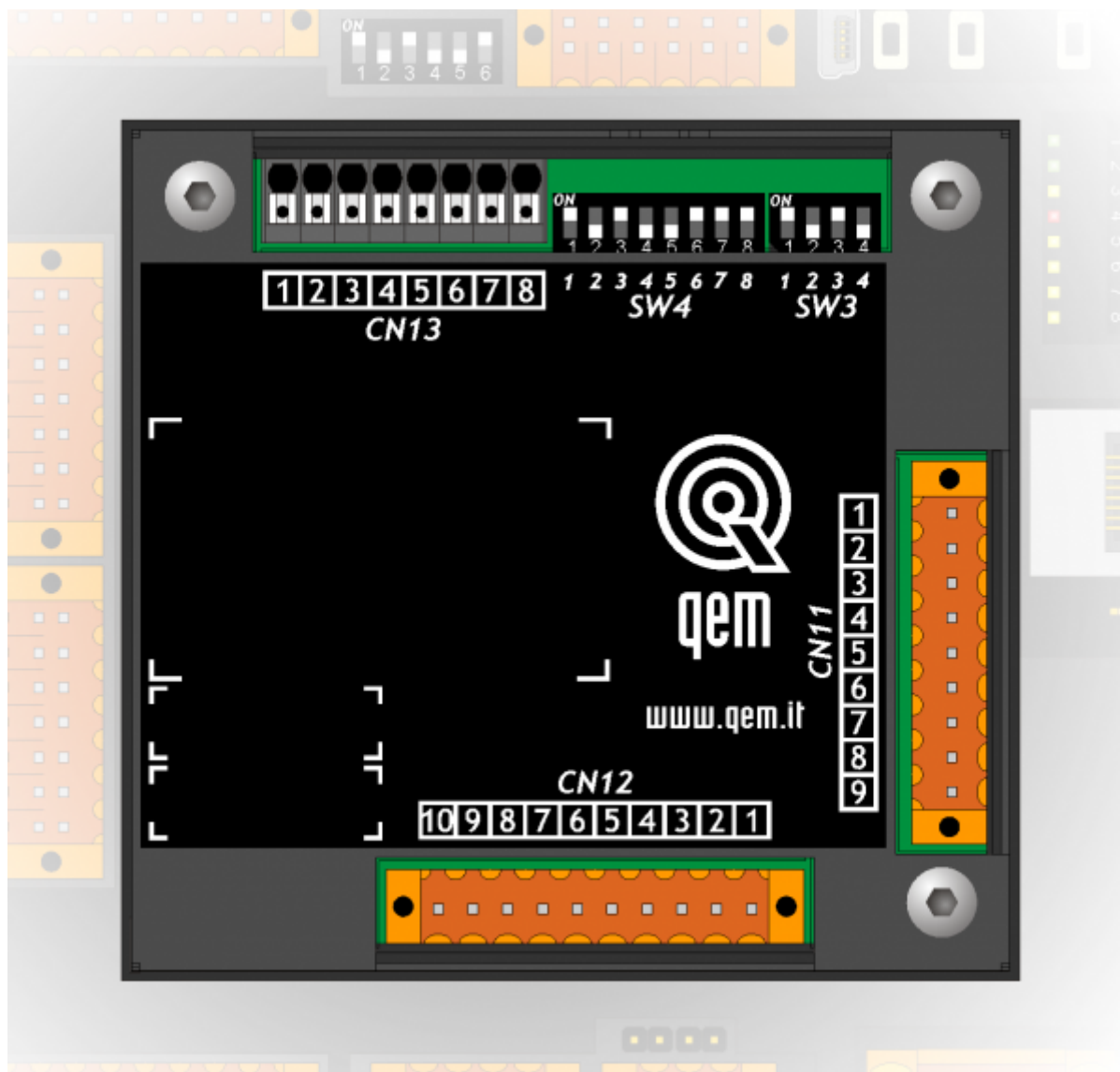


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## Specialization card 1AD2F rel.03



## Informations



| <b>Document:</b>    | <b>MIM1AD2F02</b>                                                                                                                                 |                                                                                                     |            |            |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|------------|------------|
| <b>Description:</b> | Installation and maintenance manual                                                                                                               |                                                                                                     |            |            |
| <b>Editor:</b>      | Riccardo Furlato                                                                                                                                  |                                                                                                     |            |            |
| <b>Approver</b>     | Gabriele Bazzi                                                                                                                                    |                                                                                                     |            |            |
| <b>Link:</b>        | <a href="http://www.qem.eu/doku/doku.php/en/strumenti/qmoveplus/mim1AD2F02">http://www.qem.eu/doku/doku.php/en/strumenti/qmoveplus/mim1AD2F02</a> |                                                                                                     |            |            |
| <b>Language:</b>    | English                                                                                                                                           |                                                                                                     |            |            |
| Document release    | Hardware release                                                                                                                                  | Description                                                                                         | Note       | Date       |
| 01                  | 02                                                                                                                                                | New manual                                                                                          |            | 17/12/2014 |
| 02                  | 02                                                                                                                                                | Improved description of the analog input connector table and fixed the hardware release of the card |            | 18/06/2015 |
| 03                  | 02                                                                                                                                                | Fixed the SW3 setting description and example                                                       | 01/02/2016 |            |

## 1. Description

The **1AD2F** card of Qmove+ series.

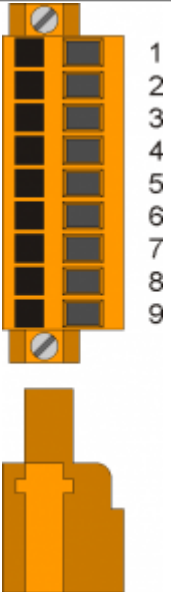
### 1.1 Equipment

|                                                                                   |                                     |
|-----------------------------------------------------------------------------------|-------------------------------------|
|  | 8 digital inputs                    |
|  | 2 multistandard analog inputs 16bit |
|  | 8 digital outputs                   |

## 2. Connections

### 2.1 Digital inputs

#### 2.1.1 8 digital inputs

| CN11                                                                              | Terminal | Simbol | Description           | Address |
|-----------------------------------------------------------------------------------|----------|--------|-----------------------|---------|
|  | 9        | 0V     | Digital inputs common |         |
|                                                                                   | 8        | I17    | Input I17             | 3.INP01 |
|                                                                                   | 7        | I18    | Input I18             | 3.INP02 |
|                                                                                   | 6        | I19    | Input I19             | 3.INP03 |
|                                                                                   | 5        | I20    | Input I20             | 3.INP04 |
|                                                                                   | 4        | I21    | Input I21             | 3.INP05 |
|                                                                                   | 3        | I22    | Input I22             | 3.INP06 |
|                                                                                   | 2        | I23    | Input I23             | 3.INP07 |
|                                                                                   | 1        | I24    | Input I24             | 3.INP08 |
|                                                                                   |          |        |                       |         |
|                                                                                   |          |        |                       |         |
|                                                                                   |          |        |                       |         |

## 2.2 Analog inputs

### 2.2.1 2 multistandard analog inputs

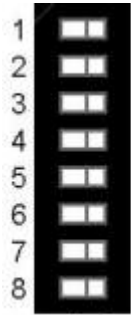
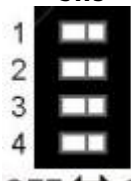
#### Connector

| CN13                                                                              | Terminal | Simbol | Description                      |             |                 | Address |
|-----------------------------------------------------------------------------------|----------|--------|----------------------------------|-------------|-----------------|---------|
|                                                                                   |          |        | Potentiometric / 0-10V / 0-20mA  | Termocouple | PT100           |         |
|  | 1        | GAI    | Analog inputs common             | -           | -               |         |
|  | 2        | VREF   | Reference volatege <sup>1)</sup> | -           | -               |         |
|  | 3        | AI1_A  | Analog input 1                   | -           | A <sup>2)</sup> | 3.AI01  |
|  | 4        | AI1_B  | -                                | TC 1 -      | B               |         |
|  | 5        | AI1_C  | -                                | TC 1 +      | C               |         |
|  | 6        | AI2_A  | Analog input 2                   | -           | A <sup>3)</sup> | 3.AI02  |
|  | 7        | AI2_B  | -                                | TC 2 -      | B               |         |
|  | 8        | AI2_C  | -                                | TC 2 +      | C               |         |

<sup>1)</sup> For potentiometric inputs

<sup>2), 3)</sup> A and B cables connected to the resistance, have the same color.  
In the case of 2-wire PT100 you must make a jumper between A and B.

#### Analog inputs setting

|                                                                                                               | Num.<br>Dip | Analog input 1  |             |      |       |        | Analog input 2  |             |      |       |        |
|---------------------------------------------------------------------------------------------------------------|-------------|-----------------|-------------|------|-------|--------|-----------------|-------------|------|-------|--------|
|                                                                                                               |             | PT100           | Termocouple | Pot. | 0-10V | 0-20mA | PT100           | Termocouple | Pot. | 0-10V | 0-20mA |
| <b>SW4</b><br><br>OFF ↔ ON | 1           | ON              | X           | OFF  | OFF   | OFF    | X               | X           | X    | X     | X      |
|                                                                                                               | 2           | OFF             | X           | ON   | ON    | ON     | X <sup>1)</sup> | X           | X    | X     | X      |
|                                                                                                               | 3           | X               | X           | X    | X     | X      | ON              | X           | OFF  | OFF   | OFF    |
|                                                                                                               | 4           | X <sup>2)</sup> | 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>SW3</b><br><br>OFF ↔ ON | 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 = setting not significant

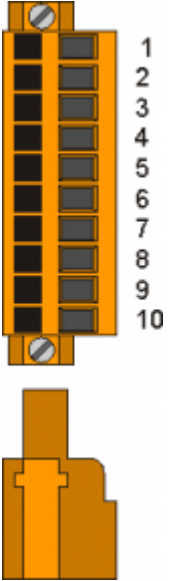
Pot. = potentiometric type input

<sup>1)</sup> To set OFF if not use for analog input 1

<sup>2)</sup> To set OFF if not use for analog input 2

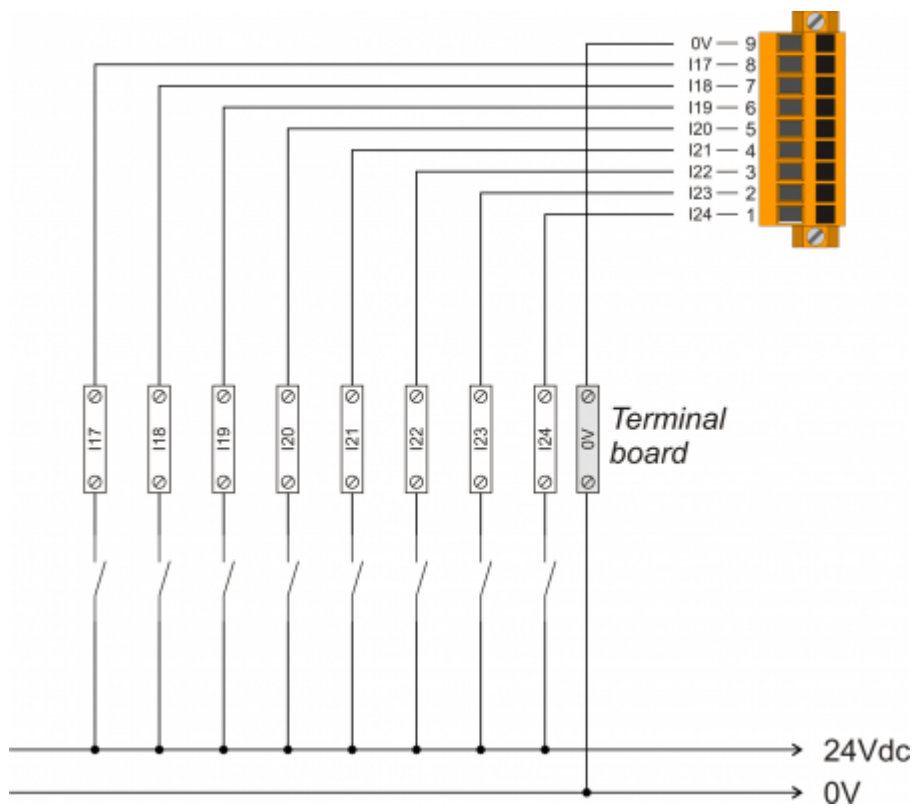
## 2.3 Digital outputs

### 2.3.1 8 protected digital outputs

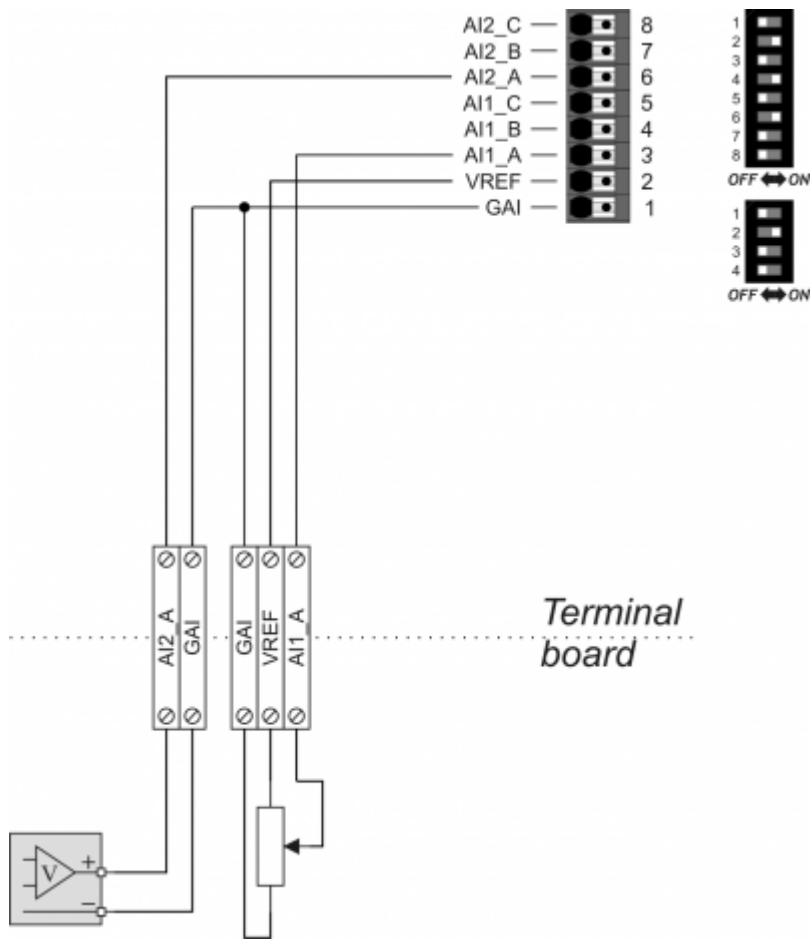
| C12                                                                               | Terminal | Simbol | Description                    | Address |
|-----------------------------------------------------------------------------------|----------|--------|--------------------------------|---------|
|  | 1        | V+     | Output power input (12÷28V dc) |         |
|                                                                                   | 2        | O17    | Digital output 17              | 3.OUT01 |
|                                                                                   | 3        | O18    | Digital output 18              | 3.OUT02 |
|                                                                                   | 4        | O19    | Digital output 19              | 3.OUT03 |
|                                                                                   | 5        | O20    | Digital output 20              | 3.OUT04 |
|                                                                                   | 6        | O21    | Digital output 21              | 3.OUT05 |
|                                                                                   | 7        | O22    | Digital output 22              | 3.OUT06 |
|                                                                                   | 8        | O23    | Digital output 23              | 3.OUT07 |
|                                                                                   | 9        | O24    | Digital output 24              | 3.OUT08 |
|                                                                                   | 10       | V-     | Output power input (0V dc)     |         |

### 3. Connection examples

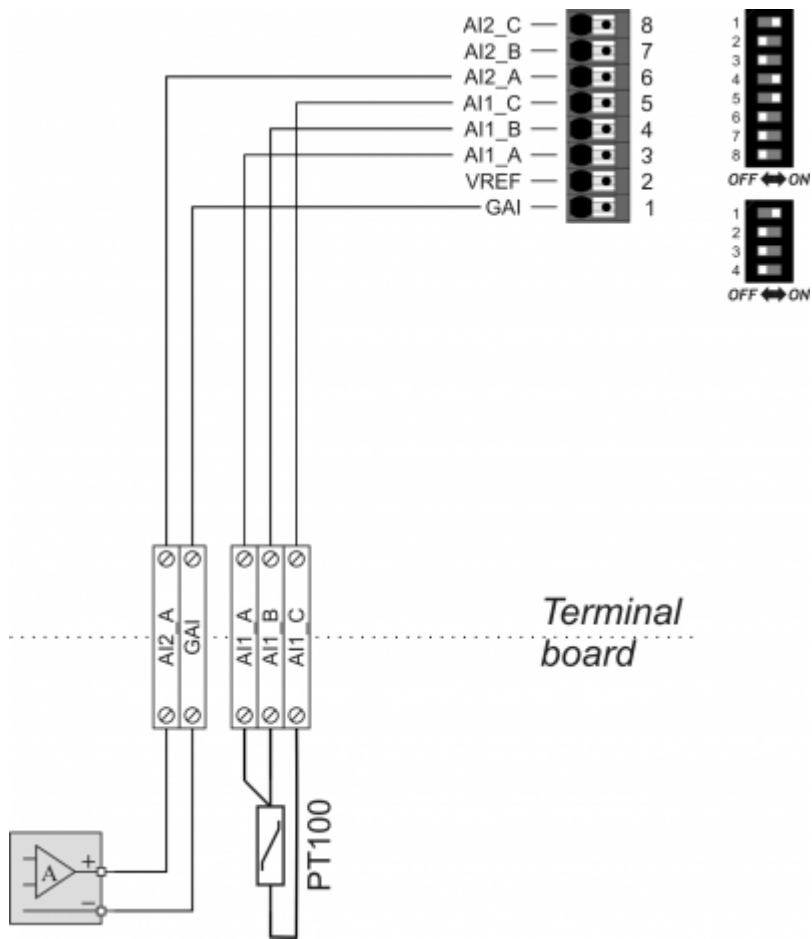
#### 3.1 Digital inputs



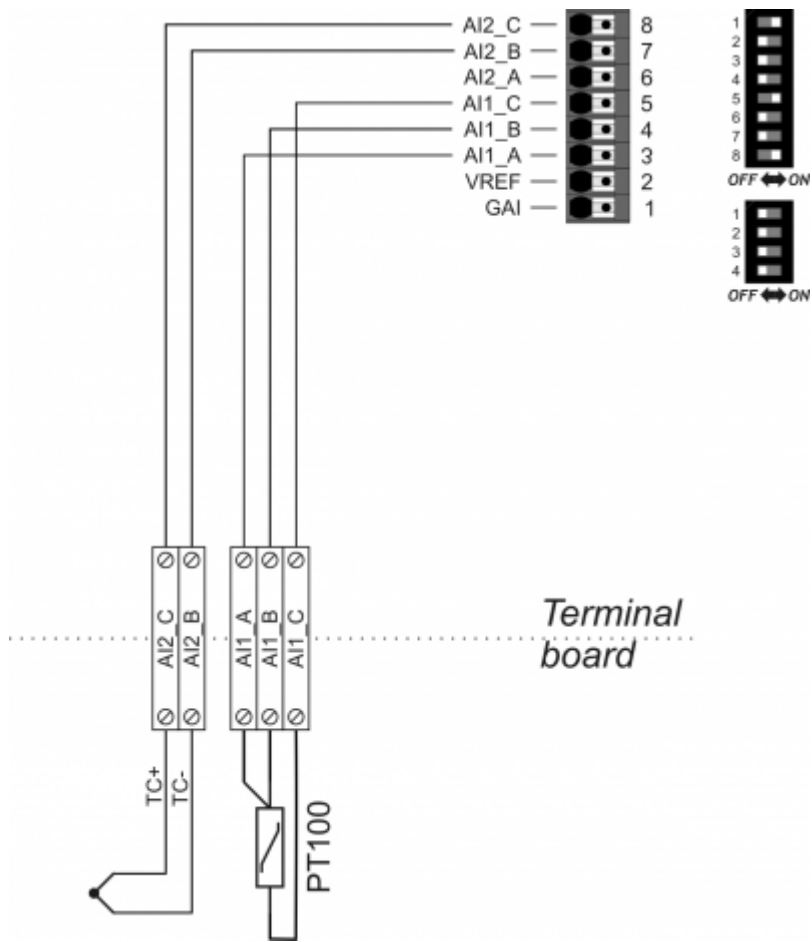
### 3.2 Potentiometric analog input 1 and voltmetric analog input 2



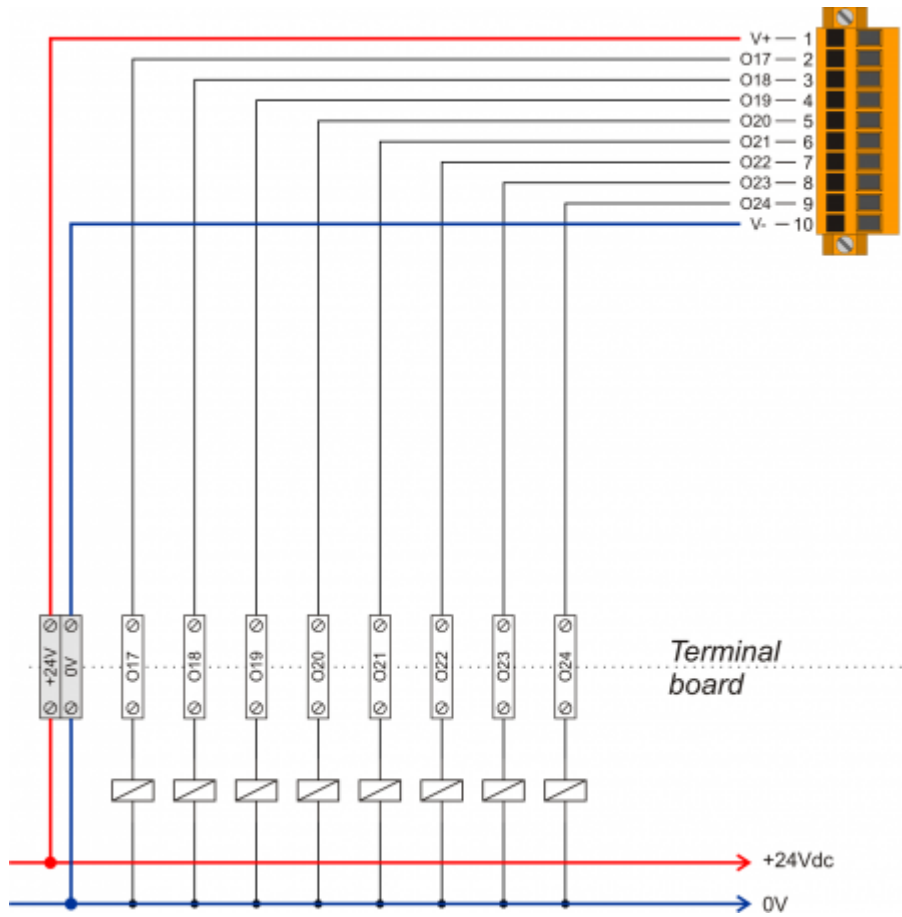
### 3.3 PT100 analog input 1 per and amperometric inputs 2



### 3.4 PT100 analog input 1 and thermocouple analog input 2



### 3.5 Protected digital outputs



## 4. Electrical features

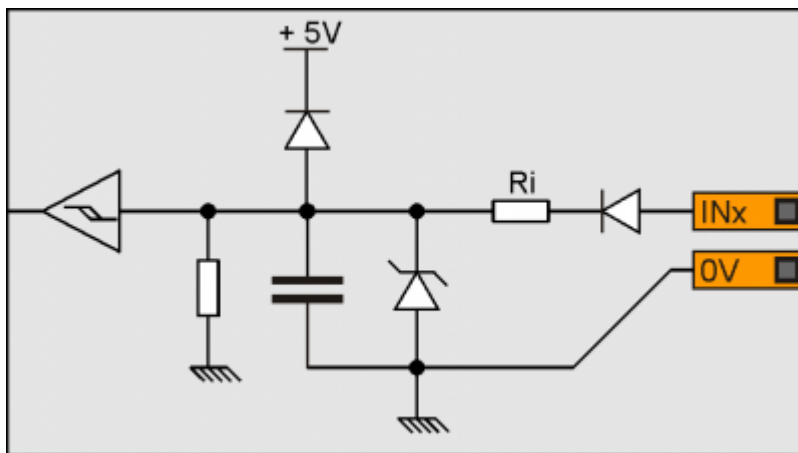
The following are the electrical hardware features.

The maximum and minimum frequency values and actual acquisition times, can still depend on any additional software filters, see the system variable "QMOVE:sys004".

### 4.1 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.



## 4.2 Analog inputs

### 4.2.1 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                     |

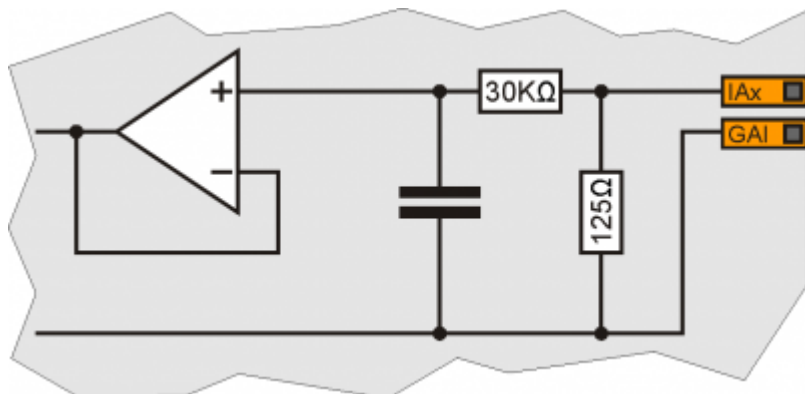
<sup>1), 2), 3), 4), 5), 6), 7), 8)</sup> Amperometric, voltmetric or potentiometric type

## 4.2.2 Amperometric analog inputs in 0-20mA configuration

|                      |                                                                                                                               |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Connection type      | Amperometric<br>(0-20 mA)                                                                                                     |
| Resolution           | 12bit/16bit <sup>1)</sup>                                                                                                     |
| Input resistance     | 125Ω                                                                                                                          |
| Value of damage      | 25 mA                                                                                                                         |
| 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

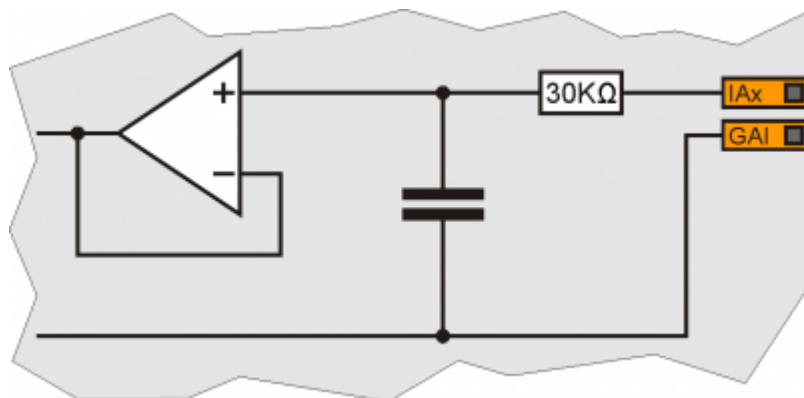


### 4.2.3 Potentiometric analog input configuration

|                                   |                                                                                                                               |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Connection type                   | Potentiometric $1K\Omega \div 20K\Omega$                                                                                      |
| Resolution                        | 12bit/16bit <sup>1)</sup>                                                                                                     |
| Reference voltage output          | 2,5Vdc                                                                                                                        |
| Max output current from reference | 10mA                                                                                                                          |
| Input resistance                  | 10M $\Omega$                                                                                                                  |
| 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 depend on the [Hardware versions](#)

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

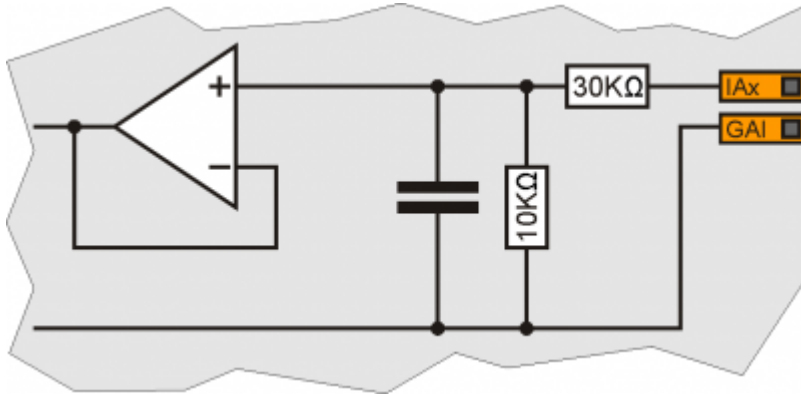


#### 4.2.4 Voltmetric analog input configuration

|                        |                                                                                                                               |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| 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



## 4.2.5 PT100 analog input 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

## 4.2.6 Termocouple analog input configuration

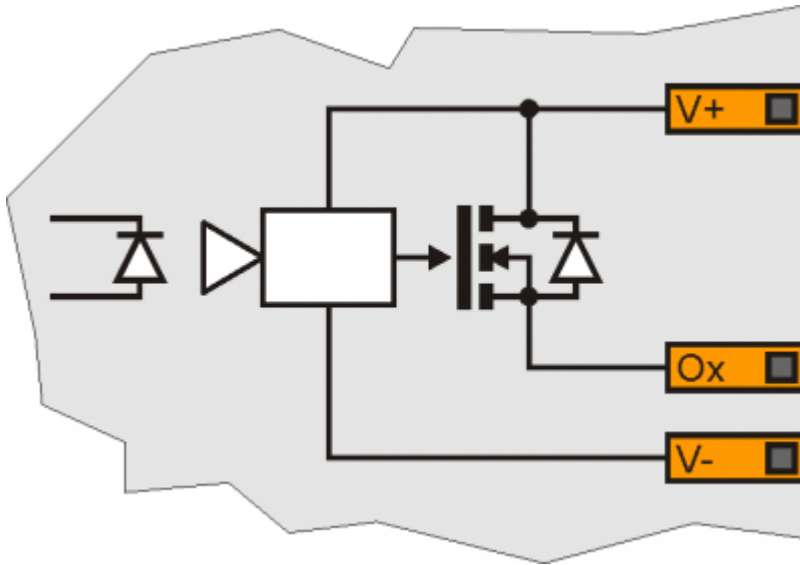
|                                        |                                                                                                                               |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| 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                        | $\pm 156.25$ mV                                                                                                               |
| Measure for cold junction compensation | Integrated                                                                                                                    |
| Input resistance (Rin)                 | 15 MO                                                                                                                         |
| Value of damage                        | 30V                                                                                                                           |
| Measurement accuracy                   | $\pm 0,2\%$ (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

## 4.2.7 Protected digital outputs

|                                   |          |
|-----------------------------------|----------|
| Switchable load                   | Dc (PNP) |
| Max. operating voltage            | 28V      |
| Insulation                        | 1000VRMS |
| Max. internal voltage drop        | 600mV    |
| Max internal resistance @ON       | 90mΩ     |
| Max. protection current           | 12A      |
| Max. operating current            | 500mA    |
| Max. current @OFF                 | 5μA      |
| Max switching time from ON to OFF | 270μs    |
| Max switching time from OFF to ON | 250μs    |



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