# Bianco NXT Drive Series

**BIA-DRIVE1-15-240 – 811939**
**BIA-DRIVE1-22-240 – 811940**
**BIA-DRIVE1-37-240 – 812868**

**BIA-DRIVE1-15 – 811941**

**BIA-DRIVE1-22 – 811942**

**BIA-DRIVE3-22 – 811943**

**BIA-DRIVE3-40 – 811944**
**BIA-DRIVE3-55 – 811945**

**BIA-DRIVE3-75 – 811946**

**BIA-DRIVE3-110 – 811947**

**BIA-DRIVE3-150 – 811948**

**BIA-DRIVE3-185 – 811949**

**BIA-DRIVE3-220 – 811950**

**BIA-DRIVEPRO-22 – 812522**
**BIA-DRIVEPRO-37 – 812523**

Instruction Manual

# 1. Introduction

Congratulations on your new **Bianco NXT Drive**.

The BIA-DRIVE Series is designed for the Australasian market with both the end-user and the technician in mind. Featuring a handy setup wizard, programming has never been easier.

The full colour 100 x 55mm touch-screen interface ensures this Drive is simple to navigate for rapid access to clear, concise, system information. Displaying plain language fault codes and protection notices so you're always informed and in control.

Features

- Control and protect pumps up to 22kW
- Control up to 5 pumps (1 drive per pump) Master, Back-Up Master and up to 3 additional auxiliary drives via RS485 comms
- Variable frequency output for constant pressure control
- Minimise wasted energy and reduce the need for large pressure tanks
- 'Soft-starting' for low motor start current
- Timing group for sequencing up to 5 set points at pre-set times.
- Trip history (last 3 messages)
- 25 plain language fault messages
- Provides protection from: dry run, high and low voltage, input and output short circuits, high and low water pressure, input and output phase failure, high temperature and sensor faults
- 24V, 10V and 5V supply circuits
- Digital and analogue (voltage or current) inputs
- Relay and analogue outputs
- Multi-functional terminals

| Part Number | Item Code | Voltage In | Voltage Out | kW | A |
|---|---|---|---|---|---|
| BIA-NXT-DRIVE1150-240 | 811939 | 1 Phase 240V in | 1 phase 240V out | 1.5 | 7 |
| BIA-NXT-DRIVE1220-240 | 811940 | | | 2.2 | 10 |
| BIA-NXT-DRIVE1370-240 | 812868 | | | 3.7 | 17 |
| BIA-NXT-DRIVE1150 | 811941 | 1 Phase 240V in | 3 phase 240V out | 1.5 | 7 |
| BIA-NXT-DRIVE1220 | 811942 | | | 2.2 | 10 |
| BIA-NXT-DRIVE3220 | 811943 | 3 Phase 415V in | 3 Phase 415V out | | 5.1 |
| BIA-NXT-DRIVE3400 | 811944 | 3 Phase 415V in | 3 Phase 415V out | 4 | 9 |
| BIA-NXT-DRIVE3550 | 811945 | | | 5.5 | 13 |
| BIA-NXT-DRIVE3750 | 811946 | | | 7.5 | 17 |
| BIA-NXT-DRIVE31100 | 811947 | | | 11 | 25 |
| BIA-NXT-DRIVE31500 | 811948 | 3 Phase 415V in | 3 Phase 415V out | 15 | 32 |
| BIA-NXT-DRIVE31850 | 811949 | | | 18.5 | 38 |
| BIA-NXT-DRIVE32200 | 811950 | | | 22 | 45 |
| BIA-NXT-DRIVEPRO22 | 811951 | 1 Phase 240V in | 1 phase 240V out | 2.2 | 10 |
| BIA-NXT-DRIVEPRO37 | 811952 | 3 Phase 415V in | 3 Phase 415V out | 3.7 | 17 |

| Part Number | Item Code | Description |
|---|---|---|
| BIA-VMS-10BAR-TRAN | 811953 | Vertical Multi-stage pressure transducer 10 bar |
| BIA-VMS-16BAR-TRAN | 811954 | Vertical Multi-stage pressure transducer 16 bar |
| BIA-VMS-25BAR-TRAN | 811955 | Vertical Multi-stage pressure transducer 25 bar |

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## 3. Symbols used in this manual

| | |
|---|---|
| | Warning – Electrical safety |
| | Warning – Potential consequences of use outside of intended application(s). Includes environmental condition warnings. |
| | Mandatory warning |
| | Warning to disconnect power |
| | Read carefully |

## 4. Minimising EMI (Electromagnetic Interference)

EMI Refers to unwanted electromagnetic signals or noise generated by the VFD or external sources, which can interfere with the proper functioning of electronic devices. VFDs, due to their rapid switching (e.g., in the IGBTs), can be significant sources of EMI, which can disrupt nearby sensitive equipment.

- To minimise the effect of EMI for signal conductors it is recommended to use Twisted Pair and Shielded cable.

- Alternately, use single conductors and twist to provide a balanced capacitance and inductive coupling thus cancelling out differential mode interferance.

Installing shielded power cable is the most effective means to alleviate EMI problems. The cable's shield forces the noise current to flow directly back to the VFD before it gets back into the power network or takes other undesirable and unpredicable high frequency paths. Unlike signal wiring, the shielding on the motor cable should be terminated at both ends.

- If shielded cable is not available, then conductors plus ground in a conduit will provide some degree of protection.

Of all of the methods to mitigate EMC (Electromagnetic Compatibility) issues, grounding is the most effective and least costly. The importance of good grounding cannot be overstated.

The ground wire should be big (>3.5mm$^2$) and short.

# 5. Warnings and Cautions

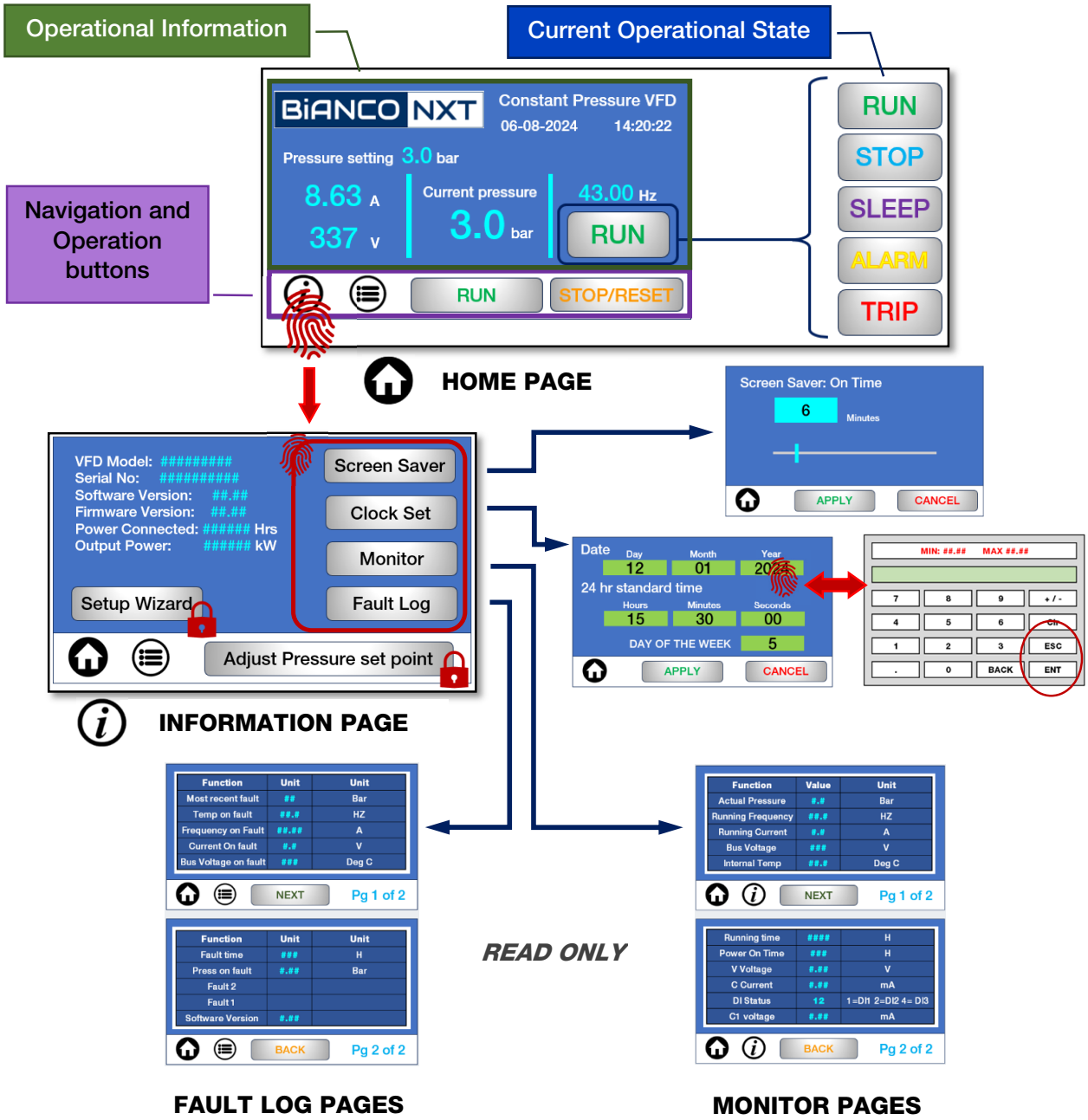
| | |
|---|---|
| | Read the manual carefully before starting. |
| | Prior to starting installation or maintenance, the controller must be disconnected from the power supply. Allow 5 minutes for the internal electronics to discharge before opening the cover. |
| | Any changes or modification to the wiring must be carried out by competent, skilled and suitably qualified personnel only. |
| | A qualified electrician should correctly size and install circuit breakers to protect the power supply. The fitment of additional surge protection is recommended. |
| | Never open the cover while controller is connected to electrical supply. Disconnect and allow 5 minutes for the internal electronics to discharge before opening the cover. |
| | This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance. |
| | Ensure the controller is a suitable size for the pump motor size according to the amperage required (P1 power). |
| | Avoid installing the BIA-DRIVE where it could experience the following conditions:<br>i. Where there is significant vibration and/or mechanical shock.<br>ii. Where it could be exposed to corrosive liquids or gasses, or to flammable materials, solvents, etc.<br>iii. Extreme heat and cold. Operating range 0 – 40°C.<br>iv. Protect the controller from rain, moisture, humidity or dust. |

# 6. User Interface and Programming Quick Guide

The user interface provides access to three key groups of information:
User, Installer and Programmer.

**User Level**: No password required

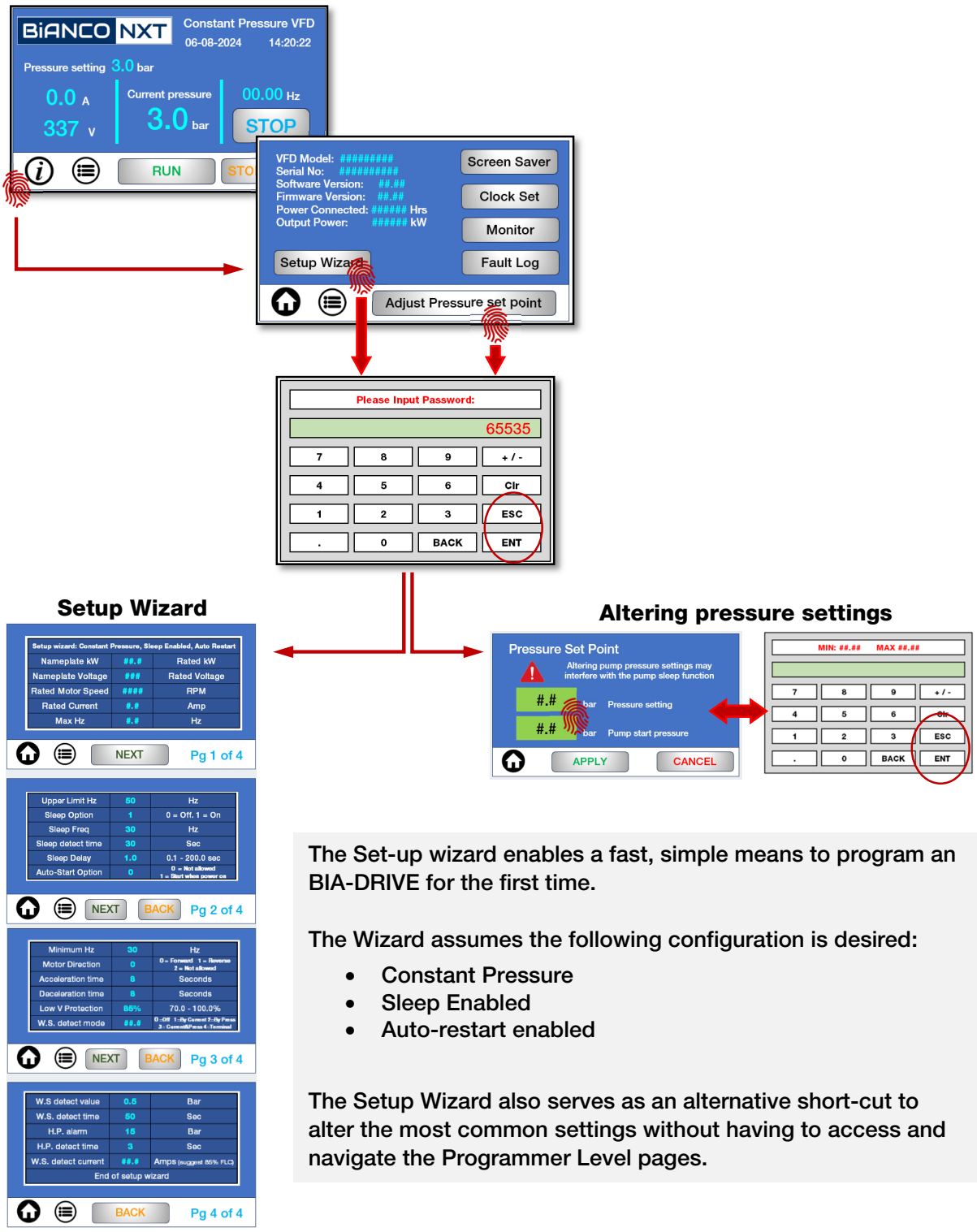
- Display screen summarises current operating conditions. Greater detail easily accessible.
- The screen saver duration can be set; the date and time can be altered and the fault log (last 3 faults) viewed.
- User screens are especially useful for monitoring system operation and diagnosing faults.



# 6a. User Interface and Programming Quick Guide cont'd

**Installer Level**: Password required

Access to the Setup Wizard and start / operational pressure set points.




The Set-up wizard enables a fast, simple means to program an BIA-DRIVE for the first time.

The Wizard assumes the following configuration is desired:

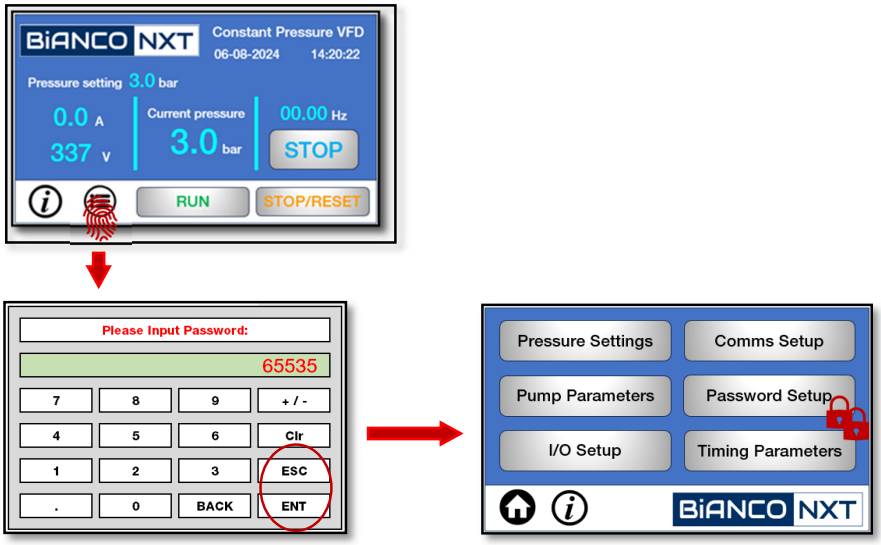
- Constant Pressure
- Sleep Enabled
- Auto-restart enabled

The Setup Wizard also serves as an alternative short-cut to alter the most common settings without having to access and navigate the Programmer Level pages.

## 6b. User Interface and Programming Quick Guide cont'd

**Programmer Level**: Password required

Access to a comprehensive suite of programming parameters.




Accessing the Programming Level opens up six additional parameter groups.

**Pressure settings**: Sensor setup and tuning, sleep functions, Low-Pressure, High-Pressure setup, PID setup and tuning and Alarm options

**Pump Parameters**: Motor setup, Rotation, Voltage, Current, Frequency, Start/Stop options

**Input/Output Setup:** V/Freq tuning, C/Freq tuning, Di setup, Mo and Relay output

**Comms Setup:** Comms settings and multi-pump setup

**Password Setup:** Requires Level 2 password

**Timing Parameters:** Up to 5 stages. Timing function to set pump run cycles or pressure set point mode to allow for operation at alternative set point(s) at programmed times

## 7. Operating Conditions

Install out of direct sunlight and in a location free from dust, corrosive gases, inflammable gases, oil mist, steam and/or water droplets.

**Environmental Temperature:** -10ºC to +40ºC

Derate 4% output capacity every 1ºC above 40ºC up to a maximum of 50ºC

**Humidity:** ≤ 95% RH, no water condensation

**Vibration:** < 5.9m / S2 (0.6G)

**Altitude:** Lower than 1000m. Derate 1% capacity every 100m height increase over 1000m.

# 8. Technical Specifications

**Input & Output Parameters**

- Start Frequency: 0.01-10.00Hz
- Input Voltage: 220VAC ±15%, 380V ±15%
- Input Frequency Range: 50/60Hz, fluctuation ±5%
- Output Voltage ~ 0 to rated input voltage
- Output Frequency ~ 0-200Hz

**Function:** Variable speed, Constant pressure water supply

**Control Mode:** V/F control (constant torque)

- Starting Torque ~ 0.5Hz ±100%
- Speed Adjustable Range ~ 1:100
- Speed-holding precision ~ ±1.0%
- Overload Capability ~ 150% rated current for 60s; 180% rated current for 1s
- Acceleration/deceleration Time ~ 0.1-3600s

**Peripheral Interface**

- Programmable Digital Input: 2 means of digital terminal input
- Programmable Analog Input ~V: 0-5V V (remote pressure gauge): 0-10V
  C (pressure transducer): 4-20mA
- Replay Output ~ 1-way output, programmable
- Open Collection Output ~ 1-way output, programmable
- Command Running Channel ~ three kinds of channels: 1. Operational panel 2. Control terminal 3. Serial communication port, choose 1 and 2 for master drive and 3 for auxiliaries
- Built-in PID ~ Advanced PID arithmetic to realise closed-loop control system
- Stall Speed Control ~ Automatically limit current and voltage at running period to prevent tripping due to frequent overcurrent or overvoltage
- Master and Auxiliaries connection ~ Extensible RS485 design, one drive in the system can be master and controls the other auxiliary drives (4 at most) to work by communication mode. Master drive sends PID feedback information to the auxiliary drives and monitors status of auxiliaries in real time. Any failure of the auxiliary drives does not affect the others.

**Controller Function**

**Multi-pump Control:**

1. Each pump requires an individual BIA-DRIVE
2. Nominate one or two master controllers (2nd is standby master) and max. 4 auxiliaries (standby master also works as auxiliary) to combine work. All the drives are connected through a RS485 Communication line.
3. Should the primary master controller fail, the standby master takes over to command the whole system. The master drives are (both) equipped with pressure transducers. Auxiliary drives do not require transducers.
4. The master detects pipe water pressure via the pressure transducer and communicates the signal to the auxiliaries, automatically controlling the auxiliaries to run or stop and PID status according to the water pressure condition.
5. Should the primary master controller fail to operate, the standby master will automatically replace the master to control the system. Should any auxiliary drive fail to operate, the system will just skip by and start the next controller, ensuring the automatic shift of pump group.
6. The pumps run alternately (8 hours by default) to balance every pump's running time to prolong service life of the whole pump-set.

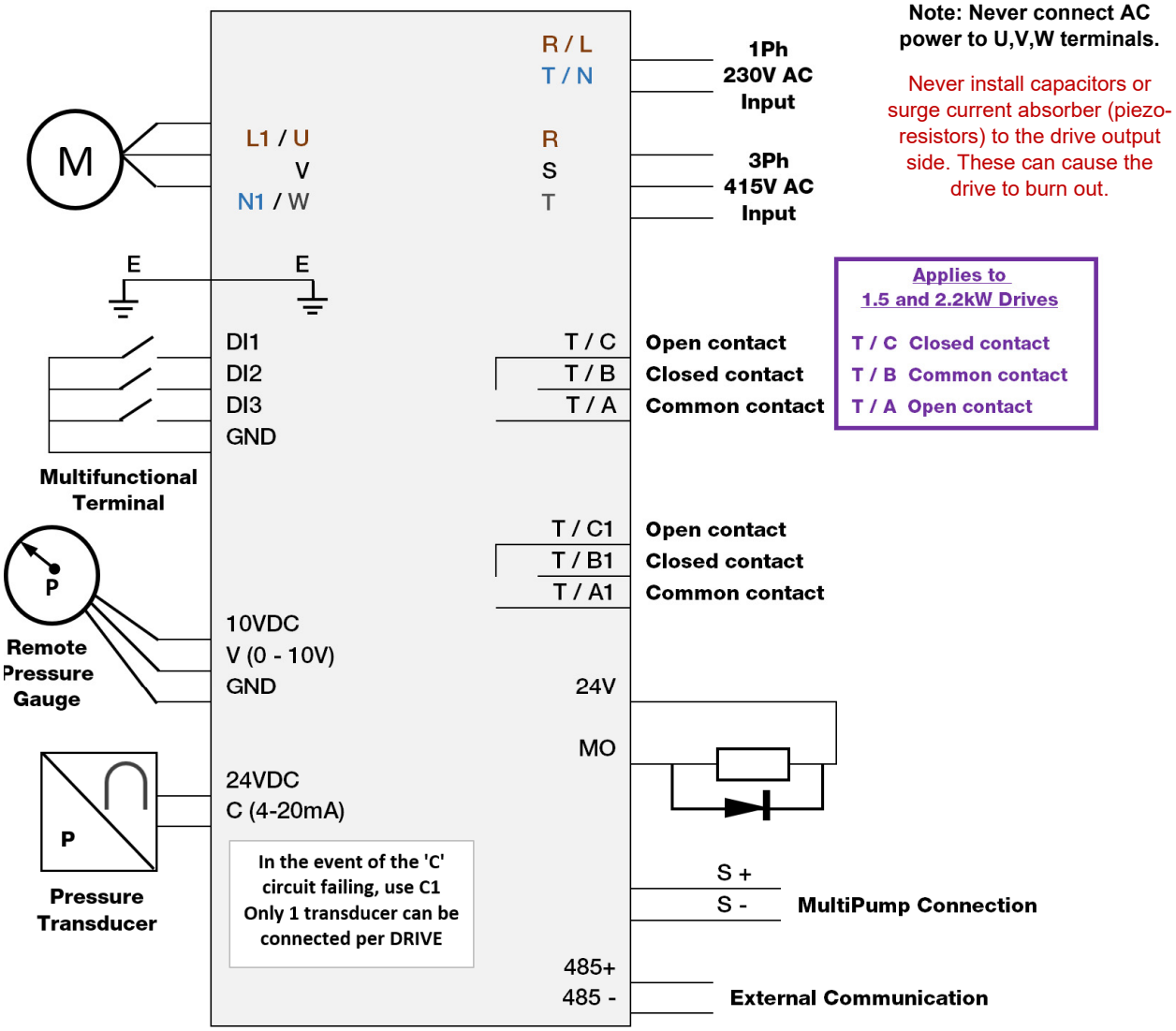
# 9. Function Descriptions

<table>
<tr><th></th><th>Action</th><th>Default</th></tr>
<tr><td>Sleep Function<br><br>Pressure Group<br>Parameter #10<br>or Wizard</td><td>When there is no water demand, the pump will decelerate to the minimum frequency.<br><br>Following a detection cycle the controller will enter sleep mode and stop the pump.<br><br>When the pressure drops below the user-set parameter value the controller will wake up automatically and restart the pump.</td><td>Valid</td></tr>
<tr><td>Restart After Power On<br><br>Pump Group Parameter #25<br>or Wizard</td><td>In the event of a controller power interruption, with this setting VALID, normal operation will resume automatically when power is restored.</td><td>Invalid</td></tr>
<tr><td>Anti-seize Function<br><br>Pressure Group<br>Parameter #13<br>Tune parameters #24 - #26</td><td>Rotating machinery such as pumps can develop mechanical issues if allowed to sit stationary for extended periods of time. Once this setting is made VALID, the pump will run briefly for a short period periodically to prevent internal corrosion, debris accumulation or lack of lubrication from causing issues</td><td>Invalid</td></tr>
<tr><td>Day-Part Control<br><br>Timing Group</td><td>Using the timing group, a day can be divided into blocks of time. The user can elect to prevent the pump running during a set time period OR set different operating pressures throughout the day</td><td>Invalid</td></tr>
<tr><td>Input Signals<br><br>Section 25<br>Low water-level protection by float<br><br>Section 26<br>Remote stop / start switch</td><td>The controller can accept up to 3 external inputs with optional valid/invalid timers<br><br>Di3 is preset to accept a low water level (no-run) float input. Normally open circuit, a float in the down position closes the circuit and prevents the pump(s) running<br><br><table><tr><td>Di 1 Option</td><td rowspan="3">0 = Disabled 1= Forward<br>2 = Reverse 3 = Fault Input<br>4 = Rapid stop<br>5 = Fault input<br>6 = PID closed<br>7 = Keypad Command<br>8 = Terminal Command<br>9 = Comm Command<br>10 = Fault Input is constantly closed<br>11 = Water Shortage</td></tr><tr><td>Di 2 Option</td></tr><tr><td>Di 3 Option</td></tr></table></td><td>Invalid</td></tr>
<tr><td>Outputs</td><td>The controller has 2 x relay outputs and an open contact<br><br><table><tr><td>MO Output</td><td rowspan="3">0 = Disabled<br>1= Run status<br>2 = Fault<br>3 = FDT1<br>4 = FDT2<br>5: Run at 0 Freq<br>6 = Lower limit Freq Run<br>7 = Upper limit Freq Run<br>8 = Standby<br>9 = Sleep<br>10 = Temp. Arrival</td></tr><tr><td>Relay (TA, TB, TC)</td></tr><tr><td>Relay (TA1, TB1, TC1)</td></tr></table></td><td>Invalid</td></tr>
</table>

# 10. Wiring

Always use an electrical outlet that is protected by Residual Current Device (RCD) safety switch with a trip current of 30mA or less. A safety switch is required by Australian/New Zealand Standard AS/NZS 3000.

- Install with a suitably rated circuit breaker.
- All wiring must be carried out by a suitably qualified technician.




**Note: Never connect AC power to U,V,W terminals.**

Never install capacitors or surge current absorber (piezo-resistors) to the drive output side. These can cause the drive to burn out.

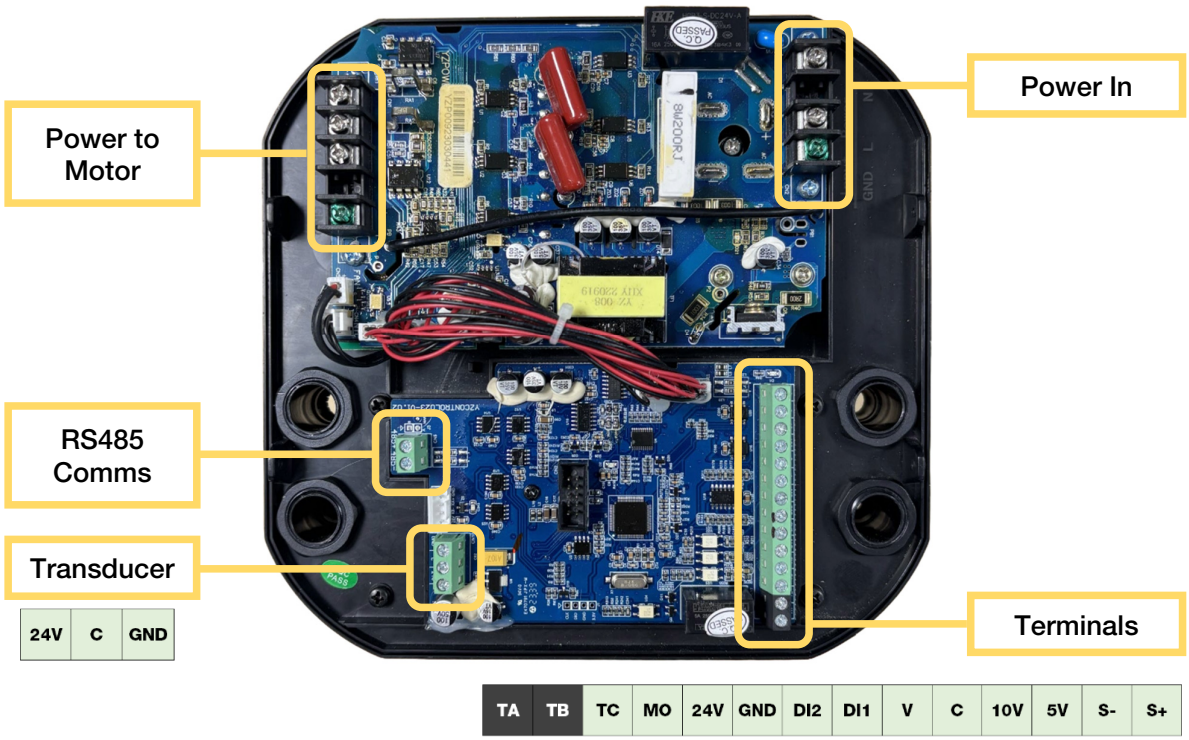
Power must be off for at least 10 minutes and isolated before wiring and inspection to avoid the risk of electric shock.

Ensure high-voltage wiring terminals are connected tightly to avoid damage on the device due to loose connections or arcing.

Take care than no foreign objects are left inside the drive, i.e. wire fragments, solder, metal, etc., which could cause a short circuit and damage the drive.

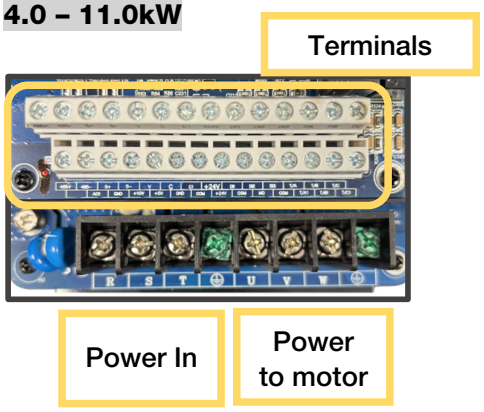
# 11. Terminals

**Drives up to 2.2kW**

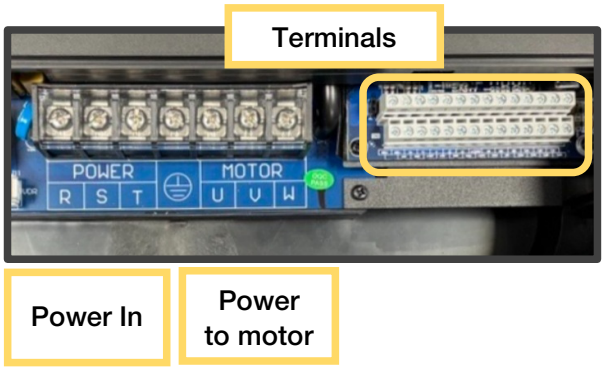



| Terminal Name | Description |
|---|---|
| DI1, DI2 | Digital input 24V GND<br>Input voltage: 9-30V, input resistance: 10kΩ |
| V | Analog input, voltage: 0-1 0V, input resistance: 6.8kΩ |
| C | Analog input, current: 4-20mA, input resistance: 5000Ω |
| 10V | 10V supply, output current: 0-100mA |
| GND | Zero reference level for 5V, 10V, 24V |
| MO | Open contact. Common terminal: GND, input: 0-24V, 0-50mA |
| 24V | Power supply |
| 5V | Power supply |
| T/A, TB, T/C | **For 1.5kW and 2.2kW**<br>Relay output: T/A, T/B open, T/B, T/C closed<br>Contact capacity: AC250V / 3A, DC30V / 1A |
| S+, S- | Multi-pump control connection |
| 485+, 485- | External signal terminals |

**4.0 – 11.0kW**




**15.0 – 22.0k**




| 485+ | 485- | S+ | S- | V | C | C1 | +24V | DI1 | DI2 | DI3 | T/A | T/B | T/C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| | A01 | GND | +10V | +5V | GND | COM | +24V | COM | MO | COM | T/A1 | T/B1 | T/C1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| Terminal Name | Description |
|---|---|
| DI1, DI2, DI3 | Digital input 24V GND<br>Input voltage: 9-30V, input resistance: 10kΩ |
| V | Analog input, voltage: 0-1 0V, input resistance: 6.8kΩ |
| C | Analog input, current: 4-20mA, input resistance: 5000Ω |
| C1 | *Analog input, current: 4-20mA, input resistance: 5000Ω*<br>Backup circuit should 'C' fail |
| 10V | 10V supply, output current: 0-100mA |
| GND | Zero reference level for 5V, 10V, 24V |
| MO | Open contact. Common terminal: GND, input: 0-24V, 0-50mA |
| 24V | Power supply |
| 5V | Power supply |
| T/A, T/B, T/C<br>T/A1, T/B1, T/C1 | **For 4-22kW**<br>Relay output: T/A, T/C Open, T/A, T/B Closed, T/A1, T/C1 Open, T/A1, T/B1 Closed.<br>Contact capacity: AC250V / 3A, DC30V / 1A |
| S+, S- | Multi-pump control connection |
| 485+, 485- | External signal terminals |
| A01 (4 – 22kW only) | Analogue output: 0-10V, GND |

## Program parameter hierarchy

| | |
|---|---|
| | Essential parameter – input value for motor and essential operating options |
| | Important parameters – alter according to site specific requirements |
| | Common fine-tuning parameters |
| | Parameters to access advanced options |
| | Advanced settings. Alter with care as unexpected behaviours may occur |

# 12. Pressure Group Parameters – with notes

| Pressure Group: 34 parameters, 6 pages | | | |
|---|---|---|---|
| | **Function** | **Set Range** | |
| 1 | Set Press | 0.0-60.0 bar Default 3.0 bar | Desired operating pressure |
| 2 | Start Press | 0 – U0 - 00 bar Default 2.4 bar | Pump start pressure |
| Acceleration/Deceleration rates are managed in the PUMP GROUP Parameters | | | |
| 3 | Sensor Type | 0 = (0-10V) 1 = (4-20mA: C) 5 = (4-20mA: C1) Default = 1 | Outlet pressure sensor type |
| 4 | Sensor Range | 0.0-60.0 bar Default 10 bar | Outlet pressure sensor range |
| 5 | Pressure correction | 0-2.000 Default = 1.000 | Digital pressure value offset |
| Parameter #5 allows the user to apply an offset, so the digital reading agrees with an analogue pressure gauge | | | |

SLEEP FUNCTION [Parameters 6,7,9,10,11 and 26]

In normal operation, the Drive references the pressure value. Once the pressure reaches the target pressure [Parameter #1] the Drive will reduce the frequency to see what happens.

If the pressure falls, the Drive logic determines water use is occurring and will adjust speed to achieve the target pressure again.

If the pressure remains within range, the Drive will check/adjust 2 more times. If pressure remains within tolerance despite reducing pump speed, the Drive will determine there is no water consumption and should go to sleep.

| | | | |
|---|---|---|---|
| 6 | Frequency Drop Time | 0.0 – 100 (0 = Off) Default = 1 | Do not alter |
| 7 | Sleep Detect Time | 3 – 6000 seconds Default = 30 s | Time period of speed reducing checks |
| 8 | Water Shortage Detect mode | 0 = Off 1 = By Current 2 = By Press. 3 = By Current and Press. 4 = Terminal Default = 2 | Select the means by which the controller will determine when there is insufficient water available. Set Parameters 15 – 18 according to the method selected. |
| 9 | Leakage Factor | 0 – 10.0 Default = 1.0 | Allowable pressure drop in system before the pump(s) exit sleep mode and resume operation. A larger value allows greater pressure drop. |
| 10 | Sleep Option | 0 = OFF 1 = ON Default: 1 = ON | ~ |
| 11 | Sleep Frequency | 0.00Hz – 100 Hz Default = 35 Hz | See below |

Parameter #11 is the frequency at which the pump begins the sleep test cycle after the time period programmed at Parameter #26. The pump must be able to maintain its set pressure [Parameter 1] at this speed setting. Ensure that the parameter #11 value is greater than the PUMP GROUP / Parameter #15 [Lower Limit Frequency] value.

| | | | |
|---|---|---|---|
| 12 | Anti-freezing / rust | 0 = OFF 1 = ON Default: 1 = ON | As above |
| 13 | Sensor-off value | 0.0 - 100.0% Default = 5.0 | ~ |
| 14 | Sensor-off time | 0.0 - 3000.0 seconds Default = 10 s | ~ |
| 15 | Water shortage detect value | 0 – 200 bar (L.P. setting) Default = 0.5 bar | Valid when Parameter #8 = 2 or 3 |
| 16 | Water shortage detect frequency | 00.0 - 99.99 Hz Default = 45 Hz | ~ |
| 17 | Water shortage detect delay | 0.1 - 999.9 seconds Default = 50 s | Ignore time when Parameter #8 condition is valid |
| 18 | Water shortage current | Model Dependent, Suggest 85% FLC | Valid when Parameter #8 = 1 or 3 |
| 19 | High-pressure alarm | 0 - 200.0 bar Default = 15 bar | H.P. Alarm setting |
| The High-pressure alarm value is independent of the pump operating and start pressures. Ensure it is set to a higher value than the operating pressure value (suggested setting 3 bar higher than desired operating pressure) | | | |
| 20 | High-pressure detect time | 0.1 - 200.0 seconds Default = 3 s | Duration before triggering an alarm state |
| 21 | Low-pressure alarm | 0.0 - 60.0 bar Default: 0 = Off | L.P. Alarm setting |
| When P#8 [Water Shortage Detect Mode] is set to Value 2 or 3 (referencing pressure), P#21 [Low Pressure alarm] value must be set lower than or equal to P#15 [Water Shortage Detect Value) | | | |

## ANTI SEIZE / RUST FUNCTION [Parameters 12, 24 – 26]

Water pumps, especially those that are not in continuous operation, can be prone to mechanical seizing due to corrosion or rust build-up. When metal components corrode over time, there is a greater likelihood of increased friction or complete seizure.

These settings cause the pump to run periodically for a short time at low rpm to mitigate the risk of seizure

## WATER SHORTAGE FUNCTION [Parameters 8,15 – 18 and 21]

BIA-DRIVE provides a function which allows the user to select the means by which the controller determines a lack of water [Parameter #8]. This may be turned off. The default setting is by (low) pressure, but the user may elect to use current or a combination of both.

Alternately, by selecting P#8 = Value 4 [Terminal] a switched input such as a float can be connected to one of the three normally open DI (direct input) terminals. See Section 25.

Whenever the drive detects a signal or condition outside of the water shortage programmed values, the pump will shut down automatically. After a set time period it will restart to check that pressure can restore to normal. If pressure does not re-establish, the drive will shut down again and repeat the cycle.

| | | | | |
|---|---|---|---|---|
| 22 | Low-pressure detect time | 0.1 - 6000.0 sec | Default = 60 sec | Time-period pressure must be less than or equal to P#21 |
| 23 | Anti-freezing cycle | 3 - 60000 min | Default = 1500 min | Period of inactivity before commencing an anti-freeze cycle |
| 24 | Anti-freezing time | 0 - 6000 sec | Default = 10 sec | Duration of the anti-freeze cycle |
| 25 | Anti-freezing freq. | 00.00 - 99.99 Hz | Default = 30 Hz | Anti-freeze rotation speed |
| 26 | Sleep delay | 0.1 - 200.0 sec | Default = 1.05 sec | Related to Parameter 11 – Sleep frequency |

## TUNING PID SETTINGS:

Tuning the PID parameters for system response and stability is a largely intuitive process.

Make a note of initial (starting) values before adjustment, so settings can be reversed if needed

Make gradual changes.

PID refers to a common control logic comprising three elements: Proportional, Integral, and Derivative.

1. Proportional Term: This term calculates the error value, which is the difference between the desired Set Point [ SP ] and the actual Process Value [ PV ], multiplied by a proportional gain factor [ Kp ]. The result [ e(t) ] represents the immediate error value and directly influences the controller's response to bring PV closer to SP.
2. Integral Term: This term considers the cumulative error over time. By summing past error values, it corrects for any persistent steady-state errors that the proportional term alone cannot eliminate.
3. Derivative Term: This term evaluates the rate of change of the error over time. It anticipates future error trends, which helps dampen rapid fluctuations and improves stability, especially when the system undergoes abrupt changes.

$$\frac{de(t)}{dt}$$

The controller uses these three methods to automatically correct the Process Value and achieve the Set Point:

- Proportional (P) Component: Responds to the current error by producing an output proportional to its magnitude, providing immediate correction based on the current distance from SP.
- Integral (I) Component: Addresses cumulative past errors to eliminate any remaining steady-state discrepancies over time.
- Derivative (D) Component: Predicts future error trends by assessing the rate of error change, helping to prevent overshoot and enhancing stability during rapid system changes.

## KEY PARAMETERS:

Kp (Proportional Gain) defines the strength of the response.

Integral Time determines the speed at which the cumulative correction is applied.

Derivative Time (also known as PID Change Deviation) is particularly useful for damping responses in fast-acting systems, though it has a lesser effect in slower systems like pumping applications.

| | | | | |
|---|---|---|---|---|
| 27 | Kp1 | 0.0 - 50.0 | Default = 3.0 | ~ |
| 28 | Integral Time 1 | 0.1 - 100.0 sec | Default = 1 sec | ~ |
| 29 | Kp2 | 0.0 - 50.0 | Default = 3.0 | ~ |
| 30 | Integral Time 2 | 0.1 - 100.0 sec | Default = 2 sec | |
| 31 | PID Change Deviation | 0 – 100% | Default = 60% | ~ |

| | | | | |
|---|---|---|---|---|
| 32 | Alarm reset occurrences | 0 – 1000 | Default = 200 | Number of times the drive will reset alarm occurrences when P#34 is valid. Once the P#34 value is exceeded, the drive will remain inactive in an alarm state. |
| 33 | Alarm reset time | 0 – 60000 min | Default = 10 min | Delay period before resetting an alarm when P#34 is valid. |
| 34 | Alarm reset option | 0 = OFF 1 = ON | Default:1 = ON | Option to automatically reset an alarm condition. |

## 13. Comm Group Parameters – with notes

| Communication Group: 10 parameters, 2 pages | | | |
|---|---|---|---|
| Item | Function | Set Range | Default |
| 1 | Comm Address | 1,2 for master; 3-5 for slave | 1 |
| 2 | Alternation Time | 0-60000 min | 480 min |
| 3 | Slave Qty | 0 - 4 | 0 |
| 4 | Multi pump control | 0 = Master/slave control<br>1 = Simultaneous | 0 |
| 5 | Pump adding delay | 0.1-600.0 sec | 1.0 sec |
| 6 | Pump reducing delay | 0.1-600.0 sec | 0.1 sec |
| 7 | Standby Pump delay | 0.1-600.0 sec | 5.0 sec |
| 8 | Baud Rate for Comm | 5 = 9600 6 = 19200 7 = 38400 | 6 |
| 9 | External address | 0 - 247 | 1 |
| 10 | External baud rate | 5 = 9600 6 = 19200 7 = 38400 | 5 |

# 13a. Comm Group: Multi-pump Setup notes

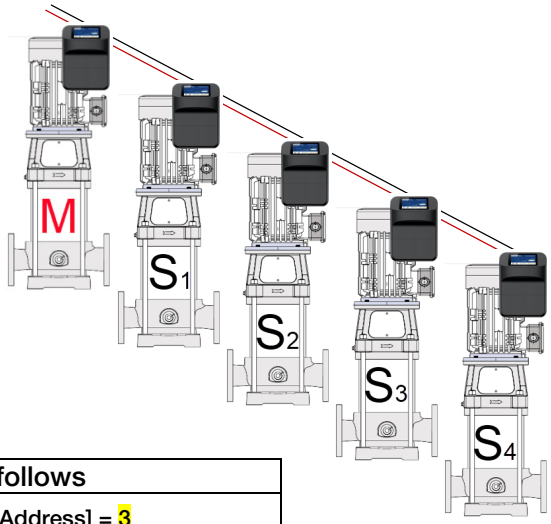
## Multi-pump Control

1. Each pump requires an individual BIA-DRIVE
2. All the drives are connected through a communication line.
3. Nominate either one or two master controllers. The second acts as a standby master.
4. A maximum of 4 slave controllers can be added. If a standby master is nominated, it also operates as an auxiliary to combine work.
5. Should the primary master controller fail, the standby master will take over to command the whole system. To operate as a master drive, the controller(s) must have a with pressure transducer connected. Auxiliary drives do not require transducers.
6. The master detects pipe water pressure via the pressure transducer and communicates the signal to the auxiliaries, automatically controlling the auxiliaries to run or stop and their PID status according to the water pressure condition.
7. Should the primary master controller fail to operate, the standby master will automatically replace the master to control the system. Should any auxiliary drive fail to operate, the system will just skip past and start the next controller, ensuring the automatic shift of the pump group.
8. The pumps run alternately (8 hours by default) to balance every pump's running time to prolong service life of the whole pump-set. COMM GROUP / Parameter #2 [Alternation time]

**Use shielded twin-core cable to connect S+ to S+ and S- to S- in parallel from one drive to the next before setting parameters.**

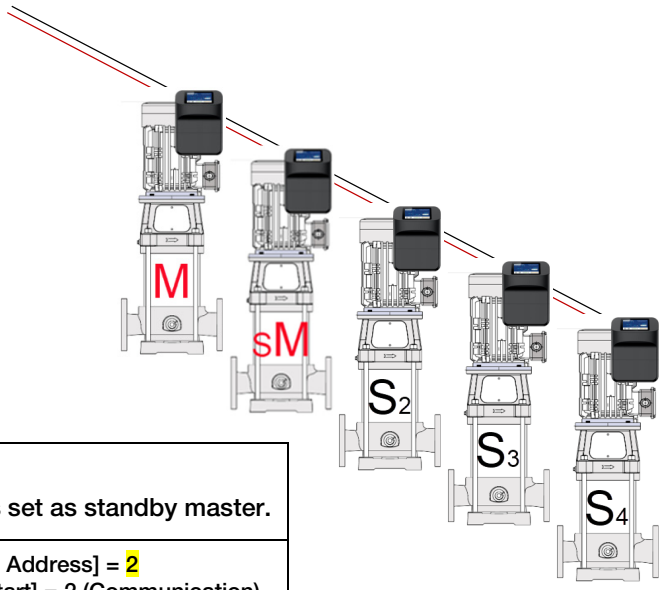
### (1) One-master pump setting:

| Pump 1 **Master** controller<br>COMM GROUP Parameters | | |
|---|---|---|
| #4 | Multi Pump Control<br>0 = Master / Slave | 0 |
| #1 | Comm Address (Master) | 1 |
| #3 | Slave Quantity<br>Set according to system | 0 - 4 |




| Set every **slave** controller as follows | |
|---|---|
| Pump 2<br>Slave 1 | COMM GROUP / Parameter #1: [Comm Address] = 3<br>PUMP GROUP / Parameter #9: [Stop/Start] = 2 (Communication)<br>PUMP GROUP / Parameter #10: [Freq Input] = 2 (Communication) |
| Pump 3<br>Slave 2 | COMM GROUP / Parameter #1: [Comm Address] = 4<br>PUMP GROUP / Parameter #9: [Stop/Start] = 2 (Communication)<br>PUMP GROUP / Parameter #10: [Freq Input] = 2 (Communication) |
| Pump 4<br>Slave 3 | COMM GROUP / Parameter #1: [Comm Address] = 5<br>PUMP GROUP / Parameter #9: [Stop/Start] = 2 (Communication)<br>PUMP GROUP / Parameter #10: [Freq Input] = 2 (Communication) |
| Pump 5<br>Slave 4 | COMM GROUP / Parameter #1: [Comm Address] = 6<br>PUMP GROUP / Parameter #9: [Stop/Start] = 2 (Communication)<br>PUMP GROUP / Parameter #10: [Freq Input] = 2 (Communication) |

## (2) Two-master pump setting:




| Pump 1 **Master** controller<br>COMM GROUP Parameters | |
|---|---|
| Multi Pump Control<br>0 = Master / Slave | 0 |
| Comm Address (Master) | 1 |
| Slave Quantity<br>Set according to system | 0 - 4 |

| Pump 2 **Standby Master** controller<br>Pump 2 must be connected to sensor when it is set as standby master. | |
|---|---|
| Standby Master and Aux | COMM GROUP / Parameter #1: [Comm Address] = 2<br>PUMP GROUP / Parameter #9: [Stop/Start] = 2 (Communication)<br>PUMP GROUP / Parameter #10: [Freq Input] = 2 (Communication) |

| Set **slave** controllers as follows | |
|---|---|
| Pump 3<br>Slave 2 | COMM GROUP / Parameter #1: [Comm Address] = 3<br>PUMP GROUP / Parameter #9: [Stop/Start] = 2 (Communication)<br>PUMP GROUP / Parameter #10: [Freq Input] = 2 (Communication) |
| Pump 4<br>Slave 3 | COMM GROUP / Parameter #1: [Comm Address] = 4<br>PUMP GROUP / Parameter #9: [Stop/Start] = 2 (Communication)<br>PUMP GROUP / Parameter #10: [Freq Input] = 2 (Communication) |
| Pump 5<br>Slave 4 | COMM GROUP / Parameter #1: [Comm Address] = 5<br>PUMP GROUP / Parameter #9: [Stop/Start] = 2 (Communication)<br>PUMP GROUP / Parameter #10: [Freq Input] = 2 (Communication) |

### Double-Master pump alternation

Pump 1 controller and Pump 2 controller must each have a sensor connected

1. The master pump status is shifted from Pump 1 to Pump 2 under the following circumstances:
   a) Comm signal is off between Pump 1 and Pump 2
   b) Pump 1 sensor at fault protection status
   c) Pump 1 is damaged.
2. Pump 2 controller operates as master pump until the above (a.b.c.) are resolved. Pump 1 controller will resume master pump status again only after switching power off and on.
3. While running, the master pump status shifts to Pump 2 only when Pump 1 signal is off.

After cycling power, Pump 2 controller must receive a signal from Pump 1 to determine whether it assumes master pump status or not.

**Note: In the one master pump system, if Pump 1 has problems such as phase loss, overvoltage, undervoltage protection, the other slave pumps operate normally.**

# 14. Pump Group Parameters – with notes

| Pump Group 32 parameters, 6 pages | | | |
|---|---|---|---|
| **Item** | **Function** | **Set Range** | **Default** |
| 1 | Initialisation | 0 - 9999 | 0 |
| 2 | Motor Rated Power | 1 - 1000 kW | Set according to motor nameplate |
| 3 | Motor Rated Speed | 1 - 10000 rpm | |
| 4 | Motor Rated Voltage | 1 - 800 V | |
| 5 | Motor Rated Current | 01 - 1000.0 A | |
| 6 | Rotation Direction | 0 = Forward 1 = Reverse<br>2 = Not allowed | 0 |
| 7 | Stop method | 0 = Stop by deceleration<br>1 = Natural Stop | 0 |
| 8 | Low-voltage protection | 70.0 - 100.0% | 100.00% |
| 9 | Stop-and-start command | 0 = Keypad 1 = Terminal (DI terminal)<br>2 = Communication (User display) | 2 |
| 10 | Frequency given | 0 = UO-14<br>1= PID 2 = Com. (Slave Com2)<br>3 = External control (0 – 10 V)<br>4 = External control (4 – 20 mA)<br>5 = C1 (4 – 20 mA) | 1 |
| 11 | Acceleration time | 0.1 - 6000.0 s | 8.0 s |
| 12 | Deceleration time | | |
| 13 | Max. Frequency | 5.00 – 200 Hz | 50.00 Hz |
| 14 | Upper-limit Frequency | | |
| 15 | Lower-limit Frequency | | 0.0 Hz |
| 16 | Hand Input Frequency | 0.00 – 200 Hz | 50.00 Hz |
| 17 | Carrier Frequency | 1 - 12 | 6 |
| 18 | Output phase-loss protection | 0 = Off 1 = On | 1 |
| 19 | Motor overload gain protection | 20.0 - 1000.0% | 100.0% |
| 20 | Torque Boost | 0 - 20% | Model-dependent |
| 21 | GND short circuit protection | 0 = Off 1 = On | 1 |
| 22 | Overcurrent stall gain | 0-100.0 s | 20 s |
| 23 | Overcurrent stall current | 100.0 - 200.0% | 160.0% |
| 24 | Overvoltage stall / Overvoltage protection | 110 – 145% | 130% |
| 25 | Auto-start option | 0 = Not allowed<br>1 = Start when power on | 0 |
| 26 | Auto-start delay when power is on | 0 - 100.0 s | 1.0 s |
| 27 | Fault Reset attempts | 0 - 20 | 3 |
| 28 | Fault Reset Time | 0.1 - 100.0 s | 10.0 s |

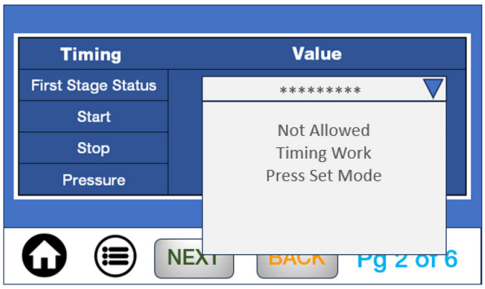
| | | | |
|---|---|---|---|
| 29 | Quick-reducing Current | 0 = Off 1 = On | 1 |
| 30 | Input phase-loss protection | 0 = Off 1 = On | 1 |
| 31 | Motor type selection | 0 = Asynchronous motor<br>1 = Permanent magnet synchronous | 0 |
| 32 | Motor Rated Frequency | 50 Hz | Set according to motor nameplate |

## 15. Timing Group Setup notes

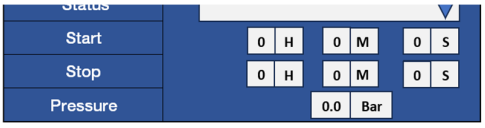
PRESSURE GROUP, Parameter 1

**Timing Work:** The controller will ONLY operate at the times and pressure(s) set at each stage.

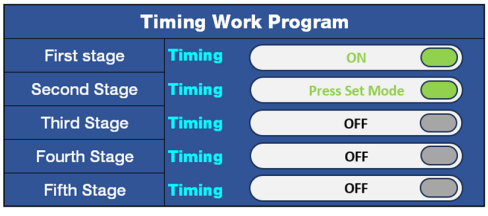
**Press Set Mode:** The controller operates for the programmed time and at the pressure programmed at that stage. Outside of the programmed stages, the controller operates normally on demand at the pressure set at.

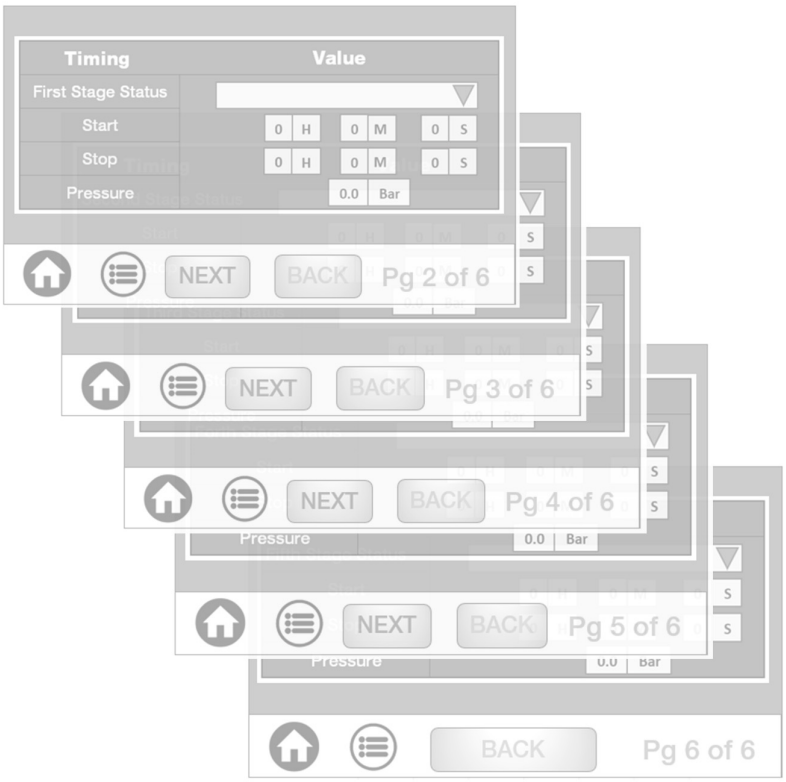



Select the mode




Set Start/Stop times and pressure




Once programming is complete, the first page of the timing group shows how many Stages are active AND which Mode they are set to.

# 16. I/O Group Parameters – with notes

| Input / Output Group 25 parameters, 5 pages | | | |
|---|---|---|---|
| **Item** | **Function** | **Set Range** | **Default** |
| 1 | Min V | 0.00 – 10.00 | 0.00 |
| 2 | Min V Freq | 0.0 – 100% | 0.0% |
| 3 | Max V | 0.00 – 10.00 | 10.00 |
| 4 | Max V Freq | 0.0 – 100% | 100% |
| 5 | V Filter time | 0.01 – 10.00 seconds | 0.05 s |
| 6 | Min C | 0.00 – 20.00 | 4.0 |
| 7 | Min C Freq | 0.0 – 100.0% | 0.0% |
| 8 | Max C | 0.00 – 20.00 | 20.00 |
| 9 | Max C Freq | 0.0 – 100.0% | 100.0% |
| 10 | C Filter time | 0.01 – 10.00 seconds | 0.05 s |
| 11 | Di 1 Option | 0 = Disabled 1 = Forward 2 = Reverse 3 = Fault input 4 = Haste stop 5 = Reset 6 = PIO closed 7 = Keypad command 8 = Terminal command 9 = Com command 10 = Fault input normally closed 11 = Water shortage | 0 |
| 12 | Di 2 Option | | 0 |
| 13 | Di 3 Option (4.0kW and up only) | | Di 3 Default 11 |

Smaller driver with only 2 DI terminals should ensure DI3 is set to Zero.

| | | | |
|---|---|---|---|
| 14 | Mo Output | 0 = Disabled 1 = Run Status 2 = Fault 3 = FDT1 4 = FOT2 5 = Run at 0 freq. 6 = Lower-limit freq. run 7 = Upper-limit freq. run 8 = Standby 9 = Sleep 10 = Temp Arrival | 1 |
| 15 | Relay (TA, TB, TC) | | 2 |
| 16 | Relay (TA1, TB1, TC1) | | 1 |
| 17 | Di1 valid delay | 0.0 – 3600.0 seconds | 0.0 seconds |
| 18 | Di1 invalid delay | | |
| 19 | Di2 valid delay | | |
| 20 | Di2 invalid delay | | |
| 21 | Di3 valid delay | | |
| 22 | Di3 invalid delay | | |
| 23 | MO output delay | | |
| 24 | Relay Delay | | |
| 25 | Relay1 Delay | | |

# 17. Periodic Maintenance

Operation can suffer if the controller suffers overheating. Ambient temperature should be maintained in the range 0–40°C and humidity between 20 to 90%.

Over the life of the controller, a build-up of dust or dirt can result in the controller operating at a higher temperature than normal.

The controller should be installed where airborne dust is minimised.

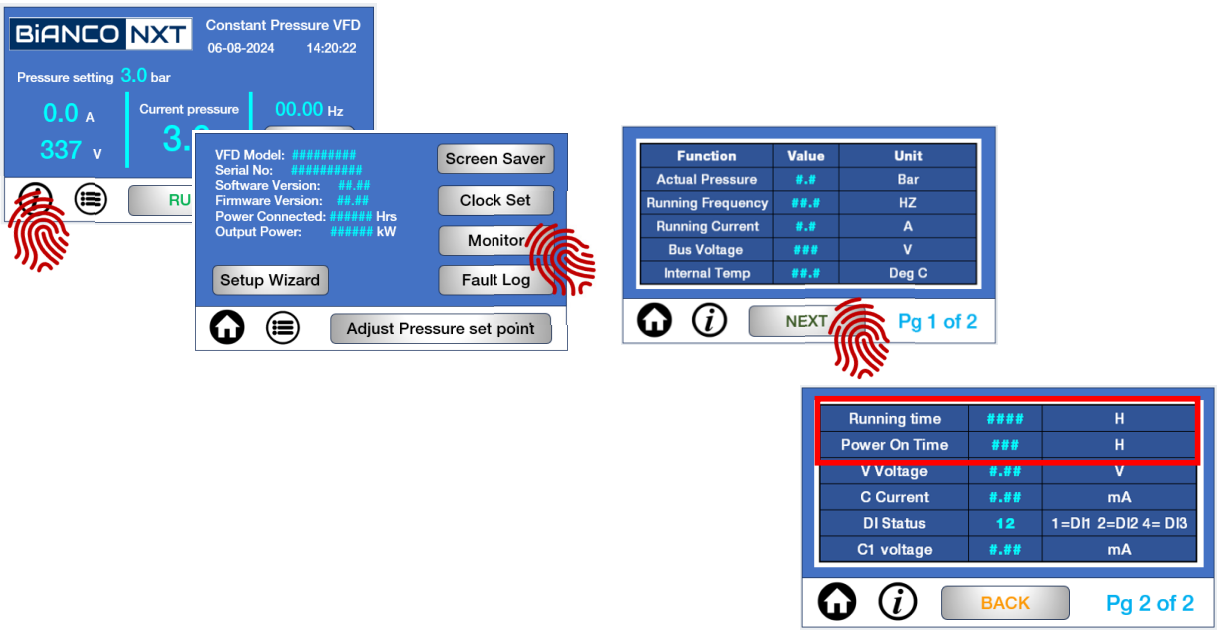
The cover should be removed periodically and vacuum or low-pressure air used to remove any build-up of dust or dirt especially on the PCBs, on the fans and on the cooling plate/heatsink fins.

While the cover is removed, check the control terminal screws are tight.

The BIA-DRIVE controllers are fitted with cooling fans to assist with controlling temperature. If the operation of the fan is compromised or the fan has failed, abnormal operation may result.

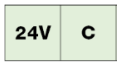
- Fans and capacitors are considered wearing parts.
- Expected fan life = 20,000 hours running.
- Expected capacitor life = 30 – 40,000 hours running.
- Abnormal appearance, colour or smell indicates that the capacitor is faulty.

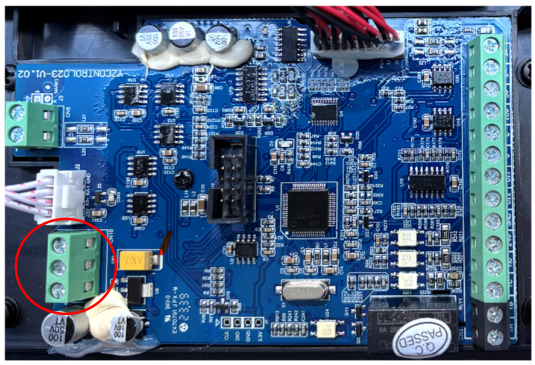
<u>Checking operating hours:</u>



# 18. Setup quick guide – (4-20mA input)

Up to 2.2kW, remove the front cover.

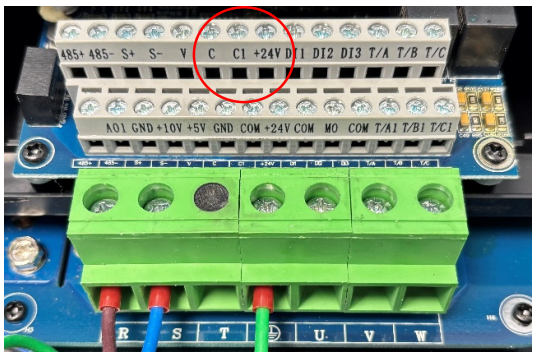


The DRIVE-PRO cabinets include a pre-wired terminal strip.

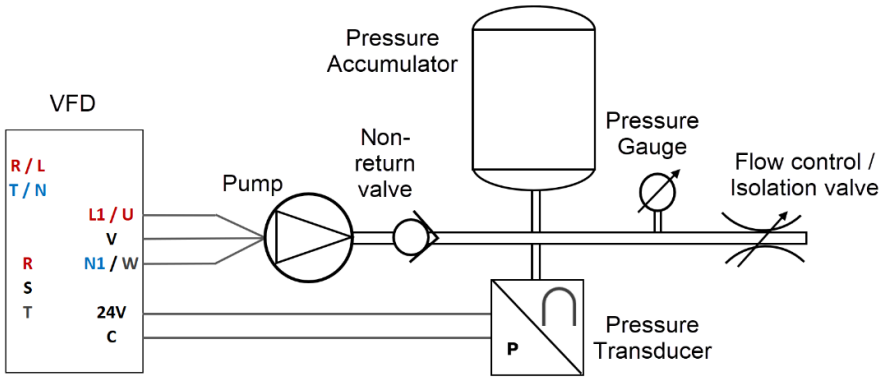
- Connect the incoming power supply
- Connect the wiring to the pump motor
- Connect the pressure transducer

To access the terminals inside the DRIVE, (4kW and up) remove the lower front cover.



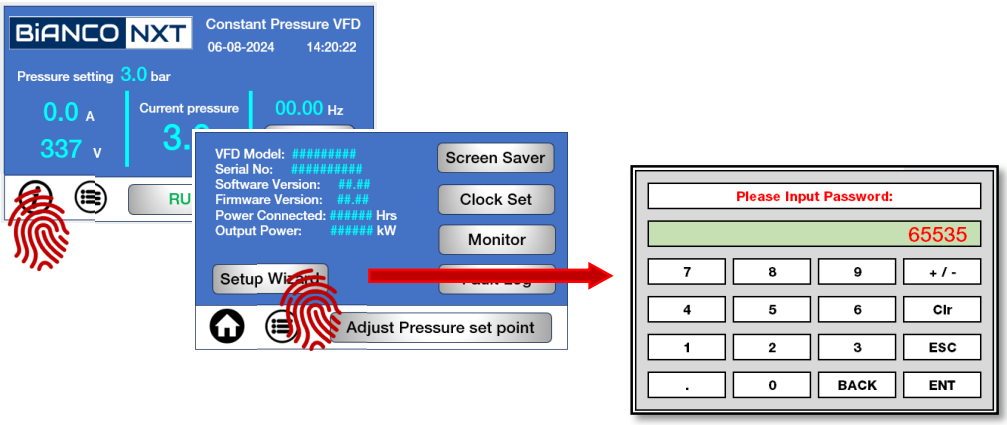

A full list of terminals and their functions can be found on pages 12 and 13.

**Ensure the installation meets the minimum requirements as shown below**



# 19. Setup quick guide – Setup Wizard (4-20mA input)

As the bare minimum, **EVERY** Drive requires programming via the Setup Wizard.




| Setup wizard: Constant Pressure, Sleep Enabled, Auto Restart | | | |
|---|---|---|---|
| Pump Group #1 | Nameplate kW | ##.# | Rated kW |
| Pump Group #4 | Nameplate Voltage | ### | Rated Voltage |
| Pump Group #3 | Rated Motor Speed | #### | RPM |
| Pump Group #5 | Rated Current | #.# | Amp |
| Pump Group #13 | Max Hz | #.# | Hz |
| Pump Group #15 | Upper Limit Hz | 50 | Hz |
| Press Group #10 | Sleep Option | 1 | 0 = Off. 1 = On |
| Press Group #11 | Sleep Freq | 30 | Hz |
| Press Group #7 | Sleep detect time | 30 | Sec |
| Press Group #26 | Sleep Delay | 1.0 | 0.1 - 200.0 sec |
| Pump Group #25 | Auto-Start Option | 0 | 0 = Not allowed<br>1 = Start when power on |
| Pump Group #15 | Minimum Hz | 30 | Hz |
| Pump Group #6 | Motor Direction | 0 | 0 = Forward 1 = Reverse<br>2 = Not allowed |
| Pump Group #11 | Acceleration time | 8 | Seconds |
| Pump Group #12 | Deceleration time | 8 | Seconds |
| Pump Group #8 | Low V Protection | 85% | 70.0 - 100.0% |
| Press Group #8 | W.S. detect mode | ##.# | 0 =Off 1=By Current 2=By Press<br>3= Current&Press 4=Terminal |
| Press Group #15 | W.S detect value | 0.5 | Bar |
| Press Group #17 | W.S. detect time | 50 | Sec |
| Press Group #19 | H.P. alarm | 15 | Bar |
| Press Group #20 | H.P. detect time | 3 | Sec |
| Press Group #18 | W.S. detect current | ##.# | Amps (suggest 85% FLC) |
| End of setup wizard | | | |

In most cases, for a single Pump / Master DRIVE arrangement, after connecting the pressure transducer tuning the setup wizard is all that is required.

Check and alter every setting as necessary.

For Multi-pump / Multi-DRIVE systems, the Master Drive and Standby Master both require a transducer connected.

The Master Drive requires every Wizard setting checked and altered. The Standby Master and Slave Drives require ONLY the parameters highlighted in the green boxes altered.

## 20. Setup quick guide – Bore pump, constant pressure (4-20mA input)

Bore motors with Kingsbury-type thrust bearings: Set acceleration / deceleration to 2.0 seconds.

## 21. Setup quick guide – Dual pump-set, constant pressure

| Drive type | Comm Group: | Parameters setting |
|---|---|---|
| Master Drive 1 | Frequency Given: Default | 1 = PID |
| | Comm. address | 1 |
| | Follower qty | 1 |
| Standby Master Drive 2 | Start/stop command: | 2 |
| | Frequency given | 2 |
| | Comm. address | 2 |

## 22. Setup quick guide – Triple pump-set, constant pressure

| Drive type | Comm Group: | Parameters setting |
|---|---|---|
| Master Drive 1 | Frequency Given: Default | 1 = PID |
| | Comm. address | 1 |
| | Follower qty | 2 |
| Standby Master Drive 2 | Start/stop command: | 2 |
| | Frequency given | 2 |
| | Comm. address | 2 |
| Slave 1 Drive 3 | Start/stop command: | 2 |
| | Frequency given | 2 |
| | Comm. address | 3 |

## 23. Setup quick guide – 'Soft Start' without pressure control

Disable transducer setting.

PRESSURE GROUP / Parameter #3 [Sensor Type]: Set to 0 (0-10V)

I/O GROUP / Parameter 11 [Di 1 Option]: Set to the preferred start method.

7 = Keypad Command

8 = Terminal Command (see section 26)

9 = Comm Command (Drive Display Screen)

Set Acceleration / Deceleration times:

Centrifugal pump: 5 – 8s accel. / decel. recommended

Set to 2.0s for bore motors with Kingsbury-type thrust bearing.

# 24. Setup quick guide – Speed control via external input

**0.75 and 2.2kW BIA-DRIVES**

**Pump Group**

- Start /Stop command: = 1
- Frequency given: = 3 (0–10V)
- Connect external device(s) to Di1 and GND

**4.0kW BIA-DRIVES and larger**

**Pump Group**

- Start /Stop command: = 1
- Frequency given: = 4 (4–20mA)
- Connect external device(s) to Di1 and GND

# 25. Setup quick guide – Water shortage control via float

## Water-level protection using a float switch input

**Step 1: Pressure Group - Parameter #8:** Change setting from 2 to 4 – *note this setting can also be altered in the setup wizard*

| | | | |
|---|---|---|---|
| 8 | Water shortage detect mode | 0 = Off 1 = By Current<br>2 = By Press. 3 = By Current and Press. 4 = Terminal Default = 2 | Select the means by which the controller will determine when there is insufficient water available. |

**Step 2: Pressure Group - Parameter #17:** This is effectively a shutdown-delay period – *note this setting can also be altered in the setup wizard*

| | | | |
|---|---|---|---|
| 17 | Water shortage detect delay | 0.1 - 999.9 sec Default = 50 sec | Ignore time when Parameter #8 condition is valid |

**Step 3: Elect an input to connect the float to and alter I/O Group - Parameter #11, 12 or 13**

The smaller drives (0.75–2.2kW) have 2 x Direct Inputs. The larger sizes have 3 x Direct Inputs. Connect the [float] switch across one of the direct input terminals and a ground terminal.

**Change the value of the Direct Input the [float] switch is connected to (DI1, DI2 or DI3) to 11. If the other DI terminals are unused, set their values should to Zero.**

| | | | |
|---|---|---|---|
| 11 | Di 1 Option | 0 = Disabled 1 = Forward 2 = Reverse 3 = Fault input 4 = Haste stop 5 = Reset 6 = PIO closed 7 = Keypad command 8 = Terminal command 9 = Com command 10 = Fault input normally closed 11 = Water shortage | |
| 12 | Di 2 Option | | |
| 13 | Di 3 Option | | Di 3 Default 11 |

**Step 4: (Optional)**

If desired, delays can be entered for the relevant Direct Input at I/O Group Parameters #17–22.
**It is not essential to alter these timings but with respect to water shortage, this can act as a restart delay/recovery time over and above the float switch operating.**

When the float switch falls to its OFF position, after the **Pressure Group - Parameter #17: Water Shortage Delay Time** has elapsed, a message will appear on the screen: "Low Float Prot."

When the drive has decelerated to 0Hz, the screen will display ALARM and continue to display the message with the reason.

Press RESET to restart.

# 26. Setup quick guide – Remote Run / No-run control

## Remote Run / No-Run control

**Step 1: Pump Parameters - Parameter #9:** Change setting from 2 (Communication) to 1 (Terminal)

| | | | |
|---|---|---|---|
| 9 | Stop and start command | 0 = Keypad 1 = Terminal<br>2 = Communication | 2 |

The control buttons (RUN/STOP) at the bottom of the screen are now overridden and have no effect.

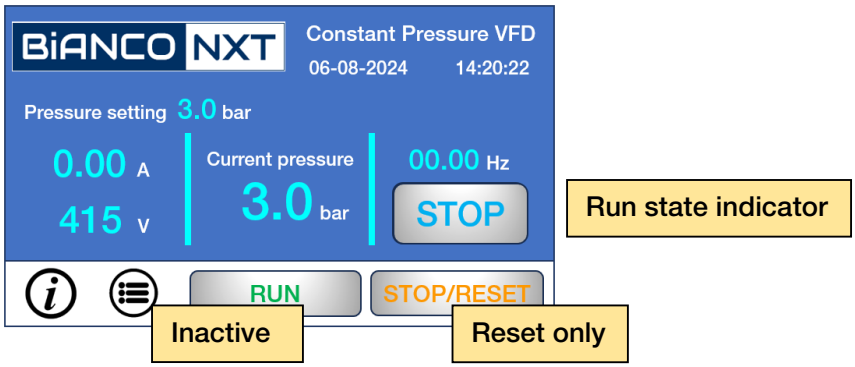
**Step 2: Connect the switch to in input and alter I/O Group - Parameter #11, 12 or 13**

The smaller drives (0.75–2.2kW) have 2 x Direct Inputs. The larger sizes have 3 x Direct Inputs.
Connect the switch across the desired input terminal and a GND terminal.
**Change the value of the Direct Input the switch is connected to (DI1, DI2 or DI3) to 1.**

| | | | |
|---|---|---|---|
| 11 | Di 1 Option | 0 = Disabled 1 = Forward 2 = Reverse 3 = Fault input 4 = Haste stop 5 = Reset 6 = PIO closed 7 = Keypad command 8 = Terminal command 9 = Com command 10 = Fault input normally closed 11 = Water shortage | |
| 12 | Di 2 Option | | |
| 13 | Di 3 Option (4.0kW and up only) | | Di 3 Default 11 |

**Step 3: (Optional)**

If desired, delays can be entered for the relevant Direct Input at I/O Group Parameters #17–22.
**It is not essential to alter these timings.**




When the switch is OFF (Open Circuit), the Drive enters a no-run state and the run-state indicator on the screen will display STOP.

When the switch is ON (Closed Circuit), the Drive enters a (ready-to) run state.
Start / Stop control is achieved according to the Drive configuration.
The screen will display the current operating state of the Drive.

RUN SLEEP ALARM TRIP

The only time the run state indicator will display STOP is when the control circuit is closed.

To restore control to the User Display: **Pump Parameters - Parameter #9:** Change setting to 2.

# 27. Appendix 1: Pressure Group Parameter List

| Pressure Group: 34 parameters, 6 pages | | | |
|---|---|---|---|
| **Item** | **Function** | **Set Range** | **Default** |
| 1 | Set Press | 0.0 - 60.0 bar | 3.0 bar |
| 2 | Start Press | 0 – U0 - 00 bar | 2.4 bar |
| 3 | Sensor Type | 0 = (0 - 10V) 1 = (4-20mA) 5 = (4-20mA) | 1 |
| 4 | Sensor Range | 0.0 - 60.0 bar | 10.0 bar |
| 5 | Press. correct | 0 - 2.000 | 1.000 |
| 6 | Frequency drop time | 0.0 – 100 (0 = Off) | 1 |
| 7 | Sleep Detect Time | 3 – 6000 sec | 30 sec |
| 8 | Water shortage detect mode | 0 = Off 1 = By Current 2 = By Press. 3 = By Current and Press. 4 = Terminal | 2 |
| 9 | Leakage factor | 0 – 10.0 | 1.0 |
| 10 | Sleep Option | 0 = OFF 1 = ON | 1 |
| 11 | Sleep Frequency | 0.00Hz – 100 Hz | 35.00 Hz |
| 12 | Anti-freezing / rust | 0 = OFF 1 = ON | 1 |
| 13 | Sensor off value | 0.0 - 100.0% | 5.0 |
| 14 | Sensor off time | 0.0 - 3000.0 sec | 10.0 sec |
| 15 | Water shortage detect value | 0 – 200 bar (low-pressure setting) | 0.5 bar |
| 16 | Water shortage freq. | 00.00 - 99.99 Hz | 45.00 Hz |
| 17 | Water shortage delay | 0.1 - 999.9 sec | 50.0 sec |
| 18 | Water shortage Current. | Model-dependent | Amps |
| 19 | High Pressure alarm | 0 - 200.0 bar (Suggest setting 3 bar above cut-out pressure) | 15.0 bar |
| 20 | High Pressure detect time | 0.1 - 200.0 sec | 3.0 sec |
| 21 | Water shortage alarm | 0.0 - 60.0 bar | 0 bar |
| 22 | L.P. detect time | 0.1 - 6000.0 sec (low pressure) | 60.0 sec |
| 23 | Anti freezing cycle | 3 - 60000 min | 1500 min |
| 24 | Anti freezing time | 0 - 6000 sec | 10 sec |
| 25 | Anti freezing freq. | 00.00 - 99.99 Hz | 30.00 Hz |
| 26 | Sleep Delay | 0.1 - 200.0 sec | 1.05 sec |
| 27 | Kp1 | 0.0 - 50.0 | 3.0 |
| 28 | Integral Time 1 | 0.1 - 100.0 sec | 1.0 sec |
| 29 | Kp2 | 0.0 - 50.0 | 3.0 |
| 30 | Integral Time 2 | 0.1 – 100.0 sec | 2.0 sec |
| 31 | PID Change Deviation | 0 – 100% | 50% |
| 32 | Alarm reset occurrences | 0 – 1000 | 200 |
| 33 | Alarm reset time | 0 – 60000 min | 10 min |
| 34 | Alarm reset Option | 0 = OFF 1 = ON | 111 |

# 28. Appendix 2: Comm Group Parameter List

| Communication Group: 10 parameters, 2 pages | | | |
|---|---|---|---|
| **Item** | **Function** | **Set Range** | **Default** |
| 1 | Comm Address | 1,2 for master; 3-5 for slave | 1 |
| 2 | Alternation Time | 0-60000 min | 480 min |
| 3 | Slave Qty | 0 - 4 | 0 |
| 4 | Multi-pump control | 0 = Master/slave control<br>1 = Simultaneous | 0 |
| 5 | Pump-adding delay | 0.1-600.0 sec | 1.0 sec |
| 6 | Pump-reducing delay | 0.1-600.0 sec | 0.1 sec |
| 7 | Standby Pump delay | 0.1-600.0 sec | 5.0 sec |
| 8 | Baud Rate for Comm | 5 = 9600 6 = 19200 7 = 38400 | 6 |
| 9 | External address | 0 - 247 | 1 |
| 10 | External baud rate | 5 = 9600 6 = 19200 7 = 38400 | 5 |

# 29. Appendix 3: Pump Group Parameter List

| Pump Group 32 parameters, 6 pages | | | |
|---|---|---|---|
| **Item** | **Function** | **Set Range** | **Default** |
| 1 | Initialization | 0 - 9999 | 0 |
| 2 | Motor Rated Power | 1 - 1000 kW | Set according to motor nameplate |
| 3 | Motor Rated Speed | 1 - 10000 rpm | |
| 4 | Motor Rated Voltage | 1 - 800 V | |
| 5 | Motor Rated Current | 01 - 1000.0 A | |
| 6 | Rotation Direction | 0 = Forward 1 = Reverse<br>2 = Not allowed | 0 |
| 7 | Stop method | 0 = Stop by deceleration<br>1 = Natural Stop | 0 |
| 8 | Low voltage Protection | 70.0 -100.0 % | 100.00% |
| 9 | Stop and start command | 0 = Keypad 1 = Terminal<br>2 = Communication | 2 |
| 10 | Frequency given | 0 = UO-14<br>1= PID 2 = Com. (Slave Com2)<br>3 = External control (0-10v)<br>4 = External control (4 – 20 mA)<br>5 = C1 (4 – 20mA) | 1 |
| 11 | Acceleration time | 0.1 - 6000.0 S | 8.0 sec |
| 12 | Deceleration time | 0.1 - 6000.0 S | 8.0 sec |
| 13 | Max Frequency | 5.00 – 200Hz | 50.00 Hz |
| 14 | Upper limit Frequency | 5.00 – 200Hz | 50.00 Hz |
| 15 | Lower limit Frequency | 5.00 – 200Hz | 0.0 Hz |
| 16 | Hand Input Frequency | 0.00 – 200Hz | 50.00 Hz |
| 17 | Carrier Frequency | 1 - 12 | 6 |
| 18 | Output phase loss protection | 0 = Off 1 = On | 1 |
| 19 | Motor overload Gain Protection | 20.0 – 1000.0% | 100.0% |
| 20 | Torque Boost | 0 - 20% | Model dependent |
| 21 | GND short circuit protection | 0 = Off 1 = On | 1 |
| 22 | Overcurrent stall gain | 0-100.0 sec | 20 sec |
| 23 | Overcurrent stall current | 100.0 - 200.0% | 160.0% |
| 24 | Overvoltage stall / Overvoltage protection | 110 – 145% | 130% |
| 25 | Auto Start option | 0 = Not allowed<br>1 = start when power on | 0 |
| 26 | Auto Start delay when power is on | 0 – 100.0 sec | 1.0 sec |
| 27 | Fault Reset attempts | 0 - 20 | 3 |
| 28 | Fault Reset Time | 0.1-100.0 sec | 10.0 sec |
| 29 | Quick reducing Current | 0 = Off 1 = On | 1 |
| 30 | Input phase loss protection | 0 = Off 1 = On | 1 |
| 31 | Motor type selection | 0 = Asynchronous motor<br>1 = Permanent magnet synchronous | 0 |
| 32 | Motor rated Frequency | 50 Hz | Set according to motor nameplate |

# 30. Appendix 4: I/O Group Parameters

| Input / Output Group 25 parameters, 5 pages | | | |
|---|---|---|---|
| **Item** | **Function** | **Set Range** | **Default** |
| 1 | Min V | 0.00 – 10.00 | 0.00 |
| 2 | Min V Freq | 0.0 – 100% | 0.0% |
| 3 | Max V | 0.00 – 10.00 | 10.00 |
| 4 | Max V Freq | 0.0 – 100% | 100% |
| 5 | V Filter time | 0.01 – 10.00 sec | 0.05 sec |
| 6 | Min C | 0.00 – 20.00 | 4.0 |
| 7 | Min C Freq | 0.0 – 100.0% | 0.0% |
| 8 | Max C | 0.00 – 20.00 | 20.00 |
| 9 | Max C Freq | 0.0 – 100.0% | 100.0% |
| 10 | C Filter time | 0.01 – 10.00 sec | 0.05 sec |
| 11 | Di 1 Option | 0 = Disabled 1 = Forward 2 = Reverse 3 = Fault input 4 = Haste stop 5 = Reset 6 = PIO closed 7 = Keypad command 8 = Terminal command 9 = Com command 10 = Fault input is constantly closed 11 = Water shortage | 0 |
| 12 | Di 2 Option | | 0 |
| 13 | Di 3 Option | | 11 |
| 14 | Mo Output | 0 = Disabled 1 = Run Status 2 = fault 3 = FDT1 4 = FOT2 5 = Run at 0 freq. 6 = Lower limit freq. run 7 = Upper limit freq run 8 = Standby 9 = Sleep 10 = Temp Arrival | 1 |
| 15 | Relay (TA, TB, TC) | | 2 |
| 16 | Relay (TA1, TB1, TC1) | | 1 |
| 17 | Di1 valid delay | 0.0 – 3600.0 sec | 0.0 sec |
| 18 | Di1 invalid delay | 0.0 – 3600.0 sec | 0.0 sec |
| 19 | Di2 valid delay | 0.0 – 3600.0 sec | 0.0 sec |
| 20 | Di2 invalid delay | 0.0 – 3600.0 sec | 0.0 sec |
| 21 | Di3 valid delay | 0.0 – 3600.0 sec | 0.0 sec |
| 22 | Di3 invalid delay | 0.0 – 3600.0 sec | 0.0 sec |
| 23 | MO output delay | 0.0 – 3600.0 sec | 0.0 sec |
| 24 | Relay Delay | 0.0 – 3600.0 sec | 0.0 sec |
| 25 | Relay1 Delay | 0.0 – 3600.0 sec | 0.0 sec |

# 31. Appendix 5: Alarm Codes and Solutions

**Common alarm codes and solutions**

| Alarm Description | Possible Reasons | Solutions |
|---|---|---|
| **Low Flow Prot** | 1. Low inlet flow<br>2. Water pressure below 0.5 bar.<br>3. Low water pressure, set too high | 1. Increase incoming water<br>2. Low flow detect mode – set 2<br><br>3. Decrease low water-protection current |
| **H.P. Prot** | 1. Actual pressure exceeds 15 bar<br>2. Sensor malfunction, the readout exceeds 15 bar | 1. Actual pressure exceeds 15 bar<br><br>2. Sensor malfunction, the readout exceeds 15 bar |
| **L.P. Prot** | 1. Pressure below 0.5 bar<br>2. Pressure below 0.5 bar while pump rotates reversely.<br>3. Water consumption is bigger than outlet flow.<br>4. Low press alarm set too high | 1. Remove the air in the pump<br>2. Adjust rotation direction<br>3. Increase the inlet flow<br>4. Replace with bigger size pump or reduce water consumption.<br>5. Lower the alarm set value |
| **Low Cur. Prot** | 1. Incoming water shortage.<br>2. Drive's power is bigger than that of pump.<br>3. Low water detecting current is set high | 1. Increase incoming water<br>2. Low flow detect mode set 2<br><br>3. Decrease low water protection current |

**Faults and Troubleshooting**

| Fault Type | Possible Reasons | Solutions |
|---|---|---|
| **O/P SCC** | 1. Short circuit or connected to ground<br>2. Overload | 1. Inspect wiring<br><br>2. Contact factory |
| **Accel OC** | 1. Short acceleration time<br>2. High torque boost or V/F curve is not applicable | 1. Increase acceleration time<br>2. Lower torque boost;<br>Increase volts; Adjust V/F curve |
| **Decel OC** | Short deceleration time | Increase deceleration time |
| **Run OC** | Load sharply change | Reduce load fluctuation |
| **SWOC** | Software Overcurrent | Alter PID values |
| **Internal Fault** | Hardware problems | Contact factory |
| **GND Fault** | 1. Drive or motor output is connected to ground<br>2. Drive input connected to output | 1. Inspect wiring<br><br>2. Inspect motor aging problems. |
| **Accel OV** | 1. High input voltage<br>2. Frequent switching on and off | Inspect the power and voltage |
| **Decel OV** | 1. Short decel. time<br>2. Abnormal input voltage. | 1. Increase decel. time<br>2. Inspect power voltage<br>3. Reinstall brake resistor |

**Faults and Troubleshooting cont'd**

| | | |
|---|---|---|
| **Run OV** | 1. Abnormal input voltage.<br>2. Feedback energy | 1. Inspect power<br>2. Reinstall brake resistor |
| **Underload Prot** | 1. Drive output virtual wiring<br>2. No load | 1. Inspect wiring<br>2. Inspect load |
| **Drive OL** | 1. Excessive electrical load<br>2. Short acceleration time<br>3. High torque increase or V/F curve not applicable<br>4. Low grid voltage | 1. Reduce load or replace with a higher output drive<br>2. Increase accel. time<br>3. Lower torque. Increase voltage, adjust V/F curve.<br>4. Check grid voltage |
| **Motor OL** | 1. Too big load<br>2. Too short acceleration time<br>3. Protection value is too small<br>4. Torque increases too high or V/F curve not applicable | 1. Reduce load or replace with a higher output drive<br>2. Increase acceleration time<br>3. Increase overload protection value<br>4. Lower torque. Increase voltage to adjust V/F curve. |
| **Current detection fault** | 1. Damage of detecting device or circuit fault<br>2. Auxiliary power problems | Contact factory |
| **Low Volt Run** | 1. Abnormal input voltage<br>2. Big load in power grid | 1. Inspect power voltage<br>2. Detach electricity supply |
| **Open Terminal** | External devices fault (input signal exists) | Inspect the signal and its related devices |
| **Closed Terminal** | | |
| **Drive overheat** | 1. Dust<br>2. High environmental temp.<br>3. Fan damaged | 1. Clean up air duct<br>2. Lower carrier frequency<br>3. Replace fan |
| **I/P phase loss** | 1. Input voltage phase loss<br>2. Input voltage is too low | 1. Check input wires connection<br>2. Check grid phase loss |
| **O/P Phase loss** | Bad connection of drive to motor | Inspect wiring |
| **Storage Faults** | Hardware fault | Contact factory |
| **Running time reaches set time** | Running time reaches set time | Contact factory |
| **Sensor Fault** | 1. PID signal is off<br>2. Sensor is broken<br>3. Sensor setting problem | 1. Check feedback channel<br>2. Check sensor has fault or not<br>3. Check if the feedback signal complies with setting |
| **Comm Fault** | Data sending and/or receiving is incorrect | 1. Check wiring<br>2. Contact manufacturer |
| **Interfere Fault** | Improper operation caused by the surrounding EMI | Use absorption circuit to eliminate the surrounding interference |

# 32. Warranties – Terms and Conditions

This warranty is given in addition to the consumer guarantees found within the Australian Competition and Consumer Act 2010 (Cth) for goods purchased in Australia and the Consumer Guarantees Act 1993 NZ for goods purchased in New Zealand:

**1)** White International Pty Ltd / White International NZ Ltd (White International) warrant that all products distributed are free from defects in workmanship and materials, for their provided warranty period as indicated on the top or opposite side of this document. Subject to the conditions of the warranty, White International will repair any defective products free of charge at the premises of our authorised service agents throughout Australia and New Zealand if a defect in the product appears during the warranty period. If you believe that you have purchased a defective product and wish to make a claim under this warranty, contact us on our Sales Hotline on 1300 783 601, or send your claim to our postal address or fax line below and we will advise you as to how next to proceed. You will be required to supply a copy of your proof of purchase to make a claim under this warranty.

**2)** This warranty excludes transportation costs to and from White International or its appointed service agents and excludes defects due to non-compliance with installation instructions, neglect or misuse, inadequate protection against the elements, low voltage or use or operation for purposes other than those for which they were designed. For further information regarding the suitability of your intended application contact us on our Sales Hotline on 1300 783 601. If you make an invalid claim under this warranty, the original product will be sent back to you unrepaired.

**3)** This warranty refers only to products sold after the 1st January 2012, and is not transferable to another product type and only applies to the original owner, purchaser or end user, and is in addition to the consumer guarantees found within the Competition and Consumer Act 2010 (Cth) for goods purchased in Australia and the Consumer Guarantees Act 1993 (NZ) for goods purchased in New Zealand.

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

**5)** To the fullest extent permitted by law, White International excludes its liability for all other conditions or warranties which would or might otherwise be implied at law. To the fullest extent permitted by law, White International's liability under this warranty and any other conditions, guarantees or warranties at law that cannot be excluded, including those in the Competition and Consumer Act 2010 (Cth), is expressly limited to: (a) in the case of products, the replacement of the product or the supply of equivalent product, the payment of the cost of replacing the product or of acquiring an equivalent product or the repair of the product or payment of the cost of having the product repaired, is at the discretion of White International or a 3rd party tribunal elected under the Competition and Consumer Act 2010 (Cth) for goods purchased in Australia and the Consumer Guarantees Act 1993 (NZ) for goods purchased in New Zealand; and

**6)** To the fullest extent permitted by law, this warranty supersedes all other warranties attached to the product or its packaging.

**7)** In the case of services, supplying the services again or the payment of the cost of having the services supplied again, is at the discretion of White International or a 3rd party tribunal elected under the Competition and Consumer Act 2010 (Cth) for goods purchased in Australia and the Consumer Guarantees Act 1993 (NZ) for goods purchased in New Zealand.

**8)** Our warranty commences from the date of purchase of the above-mentioned products. Proof of purchase is required before consideration under warranty is given.

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*Retain the printed copy along with your purchase receipt for your records.*

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