

# SEC I/O

## DIN-Rail Digital I/O Device

### General Operating, Maintenance and Installation Manual



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# Table of Contents

- 1 Introduction ..... 2
- 2 Hardware Description ..... 3
  - 2.1 General ..... 3
  - 2.2 Operating and Display Elements on the Device Front Panel ..... 3
  - 2.3 Hardware Components ..... 4
    - 2.3.1 Serial Ports ..... 4
    - 2.3.2 Ethernet Interfaces ..... 5
    - 2.3.3 Digital Input Connector ..... 6
    - 2.3.4 Digital Output Connector..... 6
    - 2.3.5 Analog Input Connector ..... 7
    - 2.3.6 Pin Assignment Variant 1 (8xDI/8xDO)..... 8
    - 2.3.7 Pin Assignment Variants 2 and 3 (4xDI/4xDO/4xAI) ..... 8
    - 2.3.8 Power Supply..... 9
    - 2.3.9 CPU LED ..... 10
- 3 Technical Data ..... 11

# 1 Introduction

All technical information, descriptions and illustrations contained in this operating, maintenance and installation manual remain our property and shall not be used otherwise than for operating this system, nor shall they be copied, reproduced or passed on to third parties or brought to their notice without our prior written consent.

The information represented in this manual is in keeping with current standards and is subject to later alterations.

This manual contains important instructions referring to safe installation, commissioning, operation and maintenance.

Read this manual carefully before starting up that device and observe the instructions.

In order to comply with the guidelines for electro-magnetic compatibility in industrial PCs (or other variants) only CE-certified components are used in compliance with project-specific requirements.

It is to be noted that the digital I/O device (SEC I/O) has not been protected against lightning and the operator should, if desired, take appropriate protective precautions.

Our RS-232 isolator provides efficient protection of your data and equipment against external influences. We will be pleased to draw up a non-binding offer for you.

All trademarks and brand names contained in this user manual are for identification purposes only and can be owned by their respective holders.

Finally, we want to draw your attention to the fact that any warranties with respect to delivered goods will be invalid in the event that:

- Operation, servicing and maintenance are not carried out accurately according to the instructions; repairs are not carried out by our personnel or without our prior written consent.
- Commissioning is not carried out by our personnel or we have not given our approval for the commissioning or the commissioning is carried out by untrained personnel.
- The unit is used inadequately, incorrectly, negligently or inappropriately or for a purpose other than that originally intended.
- The serial number is removed from the product.

## **For your protection, observe the following safety precautions when setting up your equipment:**

- Follow all cautions and instructions marked on the equipment.
- Ensure that the voltage and frequency of your power source match the voltage and frequency inscribed on the equipment's electrical rating label.
- Never push objects of any kind through openings in the equipment. Dangerous voltages may be present. Conductive foreign objects could produce a short circuit that could cause fire, electric shock, or damage to your equipment.

## 2 Hardware Description

### 2.1 General

As hardware platform the industrial controller SEC I/O is used. This maintenance free solution offers a maximum usability, reliability and optimal price-performance ratio.

Intensive tests of the embedded controller are done in our company.

Before and after a 48 hour burn-in test each device must run through a complete function test.

All components are cooled passively.  
The mains power supply is 9 - 40 V DC.

### 2.2 Operating and Display Elements on the Device Front Panel

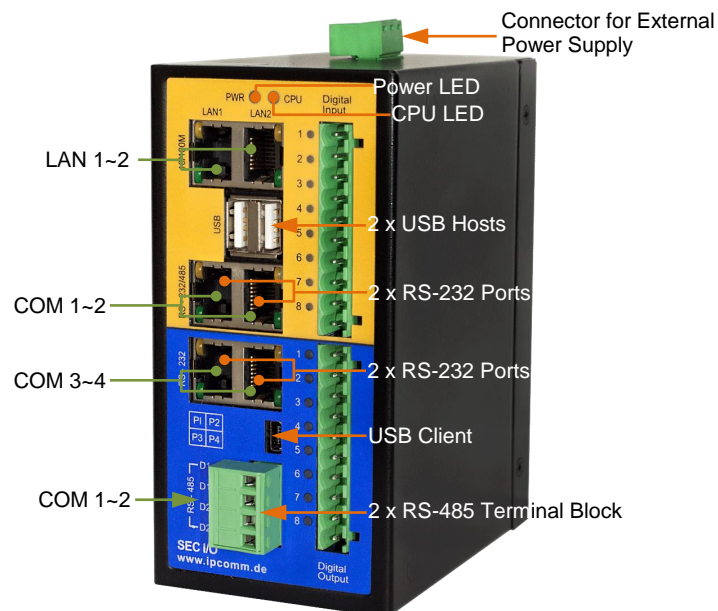


figure 1: SEC I/O front view



Figure 2: SEC I/O back view

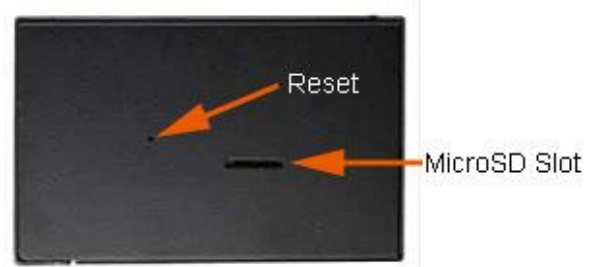


Figure 3: SEC I/O bottom view

Figure 2 shows the rear view of the device.  
There is the clip for mounting on a DIN-Rail.

## 2.3 Hardware Components

### 2.3.1 Serial Ports

The serial interfaces have four RJ45 (1 x terminal block) connectors available.

Port 1~2: software selectable RS-232 or isolated RS-485  
If RS-485 is chosen, please use terminal block connector for RS-485.

Port 3~4: RS-232 port with hardware flow control

**Note:** Only port 2 supports RS-232 full modem control DSR, DCD and DTR.

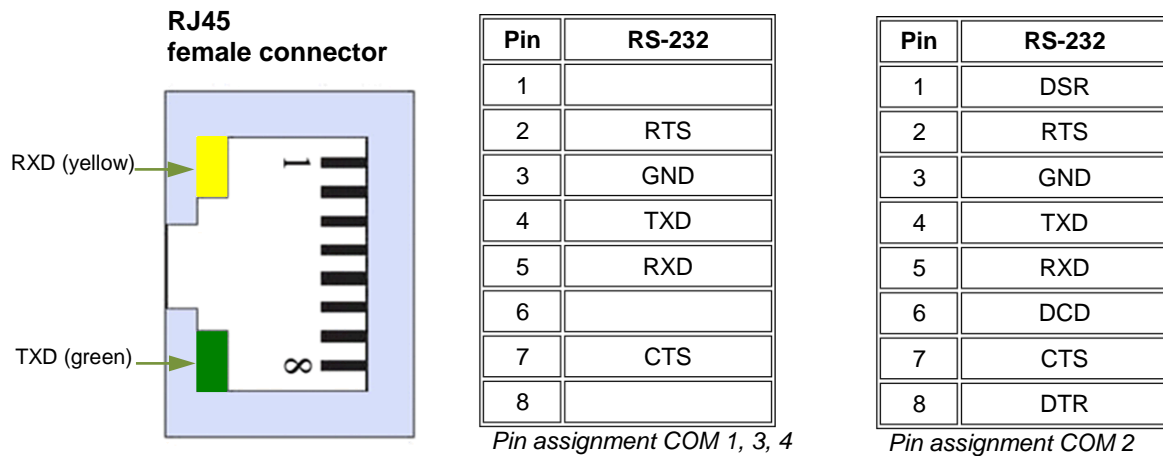


Figure 4: RJ45 female connector

The send activities (TXD) and receiving activities (RXD) are displayed by means of a green or yellow LED.

For the adequate protection against the impact of switching interferences (Burst) and surge voltage, we recommend the use of our 4 kV isolated RS-232 isolator. The used RS-232 transceivers have ESD protection up to 15 kV. The isolator was tested according to EMC guidelines and climatic and mechanical requirements in compliance with the standard IEC 61850-3.

### Terminal block

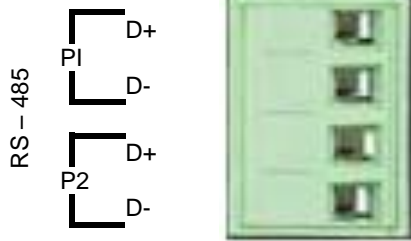
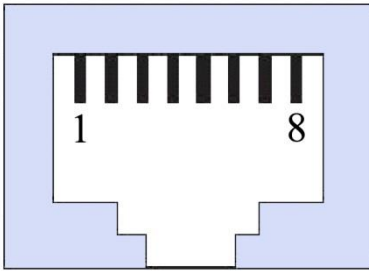


Figure 5: terminal block for RS-485 interface (COM 1~2)

## 2.3.2 Ethernet Interfaces

The embedded controller features two 10/100 Mbps BaseT (RJ45) Ethernet interfaces.

### Ethernet Port RJ45 female connector



Pin	Signal
1	ETx+
2	ETx-
3	ERx+
6	ERx-

Figure 6: pin assignment of Ethernet RJ45 interface

### 2.3.3 Digital Input Connector

Every channel isolated input is equipped with 2500 Vrms photo coupler. The inputs form a group and share the same common ground.

The specification of the isolated input channels is:

Logical high: 5~24 V DC  
 Logical low: 0~1.5 V DC  
 Input resistance: 2KOhms@0.5W  
 Response time: 20 us  
 Isolation: 2500 V RMS

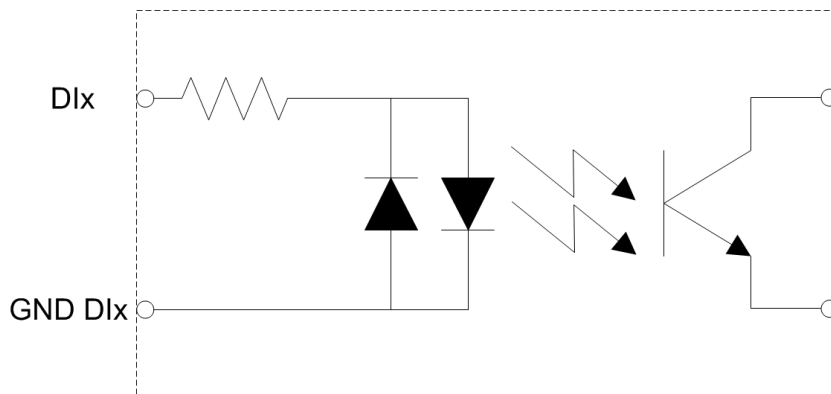


Figure 7: digital input connector

### 2.3.4 Digital Output Connector

Every digital output is equipped with a Darlington transistor pair (Allegro UDN2981A) to switch the external relay or solenoid. The internal transient-suppression diodes permit the drive to be used with inductive load. The source voltage of the drive is from 5 V DC to 50 V DC and the maximum driving current is 500 mA. 2500 Vrms isolation is provided in all DO ports.

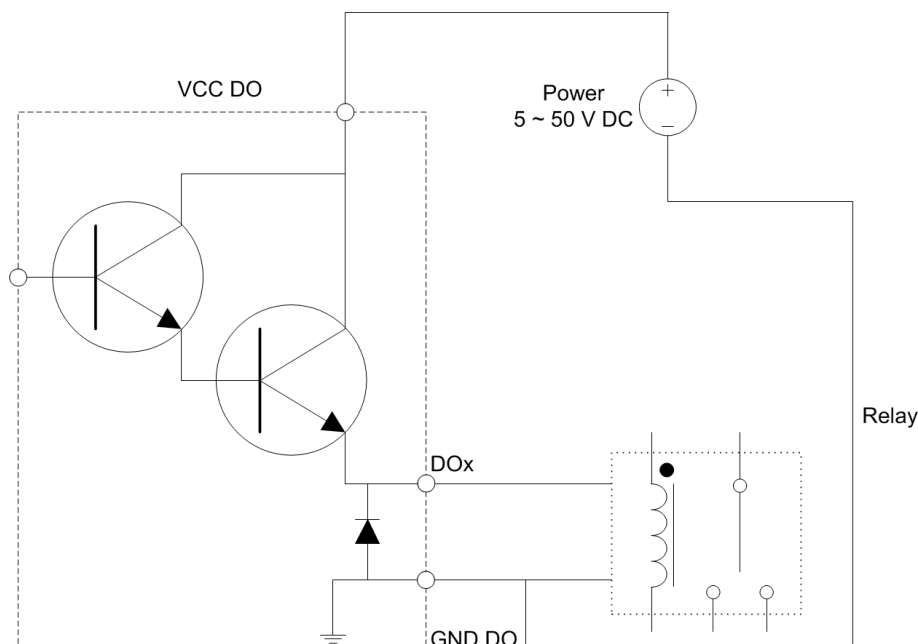


Figure 8: digital output connector

## 2.3.5 Analog Input Connector

Each of the four isolated analog input channels can be configured as various input range.

The common features are as follows:

Effective resolution:	16-bit
No. of channels:	4 (multiplexed, differential)
Sampling rate:	10 readings per second
Input type:	mV, V, mA
Input range:	
uni-polar	0~150 mV, 0~500 mV, 0~1 V, 0~5 V, 0~10 V
bi-polar	+/- 150 mV, +/- 500 mV, +/-1 V, +/-5 V, +/- 10V
current	0~20 mA
CMR:	50/60 Hz 100db
Input impedance:	20 M $\Omega$
Isolation:	1500 V RMS (three-way)

The analog input channels provide 1500 V RMS isolation. Therefore, to measure a floating signal such as a battery and single-ended source, simply connect the positive signal to AI+ and the negative (GND) signal to AI- to perform a differential measurement.

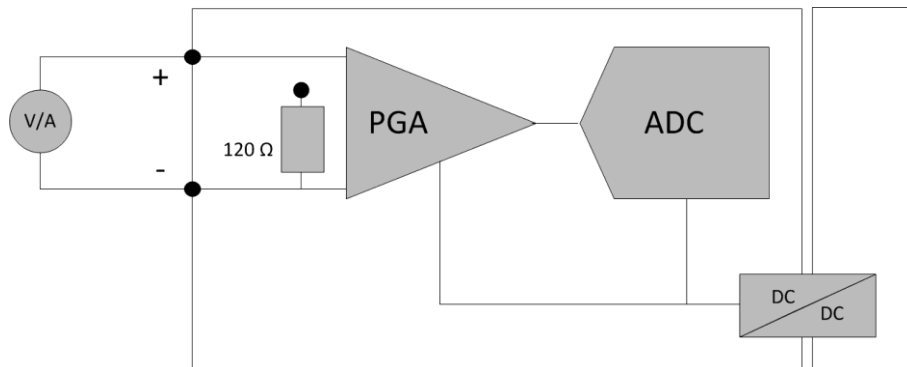


Figure 9: analog input connector

Compared to variant 2, variant 3 provides an on-board 120  $\Omega$  resistor to measure the current input.

Depending on customer requirement the corresponding variant of the SEC I/O is delivered.



### 2.3.6 Pin Assignment Variant 1 (8xDI/8xDO)

DI Ports		DO Ports	
1	DI0	1	DO0
2	DI1	2	DO1
3	DI2	3	DO2
4	DI3	4	DO3
5	GND DI0~3	5	DO4
6	DI4	6	DO5
7	DI5	7	DO6
8	DI6	8	DO7
9	DI7	9	GND DO0~7
10	GND DI4~7	10	VCC DO0~7

Table 1: port assignment variant 1<sup>1</sup>

### 2.3.7 Pin Assignment Variants 2 and 3 (4xDI/4xDO/4xAI)

AI Ports	1	AI1+	DI Ports	1	DI2
	2	AI1-		2	DI3
	3	AI2+		3	DI4
	4	AI2-		4	GND DI2~4
	5	AI3+	DO Ports	5	DO1
	6	AI3-		6	DO2
	7	AI4+		7	DO3
	8	AI4-		8	DO4
DI	9	DI1		9	GND DO1~4
	10	GND DI1		10	VCC DO1~4

Table 2: port assignment variants 2 and 3<sup>1</sup>

<sup>1</sup> DIx: isolated digital input channel  
 DOx: isolated digital output channel  
 AIx: isolated analog input channel  
 GND Dxx: ground of channel group  
 VCC: operating voltage

### 2.3.8 Power Supply

SEC I/O uses +9 V DC to 40 V DC power and input from three ports plug-in screw terminal connector.

Auto-polarity and surge protection are included in power input circuitry of SEC I/O to provide power protection.

Shielding ground provides better EMI protection. Please wire the shielding ground to an appropriate grounded metal surface.

Please pay attention to the correct polarity and input voltage.

The ground of DIN rail and power connector must be on the same potential.

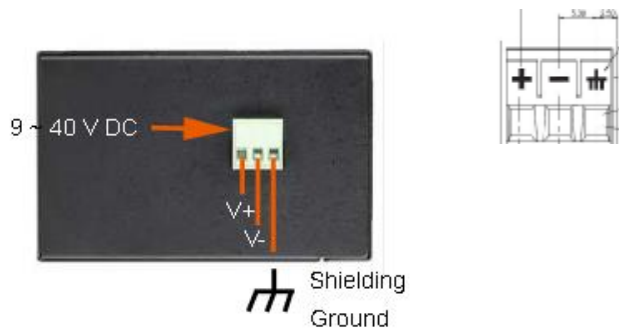


Figure 10: top view - power supply input

The female connector is always supplied. This connector has to be used. By connecting the cable with the connector, the correct polarity must be kept. The wire cross-section must be at least 0.5 mm<sup>2</sup>.

### 2.3.9 CPU LED

The CPU LED shows the states of conversion software and operating system.

Following figure shows all possible indications:

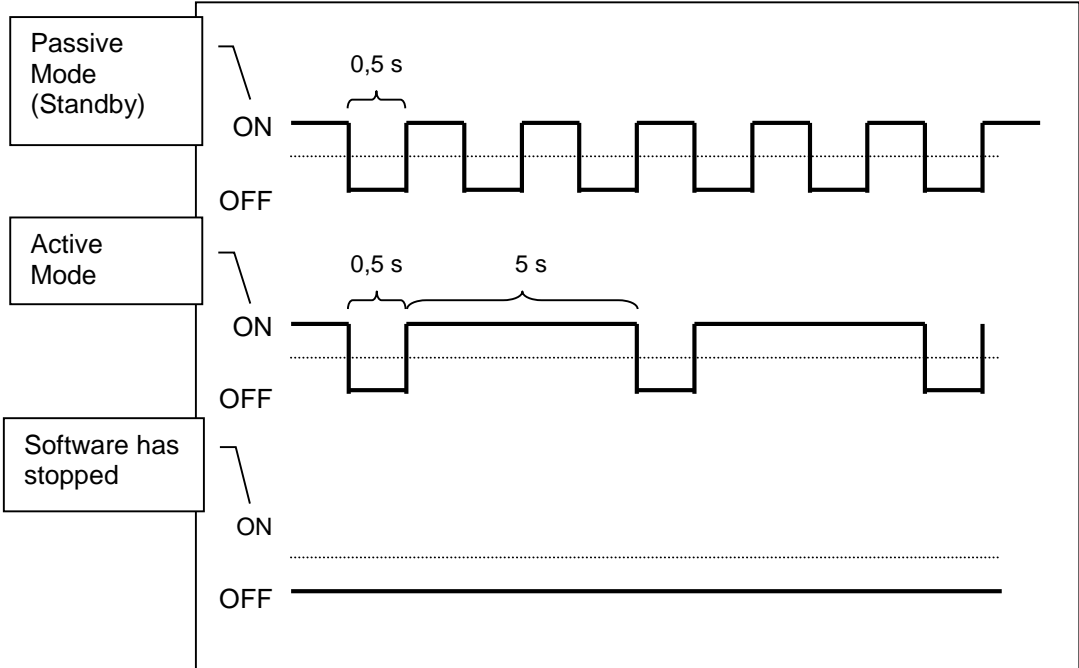


Figure 11: CPU-LED indications

# 3 Technical Data

## General

- No rotating parts

## Processor

- 400 MHz CPU

## Dynamic Memory

- 64 MB SDRAM (128 MB possible on request)

## Network Interface

- 2 x RJ45 for 10/100 Base-T
- Protection: 1.5 KV magnetic isolation

## Serial Ports

- 2 x RJ45 for RS-232
  - 2 x RJ45 configurable as RS-232 or RS-485 (terminal block)
- Note:** the RS-232 interfaces are not fully assigned (see chapter 2.3.1)

- Protection: 15 KV ESD for RS-232, 2500 Vrms isolation and 15 KV ESD for RS-485
- Baud rate: up to 921.6 Kbps
- Parity: none, even, odd, mark, space
- Data bits: 5,6,7,8
- Stop bit: 1, 1.5, 2 bits
- Flow control: RTS/CTS, XON/XOFF, none

## USB Ports

- 2 x USB 2.0 compliant, supports low speed (1.5 Mbps) and full speed (12 Mbps) data rate

## Diagnostic LEDs

- Power
- Software state (CPU-LED)
- Link and activity for LAN interface
- Transmit and receive LEDs for the RS-232 interfaces
- DI/DO status LEDs (only variant 1)

## Mass Storage

- 128 MB Flash
- 1 x MicroSD slot

## Additional Functions

- Battery buffered real time clock (RTC)
- Buzzer
- Watchdog
- Reset

## Power Input / Power Consumption

- 9 - 40 V DC / 4 W max.  
typical power consumption 60 mA (with 24 V DC without USB)

## Standards

- CE
  - EN55022 Class A:2006+A1:2007
  - EN55024:1998+A1:2001+A2:2003
  - IEC 61000-4-2:2008
  - IEC 61000-4-3:2006+A1:2008+A2:2010
  - IEC 61000-4-4:2004+A1:2010
  - IEC 61000-4-5:2005
  - IEC 61000-4-6:2008
  - IEC 61000-4-8:2009
- FCC part 15 subpart B Class A

## Housing

- Steel chassis, including clip for mounting on a 35 mm DIN-Rail
- Protection class IP30

## Dimension (without clip)

- 65 x 130 x 102.5 mm (W/H/D)

## Weight

- 0,7 kg

## Operating Environment

- Operating temperature: 0 °C – 70 °C
- Relative humidity: 5 % to 95 % non-condensing

	VARIANT 1 (8xDI/8xDO)	VARIANT 2 (4xDI/4xDO/4xAI unipolar/bipolar)	VARIANT 3 (4xDI/4xDO/4xAI current)
<b>Isolated Digital Input</b>	<ul style="list-style-type: none"> <li>No. of channels: 8</li> <li>Logical high: 5 ~ 24 V DC</li> <li>Logical low: 0 ~ 1.5 V DC</li> <li>Input resistance: 1.2k ohms@0.5W</li> <li>Response time: 20 us</li> <li>Opto-isolation: 2500 V RMS</li> </ul>	<ul style="list-style-type: none"> <li>No. of channels: 4</li> <li>Logical high: 5 ~ 24 V DC</li> <li>Logical low: 0 ~ 1.5 V DC</li> <li>Input resistance: 1.2k ohms@0.5W</li> <li>Response time: 20 us</li> <li>Opto-isolation: 2500 V RMS</li> </ul>	<ul style="list-style-type: none"> <li>No. of channels: 4</li> <li>Logical high: 5 ~ 24 V DC</li> <li>Logical low: 0 ~ 1.5 V DC</li> <li>Input resistance: 1.2k ohms@0.5W</li> <li>Response time: 20 us</li> <li>Opto-isolation: 2500 V RMS</li> </ul>
<b>Digital Output</b>	<ul style="list-style-type: none"> <li>No. of channels: 8</li> <li>Source voltage (VDD): 5~50 V DC</li> <li>Output current: 500 mA max.</li> <li>Isolation: 2500 V RMS</li> </ul>	<ul style="list-style-type: none"> <li>No. of channels: 4</li> <li>Source voltage (VDD): 5~50 V DC</li> <li>Output current: 500 mA max.</li> <li>Isolation: 2500 V RMS</li> </ul>	<ul style="list-style-type: none"> <li>No. of channels: 4</li> <li>Source voltage (VDD): 5~50 V DC</li> <li>Output current: 500 mA max.</li> <li>Isolation: 2500 V RMS</li> </ul>
<b>Analog Inputs</b>	-	<ul style="list-style-type: none"> <li>No. of channels: 4 (multiplexed, differential)</li> <li>Sampling speed: 10 readings per second</li> <li>Input range (selected by Software): <ul style="list-style-type: none"> <li>0~150mV, 0~500mV, +/- 150mV, +/- 500mV</li> <li>0~1V, 0~5V, 0~10V, +/-1V, +/-5V, +/-10V</li> </ul> </li> <li>Effective resolution: 16-bit</li> <li>Voltage input mode: differential, 100db CMR</li> <li>Voltage input impedance: 20 M <math>\Omega</math></li> <li>Isolation protection: 1500 V RMS</li> </ul>	<ul style="list-style-type: none"> <li>No. of channels: 4 (multiplexed, differential)</li> <li>Sampling speed: 10 readings per second</li> <li>Input range: <ul style="list-style-type: none"> <li>0~20mA</li> </ul> </li> <li>Effective resolution: 16-bit</li> <li>Current input impedance: 120 <math>\Omega</math></li> <li>Isolation protection: 1500 V RMS</li> </ul>

**Note:** Differences to the delivered type are possible.