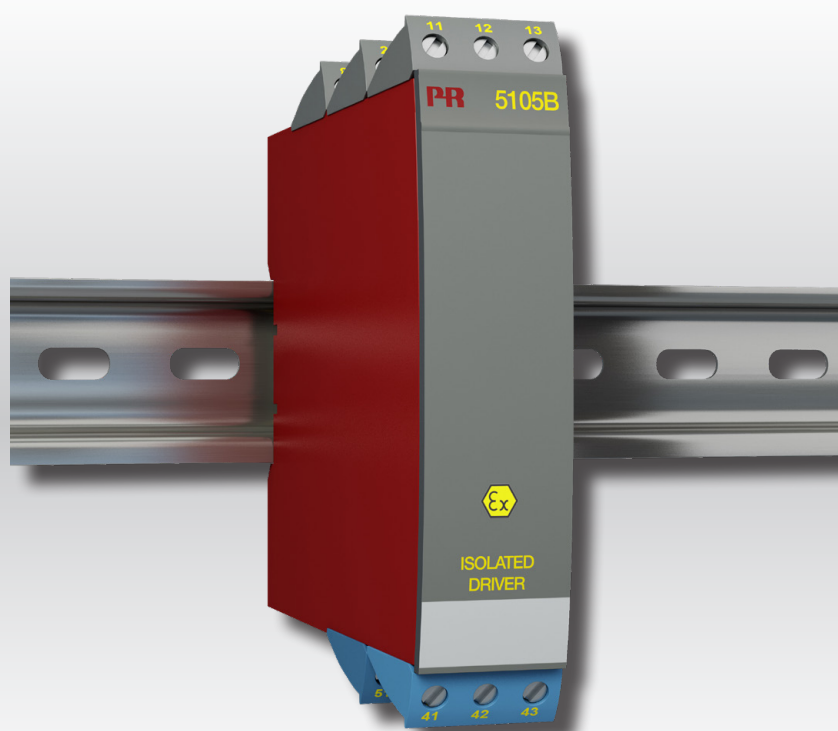


PERFORMANCE  
MADE  
SMARTER

# Product manual

## **5105B**

### *Ex-isolated driver*



TEMPERATURE | I.S. INTERFACES | COMMUNICATION INTERFACES | MULTIFUNCTIONAL | ISOLATION | DISPLAY

No. 5105BV106-UK  
From serial no. 040093126

**PR**  
electronics

# 6 Product Pillars

## *to meet your every need*

### Individually outstanding, unrivalled in combination

With our innovative, patented technologies, we make signal conditioning smarter and simpler. Our portfolio is composed of six product areas, where we offer a wide range of analog and digital devices covering over a thousand applications in industrial and factory automation. All our products comply with or surpass the highest industry standards, ensuring reliability in even the harshest of environments and have a 5-year warranty for greater peace of mind.



Temperature

Our range of temperature transmitters and sensors provides the highest level of signal integrity from the measurement point to your control system. You can convert industrial process temperature signals to analog, bus or digital communications using a highly reliable point-to-point solution with a fast response time, automatic self-calibration, sensor error detection, low drift, and top EMC performance in any environment.



I.S. Interface

We deliver the safest signals by validating our products against the toughest safety standards. Through our commitment to innovation, we have made pioneering achievements in developing I.S. interfaces with SIL 2 Full Assessment that are both efficient and cost-effective. Our comprehensive range of analog and digital intrinsically safe isolation barriers offers multifunctional inputs and outputs, making PR an easy-to-implement site standard. Our backplanes further simplify large installations and provide seamless integration to standard DCS systems.



Communication

We provide inexpensive, easy-to-use, future-ready communication interfaces that can access your PR installed base of products. All the interfaces are detachable, have a built-in display for readout of process values and diagnostics, and can be configured via push-buttons. Product specific functionality includes communication via Modbus and Bluetooth and remote access using our PR Process Supervisor (PPS) application, available for iOS and Android.



Multifunction

Our unique range of single devices covering multiple applications is easily deployable as your site standard. Having one variant that applies to a broad range of applications can reduce your installation time and training, and greatly simplify spare parts management at your facilities. Our devices are designed for long-term signal accuracy, low power consumption, immunity to electrical noise and simple programming.



Isolation

Our compact, fast, high-quality 6 mm isolators are based on microprocessor technology to provide exceptional performance and EMC-immunity for dedicated applications at a very low total cost of ownership. They can be stacked both vertically and horizontally with no air gap separation between units required.



Display

Our display range is characterized by its flexibility and stability. The devices meet nearly every demand for display readout of process signals, and have universal input and power supply capabilities. They provide a real-time measurement of your process value no matter the industry, and are engineered to provide a user-friendly and reliable relay of information, even in demanding environments.

# Ex-isolated driver

## 5105B

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## Warning



**GENERAL**

This device is designed for connection to hazardous electric voltages. Ignoring this warning can result in severe personal injury or mechanical damage. To avoid the risk of electric shock and fire, the safety instructions of this manual must be observed and the guidelines followed. The specifications must not be exceeded, and the device must only be applied as described in the following. Prior to the commissioning of the device, this manual must be examined carefully. Only qualified personnel (technicians) should install this device. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

## Warning



**HAZARD-  
OUS  
VOLTAGE**

Until the device is fixed, do not connect hazardous voltages to the device. The following operations should only be carried out on a disconnected device and under ESD-safe conditions:

- Dismantlement of the device for setting of DIP-switches and jumpers.
- General mounting, wire connection and disconnection.
- Troubleshooting the device.

**Repair of the device and replacement of circuit breakers must be done by PR electronics A/S only.**



## Warning



**INSTAL-  
LATION**

SYSTEM 5000 must be mounted on a DIN rail according to DIN 60715. The communication connector of SYSTEM 5000 is connected to the input terminals on which dangerous voltages can occur, and it must only be connected to the programming unit Loop Link by way of the enclosed cable.

## Symbol identification



**Triangle with an exclamation mark:** Read the manual before installation and commissioning of the device in order to avoid incidents that could lead to personal injury or mechanical damage. Warning / demand. Potentially lethal situations.



**The CE mark** proves the compliance of the device with the essential requirements of the directives.



**The double insulation symbol** shows that the device is protected by double or reinforced insulation.



**Ex devices** have been approved acc. to the ATEX directive for use in connection with installations in explosive areas.

# Safety instructions

## Definitions

**Hazardous voltages** have been defined as the ranges: 75 to 1500 Volt DC, and 50 to 1000 Volt AC.

**Technicians** are qualified persons educated or trained to mount, operate, and also trouble-shoot technically correct and in accordance with safety regulations.

**Operators**, being familiar with the contents of this manual, adjust and operate the knobs or potentiometers during normal operation.

## Receipt and unpacking

Unpack the device without damaging it and check whether the device type corresponds to the one ordered. The packing should always follow the device until this has been permanently mounted.

## Environment

Avoid direct sun light, dust, high temperatures, mechanical vibrations and shock, and rain and heavy moisture. If necessary, heating in excess of the stated limits for ambient temperatures should be avoided by way of ventilation.

The device must be installed in pollution degree 2 or better.

The device is designed to be safe at least under an altitude up to 2 000 m.

The device is designed for indoor use.

## Mounting

Only technicians, who are familiar with the technical terms, warnings, and instructions in the manual and who are able to follow these, should connect the device. Should there be any doubt as to the correct handling of the device, please contact your local distributor or, alternatively **PR electronics A/S, [www.prelectronics.com](http://www.prelectronics.com)**

Mounting and connection of the device should comply with national legislation for mounting of electric materials, i.e. wire cross section, protective fuse, and location.

Stranded wire should be installed with an insulation stripping length of 5 mm or via a suitable insulated terminal such as a bootlace ferrule.

Descriptions of input / output and supply connections are shown in the block diagram and side label.

The following apply to fixed hazardous voltages-connected devices:

The max. size of the protective fuse is 10 A and, together with a power switch, it should be easily accessible and close to the device. The power switch should be marked with a label telling it will switch off the voltage to the device.

Year of manufacture can be taken from the first two digits in the serial number.

## Calibration and adjustment

During calibration and adjustment, the measuring and connection of external voltages must be carried out according to the specifications of this manual. The technician must use tools and instruments that are safe to use.

## Normal operation

Operators are only allowed to adjust and operate devices that are safely fixed in panels, etc., thus avoiding the danger of personal injury and damage. This means there is no electrical shock hazard, and the device is easily accessible.

## Cleaning

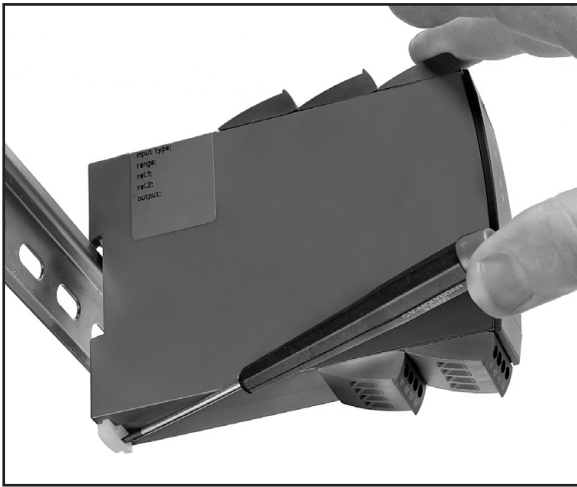
When disconnected, the device may be cleaned with a cloth moistened with distilled water.

## Liability

To the extent the instructions in this manual are not strictly observed, the customer cannot advance a demand against PR electronics A/S that would otherwise exist according to the concluded sales agreement.

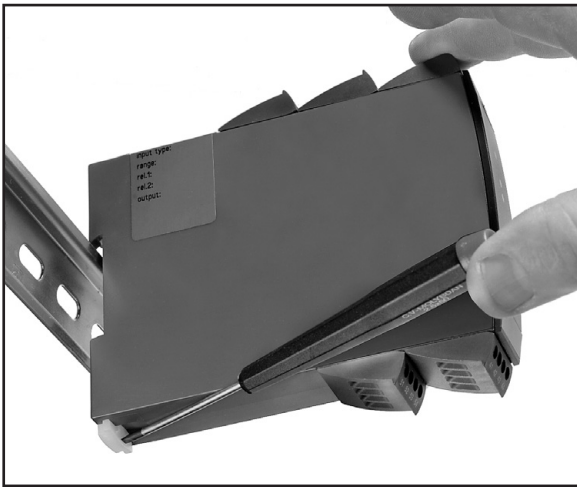
# How to demount system 5000

First, remember to demount the connectors with hazardous voltages.



**Picture 1:**

By lifting the bottom lock, the device is detached from the DIN rail.

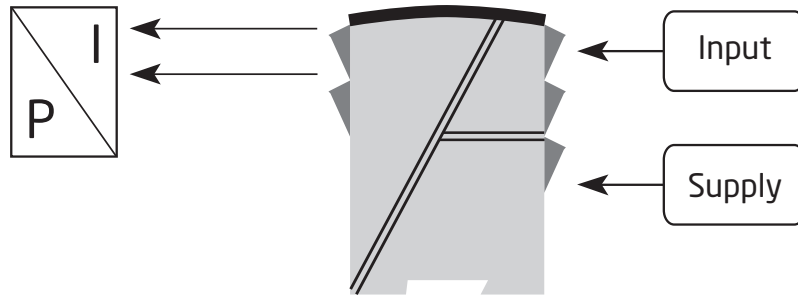


**Picture 2:**

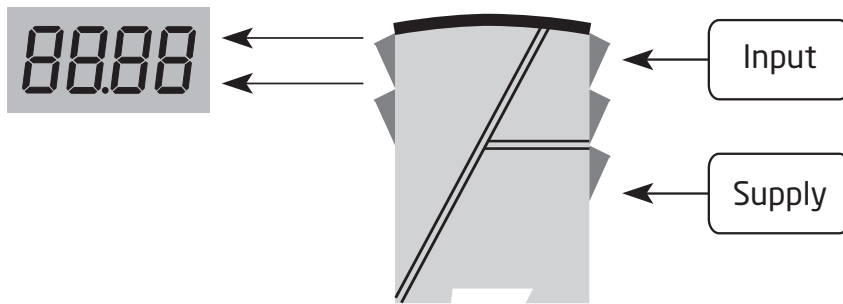
Then, by lifting the upper lock and pulling the front plate simultaneously the PCB is removed. Switches and jumpers can now be adjusted.

# Applications

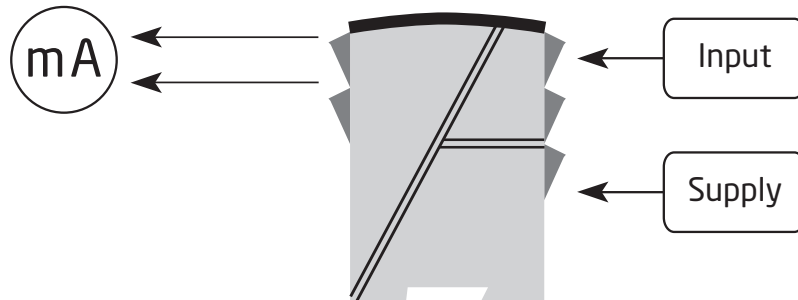
I / P Converter



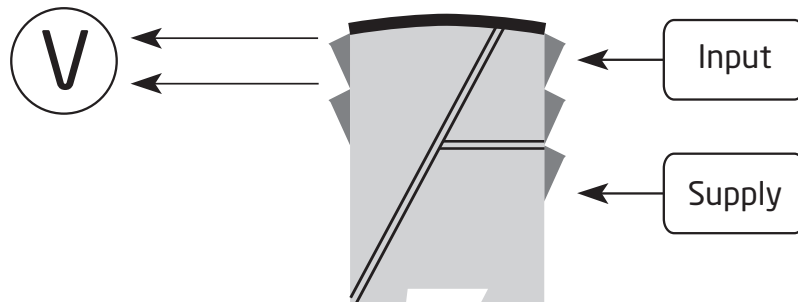
Display



Current, mA



Voltage



# Ex-isolated driver

## 5105B

- 1- or 2-channel version
- 3- / 5-port 3.75 kVAC galvanic isolation
- Driver for Ex area
- 20 programmable measurement ranges
- Universal supply by AC or DC

### Application

- Safety barrier for current signals transmitted to I/P converters and displays mounted in hazardous area.
- Safety barrier for analogue current / voltage signals transmitted to hazardous area.
- 1 : 1 or signal conversion of analogue current / voltage signals.

### Technical characteristics

- The 20 factory-calibrated measurement ranges in the 5105B can be selected by the internal DIP-switches without the need for a recalibration. Special measurement ranges can be delivered.
- PR5105B is based on microprocessor technology for gain and offset. The analog signal is transmitted at a response time of less than 25 ms.
- Inputs, outputs, and supply are floating and galvanically separated.

### Mounting / installation

- Mounted vertically or horizontally on a DIN rail. By way of the 2-channel version up to 84 channels can be mounted per metre.



## Order

| Type  | Input         | Output        | Channels   |
|-------|---------------|---------------|------------|
| 5105B | 0...20 mA : A | Special : 0   | Single : A |
|       | 4...20 mA : B | 0...20 mA : 1 | Double : B |
|       | 0...10 V : E  | 4...20 mA : 2 |            |
|       | 2...10 V : F  | 0...1 V : 4   |            |
|       | Special : X   | 0.2...1 V : 5 |            |
|       |               | 0...10 V : 6  |            |
|       |               | 2...10 V : 7  |            |

## Electrical specifications

### Environmental conditions

|                                  |                      |
|----------------------------------|----------------------|
| Operating temperature . . . . .  | -20°C to +60°C       |
| Calibration temperature. . . . . | 20...28°C            |
| Relative humidity . . . . .      | < 95% RH (non-cond.) |
| Protection degree . . . . .      | IP20                 |

### Mechanical specifications

|                                   |   |
|-----------------------------------|---|
| Dimensions (HxWxD) . . . . .      | 109 x 23.5 x 130 mm   |
| Weight approx. . . . .            | 225 g   |
| DIN rail type. . . . .            | DIN 60715 - 35 mm   |
| Wire size (min....max.) . . . . . | 0.13...2.08 mm <sup>2</sup> AWG 26...14 mm <sup>2</sup> stranded wire |
| Screw terminal torque. . . . .    | 0.5 Nm  |
| Vibration. . . . .                | IEC 60068-2-6   |
| 2...13.2 Hz . . . . .             | ±1 mm   |
| 13.2...100 Hz. . . . .            | ±0.7 g  |

### Common electrical specifications

|  |  |
|--|--|
| Supply voltage . . . . .   | 21.6...253 VAC, 50...60 Hz<br>or 19.2...300 VDCC |
| Fuse . . . . .   | 400 mA SB / 250 VAC                              |
| Max. required power, 1 / 2 channels . . . . .                                  | 1.3 W / 2.0 W                                    |
| Internal power dissipation, 1 / 2 channels. . . . .                            | 1.2 W / 2.0 W                                    |
| <i>Max. required power is the maximum power needed at terminals 31 and 33.</i> |  |
| <i>Max. power dissipation is the maximum power dissipated by the device.</i>   |  |
| Isolation voltage, test / operation. . . . .                                   | 3.75 kVAC / 250 VAC                              |
| PELV/SELV. . . . .   | IEC 61140  |
| Communications interface . . . . .   | Loop Link  |
| Signal / noise ratio. . . . .  | Min. 60 dB (0...100 kHz)                         |
| Response time (0...90%, 100...10%) . . . . .                                   | < 25 ms  |
| Signal dynamics, input / output . . . . .                                      | Analog signal chain                              |

Accuracy, the greater of the general and basic values:

| General values |                          |                                |
|----------------|--------------------------|--------------------------------|
| Input type     | Absolute accuracy        | Temperature coefficient        |
| All            | $\leq \pm 0.1\%$ of span | $\leq \pm 0.01\%$ of span / °C |

| Basic values |                           |   |
|--------------|---------------------------|---|
| Input type   | Basic accuracy            | Temperature coefficient                     |
| mA           | $\leq \pm 16 \mu\text{A}$ | $\leq \pm 1.6 \mu\text{A} / ^\circ\text{C}$ |
| Volt         | $\leq \pm 8 \text{ mV}$   | $\leq \pm 0.8 \text{ mV} / ^\circ\text{C}$  |

|   |                       |
|---|-----------------------|
| EMC - immunity influence. . . . .                                   | $< \pm 0.5\%$ of span |
| Extended EMC immunity:<br>NAMUR NE 21, A criterion, burst . . . . . | $< \pm 1\%$ of span   |

**Current input**

|   |                                    |
|---|------------------------------------|
| Measurement range . . . . .             | 0...23 mA                          |
| Min. measurement range (span) . . . . . | 16 mA                              |
| Max. offset . . . . .                   | 20% of max. value                  |
| Input resistance: . . . . .             | Nom. 10 $\Omega$ + PTC 10 $\Omega$ |

**Voltage input**

|   |                       |
|---|-----------------------|
| Measurement range . . . . .             | 0...10 VDC            |
| Min. measurement range (span) . . . . . | 8 VDC                 |
| Max. offset . . . . .                   | 20% of max. value     |
| Input resistance . . . . .              | $> 2 \text{ M}\Omega$ |

**Current output**

|                                    |                                      |
|------------------------------------|--------------------------------------|
| Signal range (span) . . . . .      | 0...23 mA                            |
| Min. signal range (span) . . . . . | 16 mA                                |
| Max. offset . . . . .              | 20% of max. value                    |
| Load (max.) . . . . .              | $\leq 770 \Omega$                    |
| Load stability . . . . .           | $\leq 0.01\%$ of span / 100 $\Omega$ |
| Current limit. . . . .             | $\leq 28 \text{ mA}$                 |

**Voltage output**

|                                    |                        |
|------------------------------------|------------------------|
| Signal range (span) . . . . .      | 0...1 VDC / 0...10 VDC |
| Min. signal range (span) . . . . . | 0.8 VDC / 8 VDC        |
| Max. offset . . . . .              | 20% of max. value      |
| Load (min.) . . . . .              | 500 k $\Omega$         |

**Ex / I.S. data**

|                 |                      |
|-----------------|----------------------|
| $U_m$ . . . . . | : 250 V              |
| $U_o$ . . . . . | : 28 VDC             |
| $I_o$ . . . . . | : 93.0 mADC          |
| $P_o$ . . . . . | : 0.65 W             |
| $L_o$ . . . . . | : 3 mH               |
| $C_o$ . . . . . | : 0.08 $\mu\text{F}$ |

**Of span** = of the currently selected measurement range

**Observed authority requirements**

|                  |                |
|------------------|----------------|
| EMC . . . . .    | 2014/30/EU     |
| LVD . . . . .    | 2014/35/EU     |
| ATEX . . . . .   | 2014/34/EU     |
| RoHS . . . . .   | 2011/65/EU     |
| EAC . . . . .    | TR-CU 020/2011 |
| EAC Ex . . . . . | TR-CU 012/2011 |

**Approvals**

|                                    |            |
|------------------------------------|------------|
| DNV-GL, Ships & Offshore . . . . . | TAA0000101 |
| c UL us, UL 508. . . . .           | E231911    |

**I.S. / Ex approvals**

|                          |                             |
|--------------------------|-----------------------------|
| ATEX . . . . .           | DEMKO 99ATEX126014          |
| c UL us, UL 913. . . . . | E233311                     |
| EAC Ex . . . . .         | EAEU KZ 7500361.01.01.08756 |

# DIP-switch programming

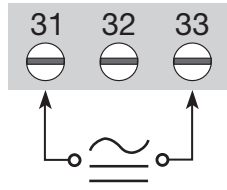
Factory-calibrated standard ranges

| Output:   | Input: (channel 2, DP 3 and DP 4) |                       |                       |                       |
|-----------|-----------------------------------|-----------------------|-----------------------|-----------------------|
|           | 0...20 mA                         | 4...20 mA             | 0...10V               | 2...10V               |
| 0...20 mA | DP1 DP2<br>On Off<br>             | DP1 DP2<br>On Off<br> | DP1 DP2<br>On Off<br> | DP1 DP2<br>On Off<br> |
| 4...20 mA | DP1 DP2<br>On Off<br>             | DP1 DP2<br>On Off<br> | DP1 DP2<br>On Off<br> | DP1 DP2<br>On Off<br> |
| 0...1 V   | DP1 DP2<br>On Off<br>             | DP1 DP2<br>On Off<br> |                       |                       |
| 0.2...1 V | DP1 DP2<br>On Off<br>             | DP1 DP2<br>On Off<br> |                       |                       |
| 0...10V   | DP1 DP2<br>On Off<br>             | DP1 DP2<br>On Off<br> | DP1 DP2<br>On Off<br> | DP1 DP2<br>On Off<br> |
| 2...10V   | DP1 DP2<br>On Off<br>             | DP1 DP2<br>On Off<br> | DP1 DP2<br>On Off<br> | DP1 DP2<br>On Off<br> |

When special measurement ranges are delivered, all DIP-switches for the channel in question are OFF.

# Connections

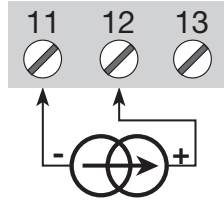
Supply:



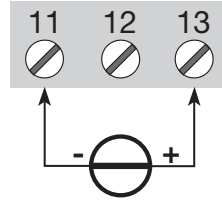
Inputs:

Channel 1

Current

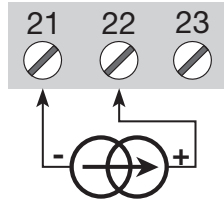


Voltage

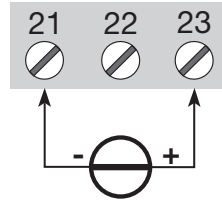


Channel 2

Current



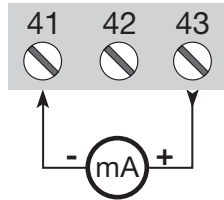
Voltage



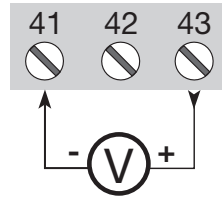
Outputs:

Channel 1

Current

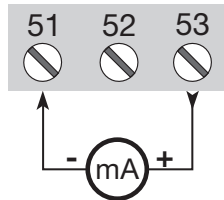


Voltage

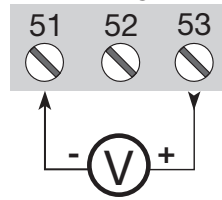


Channel 2

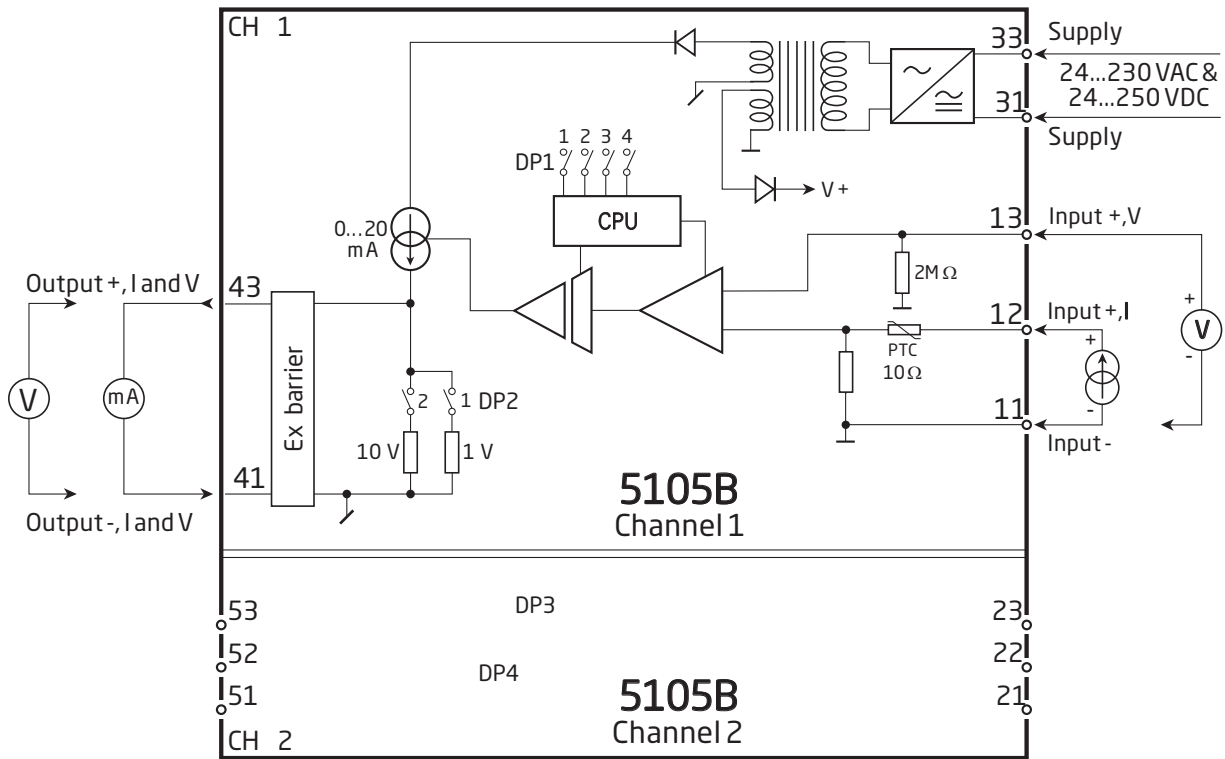
Current



Voltage



# Block diagram



# UL control drawing 5105QU01

## Hazardous (Classified) Location

Class I, Division 1, Group A,B,C,D  
 Class I, Zone 0 and 1, Group IIC  
 Class II, Division 1 Group E, F, G

## Non-hazardous

Associated apparatus  
 Galvanically isolated

Intrinsically safe apparatus  
 entity parameters:

$$V_{max. (U_i)} \geq V_{oc} (U_o)$$

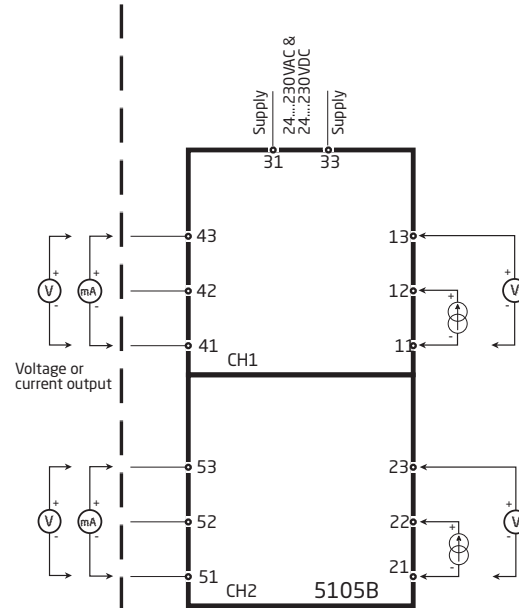
$$I_{max. (I_i)} \geq I_{sc} (I_o)$$

$$P_i \geq P_o$$

$$C_a \geq C_{cable} + C_i$$

$$L_a \geq L_{cable} + L_i$$

The sum of capacitance and inductance of cable and intrinsic safe equipment must be less or equal to  $C_a$  and  $L_a$



| 5105B Associated apparatus parameters |                    |              |             |
|---------------------------------------|--------------------|--------------|-------------|
| CH1                                   | Terminals 41 to 43 |              |             |
| CH2                                   | Terminals 51 to 53 |              |             |
| Voc (Uo)                              | 28 V               |              |             |
| Isc (Io)                              | 93 mA              |              |             |
| Po                                    | 0.65 W             |              |             |
|                                       | IIC / grp. A,B     | IIB / grp. C | IIA / grp.D |
| Ca (Co)                               | 0.052 μF           | 0.44 μF      | 1.45 μF     |
| La (Lo)                               | 2.4 mH             | 12 mH        | 20 mH       |

## Installation notes:

- 1) The maximum nonhazardous location voltage is 250 VAC/DC.
- 2) The installation shall be in accordance with the National Electrical Code NFPA 70, Articles 504 and 505.
- 3) The terminals of the two individual channels shall not be interconnected in any way.
- 4) Install in Pollution degree 2 or better
- 5) Use 60 / 75 °C copper conductors with wire size AWG: (26 - 14).
- 6) Warning: Substitution of components may impair intrinsic safety.

## Document history

The following list provides notes concerning revisions of this document.

| <b>Rev. ID</b> | <b>Date</b> | <b>Notes</b>            |
|----------------|-------------|-------------------------|
| 106            | 2507        | New EAC Ex certificate. |



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**Our trusted red boxes are supported wherever you are**

All our devices are backed by expert service and a 5-year warranty. With each product you purchase, you receive personal technical support and guidance, day-to-day delivery, repair without charge within the warranty period and easily accessible documentation.

We are headquartered in Denmark, and have offices and authorized partners the world over. We are a local

business with a global reach. This means that we are always nearby and know your local markets well. We are committed to your satisfaction and provide **PERFORMANCE MADE SMARTER** all around the world.

For more information on our warranty program, or to meet with a sales representative in your region, visit [prelectronics.com](http://prelectronics.com).

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PR electronics is the leading technology company specialized in making industrial process control safer, more reliable and more efficient. Since 1974, we have been dedicated to perfecting our core competence of innovating high precision technology with low power consumption. This dedication continues to set new standards for products communicating, monitoring and connecting our customers' process measurement points to their process control systems.

Our innovative, patented technologies are derived from our extensive R&D facilities and from having a great understanding of our customers' needs and processes. We are guided by principles of simplicity, focus, courage and excellence, enabling some of the world's greatest companies to achieve PERFORMANCE MADE SMARTER.