PERFORMANCE
MADE
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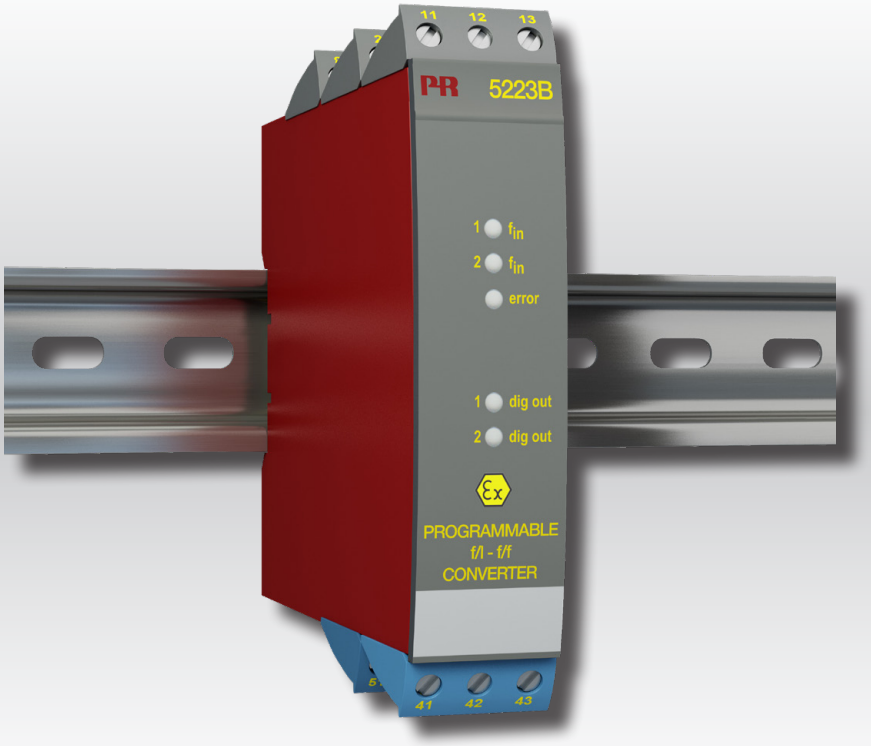
Product manual
5223
Programmable f/I - f/f converter



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

No. 5223V103-UK
From serial no. 040029001

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.

Programmable f/I - f/f converter

5223

Table of contents

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

To keep the safety distances, the relay contacts on the device must not be connected to both hazardous and non-hazardous voltages at the same time.
SYSTEM 5000 must be mounted on a DIN rail according to DIN 46277.
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.
All devices fall under Installation Category II, Pollution Degree 2, and Insulation Class II.

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

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. 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

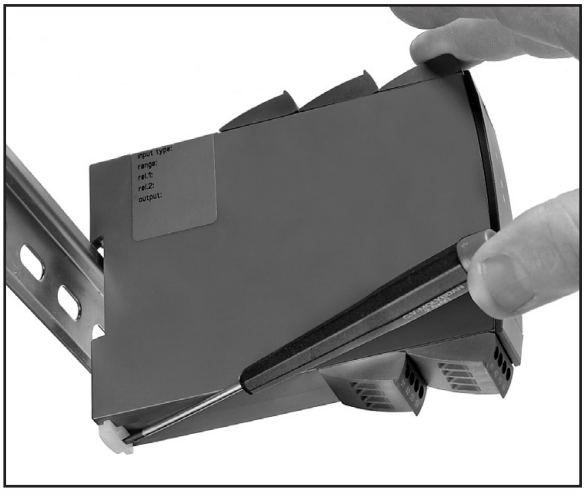
When disconnected, the device may be cleaned with a cloth moistened with distilled water.

Liability

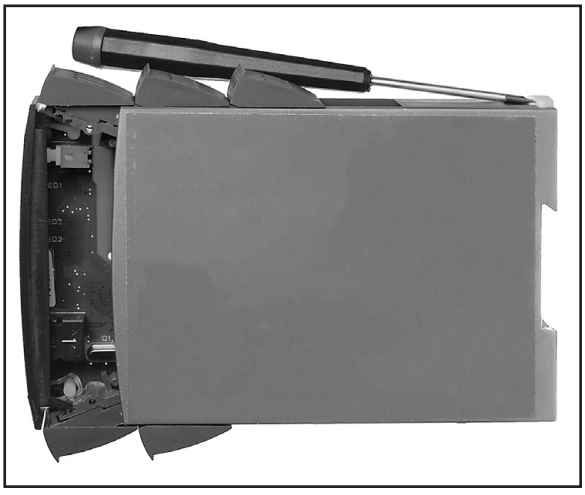
To the extent the instructions in this manual are not strictly observed, the customer cannot advance a demand against PR electronics A/S that would otherwise exist according to the concluded sales agreement.

How to demount system 5000

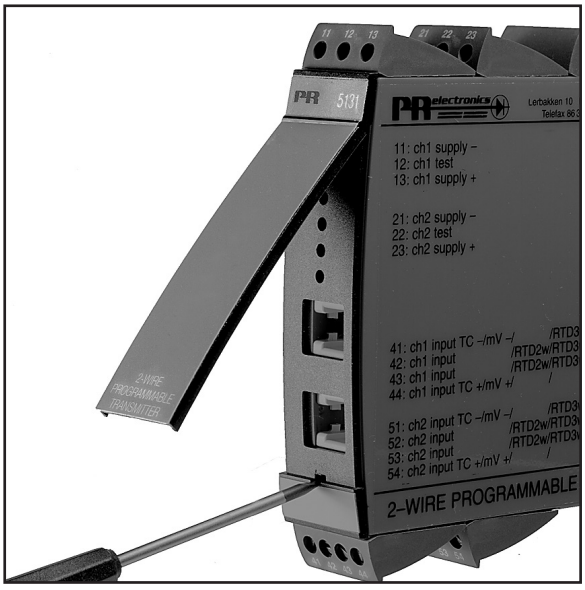
First, remember to demount the connectors with hazardous voltages.



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.



Picture 3:
By opening the front, the programming connector is accessible.

Programmable f/I - f/f converter
5223

- Pulse calculator
- Frequency generator
- Galvanic isolation, optional ATEX Ex
- Analog current and voltage output
- PNP / NPN output, optional relays
- Universal supply

In general

- By way of a standard PC and the Loop Link programming kit, the PR 5223 f/I - f/f converter is configured acc. to the requested function.
- Alternatively, the PR 5223 may be delivered fully-configured acc. to your specifications.
- Typical pulse sources are flow meters, tacho generators, mechanical switches, or inductive proximity sensors.

Applications

- The f/I function performs frequency to current and voltage conversion.
- The output can be programmed to show period, meaning that the input frequency can be converted to a linear time signal.
- The digital outputs are used as e.g. a frequency watch for speed control or as a window comparator having one status between 2 limits and the opposite status outside these limits.
- The f/f function can be used for pulse division or multiplication and as a buffer collecting fast pulse trains. The input pulses are calculated, counted in a buffer, and sent to the output as a pulse train with the programmed pulse width.
- A scale factor may be entered in all functions.
- Using both digital inputs, pulse addition or subtraction are possible. This function permits readout of the actual consumption at measurement of e.g. liquid flows forward and backward.
- The frequency generator function is used as e.g. a time base or clockgenerator.
- The 2-phase encoder, or directional f/I conversion, converts 2 90°-phased digital inputs to an analog speed signal with digital output for directional indication.
- ATEX Ex units have input for mechanical contact and NAMUR inductive proximity sensor.

Technical characteristics

Inputs

- 2 programmable inputs for standard pulse generator connection.
- Normally, the auxiliary supply and trigger level follow the sensor type, but these can be programmed to other values.
- At contact input, the 50 Hz filter should be applied.
- The PR 5223 is protected against polarity reversal on input and supply.

Analog output

- The current and voltage signals are galvanically separated from the supply and the inputs.
- The analog current and voltage output can be scaled acc. to your choice in relation to the digital input.
- Max. zero offset is 50% of selected measurement range.
- Programmable response time.
- Short-circuit-protected output.
- When both current and voltage signals are used simultaneously, the mA loop to ground must pass through the internal shunt.
- Standard voltage output (pin 12) is obtained by leading the current signal (pin 13) through an internal shunt resistor (pin 12). At voltage signals in the ranges 0...1 VDC, a 50 Ω shunt (JP1) is applied; in the ranges 0...10 VDC, a 500 Ω shunt (JP2) is applied.

Digital output(s)

- The action on the outputs can be inverted, and the hysteresis can be set acc. to your specifications.
- At power up, shifts on the outputs can be delayed for up to 999 s.
- NPN and PNP outputs for external relay, electromechanical counter, PLC input, or equivalent load.
- The outputs are current-limited by way of PTC resistors.

Relay outputs

- The PR 5223 can be delivered with 2 relay outputs that are programmed individually.

Status indication

- The PR 5223 is equipped with 5 front LEDs.
  f1 and f2 in: Indicates an active input (non-active at NPN input).
  Dig. out. 1 and 2: Indicates active output.
  Error: Programmable by use of PReset to indicate sensor errors.

Order

Type	Version		Output	
5223	Standard	: A	Analog + NPN / PNP	: 1
	ATEX Ex	: B	Analog + relay output	: 2

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. . . . . 250 g
DIN rail type . . . . . DIN 46277
Wire size (min....max.) . . . . . 1 x 2.5 mm^2 stranded wire
Screw terminal torque . . . . . 0.5 Nm

Common electrical specifications

Supply voltage . . . . . 19.2...300 VDC
21.6...253 VAC
Frequency . . . . . 50...60 Hz
Fuse . . . . . 400 mA T / 250 VAC
Internal consumption . . . . . 3 W
Max. consumption . . . . . 3.5 W
Isolation, test / operation . . . . . 3.75 kVAC / 250 VAC
Power up delay . . . . . 0...999 s
Warm-up time . . . . . 1 min.
Communications interface . . . . . Loop Link
Signal / noise ratio . . . . . Min. 60 dB
Response time, analog . . . . . < 60 ms + period
Response time, digital output . . . . . < 50 ms + period
Signal dynamics, output . . . . . 16 bit
Temperature coefficient . . . . . < ± 0.01% of span / °C
Linearity error . . . . . < ± 0.1% of span
Effect of supply voltage change . . . . . < 0.005% of span / VDC

Auxiliary voltages

NAMUR supply . . . . . 8.3 VDC ± 0.5 VDC / 8 mA
NAMUR supply Ex . . . . . 8.5 VDC ± 0.5 VDC / 8 mA
S0 supply . . . . . 17 VDC / 20 mA
NPN / PNP supply . . . . . 17 VDC / 20 mA
Special supply (programmable) . . . . . 5...17 VDC / 20 mA

EMC immunity influence . . . . . < ± 0.5%

Input

General

Measurement range . . . . . 0...20 kHz
Min. measurement range . . . . . 0.001 Hz
Max. offset . . . . . 90% of selected max. frequency
Min. pulse width (without filter) . . . . . 25 µs
Min. period (without filter) . . . . . 50 µs
Max. frequency (without filter) . . . . . 20 kHz
Min. pulse width (with filter) . . . . . 10 ms
Min. period (with filter) . . . . . 20 ms

Max. frequency (with filter)	50 Hz
Programmable trig level	0.025...6.5 V (nom.) 1...8 mA (nom.)

NAMUR input acc. to DIN 19234

Trig-level LOW	≤ 1.2 mA
Trig-level HIGH	≥ 2.1 mA
Input impedance	1000 Ω

Sensor error detection (only for NAMUR)

Breakage	≤ 0.1 mA
Short-circuit	≥ 7.0 mA
Response time	≤ 400 ms

Tacho input

Trig-level LOW	≤ -40 mV
Trig-level HIGH	≥ 40 mV
Input impedance	≥ 100 kΩ
Max. input voltage	80 VAC pp

NPN / PNP input

Trig-level LOW	≤ 4.0 V
Trig-level HIGH	≥ 7.0 V
Input impedance, standard	3.48 kΩ
Input impedance, special version	3.48...12 kΩ

2-phase encoder

Min. pulse width (without filter)	1 ms
Min. period (without filter)	2 ms
Max. frequency (without filter)	500 Hz

TTL input

Trig-level LOW	≤ 0.8 VDC
Trig-level HIGH	≥ 2.0 VDC
Input impedance	≥ 100 kΩ

S0 input acc. to DIN 43864

Trig-level LOW	≤ 2.2 mA
Trig-level HIGH	≥ 9.0 mA
Input impedance	800 Ω

Analog output

Current output

Signal range	0...20 mA
Min. signal range	5 mA
Max. offset	50% of selected max. value
Updating time	20 ms
Load (max.)	20 mA / 600 Ω / 12 VDC
Load stability	< ± 0.01% of span / 100 Ω
Current limit	≤ 23 mA

Voltage output through internal shunt

Signal range	0...10 VDC
Min. signal span	250 mV
Max. offset	50% of selected max. value
Load (min.)	500 kΩ

Active outputs (NPN / PNP)

$I_{max.}$ source	10 mA
$I_{max.}$ sink	130 mA
$V_{max.}$	28 VDC

f/f converter output

Signal range	0...1000 Hz
Min. pulse width	500 µs
Max. pulse width	999 ms
Max. duty cycle	50%

Frequency generator

Min. period	50 µs
Max. frequency	20 kHz
Duty cycle	50%

Relay output

Frequency max.	20 Hz
$V_{max.}$	250 VRMS
$I_{max.}$	2 A / AC
Max. AC power	500 VA
Max. AC power Ex version 5223B	100 VA
Max. load at 24 VDC	1 A.

Ex / I.S. data

Terminal 31, 33	
U_m	: 250 V
Terminal 42, 43 and 52, 53	
U_o	: 10.6 VDC
I_o	: 13.8 mA
P_o	: 38 mW
L_o	: 160 mH
C_o	: 1.9 µF

Of span = of the currently selected measurement range

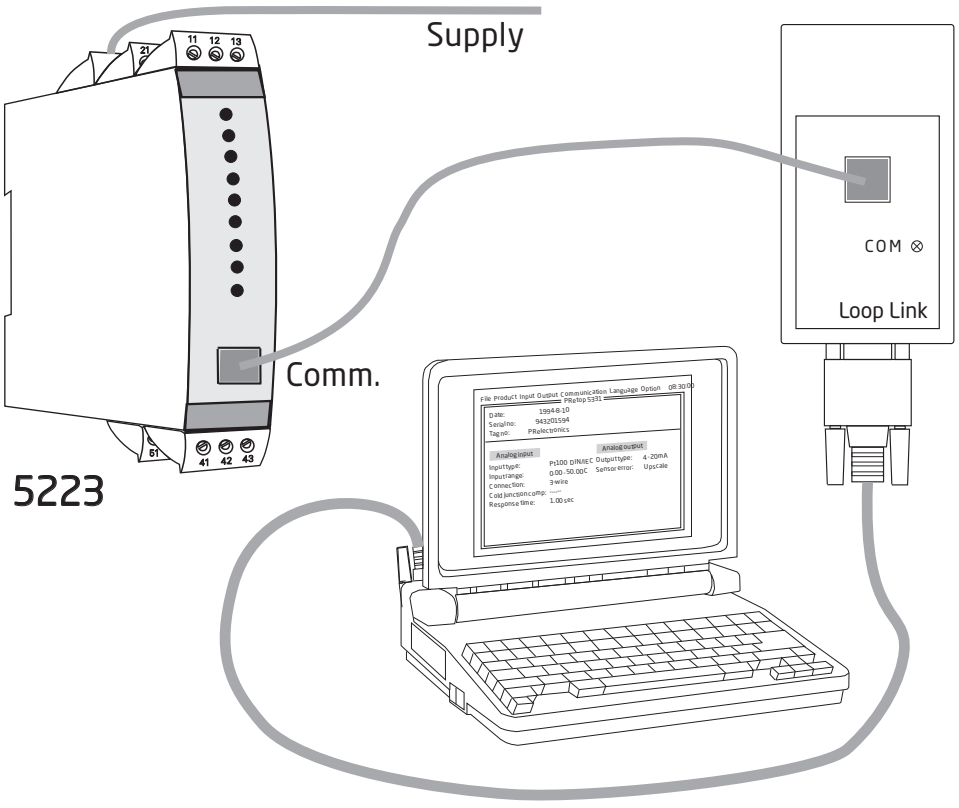
Observed authority requirements

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

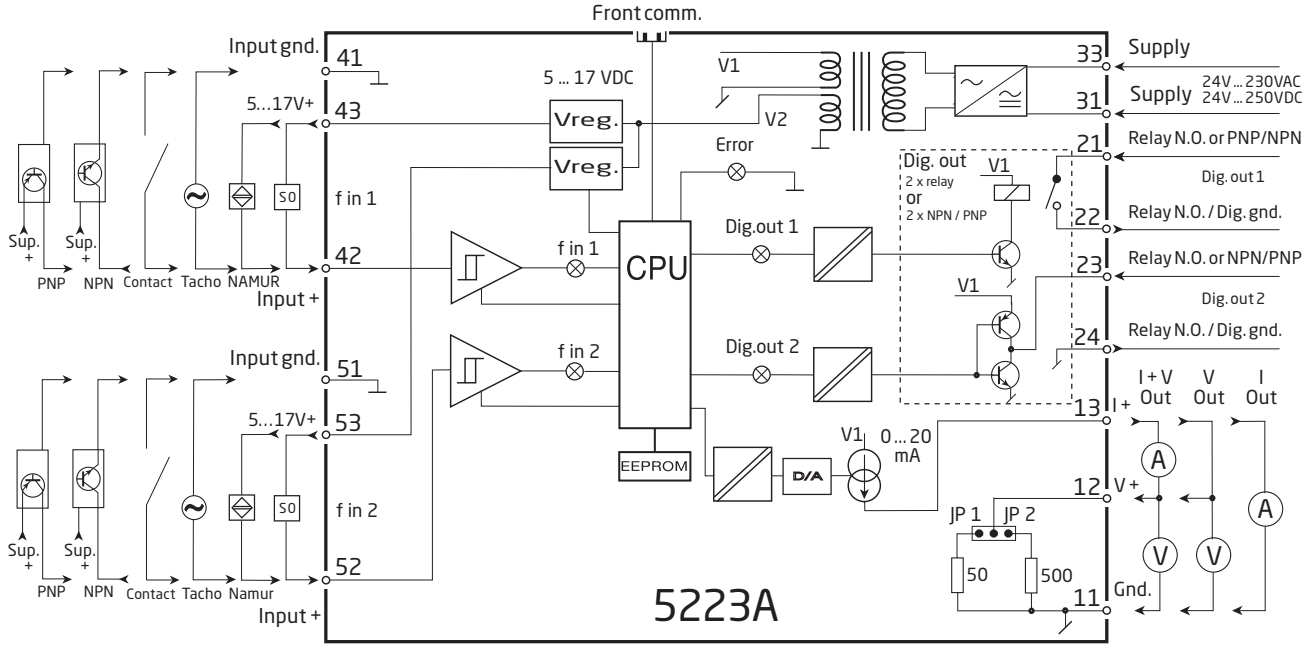
I.S. / Ex approvals - 5223B

ATEX	KEMA 04ATEX1001
EAC Ex TR-CU 012/2011	RU C-DK.HA65.B.00355/19

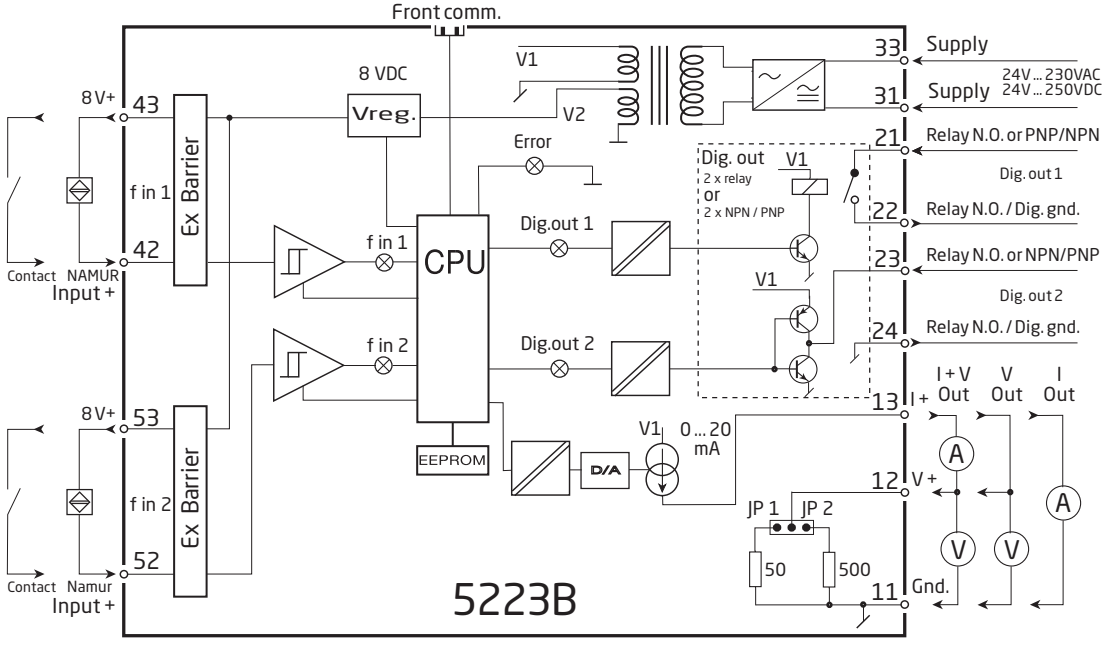
5223 connection to Loop Link



Block diagram - 5223A



Block diagram - 5223B



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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.