

HARDWARE MANUAL

Ixx24-A



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1 General

This manual covers the following products:

IHP24-A
IDP24-A with software DID-SW-001
IVC24-A
IDC24-A
ILB24-A
ILC24-A
IPC24-A

1.1 Safety instructions

For a safe installation of a Val Controls device, the following must be observed. The module must be installed by qualified personnel who are familiar with the national and international laws, directives and standards that apply to this product as well as all instructions in this manual.

The information in this manual is subject to changes without notice.

1.2 Environment

Operating temperature: -30 to 80 °C

Storage temperature: -30 to 80 °C

Extended operating temperature¹: -40 to 85°C

Extended storage temperature¹: -55 to 100°C

¹ Please contact Val Controls

Relative Humidity: < 95% (No condensation)

The printed circuit boards are coated for tropical climate and harsh environments to resist airborne contamination according to G3, ISA-71.04-2013.

Ingress protection: IP20

1.3 Mounting and dimension

Mounting: 35mm DIN rail according to EN50022.

Screw torque: 0.4Nm (3.6Lb. in)

Wire diameter: AWG14-22 (0.5mm² til 2.5mm²)

All external components must have specifications that fit the desired performance and requirements of the valve/actuator system.

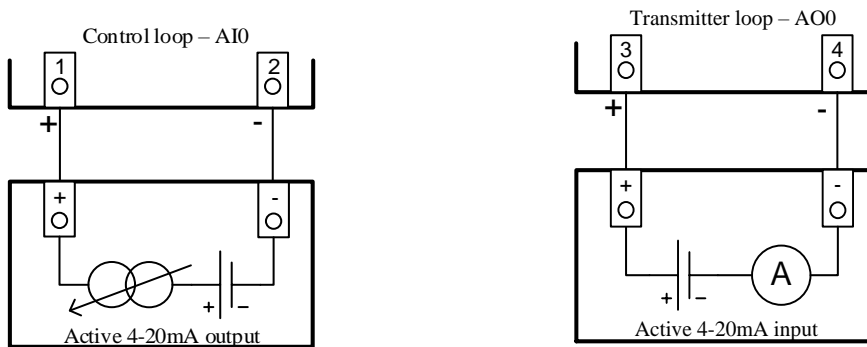
Dimensional drawing can be found on www.valcontrols.com

2 Communication

Several communication types are available as options.

2.1 Control loop – AI0 and Transmitter loop – AO0 (HART)

Passive 4-20mA input and passive 4-20mA output. On some models HART is available on either AO0 or AI0.



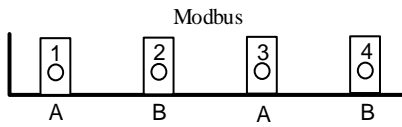
2.1.1 Terminals

| | |
|-----|----------------|
| AI0 | 1 (+) 2 (-) |
| AO0 | 3 (+) 4 (-) |

2.1.2 Electrical specifications

| Control loop – AI0 | |
|-------------------------|----------------------------------|
| Impedance | < 470 Ohm at 20mA and 9.4VDC |
| Linearity | < 0.1% |
| Temperature coefficient | 0.025% / 1°C (Warm-up: 10 min) |
| HART (optional) | FSK, 1200Hz / 2200Hz 400-800mVpp |
| Galvanic isolated | |
| Transmitter loop – AO0 | |
| Impedance | < 470 Ohm at 20mA and 9.4VDC |
| Linearity | < 0.1% |
| Temperature coefficient | 0.015% / 1°C (Warm-up: 10 min) |
| HART (optional) | FSK, 1200Hz / 2200Hz 400-800mVpp |
| Galvanic isolated | |

2.2 Modbus



2.2.1 Terminals

| Modbus | |
|--------|--|
| 1 (A) | |
| 2 (B) | |
| 3 (A) | |
| 4 (B) | |

Terminals 1 and 3 are connected inside the device. Terminals 2 and 4 are connected inside the device.

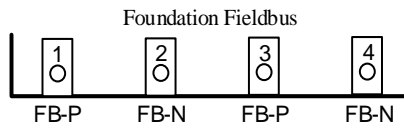
2.2.2 Electrical specifications

| Modbus | |
|----------------------|---|
| Interface | RS485 |
| Termination resistor | No internal resistor. External resistor can be applied across terminal 3 and 4. Termination resistors must have the value of 120 Ohm. |
| Galvanic isolated | |

A maximum of 247 nodes can be connected on the same daisy chain bus.

Typical shielding of the RS485 bus cable is done on the master side of the cable.

2.3 Foundation Fieldbus



2.3.1 Terminals

| Foundation Fieldbus | |
|---------------------|----------|
| Foundation Fieldbus | 1 (FB-P) |
| | 2 (FB-N) |
| | 3 (FB-P) |
| | 4 (FB-N) |

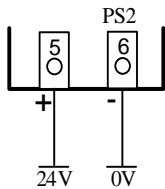
2.3.2 Electrical specifications

| FF-Fieldbus | |
|-------------|--|
| Interface | FF-Fieldbus - H1 Device Class – Basic Device |
| Termination | No internal termination |

3 Main board

3.1 Power supply – PS2

24VDC power input to the device.



Depending on device configuration, this power supply input may not be used.

3.1.1 Terminals

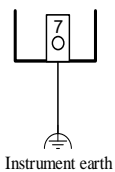
| PS2 | 5 (+) 6 (-) |
|-----|----------------|

3.1.2 Electrical specifications

| Power supply – PS2 | |
|---|----------------|
| Power supply | 20.4 – 27.6VDC |
| Power dissipation, no position sensor/loop or valves are connected. | < 2W |
| Power dissipation, with maximum load on all inputs and outputs | < 5W |

3.2 Earth

Device instrument earth terminal shall be connected to instrument earth bar at marshalling cabinet to avoid electromagnetic interference.

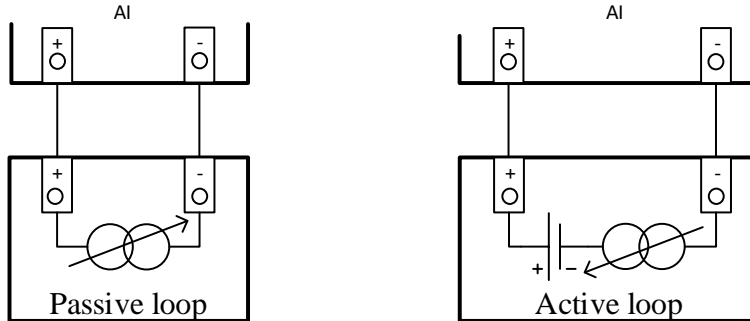


3.2.1 Terminal

| IE | 7 Instrument earth |
|----|--------------------|

3.3 4-20mA input – AI1, AI2, AI3, AI4, AI5

The analogue inputs can be used to connect passive 4-20mA sensors to the device or in the alternative configuration active 4-20mA sensors.



3.3.1 Terminals

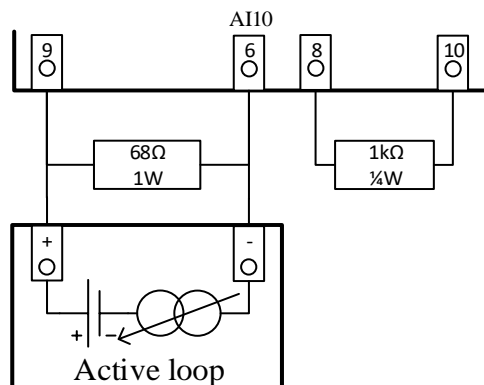
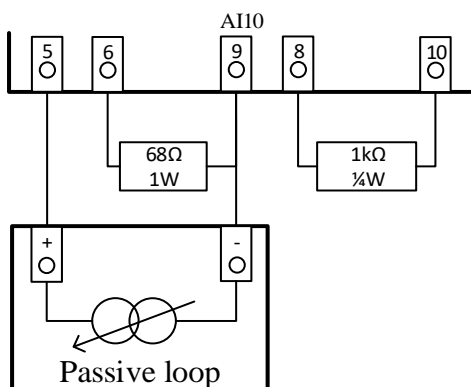
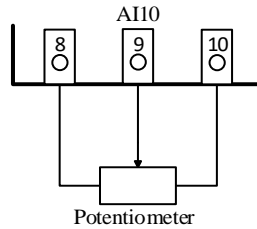
| | Passive sensor | Active sensor |
|-----|------------------|-----------------|
| AI1 | 11 (+) 12 (-) | 12 (+) 6 (-) |
| AI2 | 13 (+) 14 (-) | 14 (+) 6 (-) |
| AI3 | 15 (+) 16 (-) | 16 (+) 6 (-) |
| AI4 | 17 (+) 18 (-) | 18 (+) 6 (-) |
| AI5 | 19 (+) 20 (-) | 20 (+) 6 (-) |

3.3.2 Electrical specifications

| AI – Analogue inputs | |
|-------------------------|-------------------------------|
| External loop max Rload | 820 Ohm at 20mA and 16.4VDC |
| Operating area | 4 – 20mA |
| Minimum span | 12mA |
| Cable length | 1000 meters |
| Linearity | < 0.1% |
| Temperature coefficient | 0.01% / 1°C (Warm-up: 10 min) |
| Rin | < 100 Ohm |

3.4 Position sensor – AI10

The position feedback can be delivered from a 3-wire potentiometer. The sensor input can as an alternative also be used as a 4-20mA loop input.



The external resistors must be mounted to get the correct functionality.

3.4.1 Terminals

| | Sensor | Passive loop | Active loop |
|------|-------------------------------------|----------------|----------------|
| AI10 | 8 Pot high 9 Wiper 10 Pot low | 5 (+) 9 (-) | 9 (+) 6 (-) |

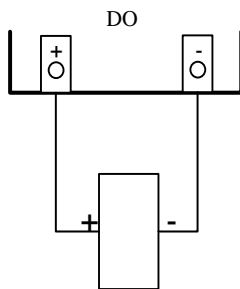
3.4.2 Electrical specifications

| AI10 – Position sensor | |
|------------------------|---------------|
| Potentiometer size | 5 kΩ to 20 kΩ |

| | |
|----------------------------|-------------------------------|
| Minimum use operating area | 40% |
| Cable length | 1.5 meters |
| Linearity | < 0.1% |
| Temperature coefficient | 0.01% / 1°C (Warm-up: 10 min) |
| AI10 – Loop | |
| External loop max Rload | 820 Ohm at 20mA and 16.4VDC |
| Operating area | 4 – 20mA |
| Minimum span | 12mA |
| Cable length | 1000 meters |
| Linearity | < 0.1% |
| Temperature coefficient | 0.01% / 1°C (Warm-up: 10 min) |
| Rin | < 100 Ohm |

3.5 Digital output – DO1, DO2, DO3, DO4, DO5, DO6

24 VDC digital outputs.



3.5.1 Terminals

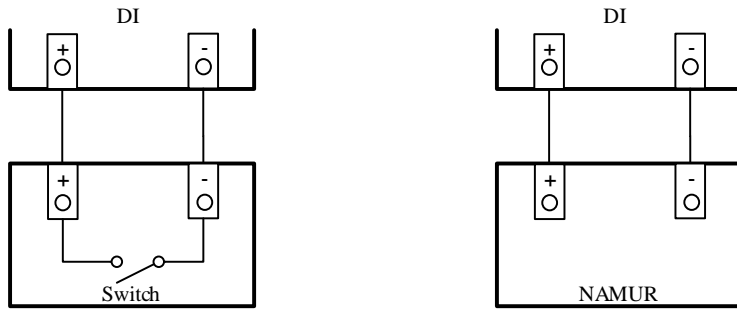
| | |
|-----|------------------|
| DO1 | 27 (+) 28 (-) |
| DO2 | 30 (+) 31 (-) |
| DO3 | 33 (+) 34 (-) |
| DO4 | 36 (+) 37 (-) |
| DO5 | 47 (+) 48 (-) |
| DO6 | 49 (+) 50 (-) |

3.5.2 Electrical specifications

| | |
|-----------------------------|---------------------|
| DO – Digital outputs | |
| Max load per digital output | up to 48W at 24VDC |
| Max load total | up to 192W at 24VDC |

3.6 Digital input – DI1, DI2, DI3, DI4

Use digital inputs to connect dry signals.



3.6.1 Terminals

| | |
|-----|------------------|
| DI1 | 39 (+) 40 (-) |
| DI2 | 41 (+) 42 (-) |
| DI3 | 43 (+) 44 (-) |
| DI4 | 45 (+) 46 (-) |

3.6.2 Electrical specifications

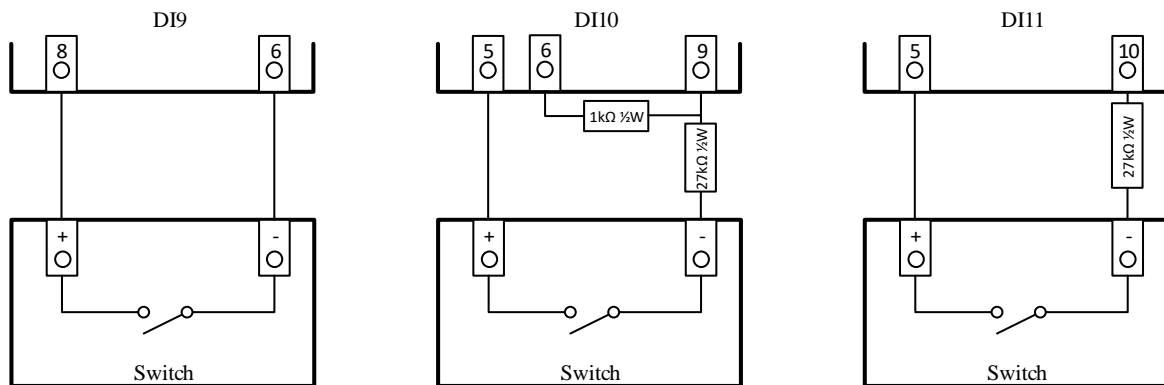
| DI – Switch | |
|--------------------------|-------------|
| Type | Switch |
| Cable length | 20 meters |
| Maximum cable resistance | 100 Ohm |
| DI – NAMUR | |
| Type | NAMUR |
| Sensor supply voltage | 8 V |
| Cable length | 1000 meters |
| Max load | 600 Ohm |
| Rin | 1040 Ohm |

4 Alternative digital inputs

DI9 to DI17 are analogue inputs but configured in a way that makes it possible to use them as digital inputs.

4.1 Digital input – DI9, DI10, DI11

DI9, DI10 and DI11 substitutes AI10



The external resistor must be mounted to get the correct functionality.

4.1.1 Terminals

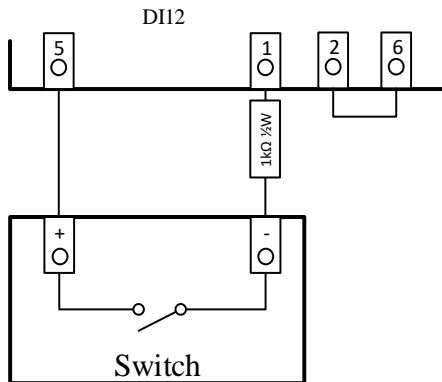
| | |
|------|-----------------|
| DI9 | 8 (+) 6 (-) |
| DI10 | 5 (+) 9 (-) |
| DI11 | 5 (+) 10 (-) |

4.1.2 Electrical specifications

| DI12 | |
|--------------|------------|
| Type | Switch |
| Cable length | 1.5 meters |

4.2 Digital input – DI12

DI12 substitutes AI0



The external resistor and connection between terminal 2 and 6 must be mounted to get the correct functionality.

4.2.1 Terminals

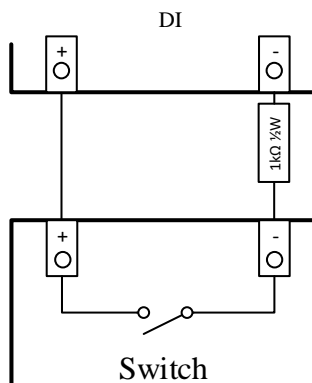
| | |
|------|----------------|
| DI12 | 1 (+) 5 (-) |
|------|----------------|

4.2.2 Electrical specifications

| DI12 | |
|--------------|-------------|
| Type | Switch |
| Cable length | 1000 meters |

4.3 Digital input – DI13, DI14, DI15, DI16, DI17

DI13 substitutes AI1, DI14 substitutes AI2, and so on.



The external resistor must be mounted to get the correct functionality.

4.3.1 Terminals

| | |
|------|------------------|
| DI13 | 11 (+) 12 (-) |
| DI14 | 13 (+) 14 (-) |
| DI15 | 15 (+) 16 (-) |
| DI16 | 17 (+) 18 (-) |
| DI17 | 19 (+) 20 (-) |

4.3.2 Electrical specifications

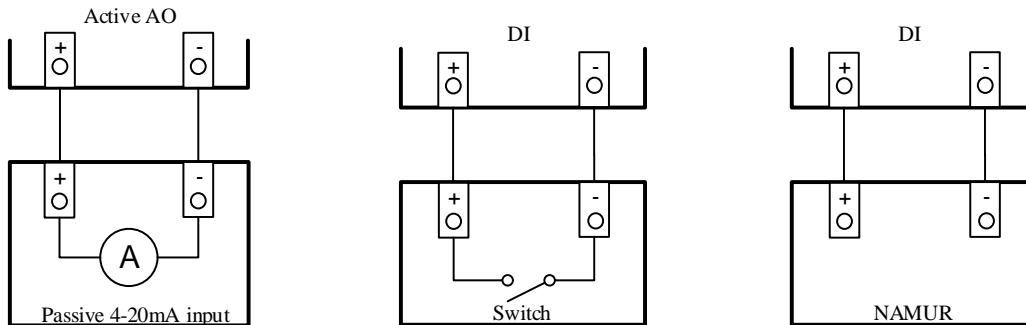
| DI – Switch | |
|--------------|-------------|
| Type | Switch |
| Cable length | 1000 meters |

5 Expansion

The expansion terminals have different function depending on which expansion module is installed.

5.1 Active analogue output – AO1, AO2 and Digital inputs – DI5, DI6

Use the two analogue outputs to connect 4-20mA loop inputs e.g. proportional valves.



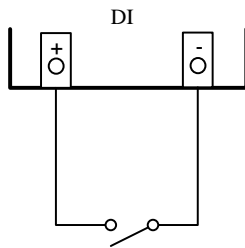
5.1.1 Terminals

| | |
|-----|------------------|
| AO1 | 21 (+) 22 (-) |
| AO2 | 23 (+) 24 (-) |
| DI5 | 51 (+) 52 (-) |
| DI6 | 25 (-) 26 (+) |

5.1.2 Electrical specifications

| AO1 – AO2 – Active analogue output | |
|---|--|
| Max load | 550 Ohm at 20mA and 20.4VDC PS2 supply |
| Linearity | < 0.1% |
| Temperature coefficient | 0.015% / 1°C (Warm-up: 10 min) |
| DI – Switch | |
| Type | Switch |
| Cable length | 20 meters |
| Maximum cable resistance | 100 Ohm |
| DI – NAMUR | |
| Type | NAMUR |
| Sensor supply voltage | 8 V |
| Cable length | 1000 meters |
| Max load | 600 Ohm |
| Rin | 1040 Ohm |

5.2 Digital input – DI5, DI6, DI7, DI8



5.2.1 Terminals

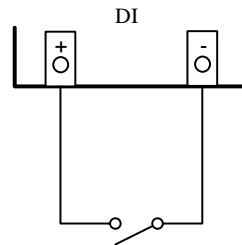
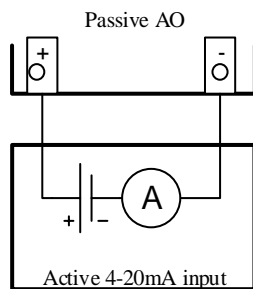
| | |
|-----|------------------|
| DI5 | 51 (+) 52 (-) |
| DI6 | 25 (-) 26 (+) |
| DI7 | 23 (+) 24 (-) |
| DI8 | 21 (+) 22 (-) |

5.2.2 Electrical specifications

| DI – Switch | |
|--------------------------|-------------|
| Type | Switch |
| Cable length | 20 meters |
| Maximum cable resistance | 100 Ohm |
| DI – NAMUR | |
| Type | NAMUR |
| Sensor supply voltage | 8 V |
| Cable length | 1000 meters |
| Max load | 600 Ohm |
| Rin | 1040 Ohm |

5.3 Passive analogue output – AO1, AO2 and Digital inputs – DI5, DI6

The two analogue outputs can be used to connect 4-20mA.



5.3.1 Terminals

| | |
|-----|------------------|
| AO1 | 21 (+) 22 (-) |
| AO2 | 23 (+) 24 (-) |
| DI5 | 51 (+) 52 (-) |
| DI6 | 25 (-) 26 (+) |

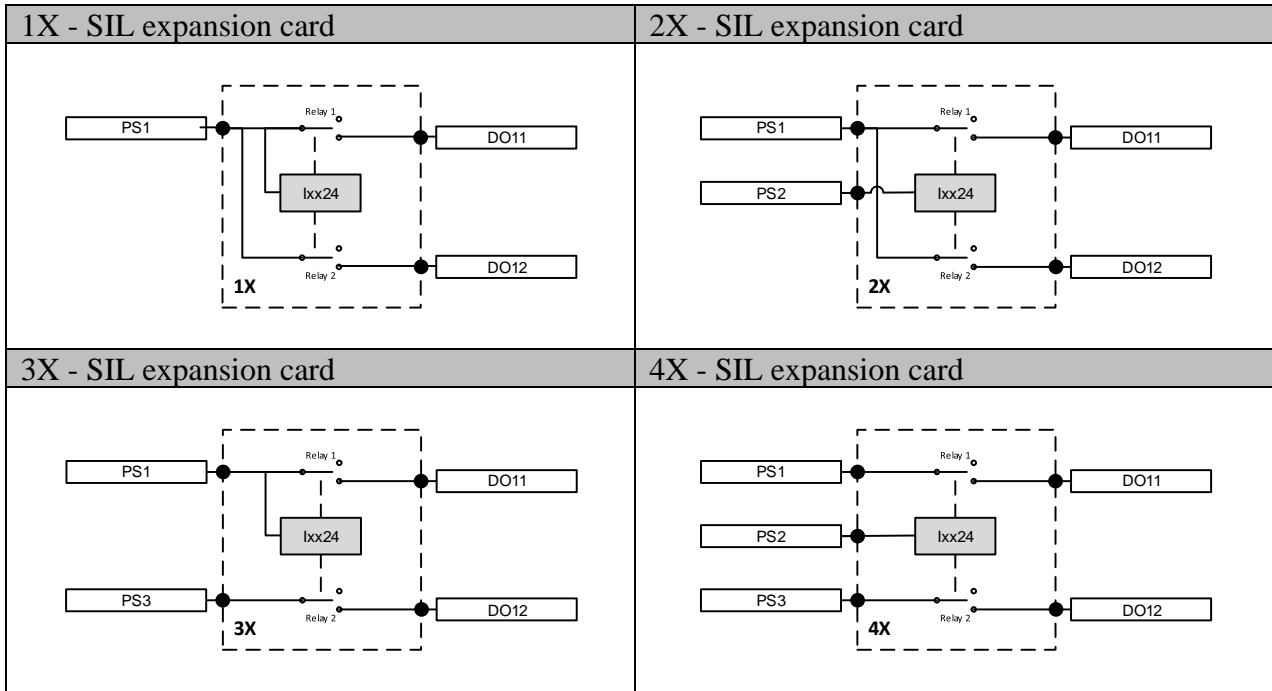
5.3.2 Electrical specifications

| AO1 – AO2 – Passive analogue output | |
|-------------------------------------|--------------------------------|
| Impedance | < 470 Ohm at 20mA and 9.4VDC |
| Linearity | < 0.1% |
| Temperature coefficient | 0.015% / 1°C (Warm-up: 10 min) |
| DI – Switch | |
| Type | Switch |
| Cable length | 20 meters |
| Maximum cable resistance | 100 Ohm |
| DI – NAMUR | |
| Type | NAMUR |
| Sensor supply voltage | 8 V |
| Cable length | 1000 meters |
| Max load | 600 Ohm |
| Rin | 1040 Ohm |

5.4 SIL – PS1, PS3, DO11, DO12

A device with an internal SIL Expansion Card can be installed in a SIL 1-4 installation without affecting the SIL level. Device can be equipped with 4 different types of SIL Expansion Cards.

The units are approved for installation in SIL 1-4 circuits, if installed as described in this manual.



| X | Relay 1 | Relay 2 |
|---|----------------|----------------|
| 1 | Normally close | Normally open |
| 2 | Normally close | Normally close |
| 3 | Normally open | Normally open |
| 4 | Normally open | Normally close |

5.4.1 Terminals

| Power supply | Digital output |
|--------------|----------------|
| 5. PS2 (+) | 23. DO11 (+) |
| 6. PS2 (-) | 24. DO11 (-) |
| 21. PS1 (+) | 25. DO12 (+) |
| 22. PS1 (-) | 26. DO12 (-) |
| 51. PS3 (+) | |
| 52. PS3 (-) | |

Note: The PS1, PS2 and PS3 must be galvanic isolated.

5.4.2 Electrical specifications

| | |
|---|-----------------------------|
| Power supply | 20.4 – 27.6VDC |
| Power dissipation, no position sensor/loop or output lamps are connected. | < 2W |
| Power dissipation, with maximum load on all inputs and outputs | < 5W, the load not included |
| Max load per DO11 and DO12 | up to 48W @24VDC |
| If PS2 is not used, total load that can be drawn from all DO/DI/AI ports (except DO11/12) | 2W |

5.5 Internal watch and SD card

5.5.1 Electrical specifications

| Internal Watch | |
|--------------------------|---|
| Time deviation | $\Delta f/f_0 = \pm 20\text{ppm}$ |
| Aging | $\Delta f/f_0 = \pm 3\text{ppm} / \text{Year}$ |
| Temperature coefficient | $\beta = -0.034 \pm 0.006\text{ppm}/^\circ\text{C}^2$ |
| Battery life (Estimated) | 10 year |

Please contact Val Controls for a replacement battery.

The SD card is used to store signatures. Do not move the SD card between devices. Contact Val Controls for a replacement SD card.

Disposal of this product and/or battery shall be in accordance with local environmental laws and regulations.

