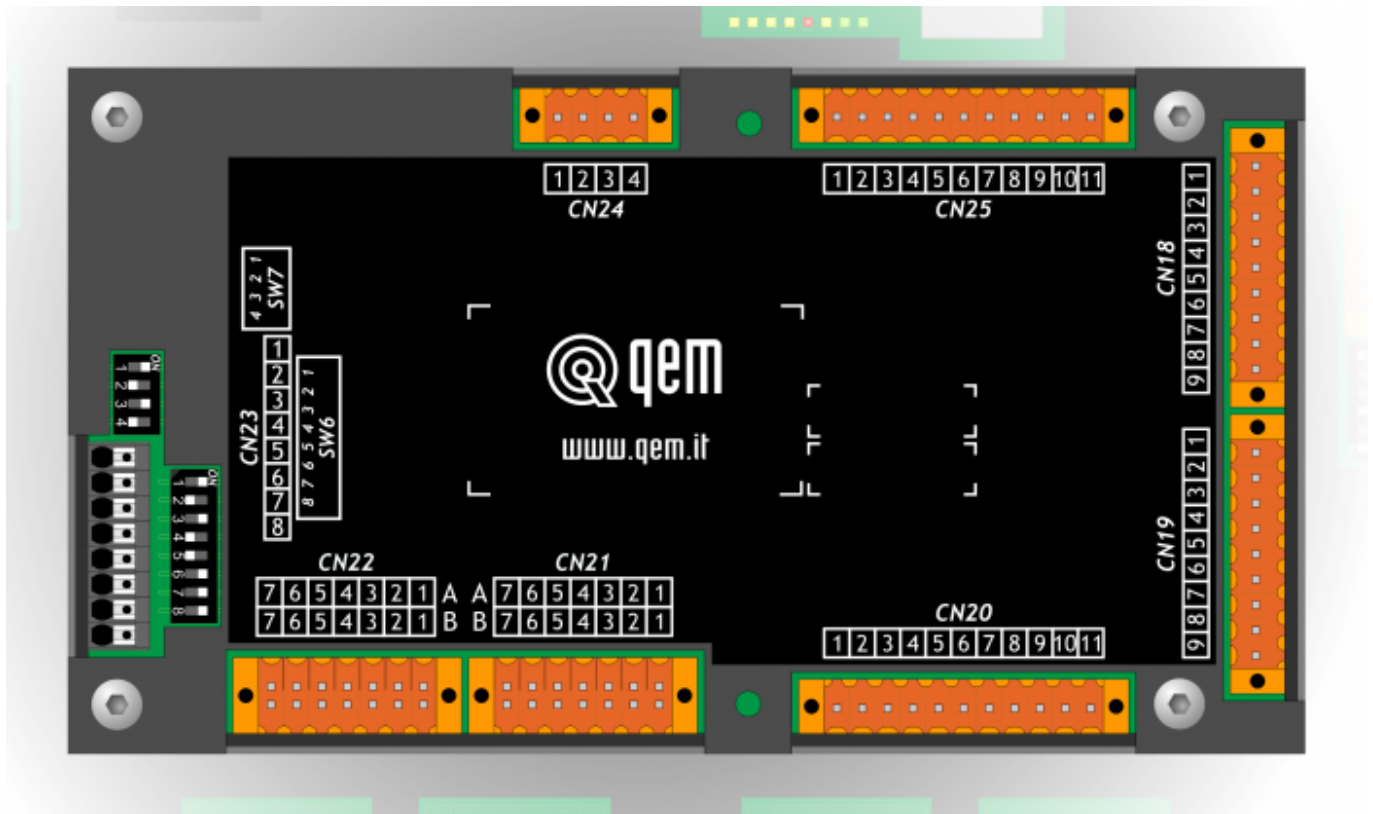


## Sommario

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## Specialization card 1MG2F rel.01



## Informations



Quality in Electronic  
Manufacturing

| <b>Document:</b>    | <b>MIM1MG2F01</b>                                                                                                                                 |              |      |            |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------|------------|
| <b>Description:</b> | Installation and maintenance manual                                                                                                               |              |      |            |
| <b>Editor:</b>      | Riccardo Furlato                                                                                                                                  |              |      |            |
| <b>Approver</b>     | Giuliano Tognon                                                                                                                                   |              |      |            |
| <b>Link:</b>        | <a href="http://www.qem.eu/doku/doku.php/en/strumenti/qmoveplus/mim1mg2f01">http://www.qem.eu/doku/doku.php/en/strumenti/qmoveplus/mim1mg2f01</a> |              |      |            |
| <b>Language:</b>    | English                                                                                                                                           |              |      |            |
| Release documento   | Hardware Release                                                                                                                                  | Description  | Note | Date       |
| 00                  | 01                                                                                                                                                | New document |      | 26/04/2016 |

## 1. Description

The **1MG2F** is a specialization card for the Qmove+ instrument.

### 1.1 standard equipment

|                                                                                   |                                                                    |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------|
|  | 16 standard digital inputs (+4 inputs alternatively to 2 counters) |
|  | 2 16bit multistandard analog inputs                                |
|  | 2 bidirectional counters                                           |
|  | 16 digital outputs                                                 |
|  | 2 analog outputs                                                   |

## 2. Techniques features



Bisogna inserire un disegno con gli ingombri meccanici dell'espansione con la copertura



### 2.1 Mechanical dimensions



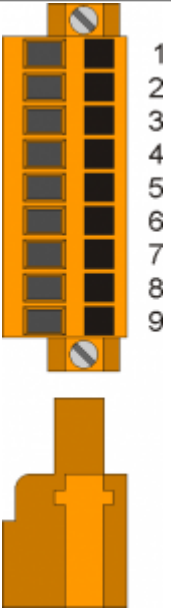
Measurements in mm

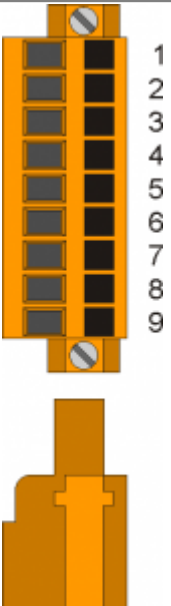


### 3. Connectors

#### 3.1 Digital inputs

##### 3.1.1 16 PNP digital inputs

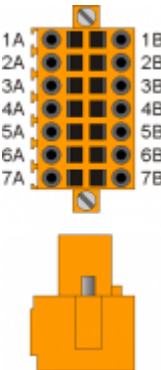
| CN18                                                                              | Terminal | Simbol | Description           | Address |
|-----------------------------------------------------------------------------------|----------|--------|-----------------------|---------|
|  | 1        | 0V     | Digital inputs common |         |
|                                                                                   | 2        | I1     | Input I1              | 3.INP01 |
|                                                                                   | 3        | I2     | Input I2              | 3.INP02 |
|                                                                                   | 4        | I3     | Input I3              | 3.INP03 |
|                                                                                   | 5        | I4     | Input I4              | 3.INP04 |
|                                                                                   | 6        | I5     | Input I5              | 3.INP05 |
|                                                                                   | 7        | I6     | Input I6              | 3.INP06 |
|                                                                                   | 8        | I7     | Input I7              | 3.INP07 |
|                                                                                   | 9        | I8     | Input I8              | 3.INP08 |

| CN19                                                                                | Terminal | Simbol | Description           | Address |
|-------------------------------------------------------------------------------------|----------|--------|-----------------------|---------|
|  | 1        | 0V     | Digital inputs common |         |
|                                                                                     | 2        | I9     | Input I9              | 3.INP09 |
|                                                                                     | 3        | I10    | Input I10             | 3.INP10 |
|                                                                                     | 4        | I11    | Input I11             | 3.INP11 |
|                                                                                     | 5        | I12    | Input I12             | 3.INP12 |
|                                                                                     | 6        | I13    | Input I13             | 3.INP13 |
|                                                                                     | 7        | I14    | Input I14             | 3.INP14 |
|                                                                                     | 8        | I15    | Input I15             | 3.INP15 |
|                                                                                     | 9        | I16    | Input I16             | 3.INP16 |

### 3.1.2 2 bidirectional input counters 200KHz



The electrical features are given in section [Electrical features](#).  
The connection examples are provided in section [Connection examples](#)

| CN22                                                                              | >Terminal | Simbol | Description                  | Address                                    |         |         |  |
|-----------------------------------------------------------------------------------|-----------|--------|------------------------------|--------------------------------------------|---------|---------|--|
|  | 1A        |        | +24V dc output <sup>1)</sup> |                                            |         |         |  |
|                                                                                   | 2A        | PHA1   | Phase A                      | Counter 1<br>PNP / Push-Pull <sup>2)</sup> | 3.INP17 | 3.CNT01 |  |
|                                                                                   | 3A        | PHB1   | Phase B                      |                                            | 3.INP18 |         |  |
|                                                                                   | 4A        | Z1     | Z                            |                                            | 1.INT05 |         |  |
|                                                                                   | 5A        | 0V     | Counter inputs common        |                                            |         |         |  |
|                                                                                   | 6A        | 0V     |                              |                                            |         |         |  |
|                                                                                   | 7A        | 0V     |                              |                                            |         |         |  |
|                                                                                   | 1B        |        | +24V dc output <sup>3)</sup> |                                            |         |         |  |
|                                                                                   | 2B        | PHA1+  | + PHA                        | Counter 1<br>Line Driver                   | 3.INP17 | 3.CNT01 |  |
|                                                                                   | 3B        | PHB1+  | + PHB                        |                                            | 3.INP18 |         |  |
|                                                                                   | 4B        | Z1+    | + Z                          |                                            | 1.INT05 |         |  |
|                                                                                   | 5B        | PHA1-  | - PHA                        |                                            |         |         |  |
|                                                                                   | 6B        | PHB1-  | - PHB                        |                                            |         |         |  |
|                                                                                   | 7B        | Z1-    | - Z                          |                                            |         |         |  |

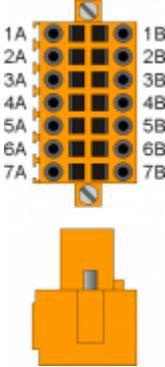
<sup>1), 3)</sup> Can be used to power the encoder. See the [Connection examples](#).

<sup>2)</sup> **Configuration type counter PNP/Push-Pull:**

5B terminal : to connect at 5A terminal

6B terminal: to connect at 6A terminal

7B terminal: to connect at 7A terminal

| CN21                                                                                | Terminal | Simbol | Description                  | Address                                      |         |         |  |
|-------------------------------------------------------------------------------------|----------|--------|------------------------------|----------------------------------------------|---------|---------|--|
|  | 1A       |        | +24V dc output <sup>1)</sup> |                                              |         |         |  |
|                                                                                     | 2A       | PHA2   | Phase A                      | Conteggio 2<br>PNP / Push-Pull <sup>2)</sup> | 3.INP19 | 3.CNT02 |  |
|                                                                                     | 3A       | PHB2   | Phase B                      |                                              | 3.INP20 |         |  |
|                                                                                     | 4A       | Z2     | Z                            | 1.INT06                                      |         |         |  |
|                                                                                     | 5A       | 0V     | Counter inputs common        |                                              |         |         |  |
|                                                                                     | 6A       | 0V     |                              |                                              |         |         |  |
|                                                                                     | 7A       | 0V     |                              |                                              |         |         |  |
|                                                                                     | 1B       |        | +24V dc output <sup>3)</sup> |                                              |         |         |  |
|                                                                                     | 2B       | PHA2+  | + PHA                        | Counter 2<br>Line Driver                     | 3.INP19 | 3.CNT02 |  |
|                                                                                     | 3B       | PHB2+  | + PHB                        |                                              | 3.INP20 |         |  |
|                                                                                     | 4B       | Z2+    | + Z                          |                                              | 1.INT06 |         |  |
|                                                                                     | 5B       | PHA2-  | - PHA                        |                                              |         |         |  |
|                                                                                     | 6B       | PHB2-  | - PHB                        |                                              |         |         |  |
|                                                                                     | 7B       | Z2-    | - Z                          |                                              |         |         |  |

<sup>1), 3)</sup> Can be used to power the encoder. See the [Connection examples](#).

<sup>2)</sup> **Configuration type counter PNP/Push-Pull:**

5B terminal : to connect at 5A terminal

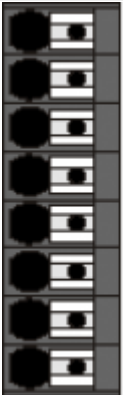
6B terminal: to connect at 6A terminal

7B terminal: to connect at 7A terminal

## 3.2 Analog inputs

### 3.2.1 2 multistandard analog inputs

#### Connector

| CN23                                                                              | Terminal | Symbol | Description                     |              |                 | Address |
|-----------------------------------------------------------------------------------|----------|--------|---------------------------------|--------------|-----------------|---------|
|                                                                                   |          |        | Potenzimeters / 0-10V / 0-20mA  | Thermocouple | PT100           |         |
|  | 1        | AI2_C  | -                               | TC 2 +       | C               | 3.AI02  |
|                                                                                   | 2        | AI2_B  | -                               | TC 2 -       | B               |         |
|                                                                                   | 3        | AI2_A  | Analog input 2                  | -            | A <sup>1)</sup> |         |
|                                                                                   | 4        | AI1_C  | -                               | TC 1 +       | C               | 3.AI01  |
|                                                                                   | 5        | AI1_B  | -                               | TC 1 -       | B               |         |
|                                                                                   | 6        | AI1_A  | Analog input 1                  | -            | A <sup>2)</sup> |         |
|                                                                                   | 7        | VREF   | Reference voltage <sup>3)</sup> | -            | -               |         |
|                                                                                   | 8        | GAI    | Common                          | -            | -               |         |

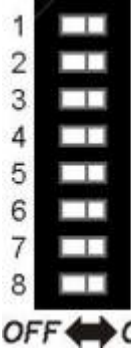
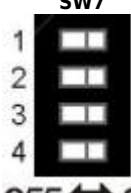


<sup>1), 2)</sup> A and B cables are connected to the same head of the PT100 wire and have the same colors.

In the case of 2-wire PT100 make a jumper between A and B.

<sup>3)</sup> For potentiometers

#### Analog inputs setting

|                                                                                                   | Num.<br>Dip | Analog input 1 |              |      |       |        | Analog input 2 |              |      |       |        |
|---------------------------------------------------------------------------------------------------|-------------|----------------|--------------|------|-------|--------|----------------|--------------|------|-------|--------|
|                                                                                                   |             | PT100          | Thermocouple | Pot. | 0-10V | 0-20mA | PT100          | Thermocouple | Pot. | 0-10V | 0-20mA |
| <b>SW6</b><br> | 1           | ON             | X            | OFF  | OFF   | OFF    | X              | X            | X    | X     | X      |
|                                                                                                   | 2           | OFF            | X            | ON   | ON    | ON     | X              | X            | X    | X     | X      |
|                                                                                                   | 3           | X              | X            | X    | X     | X      | ON             | X            | OFF  | OFF   | OFF    |
|                                                                                                   | 4           | X              | X            | X    | X     | X      | OFF            | X            | ON   | ON    | ON     |
|                                                                                                   | 5           | ON             | ON           | OFF  | OFF   | OFF    | X              | X            | X    | X     | X      |
|                                                                                                   | 6           | OFF            | OFF          | ON   | ON    | ON     | X              | X            | X    | X     | X      |
|                                                                                                   | 7           | OFF            | ON           | X    | X     | X      | X              | X            | X    | X     | X      |
|                                                                                                   | 8           | X              | X            | X    | X     | X      | OFF            | ON           | X    | X     | X      |
| <b>SW7</b><br> | 1           | X              | X            | X    | X     | X      | X              | X            | OFF  | OFF   | ON     |
|                                                                                                   | 2           | X              | X            | X    | X     | X      | X              | X            | OFF  | ON    | OFF    |
|                                                                                                   | 3           | X              | X            | OFF  | OFF   | ON     | X              | X            | X    | X     | X      |
|                                                                                                   | 4           | X              | X            | OFF  | ON    | OFF    | X              | X            | X    | X     | X      |

X = irrelevant setting

Pot. = potentiometric type input

### 3.3 Digital outputs

#### 3.3.1 16 protected digital outputs

| CN25                                                                              | Terminal | Simbol | Description                          | Address |
|-----------------------------------------------------------------------------------|----------|--------|--------------------------------------|---------|
|  | 1        | V+     | Outputs power O1÷O4 (12÷28V dc)      |         |
|                                                                                   | 2        | O1     | Digital output 1                     | 3.OUT01 |
|                                                                                   | 3        | O2     | Digital output 2                     | 3.OUT02 |
|                                                                                   | 4        | O3     | Digital output 3                     | 3.OUT03 |
|                                                                                   | 5        | O4     | Digital output 4                     | 3.OUT04 |
|                                                                                   | 6        | V+     | Outputs power input O5÷O8(12÷28V dc) |         |
|                                                                                   | 7        | O5     | Digital output 5                     | 3.OUT05 |
|                                                                                   | 8        | O6     | Digital output 6                     | 3.OUT06 |
|                                                                                   | 9        | O7     | Digital output 7                     | 3.OUT07 |
|                                                                                   | 10       | O8     | Digital output 8                     | 3.OUT08 |
|                                                                                   | 11       | V-     | Outputs power input (0V dc)          |         |

| CN20                                                                               | Terminal | Simbol | Description                            | Address |
|------------------------------------------------------------------------------------|----------|--------|----------------------------------------|---------|
|  | 1        | V+     | Outputs power O9÷O12(12÷28V dc)        |         |
|                                                                                    | 2        | O9     | Digital output 9                       | 3.OUT09 |
|                                                                                    | 3        | O10    | Digital output 10                      | 3.OUT10 |
|                                                                                    | 4        | O11    | Digital output 11                      | 3.OUT11 |
|                                                                                    | 5        | O12    | Digital output 12                      | 3.OUT12 |
|                                                                                    | 6        | V+     | Outputs power input O13÷O16(12÷28V dc) |         |
|                                                                                    | 7        | O13    | Digital output 13                      | 3.OUT13 |
|                                                                                    | 8        | O14    | Digital output 14                      | 3.OUT14 |
|                                                                                    | 9        | O15    | Digital output 15                      | 3.OUT15 |
|                                                                                    | 10       | O16    | Digital output 16                      | 3.OUT16 |
|                                                                                    | 11       | V-     | Outputs power input (0V dc)            |         |

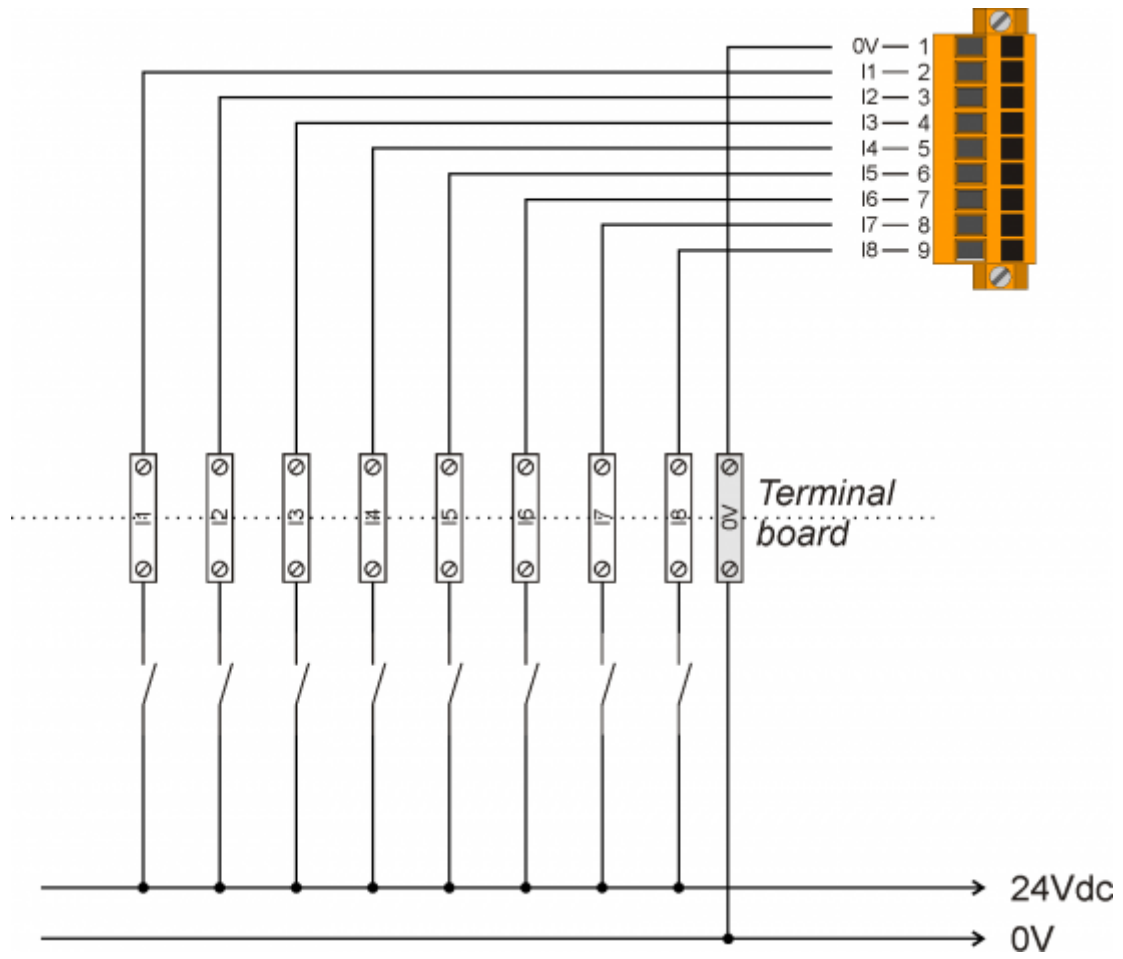
## 3.4 Analog outputs

### 3.4.1 2 +/-10V, 16bit analog outputs

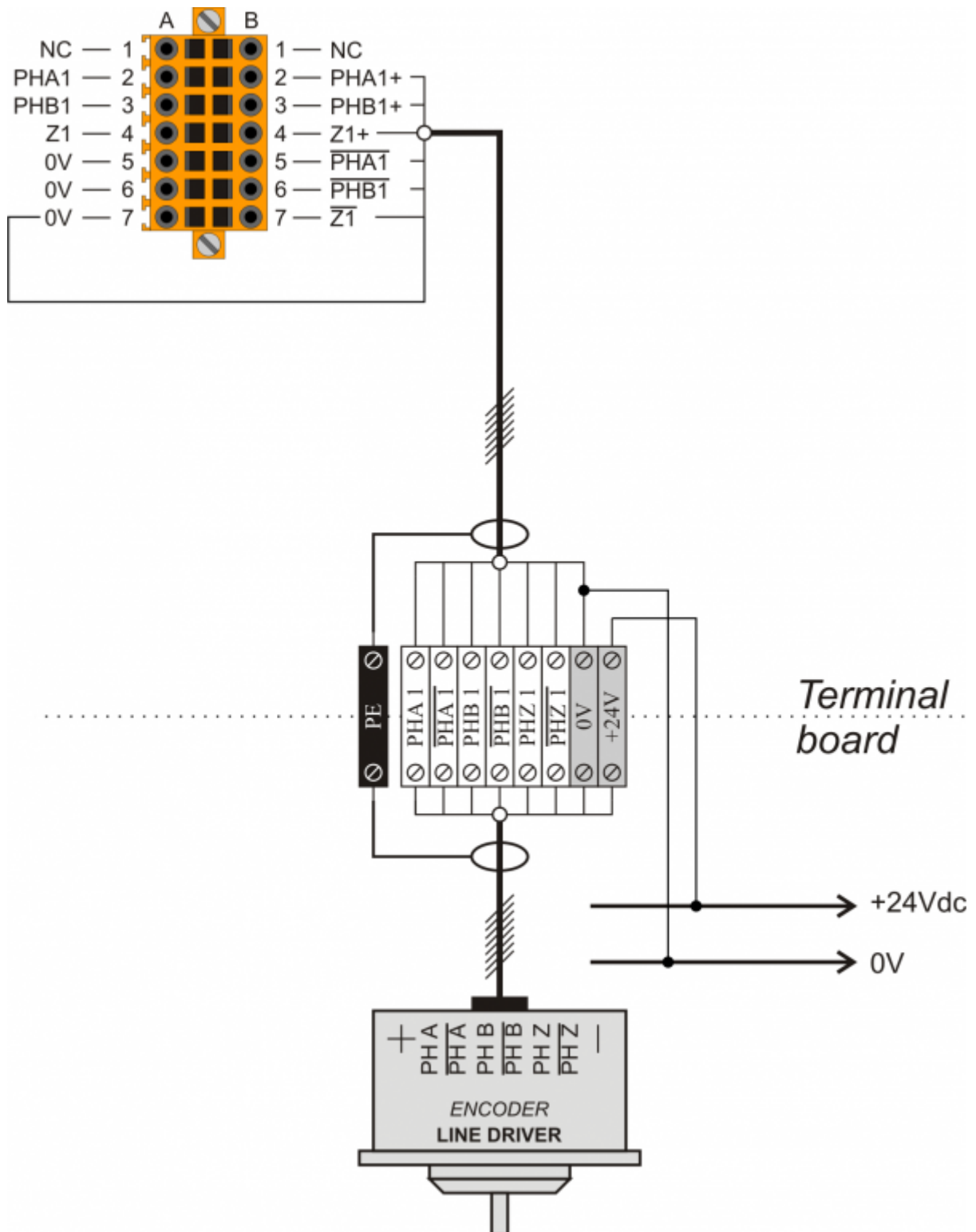
| CN24                                                                              | Terminal | Simbol | Description           | Address |
|-----------------------------------------------------------------------------------|----------|--------|-----------------------|---------|
|  | 1        | GAO    | Analog outputs common |         |
|                                                                                   | 2        | AO1    | Analog output 1       | 3.AN01  |
|                                                                                   | 3        | AO2    | Analog output 2       | 3.AN02  |
|                                                                                   | 4        | GAO    | Analog outputs common |         |

## 4. Connection examples

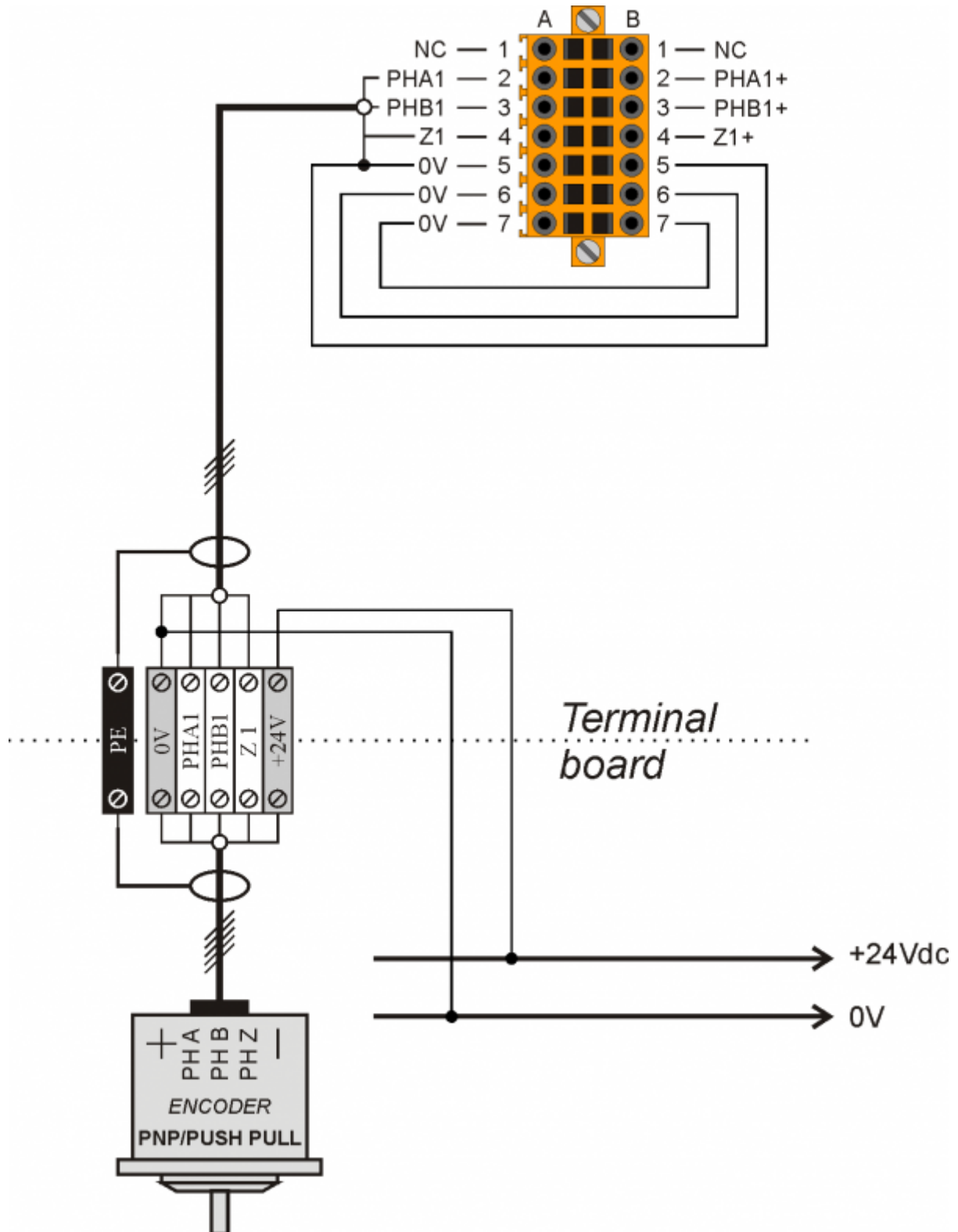
### 4.1 Digital inputs



## 4.2 Line Driver counter inputs

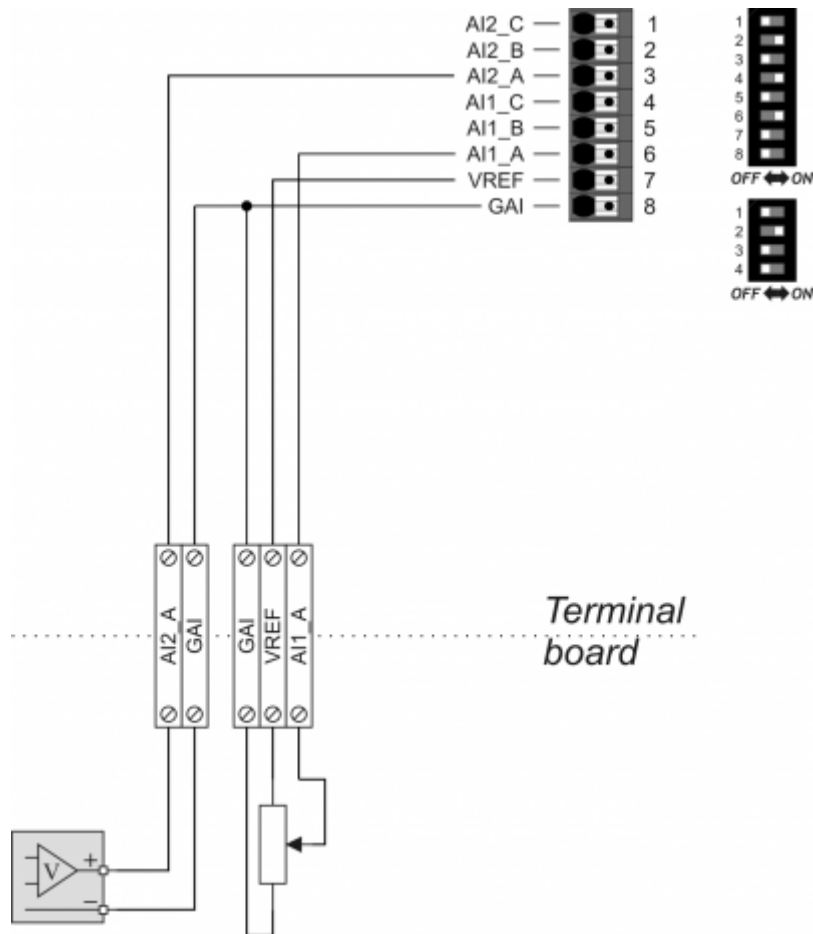


### 4.3 PNP / Push Pull counter inputs

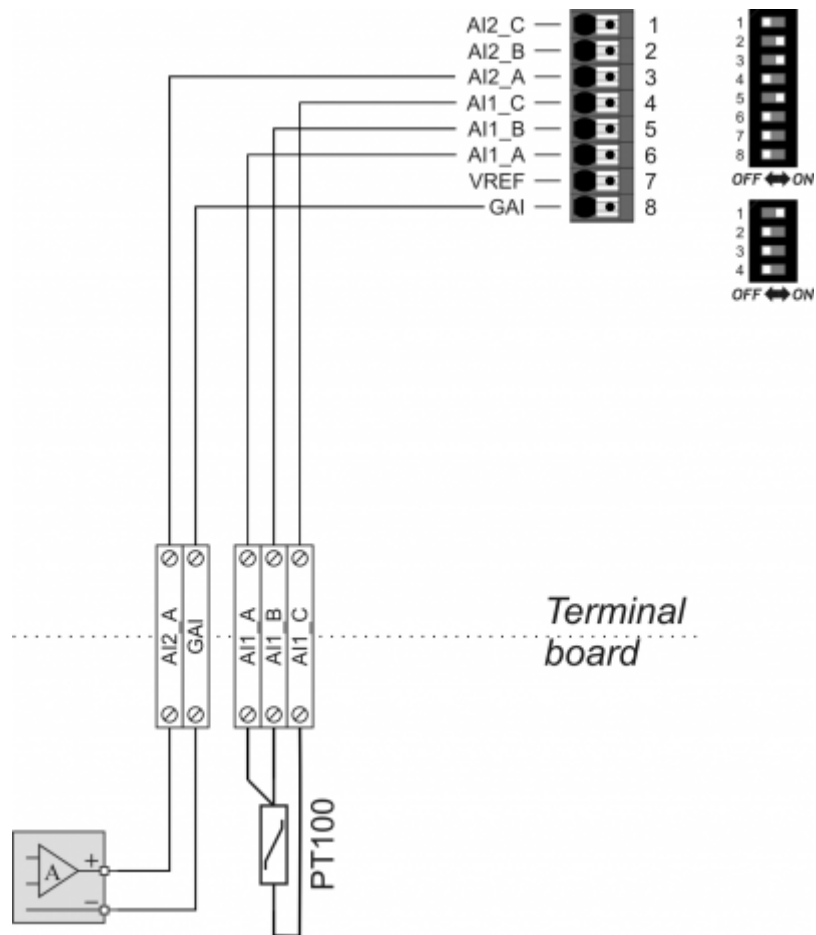


## 4.4 Analog inputs

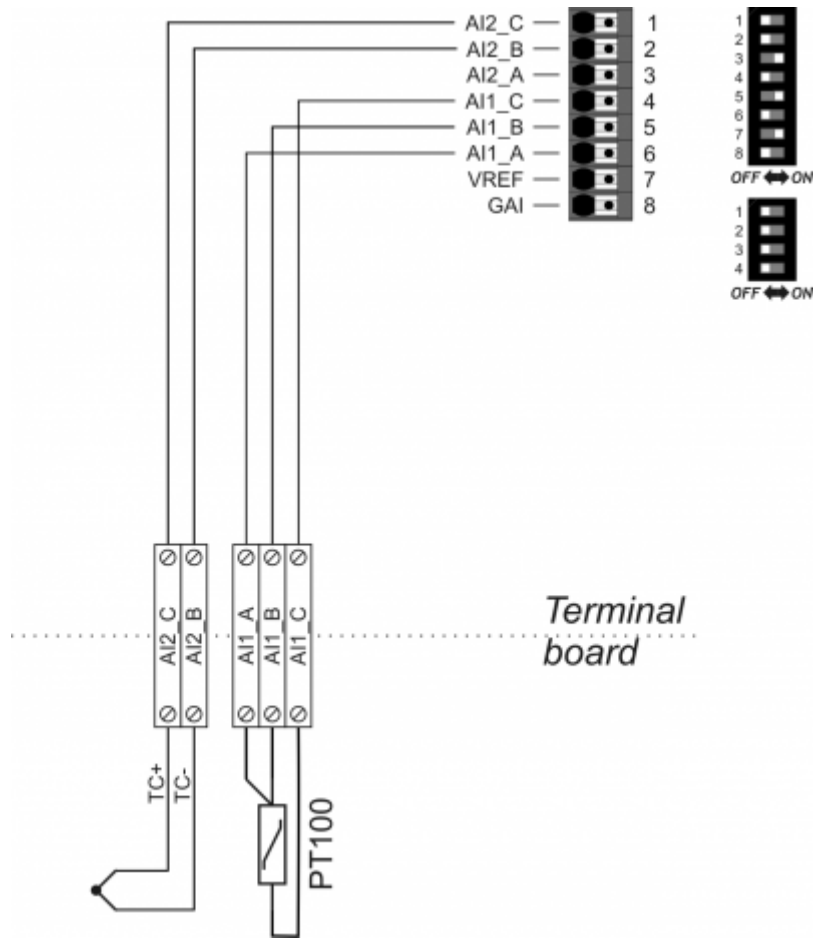
### 4.4.1 Potentiometric input 1 and voltmetric input 2



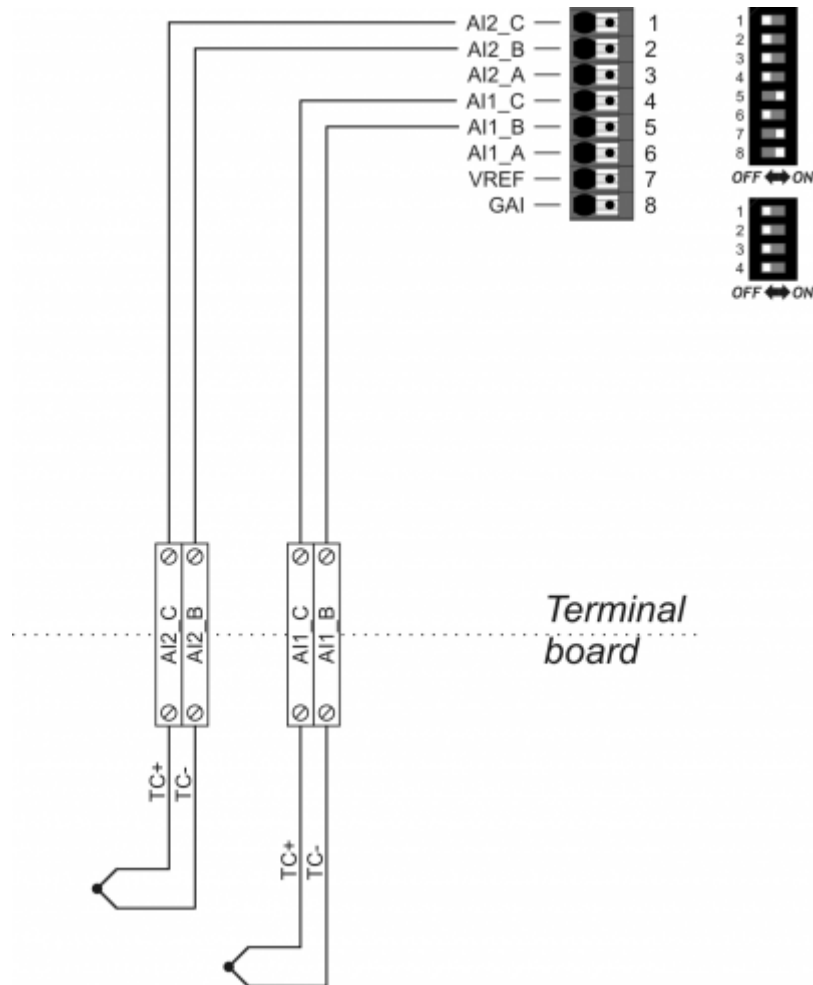
#### 4.4.2 PT100 input 1 and amperometric input 2



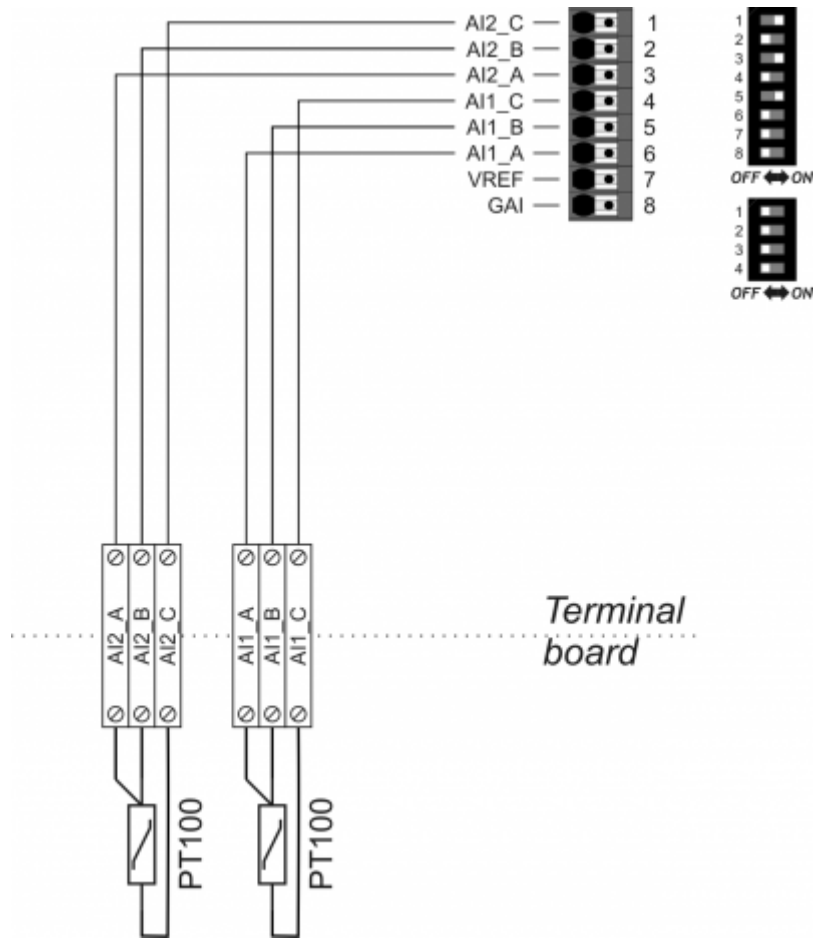
#### 4.4.3 PT100 input 1 and termocouple input 2



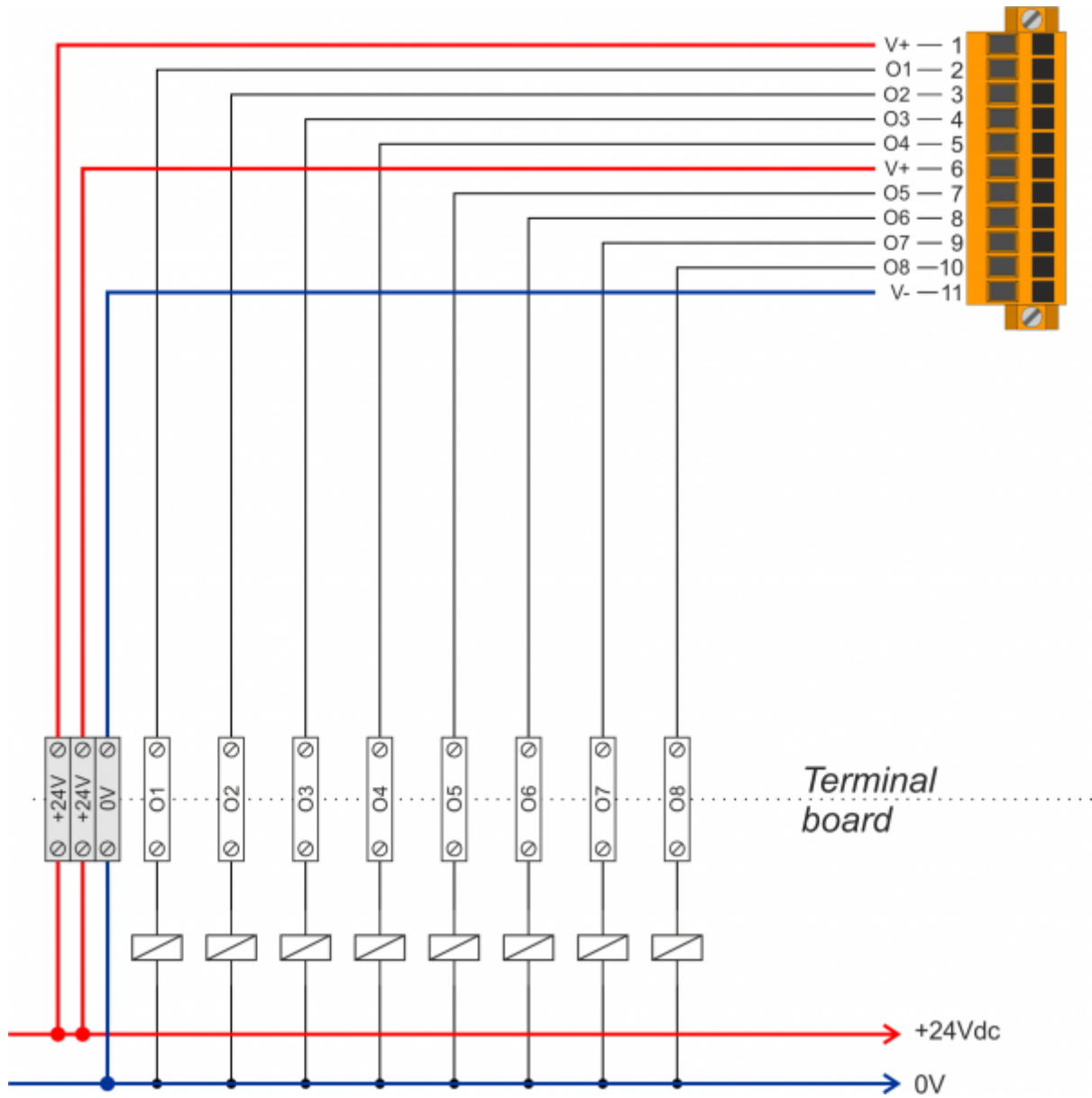
#### 4.4.4 Termocouple inputs 1 and 2



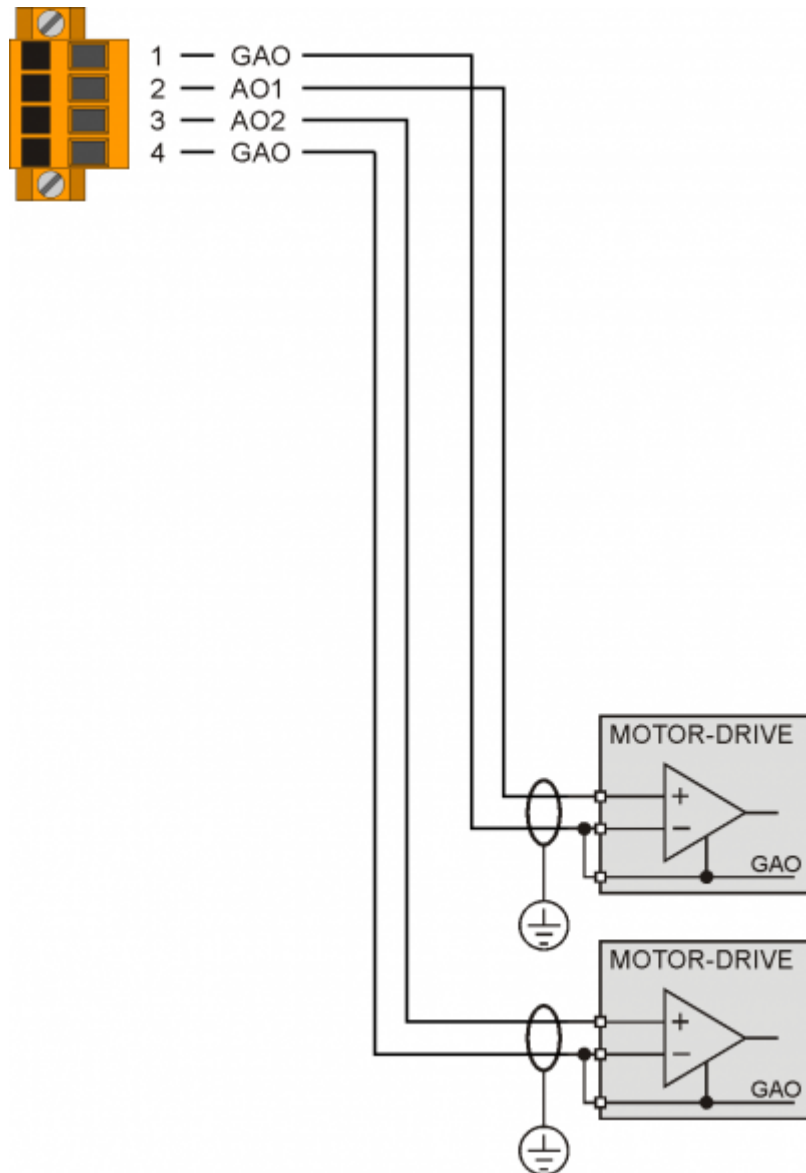
#### 4.4.5 PT100 inputs 1 and 2



## 4.5 Protected digital outputs



## 4.6 Analog outputs



## 5. Electrical features

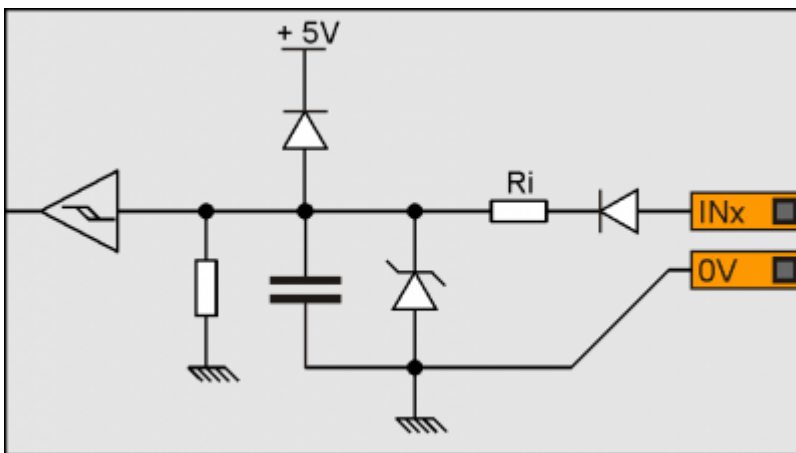
The following are the hardware electrical features .

Maximum and minimum frequency values and actual acquisition times, can depend on any additional software filters, for example to see the "QMOVE:sys004" system variable.

### 5.1 PNP digital inputs

|                                  |                         |
|----------------------------------|-------------------------|
| Type of polarisation             | PNP                     |
| Min. acquisition time (hardware) | 3ms                     |
| Isolation                        | 1000Vrms                |
| Rated operating voltage          | 24Vdc                   |
| Voltage of logic state 0         | 0-2 V                   |
| Voltage of logic state 1         | 10.5 - 26.5 V           |
| Internal voltage drop            | 5V                      |
| Input resistance (Ri)            | 2700Ω                   |
| Sink current                     | 2mA ÷ 8mA <sup>1)</sup> |

<sup>1)</sup> CAUTION: If the device connected to the inputs needs a higher minimum current, inputs may not work properly.



## 5.2 200KHz bidirectional counter inputs

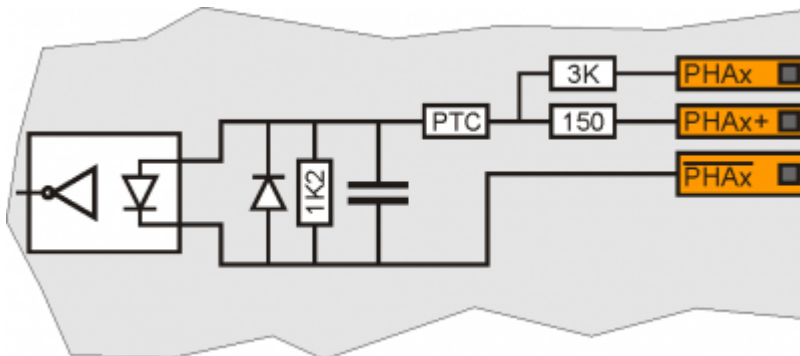


The values given in the table refer to input signals A, B and Z.  
 The max. frequency given in the table refers to A and B phase signals with a DutyCycle = 50%  
 With count frequencies over 50KHz the use of Line-Driver type encoders is recommended.

|                           |               |
|---------------------------|---------------|
| Type of polarisation      | PNP/PP        |
| Max frequency             | 200KHz        |
| Min. acquisition time     | 5µs           |
| Insulation                | 1000Vrms      |
| Rated operating voltage   | 24Vdc         |
| Voltage of logic status 0 | 0 - 2 V       |
| Voltage of logic status 1 | 10.5 - 26.5 V |
| Internal voltage drop     | 1.2V          |
| Input resistance          | 3100Ω         |

### Line-Driver

|                                         |             |
|-----------------------------------------|-------------|
| Type of polarisation                    | Line-Driver |
| Max. frequency                          | 200KHz      |
| Min. acquisition time                   | 5µs         |
| Insulation                              | 1000Vrms    |
| Rated operating voltage (PHx+ ? PHx-)   | 5Vdc        |
| Voltage of logic status 0 (PHx+ ? PHx-) | 0-1.5 V     |
| Voltage of logic status 1 (PHx+ ? PHx-) | 2-5 V       |
| Internal voltage drop                   | 1.2V        |
| Input resistance                        | 150Ω        |



## 5.3 Analog inputs

### 5.3.1 Conversion times

The electrical features depend on the type of input, configurable via DIP switch.

The conversion times from analog to digital depend on the configuration according to the table:

| Analog Input Configuration |                  | Conversion time per channel |
|----------------------------|------------------|-----------------------------|
| Input 1                    | Input 2          |                             |
| DC <sup>1)</sup>           | -                | 4.6 ms                      |
| -                          | DC <sup>2)</sup> | 4.6 ms                      |
| DC <sup>3)</sup>           | DC <sup>4)</sup> | 9.3 ms                      |
| DC <sup>5)</sup>           | TC               | 9.3 ms                      |
| DC <sup>6)</sup>           | PT100            | 79.1 ms                     |
| TC                         | -                | 9.3 ms                      |
| -                          | TC               | 9.3 ms                      |
| TC                         | DC <sup>7)</sup> | 9.3 ms                      |
| TC                         | TC               | 9.3 ms                      |
| TC                         | PT100            | 83.8 ms                     |
| PT100                      | -                | 74.5 ms                     |
| -                          | PT100            | 74.5 ms                     |
| PT100                      | DC <sup>8)</sup> | 79.1 ms                     |
| PT100                      | TC               | 79.1 ms                     |
| PT100                      | PT100            | 79.1 ms                     |

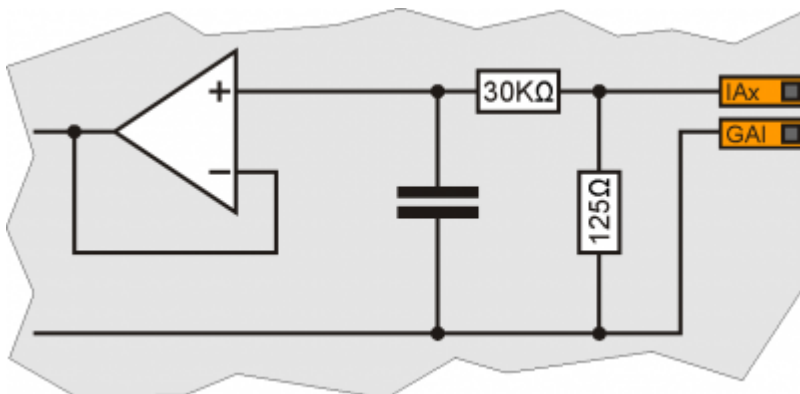
<sup>1), 2), 3), 4), 5), 6), 7), 8)</sup> Amperometric, voltmetric or potentiometric type

### 5.3.2 0-20mA analog input in amperometric configuration

|                      |                                                                                                                            |
|----------------------|----------------------------------------------------------------------------------------------------------------------------|
| Connection type      | Amperometric (0-20 mA)                                                                                                     |
| Resolution           | 12bit/16bit <sup>1)</sup>                                                                                                  |
| Input resistance     | 125Ω                                                                                                                       |
| Value of damage      | 25 mA                                                                                                                      |
| Max. Linearity error | ± 0,1% Vfs                                                                                                                 |
| Max. Offset error    | ± 0,1% Vfs                                                                                                                 |
| S.n.                 | 71 dB                                                                                                                      |
| Conversion time      | It depends on the configuration of the analog input. See section <a href="#">Conversion times</a> if present <sup>2)</sup> |
| Isolation            | 1000 Vrms                                                                                                                  |

<sup>1)</sup> It depends on the [Hardware versions](#)

<sup>2)</sup> The sampling time of the device must be equal or higher than the conversion time



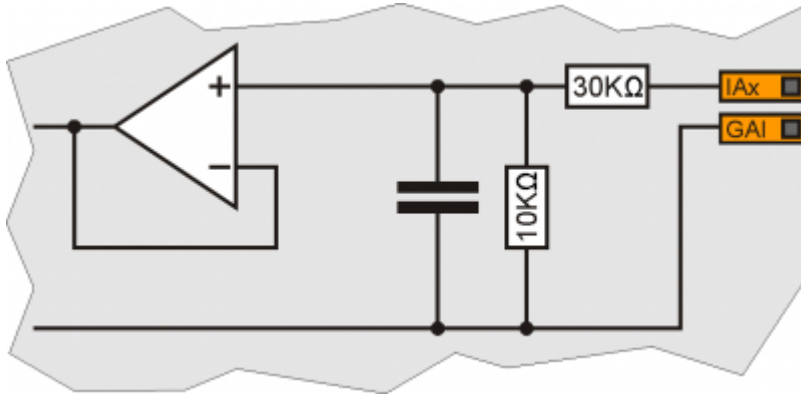


### 5.3.4 Analog input in voltmetric configuration

|                        |                                                                                                                               |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Connection type        | Voltmetrico<br>0÷10V                                                                                                          |
| Resolution             | 12bit/16bit <sup>1)</sup>                                                                                                     |
| Input resistance (Rin) | 40K $\Omega$                                                                                                                  |
| Value of damage        | 20V                                                                                                                           |
| Max. Linearity error   | $\pm 0,1\%$ Vfs                                                                                                               |
| Max. Offset error      | $\pm 0,1\%$ Vfs                                                                                                               |
| S.n.                   | 71 dB                                                                                                                         |
| Conversion time        | It depends on the configuration of the analog input.<br>See section <a href="#">Conversion times</a> if present <sup>2)</sup> |
| Isolation              | 1000 Vrms                                                                                                                     |

<sup>1)</sup> It depends on the [Hardware versions](#)

<sup>2)</sup> The sampling time of the device must be equal or higher than the conversion time



### 5.3.5 Analog input in PT100 configuration

|                                    |                                                                                                                               |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Sensor type<br>collegabile         | PT100 3 wire <sup>1)</sup>                                                                                                    |
| Measure type                       | Resistance <sup>2)</sup>                                                                                                      |
| Resolution                         | 15 bit (32767 corresponds to 250.00 °C)                                                                                       |
| Input resistance (Rin)             | 15 MΩ                                                                                                                         |
| Measuring current                  | 1 mA                                                                                                                          |
| Value of damage                    | 10V                                                                                                                           |
| Accuracy of resistance measurement | ± 0,04%                                                                                                                       |
| Conversion time                    | It depends on the configuration of the analog input.<br>See section <a href="#">Conversion times</a> if present <sup>3)</sup> |
| Isolation                          | 1000 Vrms                                                                                                                     |

<sup>1)</sup> Also connected to 2-wire terminals with jumper

<sup>2)</sup> Temperature calculated by software

<sup>3)</sup> The sampling time of the device must be equal or higher than the conversion time

### 5.3.6 Analog input in termocouple configuration

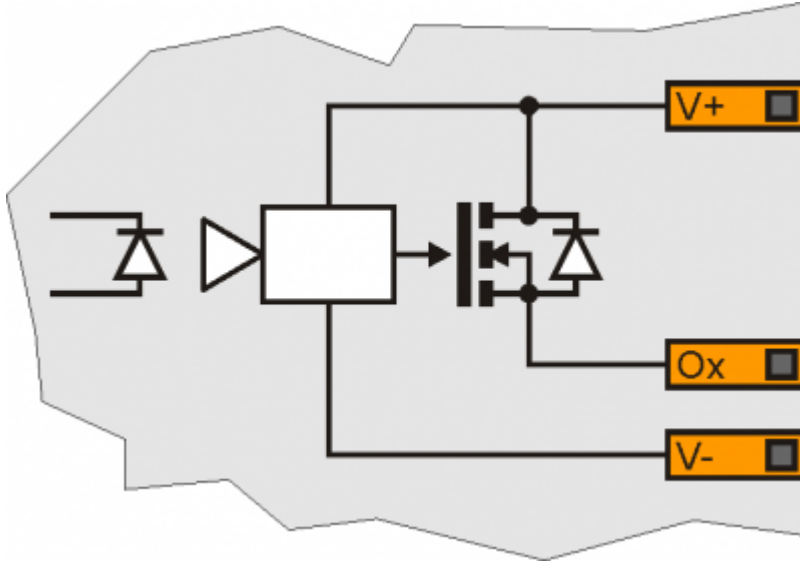
|                                        |                                                                                                                               |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Sensor type                            | Thermocouple type J,K,R,S,B,N,T,E <sup>1)</sup>                                                                               |
| Type of measure                        | Differential voltage                                                                                                          |
| Resolution                             | 16 bit                                                                                                                        |
| Measuring range                        | ±156.25 mV                                                                                                                    |
| Measure for cold junction compensation | Integrated                                                                                                                    |
| Input resistance (Rin)                 | 15 MO                                                                                                                         |
| Value of damage                        | 30V                                                                                                                           |
| Measurement accuracy                   | ± 0,2% (excluding cold junction compensation)                                                                                 |
| Conversion time                        | It depends on the configuration of the analog input.<br>See section <a href="#">Conversion times</a> if present <sup>2)</sup> |
| Isolation                              | 1000 Vrms                                                                                                                     |

<sup>1)</sup> J and K only supported by SW. Contact QEM for the support of the other sensor types.

<sup>2)</sup> The sampling time of the device must be equal or higher than the conversion time

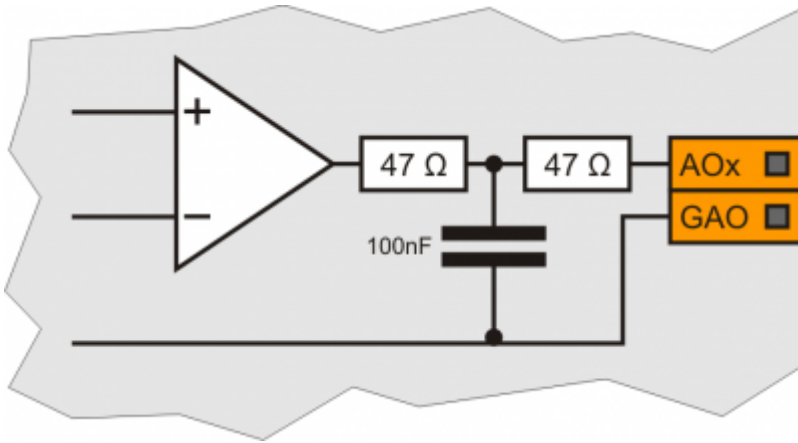
## 5.4 Protected digital outputs

|                                   |          |
|-----------------------------------|----------|
| Switchable load                   | Dc (PNP) |
| Max. operating voltage            | 28V      |
| Insulation                        | 1000Vpp  |
| Max. internal voltage drop        | 600mV    |
| Max internal resistance @ON       | 90mΩ     |
| Max. protection current           | 12A      |
| Max. operating current            | 2A       |
| Max. current @OFF                 | 5μA      |
| Max switching time from ON to OFF | 270μs    |
| Max switching time from OFF to ON | 250μs    |



## 5.5 Analog outputs

|                                                 |                |
|-------------------------------------------------|----------------|
| Type of connection                              | Common mode    |
| Insulation                                      | 1000Vrms       |
| Voltage range (minimum no load)                 | -9.8V - +9.8V  |
| Max. offset variation depending on temperature* | +/- 5mV        |
| Resolution                                      | 16bit          |
| Max. current                                    | 1mA            |
| Output variation depending on load              | 100 $\mu$ V/mA |
| Output resistance                               | 249 $\Omega$   |



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