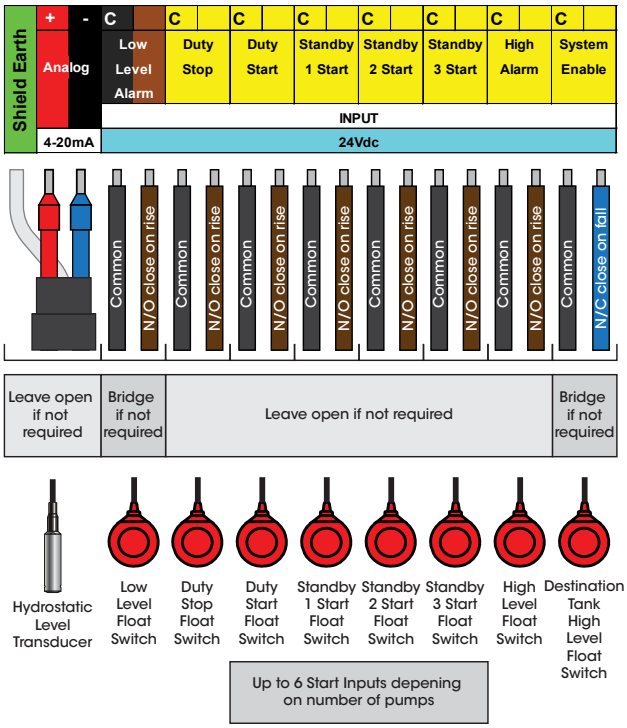
CONNECTIONS

Warning: All electrical connections must be carried out by a suitably qualified and registered electrician

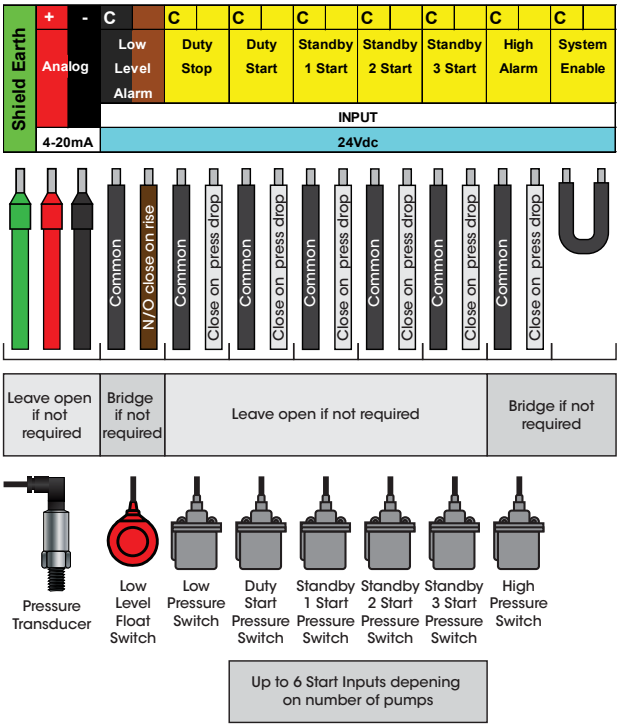
LEVEL FILL CONTROL CONNECTIONS



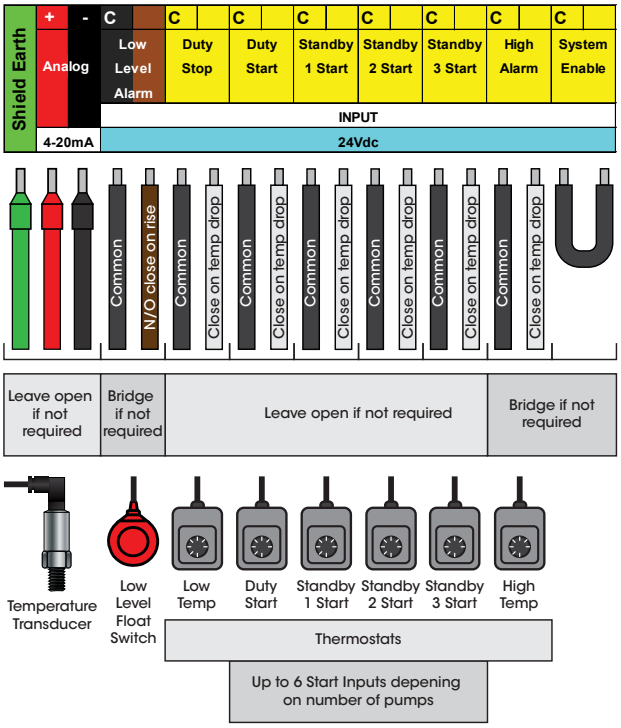
LEVEL EMPTY CONTROL CONNECTIONS



PRESSURE BOOST CONTROL CONNECTIONS



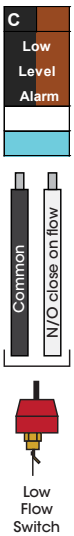
TEMPERATURE HEAT CONTROL CONNECTIONS



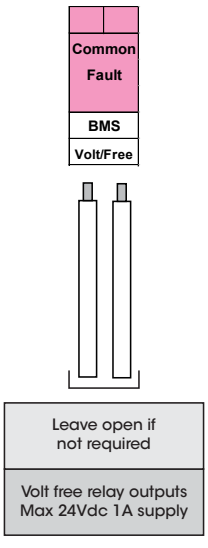
Note:

- The CS variation of the HydroWHIZ does not include din rail terminals for the analog input, as the analog input on the control module is already used for pump current sensing.
- The above shows the full range of connections available. Not all connections are necessary for operation. For example, if the analog input is in use, digital inputs for starting the pumps would typically not be used. Refer to the controller's **Inner Door Label** for common connections.
- An analog 0-10V output and Modbus RTU Serial RS485 connections for SCADA are also available on the HydroWHIZ control module. Din rail terminals are not provided as standard for these connections, but they can be wired directly to the module. See 'Control Module Connections' on page 16 for more information.

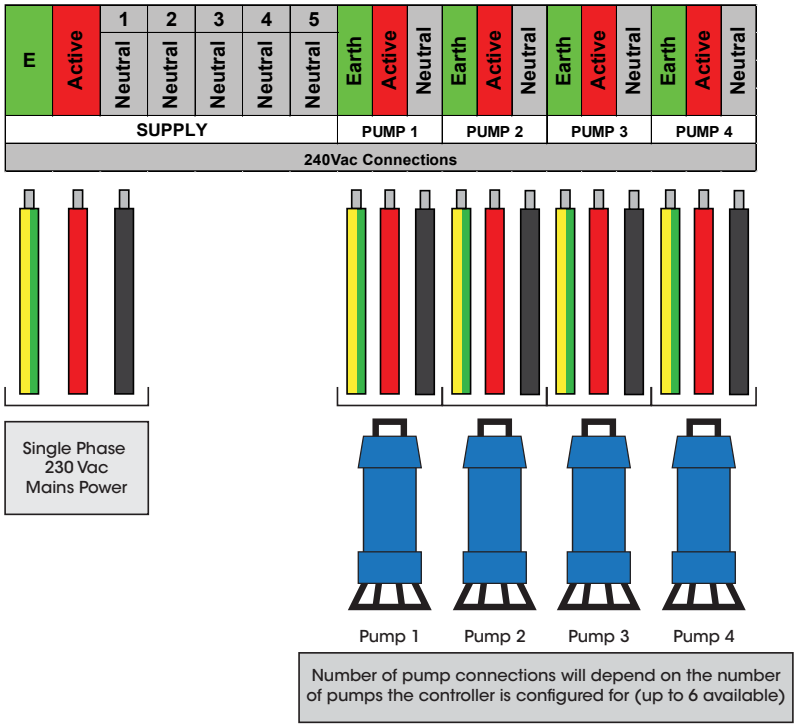
NO FLOW CONNECTION (INSTEAD OF LOW LEVEL)



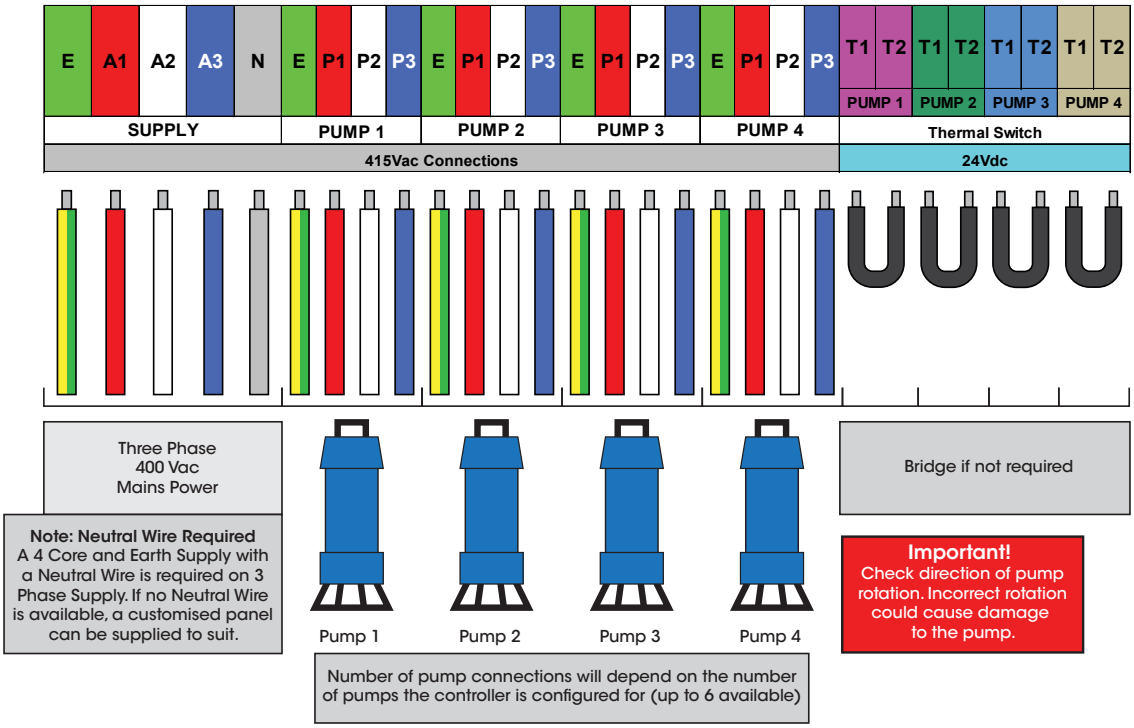
VF CONNECTIONS



1 PHASE POWER SUPPLY & PUMP CONNECTIONS (DOL VERSION)



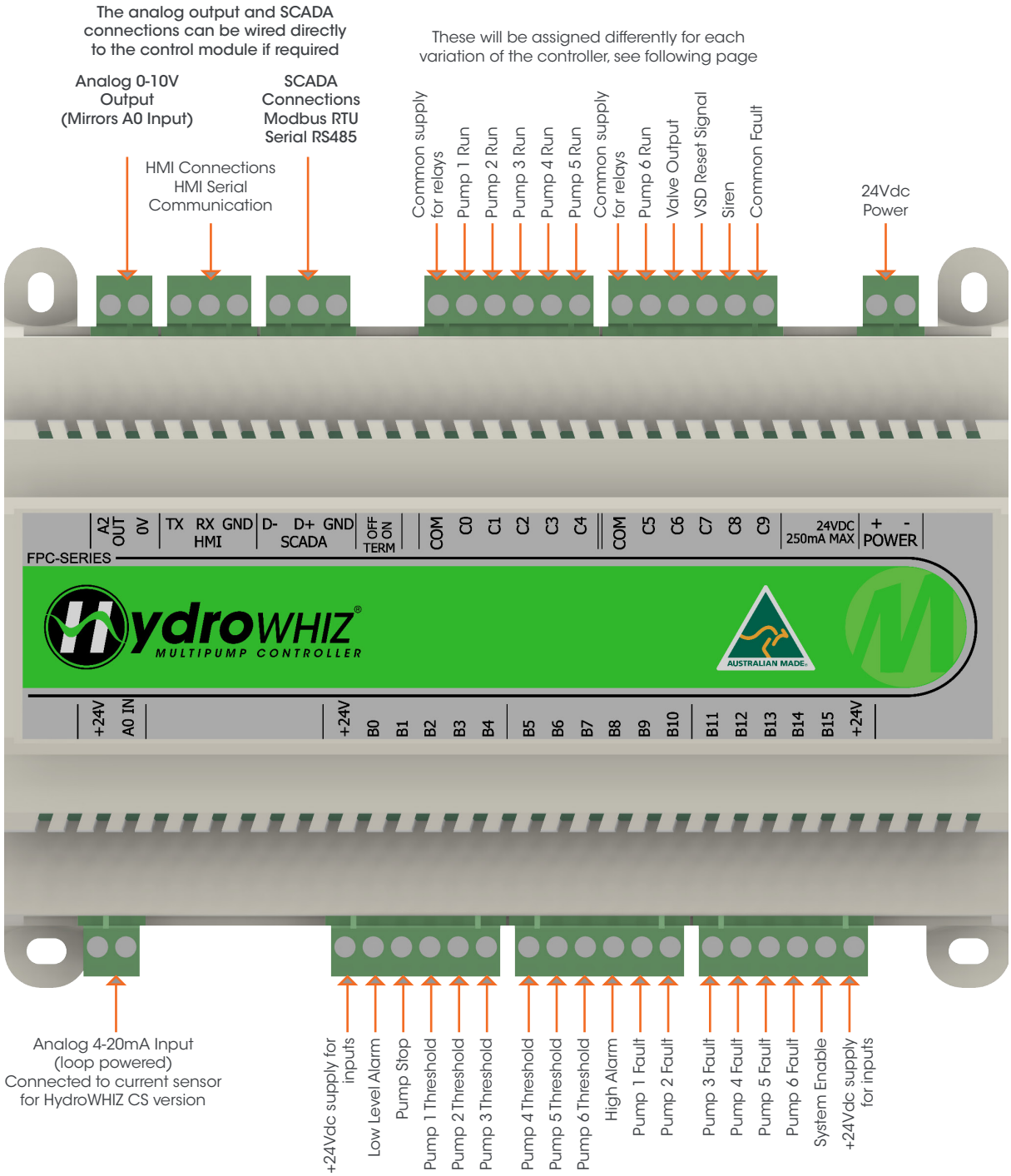
3 PHASE POWER SUPPLY & PUMP CONNECTIONS (DOL & SOFT START VERSIONS)



CONTROL MODULE CONNECTIONS

DEFAULT CONNECTIONS

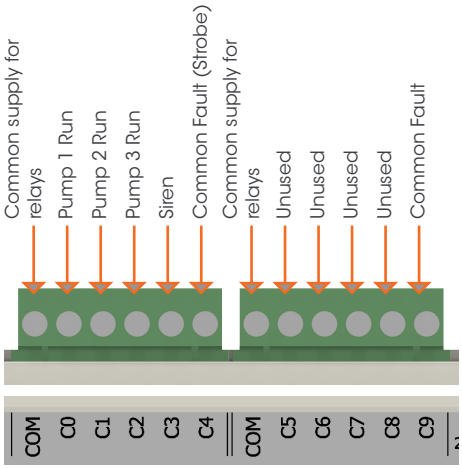
The below connections are the default connections for the HydroWHIZ control module. These connections will be consistent on each controller, except for the relay outputs (C0 to C9). The relay outputs will be assigned in the most efficient way for each variation of the HydroWHIZ DOL or Soft Start to minimise the number of additional relays and circuitry needed to provide all the outputs required for operation.
If the controller's parameters are factory reset on the diagnostics HMI screen, the control module's outputs will reset back to this default configuration. The outputs will need to be reassigned as required in the parameters screen (parameters 19.X). Also, for the CS variation, the current sensing will also need to be re-enabled. See 'HydroWHIZ CS Variation' on page 45 for more information.
See 'Parameters' on page 29 for information on the operation of the Parameters screen.



OUTPUTS - STANDARD AND CS VARIATIONS (1-3

These outputs apply to the standard and Current Sensing variations of the HydroWHIZ DOL Controller, configured to control 1-3 pumps. For 4-6 pumps, the control module connections will differ as additional pump run outputs will be required on the board.

See the controller's circuit diagram for specific connections.



For the control module output assignments for other HydroWHIZ variations, see:

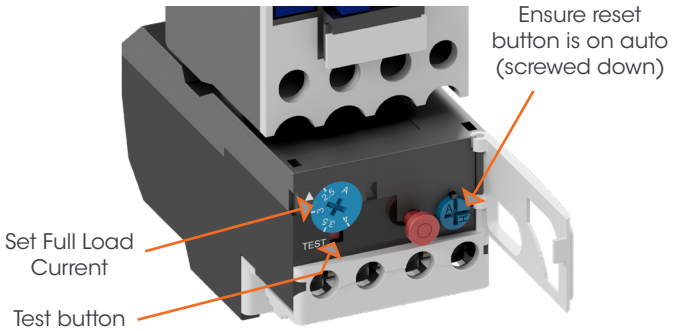
- **BMS variation -** See 'HydroWHIZ BMS Variation' on page 40.
- **SMS variation -** See 'HydroWHIZ SMS Variation' on page 41.
- **RMC variation -** See 'HydroWHIZ RMC Variation' on page 42.

THERMAL OVERLOAD DATA

THERMAL OVERLOAD SETUP

The full load current (FLC) is written on the name plate of the pump and is required to be set on the thermal overload for the pump or motor's protection. If this value is set too high, there is potential that the pump may be damaged. If set too low the pump will go into fault prematurely during normal operation. Ensure power is isolated before opening the enclosure to set the thermal overloads. The auto reset button should be left in auto (screwed down) so that the controller can latch and reset the faults from the HMI screen without the need to access the live parts.

	THREE PHASE		
CAT.NO.	JM3550		
SPEC.	35F84W7		
FRAME	56J	SER.	F1295
H.P.	1 1/2T		E
VOLTS	208-230/460		
AMPS	7.6/2.3		
HZ	50		



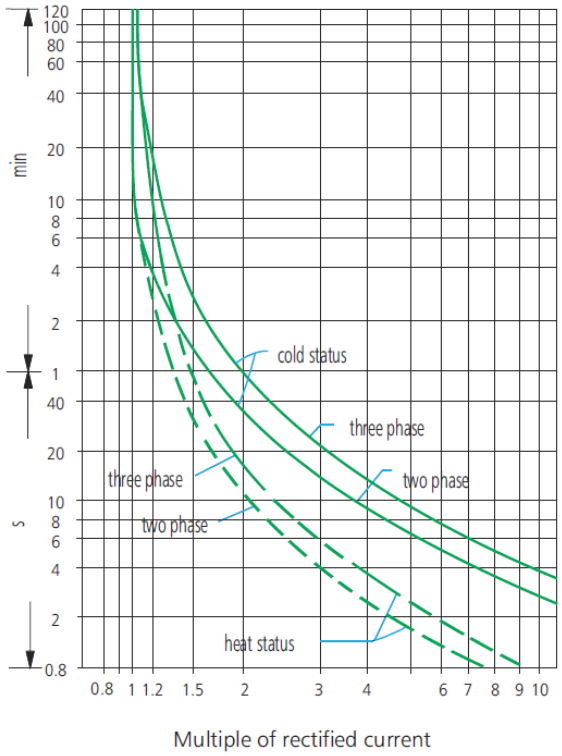
The thermal overload is designed to open the starting circuit and thus cut the power to the motor in the event of the motor drawing too much current from the supply for an extended time. The overload relay has a normally closed contact which opens due to heat generated by excessive current flowing through the circuit. To test the thermal overload is working correctly put a pump into manual run and while running hold in the test button with a small screw driver for 5-10 seconds. This should simulate excessive current and activate a pump fault.

TRIP CURVES

The current sensing circuits can measure a maximum of 11x the full load current. The trip time will vary based on the temperature of the overload, as can be seen in the adjacent graph. If cold, the fastest trip time is approximately 2.5 seconds and once warmed up the fastest time is reduced to approximately 800ms. Key times to trip are:

Multiple of Overload Setting for 3PH and Heat Status	Trip Time
1x	Will not trip
1.05x	Approx 8 minutes
1.5x	Approx 1 minute
5x	Approx 2.3 seconds
10x	Approx 800 milliseconds

As for thermal relay specific time-current characteristic curve, please see the graph to the right.



COOLDOWN

By nature of their construction, bimetallic strip based overloads have an automatic cooldown time after a trip event before the overload can be reset. When an overload condition results in the unit switching off the pump the cooldown will begin. The time for bimetallic strip cooldown is affected by the surrounding ambient temperature and the multiple of rectified current. During the cooldown period it will not be possible to reset the overload fault for that pump. Typically there will have been a sufficient period of time between the fault being triggered and a technician arriving on site for the cooldown time to have elapsed anyway.

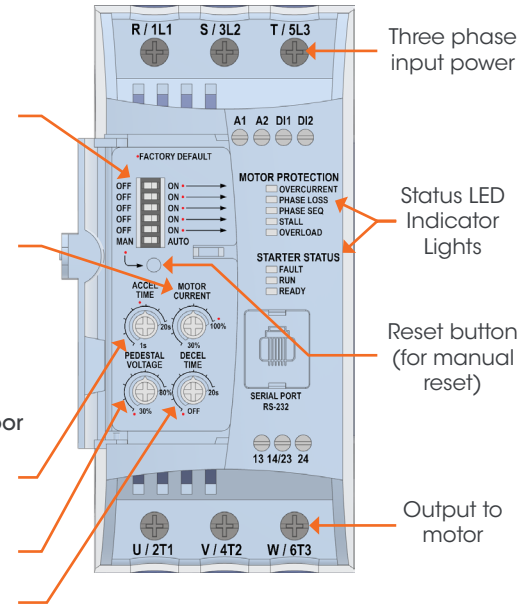
SOFT STARTER DATA (WEG SSW05)

The soft starter is rated for 10 starts per hour with 6s acceleration time, 4x FLC at 40°C. Care must be taken to limit pump starts to within the manufacturer's specification. Going beyond these limits will reduce the acceptable number of starts per hour.

- **Setting the protection dipswitches -** The soft starter protections are not required, because an external overload is in use to protect the pump motors. All dipswitches should be left in the OFF position to ensure that the soft starter is only providing soft start and stop. If turned on, the protections may cause nuicance tripping and pump faults.
- **Setting the Motor Current -** Although an external overload is in use it is recommended to set this correctly. This value is a ratio of the soft starter max current and the driven motor full load current. The soft starter max current should be written on the access door. If not, check the sticker on the side of the soft starter.
  Calculation example:
  Soft starter max current: 30A, motor FLC: 25A
  $I_{motor} / I_{soft\ starter}$ = 25A/30A = 0.833, x100 = 83.3%
  Motor current setting = 88% (set approx 5% above actual value).

Max SS Amps on Access door

- **Setting the Acceleration Ramp Time -** Set the acceleration ramp time for the motor to reach full speed. Exceeding 6 seconds will reduce the acceptable number of starts per hour.
- **Setting the Stating/Pedestal Voltage -** For high starting current motors, set the starting/pedestal voltage high enough to get motor rotation started.
- **Setting the Deceleration Ramp -** If required, adjust deceleration to reduce water hammer. This will reduce the acceptable number of starts per hour.



SOFT STARTER PROTECTIONS

Protection Description	Display	Activation
Overcurrent	Overcurrent LED	Monitoring is activated only when the Soft Starter is in rated duty (100% voltage). It trips when the motor current exceeds 3 times the value set with the Motor Current trimpot for a time greater than 1 second. Note - This protection is not required and is turned off as default on the HydroWHIZ controllers, as external overloads are used to protect the pump motors.
Phase Loss	Phase Loss LED	**At start -** Acts when there is no voltage at the power supply terminals or when motor is disconnected. **In duty (100% voltage) -** Acts 1 second after phase loss has been detected both at the motor input and output. It acts when the current flowing through the soft starter is over x% of the value set on the Motor Current trimpot, where x%= x% = 20% if Motor Current trimpot setting is between 50% - 100% x% = 30% if Motor Current trimpot setting is between 30% - 50% It also acts when a current unbalance larger than 30% is detected between the phases. Note - This protection is now turned off as default on the HydroWHIZ controllers.
Incorrect Phase Sequence	Phase Seq LED	Trips when in incorrect phase sequence. Note - This protection is not required and is turned off as default on the HydroWHIZ controllers.
Locked Rotor	Stall LED	Trips during the transition between the end of the acceleration ramp time and the contact closure of the internal by-pass relays of the Soft Starter, when the current flowing though the Soft Starter is higher than or equal to 2 times the current set with the Motor Current trimpot. Note - This protection is not required and is turned off as default on the HydroWHIZ controllers.
Motor Overload Protection	Overload LED	Monitors constantly the motor current and compares it with the value set by the Motor Current trimpot. Note - This protection is not required and is turned off as default on the HydroWHIZ controllers, as external overloads are used to protect the pump motors.
Overcurrent of the Soft Starter By-pass relay	Internal Fault LED Flashes 5 times	Monitors only when the Soft Starter is operating at full voltage (100%). Is activated when the current is higher than the adjusted value for more than 1 second. The activation level is 60A for 3-30A Soft Starters, and 200A for 45-85A Soft Starters. The internal fault LED flashes 5 times intermittently.
Overcurrent before By-pass	Internal Fault LED Flashes 4 times	Trips during the transition between the end of the acceleration ramp time and the contact making of the internal bypass relays of the Soft Starter, when the current flowing through the Soft Starter is equal to or higher than the rated level. The activation level is 37.5A for 3-30A Soft Starters, and 200A for 45-84A Soft Starters.
Thyristor Overload	Internal Fault LED Flashes 6 times	Monitors the current that flows through the Soft Starter during the acceleration and deceleration ramp time, and compares it with the rated current of the Soft Starter. Trips when the thyristors are overloaded. The internal fault LED flashes 6 times intermittently.
Frequency out of tolerance	Internal Fault LED Flashes once	Trips when the line frequency is out of range (+/- 10%), when compared with the rated frequency (50 or 60Hz). The internal fault LED flashes once intermittently.
Internal By-pass relay contact is open	Internal Fault LED Flashes 3 times	Monitors if the contact of the internal by-pass relay of the Soft Starter is operating at full voltage (100%). The internal fault LED flashes 3 times intermittently.

SOFT STARTER PROTECTIONS

Protection Description	Display	Activation
Undercurrent	Internal Fault LED Flashes 8 times	Monitors only when the Soft Starter reaches steady-state (100% of voltage). Acts when the current that flows through the Soft Starter is lower than a certain percentage of current set on the Motor Current trimpot, for a certain time period. Note - This protection is not required and is turned off as default on the HydroWHIZ controllers.
Undervoltage in the Control Supply	Internal Fault LED Flashes 2 times	Monitors the control supply voltage of the electronics (A1 and A2) constantly and trip always when Vac voltage becomes lower than 80% of the rated voltage. The internal fault LED flashes 2 times intermittently.
Ready to operate	Ready LED	On - Soft Starter has been powered on and is waiting for the enable command, or with full voltage at output. Flashing - Soft Starter is in acceleration/deceleration ramp time

See 'Soft Starter Fault Diagnosis' on page 39 for more information on the Soft Starter faults.

MOTOR OVERLOAD PROTECTION

Note - The motor overload protection is turned off by default in the HydroWHIZ controllers, as external overloads are in use to protect the pump motors. The motor overload electronic protection simulates the heating and cooling of the motor, also known as the thermal image. This heating simulation uses an input data the true RMS current. Figure 1 below shows the curve of the actuation time with the motor under overload condition. The temperature class of this function is IEC 947-4-2, Class 10.

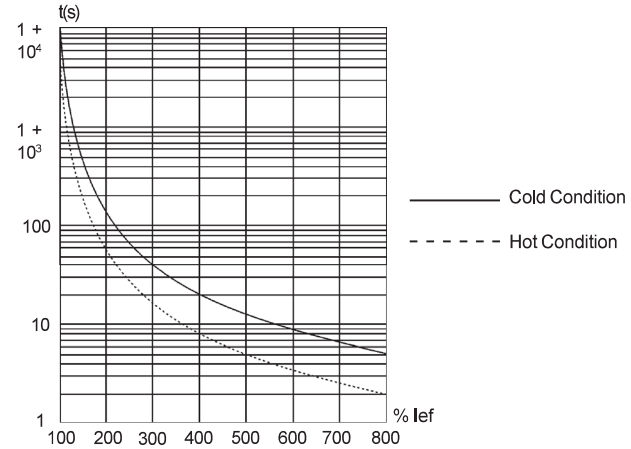


Figure 1 - Curve of the motor electronic overload protection.

Note: When the Soft Starter electronics (A1 and A2) are without power control supply voltage, the thermal image is saved internally. When the power supply voltage is re-established again (A1 and A2), the value of the thermal image returns to the value preset before the loss of power.

THYRISTOR OVERLOAD PROTECTION

When the motor is running at full voltage, the cooling of the thyristor overload thermal image occurs, due to the by-pass of the thyristors.

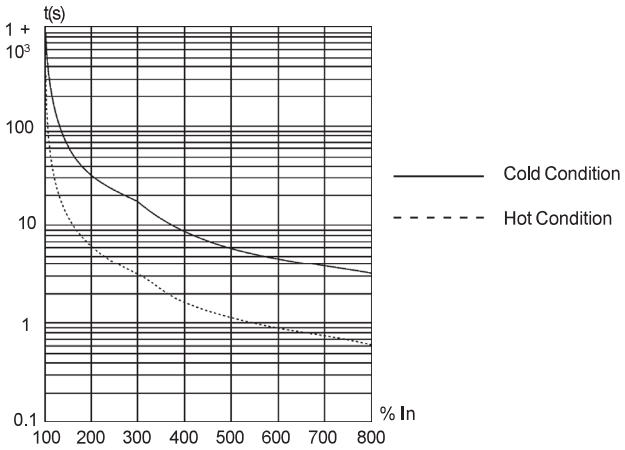


Figure 2 - Curve of the thyristor overload.

Note: The thyristor image is not saved in the internal Soft Starter memory. When the Soft Starter is restarted, the value of the thyristor image assumes zero.

SOFT STARTER AUTOMATIC RESET

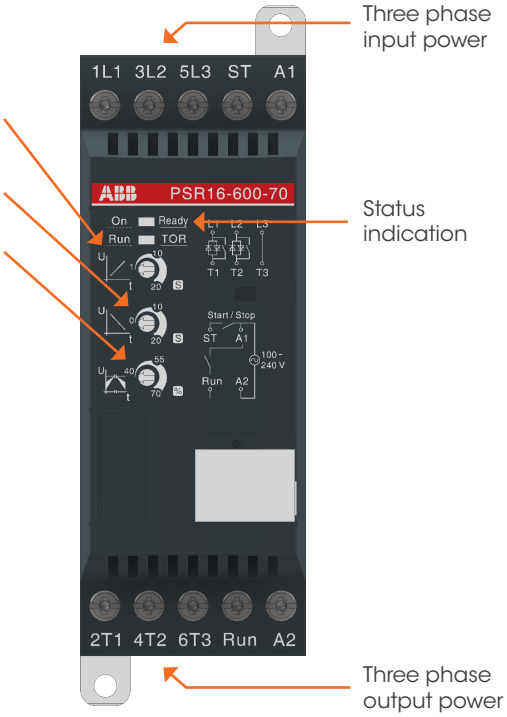
The Soft Starter provides an automatic reset by setting the dipswitch to the AUTO position. This feature must be used so that pump faults can reset via the controller's HMI.

- The automatic reset occurs after 15 minutes for the following fault conditions - Overcurrent, phase loss, locked rotor, immediate overcurrent of the Soft Starter By-pass relay, overcurrent before bypass, frequency out of tolerance, contact of the internal bypass relay is open and power control supply undervoltage. To reset these sooner, a power cycle is required.
- For incorrect phase sequence and overcurrent there is no automatic reset. A power cycle will be required to reset these faults.
- For motor overload and thyristor overload there is a specific algorithm for the automatic reset time.

SOFT STARTER DATA (ABB PSR)

The soft starter is rated for 10 starts per hour with 6s acceleration time, 4x FLC at 40°C. Care must be taken to limit pump starts to within the manufacturer's specification. Going beyond these limits will reduce the acceptable number of starts per hour.

- **Setting the Start Ramp Time -** Set the acceleration ramp time for the motor to reach full speed. Exceeding 6 seconds will reduce the acceptable number of starts per hour.
- **Setting the Stop Ramp Time -** If required, adjust deceleration to reduce water hammer. This will reduce the acceptable number of starts per hour.
- **Setting the Initial Voltage -** For high starting current motors, set the initial voltage high enough to get motor rotation started.



STATUS INDICATION

On/Ready indicator light:

- Flashing - Soft Starter control circuit is powered (A1 & A2)
- Steady - Soft Starter has mains voltage (L1, L2 & L3) and is ready to run

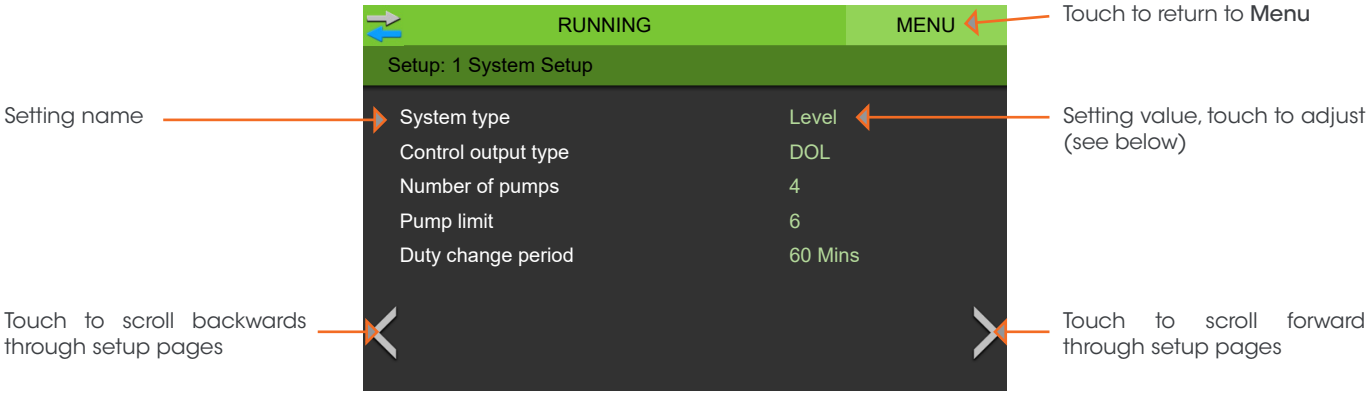
Run/TOR indicator light:

- Flashing - Soft Starter is ramping the voltage to the pump up or down
- Steady - Soft Starter is at top of ramp, running the pump at full voltage

SETUP

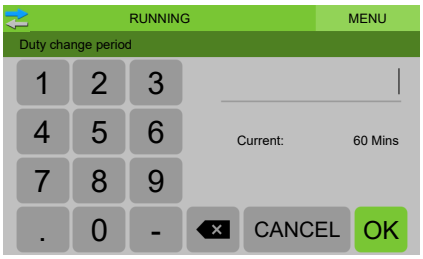
The Setup Screen is where the controller is configured for operation. To access the Setup from the Main screen, tap on the menu in the top-right corner, then tap the Setup icon. Login is required to access this screen. For the login see 'Login' on page 25
If the system mode is in auto, tapping on a setting will bring up a warning screen. Press OK to turn the system off to prevent any unexpected behaviour while the system is configured.
The pages following the System Setup page will change depending on whether the 'Level', 'Pressure' or 'Temperature' *system type* is selected, allowing users to adjust settings that are specific to each mode.
After the setup is complete the system mode needs to be changed back to auto on the main screen.

SETUP SCREEN OPERATION



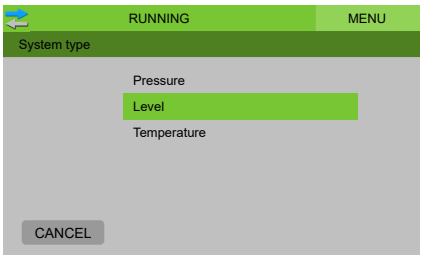
Setting Adjustment - Value

If a value setting, such as *Duty change period*, is pressed on, the keyboard screen will appear and the desired value can be entered or the process cancelled.



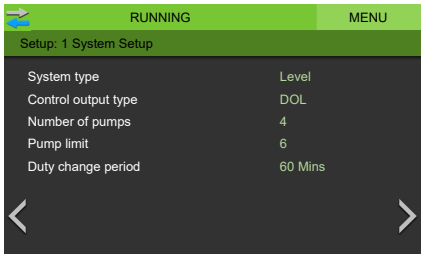
Setting Adjustment - Selection

If a selection setting, such as *System type*, is pressed on, a drop down list of all the available options for the setting will appear and the desired option can be selected or the process cancelled.



1 - SYSTEM SETUP

The main setup for the system and pump control method. See 'Functions & Fault Protection' for more information on the function of the system.

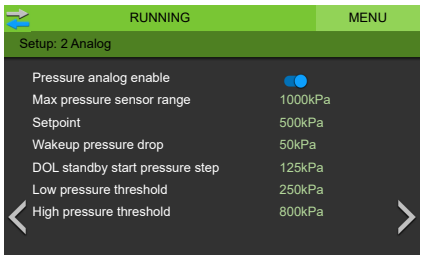


System type	Sets default system settings for the pressure, level or temperature system types.
Control output type	Sets default system settings for the DOL, Soft start or VSD controlled pumps. This setting is factory set and does not require adjustment.
Number of pumps	Total number of pumps connected which configures the display and pump selection. This setting is factory set and does not require adjustment.
Pump limit	Maximum number pumps to be running at the same time. Used to limit max flow or max power requirements.
Duty change period	Duty pump running time before initiating a duty change to the next pump.

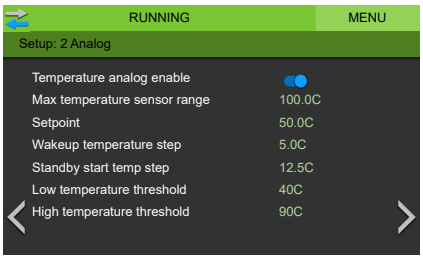
2 - ANALOG

The analog setup if using the analog input for a transducer. See 'Functions & Fault Protection' for more information on the analog settings and operation for each *system type*. If the analog input is not required, ensure it is disabled and skip this page. For the HydroWHIZ CS variation, see 'HydroWHIZ CS Variation' on page 44 for the Pump Current Protection screen which will appear instead.

Level Control



Pressure Control



Temperature Control

Level

Level analog enable	If enabled the analog input will be used in conjunction with the digital inputs for level control and alarms.
Max level sensor range	The maximum range of the analog level sensor used.
Setpoint stop level	Target *Setpoint stop level* to be reached by the system.
Wakeup level step	The analog level step from the *setpoint stop level* before the system will wake from sleep and start the duty pump. For example, in a level empty application, if the *setpoint stop level* = 0.5m and *wakeup level step* = 0.2m, the duty pump will start at 0.5m + 0.2m = 0.7m.
Standby start level step	The analog level steps from the *wakeup level step* at which the standby pumps start. Following on from the above example, if the *standby start level step* = 0.5m, the 1st standby pump will start at 0.5m + 0.2m + 0.5m = 1.2m. The 2nd standby pump will start after another 0.5m step, therefore at 1.7m, and so on for any additional standby pumps.
Low level threshold	When the analog goes below this threshold for 3 seconds the *Low level protection* will be activated.
High level threshold	When the analog goes above this threshold for 3 seconds the *High level protection* will be activated.

Pressure

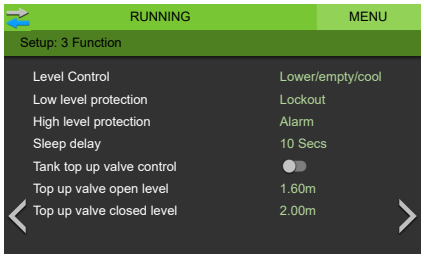
Pressure analog enable	If enabled the analog input will be used as well as the digital inputs for the pressure control and alarms.
Max pressure sensor range	The maximum range of the analog pressure sensor used.
Setpoint	Target *Setpoint* to be reached by the system.
Wakeup pressure drop	The analog pressure step below the *setpoint* before the system will wake from sleep and start the duty pump. For example, if the *setpoint* = 500kPa and the *wakeup pressure drop* = 50kPa, the duty pump will start at 500kPa - 50kPa = 450kPa.
DOL Standby start pressure step	The analog pressure steps below the *Wakeup pressure drop* at which the standby pumps start. Following on from the above example, if the *DOL standby start pressure step* = 100kPa, the 1st standby pump will start at 500kPa - 50kPa - 100kPa = 350kPa. The 2nd standby pump will start after another 100kPa drop, therefore at 250kPa.
Low pressure threshold	While a pump is running if the analog goes below this threshold for 30 seconds the *Low pressure protection* will be activated.
High pressure threshold	When the analog goes above this threshold for 3 seconds the *High pressure protection* will be activated.

Temperature

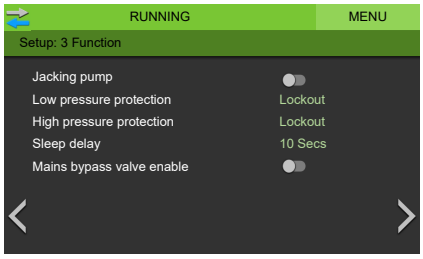
Temperature analog enable	If enabled the analog input will be used in conjunction with the digital inputs for the temperature control and alarms.
Max temperature sensor range	The maximum range of the analog level sensor used.
Setpoint	Target *Setpoint* to be reached by the system.
Wakeup temperature step	The analog temperature step from the *Setpoint* before the system will wake from sleep and start the duty pump.
Standby start temp step	The analog temperature steps from the *Wakeup temperature step* at which the standby pumps start.
Low temperature threshold	When the analog goes below this threshold for 3 seconds the *Low temperature protection* will be activated.
High temperature threshold	When the analog goes above this threshold for 3 seconds the *High temperature protection* will be activated.

3 - FUNCTION

The functional setup for the system. See 'Functions & Fault Protection' for additional information on the functions and protections of the system.



Level Control



Pressure Control

Temperature Control

Level

Level control	Sets the control direction for the corresponding *System type*. Level = empty/fill
Low level protection	Alarm = Triggers alarm only, Lockout = Triggers an alarm and shuts down the pumps, Inhibit = Shuts down the pumps only. All modes will auto reset when condition clears.
High level protection	Alarm = Triggers alarm only, Lockout = Triggers an alarm and shuts down the pumps, Inhibit = Shuts down the pumps only. All modes will auto reset when condition clears.
Sleep delay	The delay once the analog *Setpoint* is reached and all pump start inputs are open before the pumps will go to sleep.
Tank top up valve enable	If enabled the valve output will be used for a normally closed tank top up valve using the *Tank top up valve open level* and *Tank top up valve closed level*. **Note -** This feature is available upon request. Not available on the CS version of the HydroWHIZ.
Top up valve open level	The analog level at which the valve output will be energised to open the valve. Must be below the *Tank top up valve closed level*.
Top up valve closed level	The analog level at which the valve output will be de-energised to close the valve. Must be above the *Tank top up valve open level*.

Pressure

Jacking pump	If enabled jacking pump 1 will always be the first to wake from sleep. When it can't keep up with demand, one of the main pumps will start and the jacking pump will switch off after 10 seconds.
Low pressure protection	Alarm = Triggers alarm only, Lockout = Triggers an alarm and shuts down the pumps, Inhibit = Shuts down the pumps only and waits 60 seconds before auto restart. 5 failed restarts will active a lockout.
High pressure protection	Alarm = Triggers alarm only, Lockout = Triggers an alarm and shuts down the pumps, Inhibit = Shuts down the pumps only. All modes will auto reset when condition clears.
Sleep delay	The delay once the analog *Setpoint* is reached and/or all pump start inputs are open before the pumps will go to sleep.
Mains bypass valve enable	If enabled, the valve output will be used for a normally open mains bypass valve, energising it shut during normal operation and de-energising the valve open on digital low level, system off, disabled or lockout. **Note -** This feature is available as standard on the HydroWHIZ RMC version.

Temperature

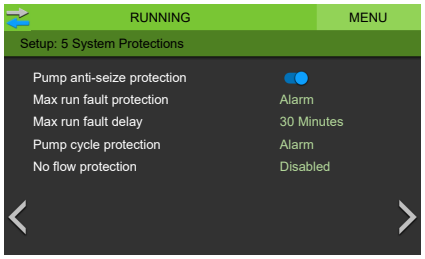
Temperature control	Sets the control direction for the corresponding *System type*. Temperature = cool/heat
Low temperature protection	Alarm = Triggers alarm only, Lockout = Triggers an alarm and shuts down the pumps, Inhibit = Shuts down the pumps only. All modes will auto reset when condition clears.
High temperature protection	Alarm = Triggers alarm only, Lockout = Triggers an alarm and shuts down the pumps, Inhibit = Shuts down the pumps only. All modes will auto reset when condition clears.
Sleep mode	None = System won't sleep, always at least 1 pump running, Setpoint based = System will go to sleep after the *sleep delay* when the analog *Setpoint* has been reached and/or all digital start inputs are open. Speed based = Not applicable in temperature operation.
Sleep delay	If *Sleep mode* = Setpoint based, this is the delay once the analog *Setpoint* is reached and/or all pump start inputs are open before the pumps will go to sleep.

4 - VSD

VSD setup is not required for DOL or Soft Start controllers, skip this page.

5 - SYSTEM PROTECTIONS

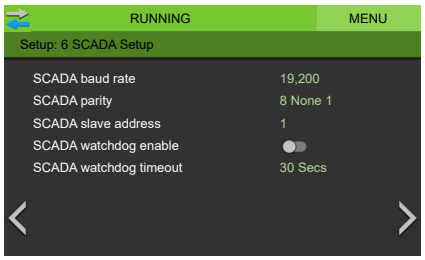
The optional additional system protections. See 'Functions & Fault Protection' for more information on the system protections.



Pump anti-seize protection	If any pump has not run for 7 days, the pump will be run for 5 seconds to prevent seizing, as long as the system mode is in sleep, disabled or inhibit.
Max run fault protection	Alarm = Alarm only if a pump runs continuously for the *max run fault delay*. Pump = If a pump runs continuously for the *Max run fault delay* then the pump will inhibited, with 5 restart attempts before locking out the pump. System = If all available pumps are running continuously for the *Max run fault delay* then the system will be inhibited, with 5 restart attempts before locking out the system.
Max run fault delay	The delay period that the pumps run continuously for, before the *Max run fault protection* is activated.
Pump cycle protection	If the system goes to sleep but wakes up within 5 seconds 10 times within an hour, the fault will be activated. Alarm = Alarm only, Lockout = Alarm and pump shut down.
No flow protection	Alarm = Alarm only if a pump runs with no flow for 30 seconds. Pump = If a pump runs with no flow for 30 seconds then it will be inhibited and another pump brought into operation. System = If a pump runs with no flow for 30 seconds then the system will be inhibited. The controller will attempt to restart the inhibited pump or system after a 30 minute delay. If 5 consecutive restarts fail to achieve flow the pump or system will be locked out. **Note -** This function uses a 'close on flow' flow switch connected to the low level alarm input instead of a low level float switch.

6 - SCADA SETUP

The SCADA setup for remote monitoring and control over the Modbus RS485 connection. See 'SCADA Communication' on page 30 for more information.



SCADA baud rate	The speed of the modbus communications.
SCADA parity	The bit format of the modbus packets.
SCADA slave address	The slave ID of the device. Each device on the one serial link must have a different device number.
SCADA watchdog enable	If enabled modbus register 3817 must be successful written =1 less than every *SCADA watchdog period* otherwise a SCADA watchdog alarm will be activated and the pumps shutdown. This is used as a 'Keep alive' function.
SCADA watchdog period	The delay after the last successful modbus command before the SCADA watchdog alarm would be activated.

HMI OPERATION

MAIN SCREEN

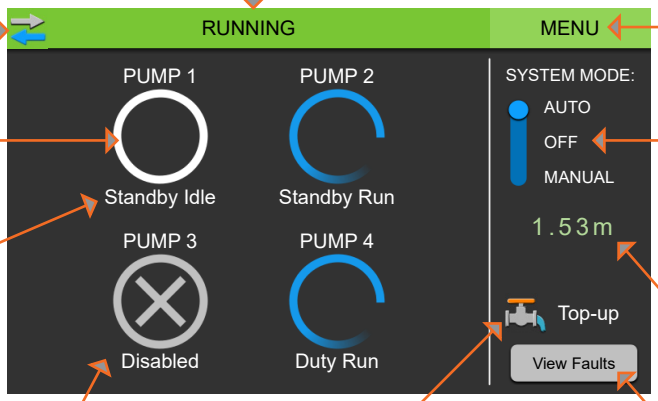
The default screen on the HydroWHIZ HMI, providing an overview of the system, pump and valve status and auto/off/manual control.

System Status (see 'Diagnostics' on page 32 for list of system states)

HMI Communication Status, HMI is communicating with module if symbol is flashing

Touch to go to individual **Pump** screen for additional information and auto or manual control

Pump status (see 'Diagnostics' on page 34 for a list of pump states)



Touch to go to **Menu** screen for access to other HMI screens

Touch to change the **System Mode** to auto, off or manual. Manual mode will override the system protections if individual pump manual operation is required (login required).

Current analog reading based on level, pressure or temperature selection in the setup (pump running amps will display on CS version)

Touch to access **Alarms** screen to view current and historical alarms, mute siren and reset faults. Button flashes red when there is an active fault.

The number of pumps displayed on this screen is based on the selection in the setup (1-6 pumps)

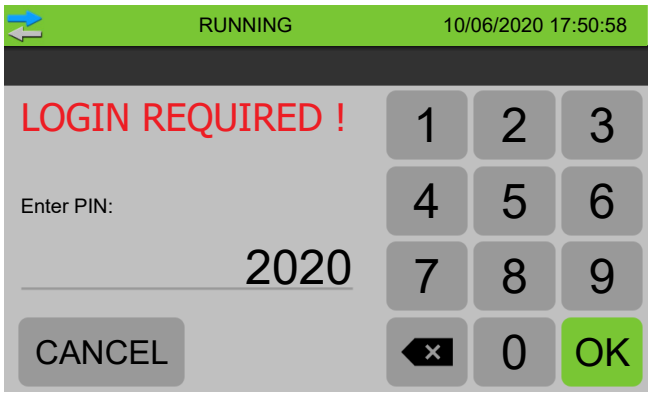
Valve status if a tank top up or bypass valve is enabled in the setup


Valve Closed


Valve Open

LOGIN

Login is required for performing various actions on the HMI, such as putting the system in manual mode, resetting logged data and configuring the controller on the setup screens. The default PIN is 2020.



PUMP SCREEN

The individual pump monitoring and control screen.

Touch to access **Menu** screen

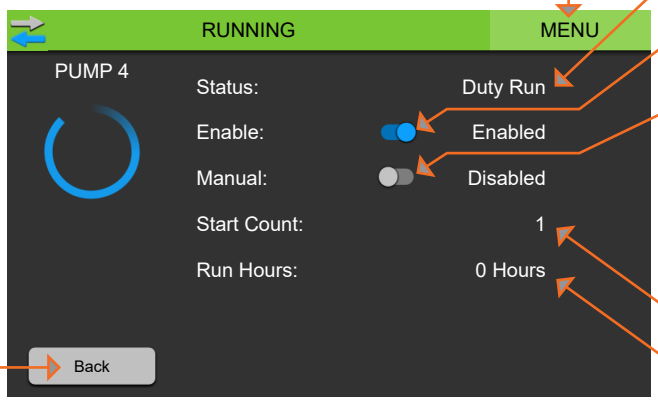
Pump status (see 'Diagnostics' on page 34 for a list of pump states)

Touch to enable or disable the pump

Touch to enable or disable pump manual mode. If this is enabled the pump will override the automatic controls and run if no lockout faults are active. The pump enable switch must also be on for this to function.

Number of pump starts

Number of pump run hours



Touch to return to the **Main** screen

MENU

The Menu Screen provides access to the other screens within the HydroWHIZ HMI.

See 'Fault Diagnosis' on page 35 for information on this screen

See 'Logged Data' on page 28 for information on this screen

See 'Setup' on page 22 for information on this screen

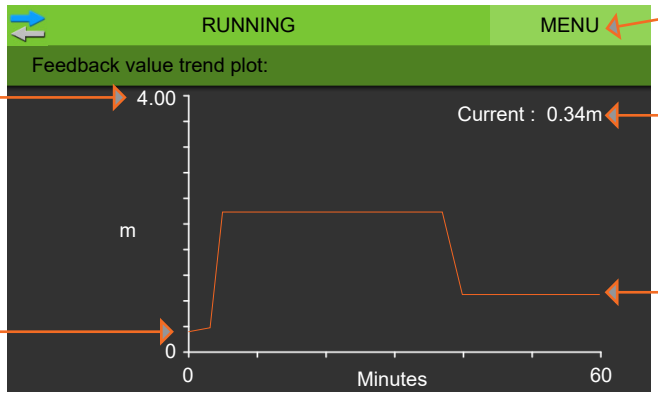
See 'Parameters' on page 29 for information on this screen

Current date and time. This must be set under the Set Time & Date screen (see below)

See 'Diagnostics' on page 32 for information on this screen

TREND PLOT

Displays a graph of the analog level, pressure and temperature value over the last 60 minutes, as well as the current value.



Maximum sensor range

Current analog reading

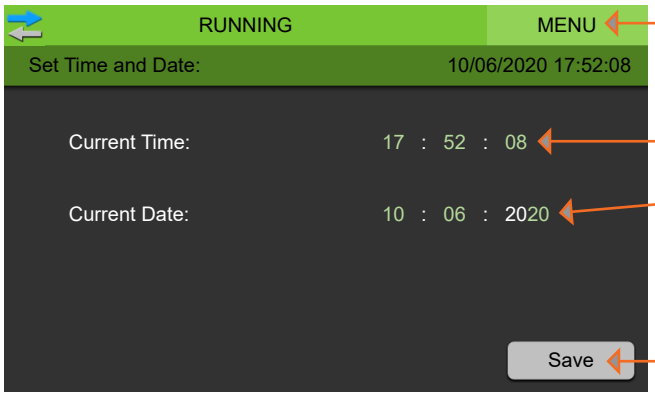
Touch to return to **Menu**

Current analog value

Analog value 60 minutes ago

SET TIME & DATE

Allows the user to set the current time and date.



Touch to return to **Menu**

Touch to adjust the time (set as 24 hour time)

Touch to adjust the date

Touch to apply above values to the controller

LOGGED DATA

SYSTEM LOGGED DATA

Displays various system event counters, overall system run hours and the next service due date.

RUNNING | MENU

Logged Data: System | Faults 1 | Faults 2 | Pumps

30.1 Power Cycle Count	1	Reset
30.2 Sleep Count	3	Reset
30.22 Next service due	9/11/21	Reset
31.23 System Run Hours	0	Reset

PUMP LOGGED DATA

Displays number of starts, number of faults and total run hours for each pump.

RUNNING | MENU

Logged Data: System | Faults 1 | Faults 2 | Pumps

	Starts	Faults	Run	
Pump 1:	2	0	0 h	Reset
Pump 2:	2	0	0 h	Reset
Pump 3:	1	0	0 h	Reset
Pump 4:	2	0	0 h	Reset
Pump 5:	1	0	0 h	Reset
Pump 6:	1	0	0 h	Reset

FAULT LOGGED DATA

Displays counters for the various faults.

RUNNING | MENU

Logged Data: System | Faults 1 | Faults 2 | Pumps

30.3 Pipe Fill Fail Count	0	Reset
30.4 High Pressure Count	0	Reset
30.5 Low Pressure Count	0	Reset
30.6 High Level Count	0	Reset
30.7 Low Level Count	1	Reset
30.9 Low Temp Count	0	Reset
30.10 High Temp Count	0	Reset

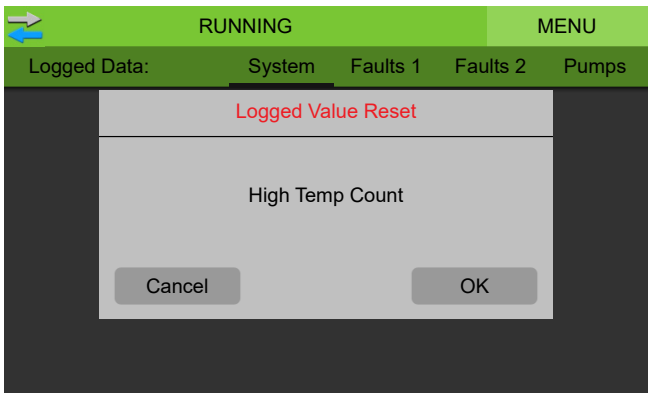
RUNNING | MENU

Logged Data: System | Faults 1 | Faults 2 | Pumps

30.14 High Current Count	0	Reset
30.13 Snore Protect Count	0	Reset
30.15 Max Run Fault Count	0	Reset
30.16 Low Flow Fault Count	1	Reset
30.18 Pump Cycle Fault Count	0	Reset
30.19 A0 Input Fault Count	0	Reset

RESETTING LOGGED DATA

Pressing reset beside any logged value on the Logged Data Screens will bring up the 'Logged Value Reset' box, allowing you to confirm or cancel the reset of the data. Login will be required first if not already logged in.
Note: If the HydroWHIZ is set back to the factory defaults on the Diagnostics screen, all the logged data will be reset.

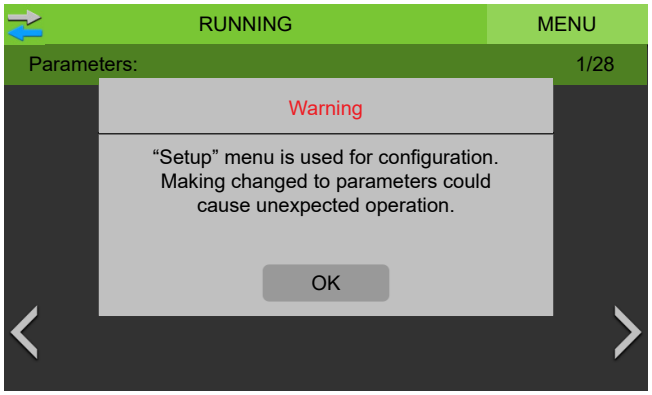


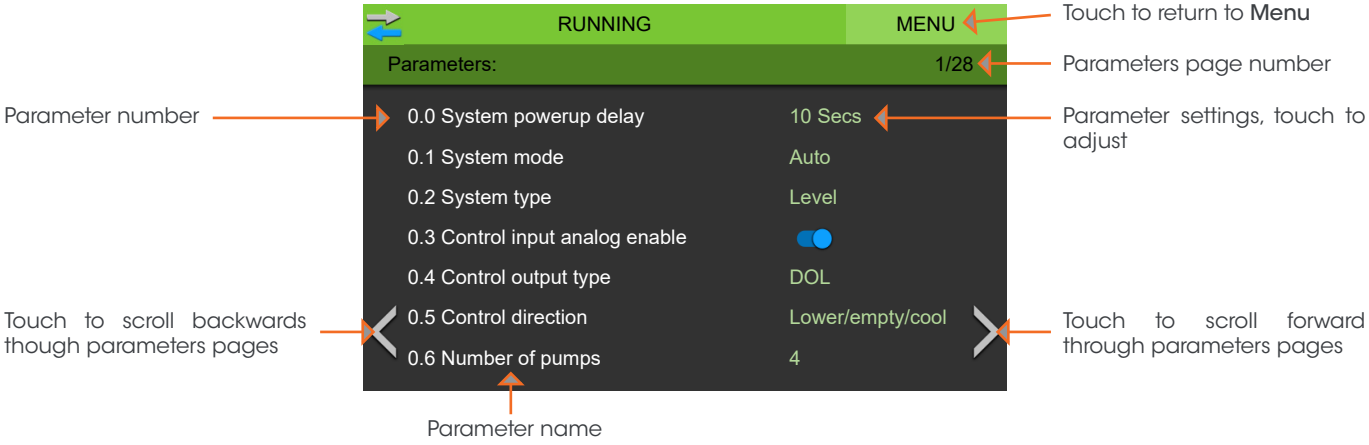
PARAMETERS

Warning: Adjusting any individual parameters through this menu may cause unexpected issues with the function and operation of the controller and should only be done after consulting a technician. Adjustments to settings should be made through the SETUP menu where possible.

PARAMETERS SCREEN OPERATION

The parameters screen displays a list of all the parameters that are used in the operation of the system. The Setup screen is used for configuration of the controller, not the parameters screen. If the parameters have been factory reset on the diagnostics page, however, the control module's outputs will need to be reassigned in the parameters screen (parameters 19.X) to match the circuit diagram, see 'Control Module Connections' on page 15 for more information. Additionally, for the Current Sensing version, the current sensing will need to be reconfigured, see 'HydroWHIZ CS Variation' on page 45 for more information. Adjusting any other parameters in this screen may cause issues with the function and operation of the controller and should only be done after consulting a technician.





PARAMETERS LIST

For a full list of all the parameters with default settings and descriptions, see the **HydroWHIZ Parameter List** document.

SCADA COMMUNICATION

DEFAULT COMMUNICATION SETTINGS

The default Modbus RTU SCADA communication settings are Baud:19200, Parity: 8N1, Slave:1. These settings can be changed through the SCADA setup page on the HMI.

ACCEPTED MODBUS FUNCTION CODES

The HydroWHIZ Modbus links support the following function codes:

01	Read coil status
02	Read input status
03	Read holding registers
05	Force single coil
06	Preset single register
16	Preset multiple registers (maximum of 32)

Care should be taken not to poll the communications too frequently, as this can cause the controller's response to become sluggish.

DATA FORMAT

All data is stored as big endian unsigned integers with the MSB on the left, unless otherwise stated. The first register starts at 1 and the actual number sent in the Modbus packet will be the register number -1.

WATCHDOG TIMER

The SCADA communication has the ability to enable a watchdog timer to shutdown the pump operation and trigger an alarm if communication with the SCADA system is lost. If the watchdog timer is enabled, register 3817 needs to be written to 1 at a faster frequency than the SCADA Watchdog Timer otherwise the 'SCADA Watchdog Timeout' alarm will activate and the pumps shutdown. As soon as this register is written successfully again the system will automatically restart operation and clear the fault.

MODBUS REGISTERS

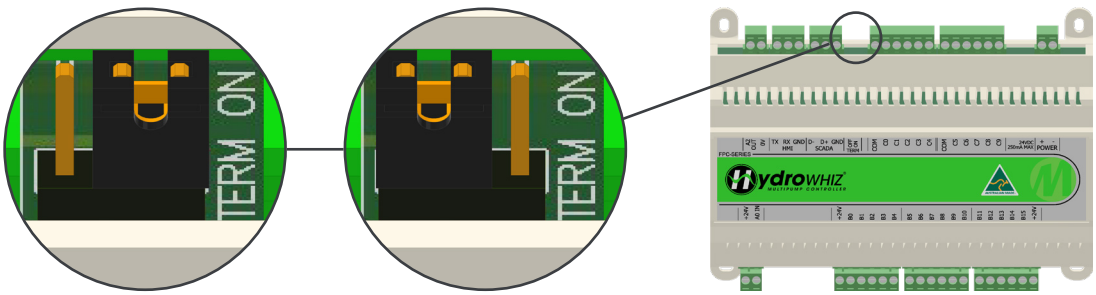
See the **HydroWHIZ Modbus Registers** document for full list of Modbus registers.

TERMINATION RESISTOR

On long cable runs a termination resistor may be required. To enable the resistor, move the jumper at the top of the HydroWHIZ module to the ON position. In shorter cable runs, or with some connected devices, the termination resistor may not be required and can be put in the OFF position.

Termination Resistor On

Termination Resistor Off



FAULT FINDING

If there is trouble communicating with the HydroWHIZ controller, follow the below steps:

1. Try reading a single Modbus register using function code 03.
2. Check the connections and try swapping the A and B wires.
3. Check the SCADA fault codes under 'Diagnostics' on page 33 and check the causes and remedies under 'Fault Diagnosis' on page 38 of this manual.
4. Turn the SCADA termination resistor on or off with the jumper bridge on the HydroWHIZ module.
5. For specific fault finding see 'Fault Diagnosis' on page 38 of this manual.

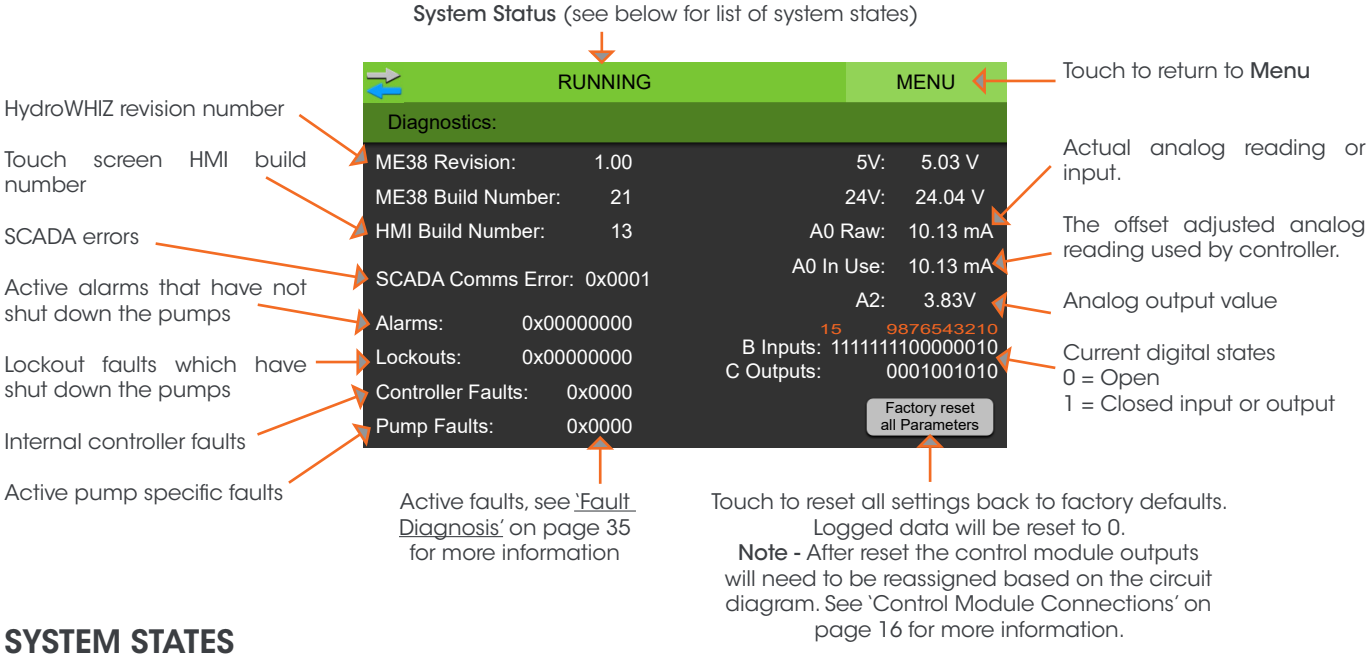
MAINTENANCE

Below is a recommended maintenace routine for the controller. How regularly it should be performed is dependent on the environment the controller is located in. Maintenance will need to be performed more regularly on controllers that are installed in more extreme environemnts, including those subject to corrosion, dust and vibration.

- Tighten screws, as these may have loosed over time, due to temperature changes
- Inspect all cables for damage
- Test correct operation of the controller touch screen HMI
- Check that the alarm strobe and buzzer are operating correctly, if applicable
- Manually start and stop the pumps to ensure the controller is operating correctly
- Clean out the enclosure fan and vents, if applicable
- Wipe down the enclosure, remove any build up of material on on the exterior and interior
- Check intergity of enclosure for rusting and moisture ingress, ensure the door seal is sealing the enclosure correctly
- Conduct a thermography test to detect hot spots in the panel

DIAGNOSTICS

DIAGNOSTICS SCREEN



SYSTEM STATES

Initialise	The system is setting up the configuration after a power failure before going into the powerup state.
Powerup	The system is powering up after power is switched on or the system is restarted.
Off	The system is turned off and will not run any pumps.
Startup	The system has woken from sleep and is configuring itself before going into the running state.
Running	The system is in auto and pumps are running.
Stage	The system is not keeping up with demand and is starting an additional standby pump to assist.
Destage	The system demand has dropped and the system is shutting down a standby pump to meet the new demand.
Duty Change	The system is changing the duty pump according to the duty share settings.
Sleep	The system is available for operation but the analog value is not at the wakeup threshold and/or no digital start inputs are active.
Lockout	The system has an active fault that is stopping the pumps from running in auto. The fault can been seen on the alarms page with a manual reset required once fault is fixed.
Disabled	The system is disabled via the digital system enable input. If not in use this input must be bridged.
Mains Water	The system is configured for mains water bypass and the tank is low or the system has an active lockout fault.
Duty Destage	The system is destaging the main duty pump to return to the jacking pump as the duty pump.
Inhibit	The system has been inhibited by an auxiliary condition which when cleared will re-initiate the system. If a timer is displayed the system will automatically restart after the timer has finished the count down. The active inhibit condition can be seen on the alarms page.
System Manual	The system has been put into manual mode which will allow pumps to be individually run in manual irrespective of any fault protections.

The fault values on the Diagnostic page are displayed in hexadecimal format which needs to be converted to binary to work out which faults are active. The easiest way is to enter the hexadecimal number into a hex to binary converter and then check the resultant binary bits, which are =1 against the tables below. Binary bit 0 is the right most digit (bit).
Example: HEX = C0 = 1100 = bit 6 and bit 7 are on = Low pressure fault and high level faults are active.

ALARMS & LOCKOUTS

Bit 0: A0 Input Fault
Bit 4: No Feedback
Bit 5: High Pressure
Bit 6: Low Pressure
Bit 7: High Level
Bit 8: Low Level
Bit 10: High Temperature
Bit 11: Low Temperature
Bit 12: Prime Loss
Bit 13: Pipe Fill Fail
Bit 14: Pump Cycle
Bit 15: No Pumps Available
Bit 18: Service Alarm
Bit 19: Scada Watchdog
Bit 20: System Manual

Bit 21: Low Current
Bit 22: Pump 1 Low Current
Bit 23: Pump 2 Low Current
Bit 24: Pump 3 Low Current
Bit 25: Pump 4 Low Current
Bit 26: Pump 5 Low Current
Bit 27: Pump 6 Low Current
Bit 28: High Current
Bit 29: Pump 1 High Current
Bit 30: Pump 2 High Current
Bit 31: Pump 3 High Current
Bit 32: Pump 4 High Current
Bit 33: Pump 5 High Current
Bit 34: Pump 6 High Current

Bit 35: Max Run
Bit 36: Pump 1 Max Run
Bit 37: Pump 2 Max Run
Bit 38: Pump 3 Max Run
Bit 39: Pump 4 Max Run
Bit 40: Pump 5 Max Run
Bit 41: Pump 6 Max Run
Bit 42: No Flow
Bit 43: Pump 1 No Flow
Bit 44: Pump 2 No Flow
Bit 45: Pump 3 No Flow
Bit 46: Pump 4 No Flow
Bit 47: Pump 5 No Flow

See 'Functions & Fault Protection' on page 4 and 'Fault Diagnosis' on page 35 for further information

SCADA COMMS ERROR

Bit 0: No error
Bit 1: UART error
Bit 2: Receive timing error
Bit 3: Receive overflow error
Bit 4: CRC error
Bit 5: Incorrect Modbus slave
Bit 6: Illegal Modbus function code
Bit 7: Illegal Modbus data address
Bit 8: Illegal Modbus data value
Bit 9: Modbus slave device failure
Bit 10: Unknown Modbus exception
Bit 11: Response timeout
Bit 12: Bad response

See 'Fault Diagnosis' on page 38 or the **HydroWHIZ Modbus Registers document** for further information

CONTROLLER FAULTS

Bit 0: EEPROM hardware failure
Bit 1: Data load error
Bit 2: 5V power rail fault
Bit 3: 24V power rail fault
Bit 4: Watchdog reset
Bit 5: Data reinitialised
Bit 6: Data initialised
Bit 7: EEPROM bank 0 checksum
Bit 8: EEPROM bank 2 checksum
Bit 9: No EEPROM signature
Bit 10: EEPROM parameter load limits
Bit 11: Real time clock failure
Bit 12: RTC low/no battery

See 'Fault Diagnosis' on page 38 for further information

PUMP FAULTS

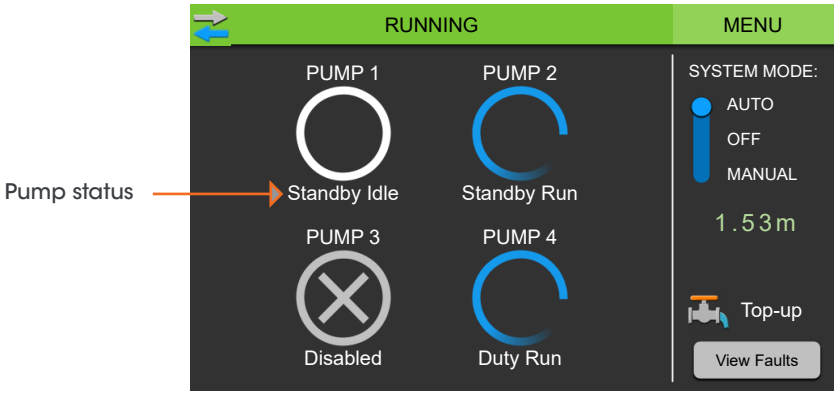
Bit 0: Pump 1	Pump 1 in fault
Bit 1: Pump 2	Pump 2 in fault
Bit 2: Pump 3	Pump 3 in fault
Bit 3: Pump 4	Pump 4 in fault
Bit 4: Pump 5	Pump 5 in fault
Bit 5: Pump 6	Pump 6 in fault

See 'Functions & Fault Protection' on page 4 and 'Fault Diagnosis' on page 35 for further information

Note: For all bit states
0 = Not active
1 = Active

PUMP STATES

Main screen

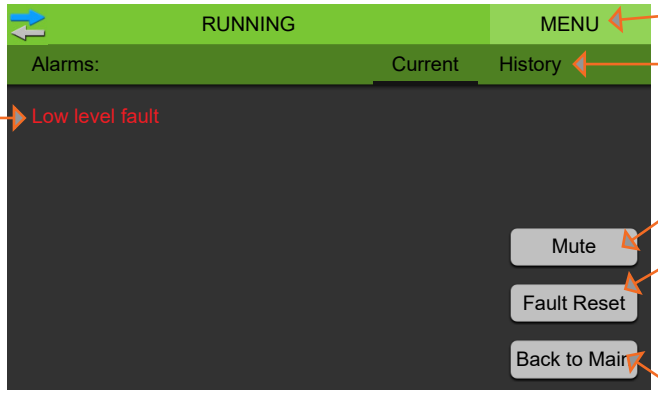


Off	Pump is off and will not run in auto or manual operation.
Disabled	Pump is disabled and will not run in auto or manual operation.
Man Off	Pump is in manual but is not running due to other restrictions, if the system is in auto mode.
Man Run	Pump is in manual and running.
Standby Idle	Pump is in auto, assigned as a standby pump and available to run.
Standby Run	Pump is in auto, assigned as a standby pump and is running.
Duty Idle	Pump is in auto, assigned as the duty pump and available to run.
Duty Run	Pump is in auto, assigned as the duty pump and is running.
New Duty	On a duty pump alternation this pump will be the pump starting to take over the duty.
Fault	Pump is in fault and will require a fault reset to resume operation.
Jacking Idle	The pump is setup as a jacking pump to always start first and is available to run.
Jacking Run	The pump is setup as a jacking pump to always start first and is running.
Start Delay	The pump is being delayed from starting to ensure smooth operation when starting multiple pumps.
Stop Delay	The pump is being delayed from stopping to reduce water hammer when stopping multiple pumps.
Antiseize Run	The pump is running based on the antiseize protection to avoid pump seizure.
Inhibit	The pump is in auto and has been inhibited by another condition, see the current alarms for active inhibit conditions.

FAULT DIAGNOSIS

CURRENT ALARMS SCREEN

List of all the active alarms and inhibit conditions (See the table below for a list of all alarms and remedies)



Touch to return to **Menu**

Touch to access the **History** screen for historical alarms

Mutes the audible alarm

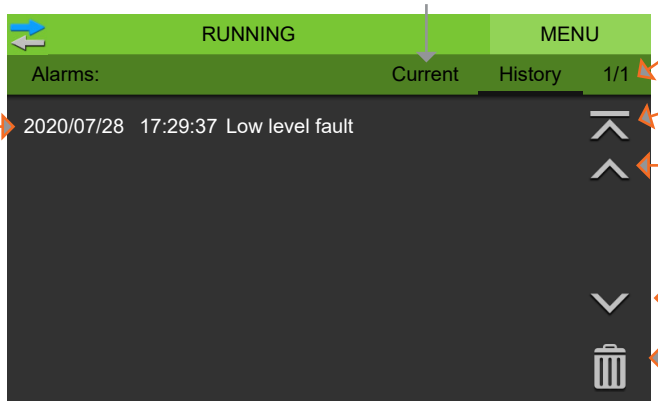
Resets any latched faults. If an alarm will not clear or comes back the alarm condition is still active and needs to be rectified before resetting.

Touch to return to **Main** screen

HISTORICAL ALARMS SCREEN

Touch to return to **Current** alarms screen

List of all the historical alarms with date and time stamps for time of alarm activation (Note: Inhibit conditions will not display on this page)



Current page/total number of pages

Touch to return to top of list

Touch to scroll up to more recent alarms

Touch to scroll down to older alarms

Clears the fault history

FAULT CAUSES & REMEDIES

Fault	Cause	Remedy
	Alarms and lockouts	
Pump Fault (1-6)	• Thermal overload has tripped as a result of high current draw (DOL version). • Soft starter has triggered a fault, see 'Soft Starter Fault Diagnosis' on page 39 for causes (Soft Start version). • Thermal switch has opened due to excessive motor temperature. • Pump contactor has failed to close.	• Check pump for jamming or locked rotor. • Check that a thermal switch, not a thermistor, is connected to the thermal switch input. • If no thermal switch is connected the input must be bridged. • Check that thermal overload is set to the appropriate setting for the pumps. See 'Thermal Overload Data' on page 18 for more information. Ensure soft starter settings are correct for the pumps. See 'Soft Starter Data' on page 19 for more information. • See 'Soft Starter Fault Diagnosis' on page 39 for remedies to soft starter faults • Check the contactor is closing when the HydroWHIZ is trying to start the pump.
A0 Input Fault	Analog reading is outside of the 4-20mA acceptable reading, possibly due to: • Transducer not connected • Broken or loose connection • Short circuit in transducer or cable	• Check sensor connections are correct • Check sensor is passive 'loop powered' • Replace sensor if faulty • If analog sensor is not in use, turn off the analog enable on page 2 of the setup
No Feedback Available	Same as A0 input fault, but could also be caused by incorrect parameter settings.	• Same as A0 input fault • If analog input is not in use, ensure analog enable is turned off on page 2 of the setup.

Fault	Cause	Remedy
High Pressure	System pressure has gone above the *High pressure threshold* and/or the high pressure input has received an open contact for the fault delay, possibly due to: • System overshoot. • Incorrect settings entered in the setup. • System blockage or shut valve. • High pressure switch installed or wired incorrectly.	• Check that the *High pressure threshold* setting is set adequately above the *setpoint* pressure in the setup. • Ensure the backup high pressure switch is 'open to fault'. • If the high pressure input is not in use it must be bridged. • Ensure the high pressure switch is installed correctly. • Test the high pressure switch. Replace if faulty. • Investigate cause of high pressure event.
Low Pressure	System pressure has gone below the *Low pressure threshold* and/or the low pressure input has received a closed contact for the fault delay, possibly due to: • Burst pipe. • Pump loss of prime. • Incorrect setup settings. • Low pressure switch installed or wired incorrectly.	• Check that the *Low pressure threshold* setting is set adequately below the *setpoint* in the setup • Ensure the backup low pressure switch is 'close on fault'. • Test the low pressure input. Replace if faulty. • Investigate cause of low pressure event.
High Level	Tank level analog value has gone above the *High level threshold* and/or the high level input has received an open contact in fill mode, or closed contact in empty mode, for the fault delay, possibly due to: • High level float switch installed or wired incorrectly, or has malfunctioned. • High level threshold is set incorrectly. • System overshoot in level fill mode, possibly due to incorrect analog reading. • Pumps are unable to keep up with inflow into the tank/pit, in level empty mode.	• Inspect the level in the tank/pit. • Check that the *High level threshold* setting is set to a suitable value above the *setpoint stop level* in the setup. • Ensure the high level float switch is at the correct position in the tank/pit. • Ensure the high level float switch is wired as close on rise (typically black and brown wires are used) in empty mode, or close on fall (black and blue wires) in fill mode. • If in fill mode and the high level input is not in use, ensure it is bridged. • If the tank/pit is not at high level, remove the high level float from the input and test. Replace if needed.
Low Level	Tank level analog value has gone below the *Low level threshold* and/or the low level input has received a close contact in fill mode, or open contact in empty mode, for the fault delay, possibly due to: • Low level float switch installed or wired incorrectly, or has malfunctioned. • Incorrect settings entered in the setup. • System overshoot in level empty mode, possibly due to incorrect analog reading. • Pumps are unable to pump enough water into the tank/pit, in level fill mode.	• Inspect the level in the tank/pit. • Check that the *Low level threshold* setting is set to a suitable value below the *setpoint stop level* in the setup. • Ensure the low level float switch is at the correct position in the tank/pit. • Ensure the low level float switch is wired as close on rise (typically black and brown wires are used) in empty mode, or close on fall (black and blue wires) in fill mode. • If in empty mode and the low level input is not in use, ensure it is bridged. • If the level in the tank/pit is not at low level, remove the low level float switch from the input and test. Replace if faulty.
High Temperature	Temperature analog value has gone above the *High temperature threshold* and/or the high temperature input has received an open contact in heat mode, or closed contact in cool mode, for the delay period, possibly due to: • High temperature thermostat installed or wired incorrectly. • High temperature settings entered incorrectly • System overshoot in temperature heat mode. • Pumps unable to keep up with demand in temperature cool mode.	• Check that the *High temperature threshold* setting is set correctly in the setup. • Ensure that the high temperature input is wired as close on fault in heat mode, or open on fault in cool mode. • If in heat mode and high alarm input is not in use, ensure it is bridged. • Ensure high temperature thermostat is installed correctly. • Test the high temperature thermostat. Replace if faulty.
Low Temperature	Temperature analog value has gone below the *Low temperature threshold* and/or the low temperature input has received a close contact in heat mode, or open contact in cool mode, for the fault delay, possibly due to: • Low temperature thermostat installed or wired incorrectly. • Low temperature settings entered incorrectly in the Setup. • System overshoot in temperature cool mode. • Pumps unable to keep up with demand in temperature heat mode.	• Check that the *Low temperature threshold* setting is set correctly in the setup. • If the low temperature input is assigned but is not required, either unassign it or bridge the input. • Ensure that the low temperature input is wired as open on fault. • Test the low temperature thermostat. Replace if faulty.

Fault	Cause	Remedy
Pump Cycle	The system has woken too quickly from sleep more than 10 times in a row, possibly due to: • Insufficient sensor settings • Poor wiring connections • Leaks in pipe work for pressure systems	• Inspect pipe work for leaks. • Inspect pressure vessel for correct setting. • Ensure check valves are shutting upon entering sleep. • If the pump cycle protection is not required, disable it in the setup.
No Pumps Available	There are no available pumps to operate in auto	• Ensure pump faults are reset • Ensure available pumps are not disabled
Max Run	A pump or all available pumps (depending on protection mode) have been running continuously for the *Max run fault delay*. Possible causes are burst pipe, loss of prime, no water available or discharge pipe blocked.	• Check the cause for all pumps running. If normal operation extend the *Max run fault delay* or disable the protection in the setup. • Fix hydraulic faults
No Flow	The low flow (low level alarm) input is not receiving a closed contact from a flow switch, possible due to: • Flow switch installed or wired incorrectly • A pump not producing flow when called to run due to a loss of prime or stalled pump.	• Check that a flow switch is wired as close on flow into the low level alarm terminals. • Check that the flow switch is installed in the correct orientation and pipe for the pump or system. • Check the pump is adequately primed. • Check the pump is mechanically free. • If a flow switch is not in use then disable the no flow protection in the setup menu on page 5 - System protections.
Service Alarm	The next service due date has been reached indicating the pumps need a service.	• Call the pump system service provider. • If no servicing is required disable the service alarm feature.
System Manual	The system has been put into manual overriding any system protections for the manual timeout period.	• Return the system back to off or auto if manual mode is not required. • Wait for the manual timeout period to finish, the system will automatically return to auto mode • Put the system in auto and put an individual pump into manual to maintain protections while running a pump manually
Low Current	The pump running current has been less than the snore current threshold for the fault delay, possibly due to: • Loss of prime. • Incorrect settings entered in the setup. • Pump burnt out. • Pump cable broken or disconnected	• Check the pump cables are connected and undamaged. • Ensure the *snore current threshold* is set to suit the pump current. • Increase the snore inhibit retry attempts where prime loss event are expected as a part of normal operation (dewatering). • Check that the pump is drawing current while running. • Check and clear pipework for air locks or debris.
High Current	The pump running current has been more than the high current threshold for the fault delay, possibly due to: • Incorrect settings entered in the setup. • Pump is jammed or rotor locked. • For pressure sewer applications, check discharge pipework for blockage.	• Check pump for jamming or locked rotor. • Ensure the *high current threshold* is set to suit the pump current.This should be set higher than the running current of the pump. • Check and clear pipework for blockages or debris.
Controller Faults		
EEPROM hardware fault	Internal controller fault - Failure with the EEPROM memory.	• Contact Supplier for support
Data load fault	Internal controller fault - Data has not loaded correctly out of EEPROM to be used for operation.	• Contact Supplier for support
5V power rail fault	Internal controller fault - A power supply issue with the internal 5V supply.	• Contact Supplier for support
24V power rail fault	Internal controller fault - A power supply issue with the external 24V supply.	• Inspect 24Vdc power supply is at correct voltage and replace if necessary, contact Supplier for support if external power supply is working correctly.
Watchdog reset	Internal controller fault - Internal hardware or software fault.	• Contact supplier for support
Data reinitialised	Internal controller fault - A data fault has occurred causing the data settings to be set back to defaults.	• Reset controller back to factory defaults and setup again. If issue persists contact Supplier for support.

Fault	Cause	Remedy
Data initialised	Internal controller fault - Initial data configuration, this alarm should only display momentarily.	• If fault persists contact Supplier for support
EEPROM bank 0 checksum	Internal controller fault - Internal data corruption with primary data.	• Controller should run off the backup data, reset the fault and if fault persists contact Supplier for support.
EEPROM bank 2 checksum	Internal controller fault - Internal data corruption with backup data.	• Controller should run off the primary data, reset the fault and if fault persists contact Supplier for support.
No EEPROM signature	Internal controller fault - Issue with EEPROM memory signature.	• Contact Supplier for support
EEPROM parameter load limits	Internal controller fault - Internal software fault or EEPROM fault	• Reset the fault, if fault persists contact Supplier for support
Real time clock failure	Internal controller fault - Internal hardware fault.	• Contact Supplier for support
RTC low/no battery	Internal controller fault - Internal RTC battery low or disconnected.	• Check the internal coin cell battery is not dislodged from its holder. Note, this does not apply to earlier modules which have a soldered battery. • Contact Supplier for support
SCADA Comms Error		
Scada Watchdog	The watchdog reset (keep alive) register 3817 has not been written to 1 within the watchdog timeout period.	• Setup continual polled write =1 to modbus register 3817 at a frequency shorter than the SCADA watchdog period • Disable the SCADA watchdog in the setup if not required
SCADA UART error	Data packets not being received correctly	• Confirm baud rate and number of bits. • Ensure that RS-485 connections are correct
SCADA Receive timing error	Signals from the Modbus master are being received before the HydroWHIZ slave is ready to receive them.	• Check the baud rate is the same on the master and the slave. • Increase the time between modbus packets
SCADA receive overflow error	Too many bytes have been received by the HydroWHIZ slave exceeding the receive buffer.	• Check the parity stop bit • Increase the time between modbus packets • Check the framing of the modbus packet is correct
SCADA CRC Error	Modbus checksum does not equal the data in the packet.	• Check Modbus baud rate and parity settings • Check cable route and shield earthing for potential sources of interference
SCADA Incorrect Modbus slave	Slave number was not an acceptable ID number.	• Check the slave ID number used is the same as the HydroWHIZ SCADA slave ID parameter
SCADA Illegal modbus function code	Function code is not a permissible function code for this controller	• See 'SCADA Communication' on page 30 for permissible function codes
SCADA Illegal Modbus address	Address used is not available or may be read or write only.	• Check the address is an available address • Check that the register is not out by + or - 1 • Check that Master Modbus reads are reading readable registers and writing to writable registers
SCADA Illegal Modbus data value	The value of a Modbus write is outside of the acceptable range.	• Check the value is in an acceptable range for the register being written to. Ranges are listed in the **HydroWHIZ Modbus Registers** document.
SCADA Modbus slave device failure	There has been an internal fault with the HydroWHIZ Modbus port.	• Try power cycling the HydroWHIZ module. • If fault persists then a replacement module may be required.

SOFT STARTER FAULT DIAGNOSIS (WEG SSW05)

FAULT CAUSES

When a fault is detected, the Soft Starter is disabled and the fault is displayed on the LEDs. All protections will automatically reset after the fault clears (the bottom dipswitch should be in the AUTO position), except for the Incorrect Phase Sequence and Overcurrent protection, which will require a power cycle to be reset.

Protection	Display	Possible causes
Phase Loss	Phase Loss LED	• Phase fault in three phase network • Short circuit or thyristor fault • Motor is not connected or connected incorrectly • Driving problems with the input contactor • Input fuses are blown • Incorrect setting of the Motor Current trimpot • Motor current consumption is lower than the required current for activation of the phase loss protection
Motor Overload	Overload LED	• Motor Current trimpot has been set incorrectly. The set value is too low for the motor. • Load on the motor shaft is too high • Too many successive motor starts • The value of the thermal protection saved when switching
Locked Rotor	Stall LED	• The time set for the acceleration ramp is shorter than the actual acceleration time • Motor shaft is locked
Thyristor overload	Internal Fault LED Flashes 6 times	• Load on the motor shaft is too high • Too many excessive starts
Undercurrent	Internal Fault LED Flashes 8 times	• Current value setting is much higher than the minimum motor operation current • Motor is at no load • In applications with hydraulic faults, the pump may be operating at no load
Overcurrent	Overcurrent LED	• Short circuit between phases • Momentary motor overload • Motor shaft is locked Note - This protection will not be reset automatically. Turn power off and on again to reset.
Incorrect phase sequence	Phase Seq LED	• Network phase sequence inverted at the input. If this occurs, turn off power, swap two wires and repower. Set up panel to suit site phase rotation.
Undervoltage in the Control Supply	Internal Fault LED Flashes 2 times	• Electronics supply lower than required • Electronic power supply with bad contact • Fuse of the electronics power supply is blown
Internal By-pass relay contact is open	Internal Fault LED Flashes 3 times	• Soft Starter is defective
Overcurrent before By-pass	Internal Fault LED Flashes 4 times	• The time set for the acceleration ramp is shorter than the actual acceleration time • Rated motor current higher than the current that can be supported by the Soft Starter • Motor shaft is locked
Overcurrent of the Soft Starter By-pass relay	Internal Fault LED Flashes 5 times	• Short circuit between phases • Rated motor current higher than the current that can be supported by the Soft Starter • Motor shaft is locked
Frequency out of tolerance	Internal Fault LED Flashes once	• The line frequency is out of range (+/- 10%), when compared with the rated frequency (50 or 60Hz)

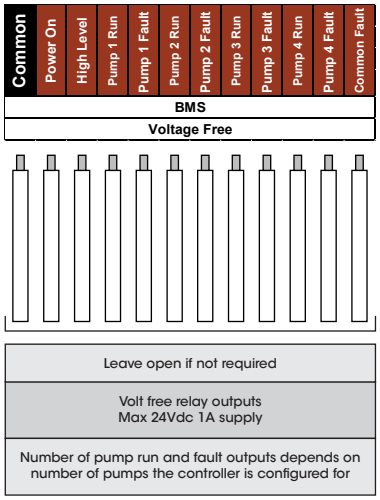
SOLVING THE MOST COMMON PROBLEMS

Problem	Check	Corrective Actions
Motor does not run	Wrong wiring	• Check all power and control connections
	Power supply loss	• Check the power supply (R, S, T) • Check the power control supply (A1, A2)
	Setting	• Check if the settings are correct for the application
	Fault	• Check if the Soft Starter is not shut down due to a fault
Motor speed oscillates	Loose connections	• Switch Soft Starter off, switch power supply off and tighten connections • Check all internal Soft Starter connections
Motor speed too high or low	Motor nameplate data	• Check if the motor has been selected according to the application
Shocks during deceleration	Soft Starter settings	• Reduce the deceleration ramp time
Shocks during acceleration	Soft Starter settings	• Reduce the acceleration ramp time • Reduce the pedestal voltage setting

BMS VARIATION

The BMS variation of the HydroWHIZ DOL or Soft Start features additional volt free outputs for power on, high level, individual pump run and individual pump fault as standard, in addition to the common fault output included on other variations.

VF CONNECTIONS



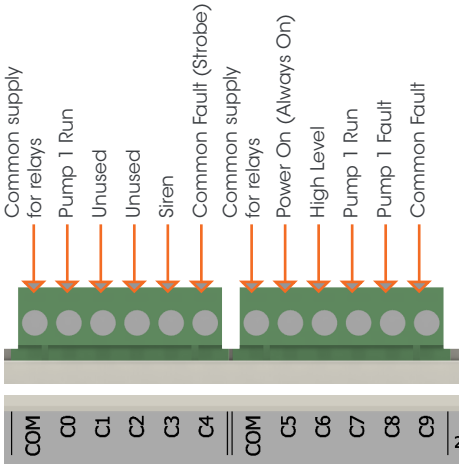
CONTROL MODULE OUTPUTS (1-3 PUMPS)

These outputs are pre-configured for the BMS variation of the HydroWHIZ. The outputs differ for each number of pumps, and additional relays are required to provide all the BMS outputs. The control module outputs for 1-4 pumps are shown below.

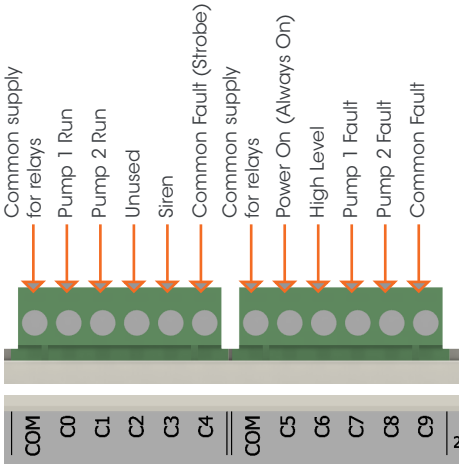
See the controller's circuit diagram for specific connections.

If the controller's parameters are factory reset on the Diagnostics screen, these outputs will need to be reassigned in the parameters list (parameters 19.X). See 'Parameters' on page 29 for more information on the operation of the parameters screen.

Single Pump

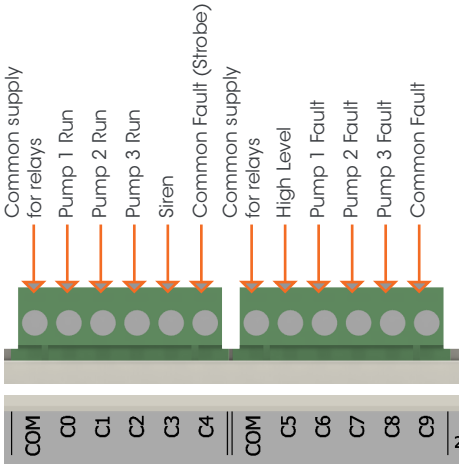


Dual Pump



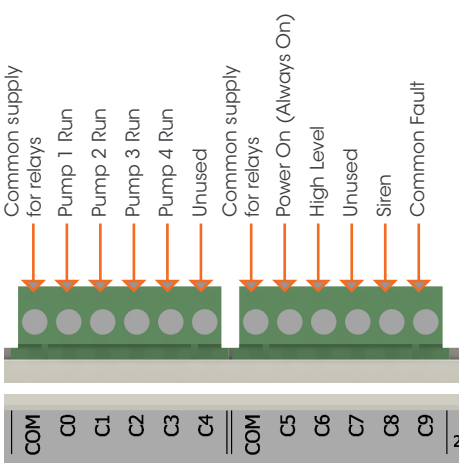
Additional relays used for Pump 1 & 2 Run BMS Outputs

Triplex Pump



Additional relays used for Power On, Pump 1, 2 & 3 Run BMS Outputs

Quad Pump



Additional relays used for Pump 1, 2 & 3 Run & Fault BMS Outputs

SMS VARIATION

The SMS variation of the HydroWHIZ features the newly designed ME-Link Module, which is a cellular CAT-M1 remote monitoring and control device utilising the 700Mhz frequency for 'best in class' signal strength. The ME-Link reports status information and active alarms from the HydroWHIZ, and can also be utilised to control external devices with the two onboard relay outputs. The ME-Link uses easy to set up SMS commands to configure the operation and alarms without the need for any additional software. The controller also features a battery and UPS for battery backup to the ME-Link module on power failure. A vandal resistant panel mount antenna is included on the controller as standard, and remote mount high gain antennas, ideal for low signal strength areas, are available on request.

SMS ALARM/STATUS COMMUNICATION

Additional features of the SMS variation of the HydroWHIZ include:

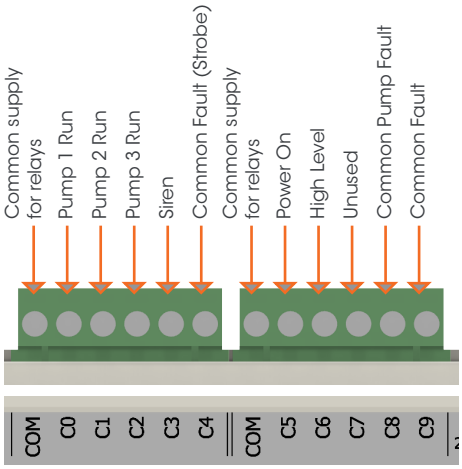
- SMS messaging for high level, common fault, common pump fault and power/battery status, and from 2 additional digital inputs
- Easily programming with SMS commands
- Up to 10 phone numbers can receive messages
- Smart help responses on incorrect commands
- Once, repeat or sequential notification messaging
- Repeat or sequential messaging until user accepted
- Daily reminder messages for active alarms
- Remote control of system and or devices via the 2 relay outputs
- Periodic test messages to ensure ME-Link is connected and operating
- Temporary disabling of notifications for site servicing
- Logged data for 'last alarm', 'acknowledgment time and number'

CONTROL MODULE OUTPUTS (1-3 PUMPS)

These outputs are pre-configured for the SMS variation of the HydroWHIZ, configured to control 1-3 pumps. For 4-6 pumps, the control module connections will differ as additional pump run outputs will be required on the board, and relays will be added to provide all the VF outputs.

See the controller's circuit diagram for specific connections.

If the controller's parameters are factory reset on the Diagnostics screen, these outputs will need to be reassigned in the parameters list (parameters 19.X). See 'Parameters' on page 29 for more information on the operation of the parameters screen.

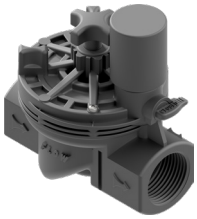


The information for the ME-Link such as module connections, SIM card installation, antenna information, link/status indication and SMS commands, refer to the **ME-Link Operation Manual**. For basic setup information, see the **HydroWHIZ DOL with SMS Quick Start Guide**, or **HydroWHIZ Soft Start with SMS Quick Start Guide**.

RMC VARIATION

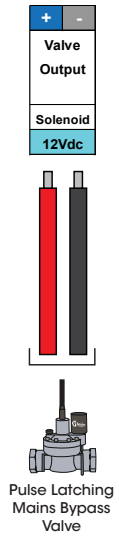
The HydroWHIZ with Rain/Mains Changeover is designed for pressure pumping applications that require mains bypass, featuring an output for a pulse latching solenoid valve to maintain water supply when the pumping system is off or locked out due to a fault, the supply tank is low or on power failure. This is pre-configured by enabling the *mains bypass valve enable* in the pressure setup.

VALVE INSTALLATION



- Valve must be installed in accordance with appropriate Plumbing Industry 'Code of Practice'.
- Valve must be installed on discharge side of the pump, not on the suction side.
- Ensure the direction of flow shown on the valve is adhered to when installing the valve.
- For best performance, the valve should be mounted in a horizontal position with the solenoid upright.
- If the valve has a manual override lever, ensure it is in the off/closed or auto position.
- If the valve has a flow control handle, screw it down until just tight, then back off two full turns to start with. This can then be adjusted further depending on the system pressure.
- The valve requires a certain amount of head pressure (varies depending on valve size) to operate correctly.
- Check the valve specifications and ensure that the pressure and flow ranges are within the limits.
- Ensure that no foreign materials enter the valve during installation to ensure the valve operates correctly.

VALVE CONNECTIONS



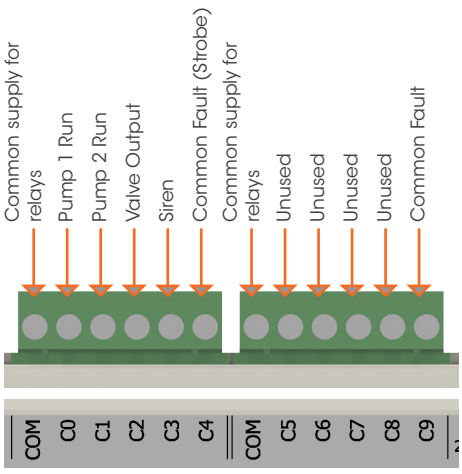
Pulse Latching
Mains Bypass
Valve

CONTROL MODULE OUTPUTS (1-2 PUMPS)

These outputs are pre-configured for the RMC variation of the HydroWHIZ Controller, configured to control 1-2 pumps. For 3-6 pumps, the control module connections will differ as additional pump run outputs will be required on the board.

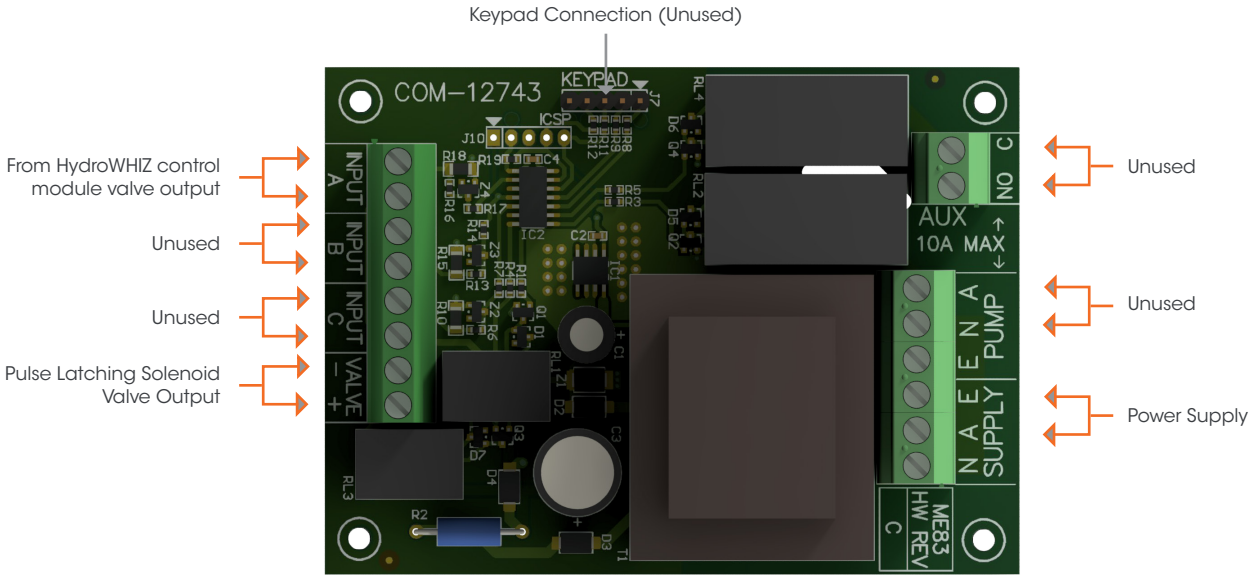
See the controller's circuit diagram for specific connections.

If the controller's parameters are factory reset on the Diagnostics screen, these outputs will need to be reassigned in the parameters list (parameters 19.X). See 'Parameters' on page 29 for more information on the operation of the parameters screen.



RAIN/MAINS CONTROL MODULE CONNECTIONS

The RMC variation of the HydroWHIZ features an additional rain/mains control module, providing the output for the pulse latching solenoid valve. The valve output from the HydroWHIZ control module is connected to input A on the rain/mains module, via a relay. The module gives two consecutive pulses to ensure the valve opens or closes, with a short delay in between to charge the capacitor. When power to the panel is turned off or fails, power stored in the onboard capacitors sends a single pulse to open the valve.



VALVE FAULT DIAGNOSIS

If the pulse latching solenoid valve is not opening or closing, firstly ensure that the valve is installed according to 'Valve Installation' on the previous page. Check that the specifications of the valve suits the installation and ensure that the solenoid is wired into the controller in the correct polarity.

Firstly, ensure that the system is in auto mode and not in mains bypass state. The valve icon on the main screen should show:  Then perform the following steps:

Solenoid and rain/mains module test:

- Isolate water supply to the valve.
- Turn off power to the panel.
- Carefully unscrew the solenoid from the valve.
- Ensure the spring is inserted into the plunger correctly and push the plunger in flush with the top of the solenoid.
- With a thumb hovered over the plunger, turn on power to the panel and see if the plunger pops out of the solenoid.
- Wait at least 10 seconds then remove power to the panel and see if the plunger sucks in flush with the top of the solenoid.
- If the plunger does not move successfully to both of these positions, the solenoid or rain/mains control module is faulty and should be replaced.
- If the plunger moves successfully, however, continue through the below steps.

Valve test:

- Clean any dirt or grit out of the hole that the solenoid screws into.
- Re-insert the solenoid with the plunger pushed in flush and open the water supply to the valve.
- Adjust the flow control handle in or out until you can hear water flowing through the valve.
- Once water is flowing, turn on power to the panel. Check that the water stops flowing through the valve.
- If not, adjust the vale open or closed until the water stops flowing and retest the valve opening by turning off power to the panel.
- If the valve still fails to open or close without adjustment, check the pressure and flow ranges suits the valve used. If so, only the valve needs replacing.

CS VARIATION

The Current Sensing version of the HydroWHIZ utilises a current sensor to detect small variations in the pump running current, which can be used for pump protection or pump control. Ideal for high pressure sewer applications using positive displacement pumps, the high current protection shuts down the pump or system if current rises due to a blockage or excessive demand. For centrifugal pumps, the max run protection feature is better suited. Ideal for dewatering and bore pumping applications, where level switches/ sensors may not be used, the low current/snore protection shuts down the pump or system on low current due to pumps running dry. These protections feature automatic restarts, with random delay periods to prevent multiple pumps from restarting simultaneously.

HIGH CURRENT PROTECTION

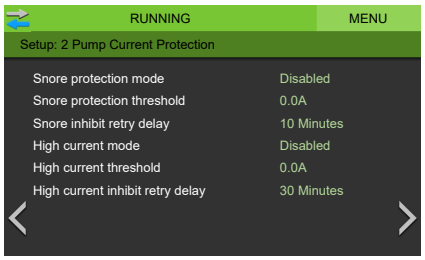
If enabled and the pump current rises above the *high current threshold* for 30 seconds, the *high current mode* will be activated. If the *high current mode* is set to 'Alarm', it triggers an alarm only, which will auto reset once the current drops below the *high current threshold* for 30 seconds. If set to 'Pump', the *high current mode* triggers an alarm and inhibits the individual pump or if set to 'System' it triggers and alarm and inhibits all the pumps. After a random delay period selected between a minimum of 30 seconds and maximum of the *high current inhibit retry delay,* the pump or system will be restarted. While a pump is running, if the current does not return above the *high current threshold* for 30 seconds, the inhibit counter will be reset. If the current returns above the *high current threshold* for the delay again, however, the pump or system will be inhibited again. If 5 consecutive attempts are made to restart the pump or system without success, the pump or system will be locked out and will require manual reset.
Note - If multiple pumps are running, the *high current threshold* is automatically adjusted to suit the number of pumps running.

SNORE/LOW CURRENT PROTECTION

If enabled and the pump current drops below the *snore current threshold* for 30 seconds, the *snore protect mode* will be activated. If set to 'Alarm', it triggers and alarm only, which will be auto reset once the current rises above the *snore current threshold* of 30 seconds. If the snore protect mode is set to 'Pump', it triggers an alarm and inhibits the individual pump or if set to 'System' it will alarm and inhibit all the pumps. After the *snore inhibit retry delay* the pump or system will be restarted. If the current is now above the *snore current threshold* for 30 seconds, the inhibit counter will be reset. If the current remains below the *snore current threshold* for the delay again, however, the pump or system will be inhibited again. If 5 consecutive attempts are made to restart the pump or system without success, the system will be locked out and will require manual reset.
If lockout is not required, the *snore inhibit retry attempts* parameter can be increased in the parameters list.
Note - If multiple pumps are running, the *snore current threshold* is automatically adjusted to suit the number of pumps running.

SETUP

The pump current protection setup page 2 is displayed instead of the analog setup, if the *Auxiliary analog assign* = 'A0 current' and *Analog feedback assign* = 'unassigned' in the parameters list. These parameters are factory set but will need to be re-configured to enable current sensing if the controller is factory reset on the Diagnostics screen. See the following page for more information.



Snore Protection mode	Alarm = Triggers alarm only, Pump = Triggers an alarm and inhibits the individual pump with 5 retries before activating a pump lockout, System = Triggers an alarm and inhibits the whole system, with 5 retries before activating a system lockout.
Snore protection threshold	The current threshold below which the *Snore protection mode* will be activated after a 30 second delay.
Snore inhibit retry delay	This will be the inhibit retry delay used before the pump or the system is restarted. The default number of restart attempts is set to 5.
High current mode	Alarm = Triggers alarm only, Pump = Triggers an alarm and inhibits the individual pump with 5 random timed retries before activating a pump lockout, System = Triggers an alarm and inhibits the whole system, with 5 random timed retries before activating a system lockout.
High current threshold	The current threshold above which the *High current mode* will be activated after a 30 second delay.
High current inhibit retry delay	The random retry delay will between 30 seconds and a maximum of this *High current inhibit retry delay* before the pump or the system is restarted. The default number of restart attempts is set to 5.

Note - In high pressure sewer applications where centrifugal pumps are used, the pump current may not rise due to a blockage therefore the above pump high current protection may not function correctly. The *Max run fault protection* under the Setup page 5 - System Protections should be used in addition to the high current protection.

RE-ENABLING CURRENT SENSING AFTER A FACTORY RESET

If all parameters have been factory reset, the controller will default back to the analog setup screen to suit a level/pressure/temperature transducer and the pump current protection will no longer function. To re-enable this function, the below parameters need to be adjusted in the parameters list, so that the Pump Current Protection setup screen will display again. See 'Parameters' on page 29 for more information on the operation of the parameters screen.

Parameters	
1.1 Analog feedback assign:	The analog input used for the auto feedback controls and if set to A0 input will display analog setup page 2. If pump current is required this must be set to unassigned.
1.2 Auxiliary analog assign:	If pump current protection is required this must be set = A0 Current to allow access to the pump current setup page 2.
1.11 Current sensor max scale	The max range of the current sensor in the panel. This is set to 20A as default to suit the standard current sensor. This must be increased if a larger sensor is in use.

USER SETTING

Setting	User Value	Setting	User Value	Setting	User Value
1 - System Setup					
System type					
Control output type					
Number of pumps					
Pump limit					
Duty change period					
2 - Analog					
Level		**Pressure**		**Temperature**	
Level analog enable		Pressure analog enable		Temperature analog enable	
Max level sensor range		Max level sensor range		Max temperature sensor range	
Setpoint		Setpoint		Setpoint	
Wakeup level step		Wakeup pressure drop		Wakeup temperature step	
Standby start level step		DOL Standby start pressure step		Standby start temp step	
Low level threshold		Low pressure threshold		Low temperature threshold	
High level threshold		High pressure threshold		High temperature threshold	
2 - Pump Current Protection					
Snore Protection mode					
Snore protection threshold					
Snore inhibit retry delay					
High current mode					
High current threshold					
High current inhibit retry delay					
3 - Function					
Level		Pressure		Temperature	
Level control		Jacking pump		Temperature control	
Low level protection		Low pressure protection		Low temperature protection	
High level protection		High pressure protection		High temperature protection	
Sleep delay		Sleep delay		Sleep mode	
Tank top up valve enable		Mains bypass valve enable		Sleep delay	
Top up valve open level					
Top up valve closed level					

Additional user settings on following page

5 - System Protections	
Pump anti-seize protection	
Max run fault protection	
Max run fault delay	
Pump cycle protection	
No flow protection	
6 - SCADA	
SCADA baud rate	
SCADA parity	
SCADA slave address	
SCADA watchdog enable	
SCADA watchdog period	