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**Programmable
Transmitter**

No. 5116V103-UK
From ser. no. 060069001



ATEX



- DK** ▶ PR electronics A/S tilbyder et bredt program af analoge og digitale signalbehandlingsmoduler til industriel automation. Programmet består af Isolatorer, Displays, Ex-barrierer, Temperaturtransmittere, Universaltransmittere mfl. Vi har modulerne, du kan stole på i selv barske miljøer med elektrisk støj, vibrationer og temperaturudsving, og alle produkter opfylder de strengeste internationale standarder. Vores motto »Signals the Best« er indbegrebet af denne filosofi - og din garanti for kvalitet.
- UK** ▶ PR electronics A/S offers a wide range of analogue and digital signal conditioning devices for industrial automation. The product range includes Isolators, Displays, Ex Interfaces, Temperature Transmitters, and Universal Devices. You can trust our products in the most extreme environments with electrical noise, vibrations and temperature fluctuations, and all products comply with the most exacting international standards. »Signals the Best« is the epitome of our philosophy - and your guarantee for quality.
- FR** ▶ PR electronics A/S offre une large gamme de produits pour le traitement des signaux analogiques et numériques dans tous les domaines industriels. La gamme de produits s'étend des transmetteurs de température aux afficheurs, des isolateurs aux interfaces SI, jusqu'aux modules universels. Vous pouvez compter sur nos produits même dans les conditions d'utilisation sévères, p.ex. bruit électrique, vibrations et fluctuations de température. Tous nos produits sont conformes aux normes internationales les plus strictes. Notre devise »SIGNALS the BEST« c'est notre ligne de conduite - et pour vous l'assurance de la meilleure qualité.
- DE** ▶ PR electronics A/S verfügt über ein breites Produktprogramm an analogen und digitalen Signalverarbeitungsgeräte für die industrielle Automatisierung. Dieses Programm umfasst Displays, Temperaturtransmitter, Ex- und galvanische Signaltrenner, und Universalgeräte. Sie können unsere Geräte auch unter extremen Einsatzbedingungen wie elektrisches Rauschen, Erschütterungen und Temperaturschwingungen vertrauen, und alle Produkte von PR electronics werden in Übereinstimmung mit den strengsten internationalen Normen produziert. »Signals the Best« ist Ihre Garantie für Qualität!

PROGRAMMABLE TRANSMITTER

5116

CONTENTS

Warning.....	2
Safety instructions.....	3
Instructions for intrinsically safe installation of 5116B	4
How to demount system 5000	5
Application.....	6
Technical characteristics.....	6
Mounting / installation.....	6
Applications.....	7
Order: 5116.....	8
Electrical specifications.....	8
Connections	14
Connections	15
Block diagram.....	16
Graphic depiction of relay actions Increasing / Decreasing ..	17
Graphic depiction of relay action Window	17
5116 connection to Loop Link.....	18
Activation of the process calibration button.....	18
Configuration of relay 1 & 2 in PReset.....	19
Process calibration 0% and 100% or only 0%.....	20
Error functions	21
Appendix	22
FM Control drawing No. 5116QF01.....	22



GENERAL

WARNING

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.



HAZARDOUS VOLTAGE

WARNING

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:

- General mounting, connection and disconnection of wires.
- Troubleshooting the device.



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



INSTALLATION

WARNING

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: 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 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 troubleshoot 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. The packing should always follow the device until this has been permanently mounted.

Check at the receipt of the device whether the type corresponds to the one ordered.

ENVIRONMENT

Avoid direct sunlight, dust, high temperatures, mechanical vibrations and shock, as well as 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 1, 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.

INSTRUCTIONS FOR INTRINSICALLY SAFE INSTALLATION OF 5116B

The intrinsically safe circuits are galvanically connected to the communications interface unit.

The communications interface may only be connected temporarily, under the condition that the connectors with terminal numbers 41...44 and 51...54 are disconnected on the 5116B.

When a higher ingress protection than IP20 is required, this has to be achieved by an additional enclosure which is suitable for the applicable environmental conditions.

When two or more units are placed next to each other it has to be assured that all the terminal numbers 41...44 and 51...54 are placed on the same side and are separated from the non-intrinsically safe circuits of the units which could be mounted above or below it.

Each combination of circuits (to terminations 41...44 or to terminations 51...53 or to terminations 51...54) shall be connected via separated cables or if the combinations are in one cable shall be type A or B in accordance with EN 60079-14 Clause 12.2.2.8.

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

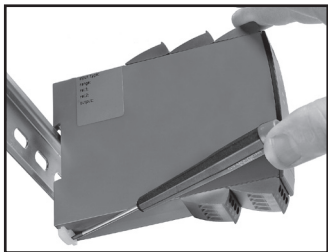
When disconnected, the device may be cleaned with a cloth moistened with distilled water.

LIABILITY

To the extent that 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:

Detach the device from the DIN rail by lifting the bottom lock.

PROGRAMMABLE TRANSMITTER

5116

- *Input for RTD, TC, mV, Ohm, potmeter, mA and V*
- *2-wire supply > 16.5 V*
- *Bipolar voltage input*
- *Output for current, voltage and 2 relays*
- *Universal AC or DC supply*

Application

- Linearised, electronic temperature measurement with RTD or TC sensor.
- Conversion of linear resistance variation to a standard analogue current / voltage signal, i.e. from solenoids and butterfly valves or linear movements with attached potentiometer.
- Power supply and signal isolator for 2-wire transmitters.
- Process control with 2 potential-free relay contacts which can be configured for advanced functions.
- Galvanic separation of analogue signals and measurement of floating signals.

Technical characteristics

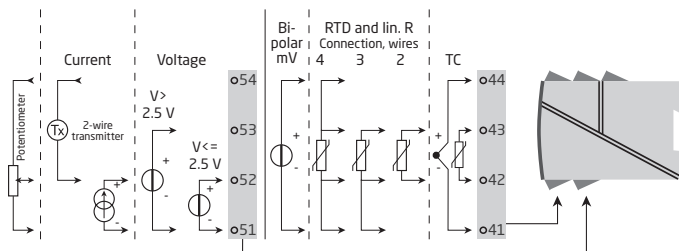
- Within a few seconds the user can program PR5116 to suit the specific application.
- By way of the front push-button the input can be calibrated to the exact span of the process. Zero drift on the process signal can be adjusted by a single press of the front button.
- Continuous check of vital stored data for safety reasons.
- 3-port 3.75 kVAC galvanic isolation.

Mounting / installation

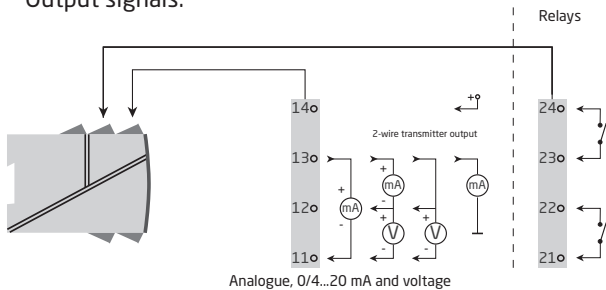
- Mounted vertically or horizontally on a DIN rail. As the devices can be mounted without any distance between neighbouring units, up to 42 devices can be mounted per metre.

APPLICATIONS

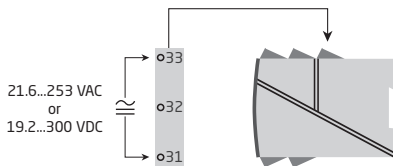
Input signals:



Output signals:



Supply:



Order: 5116

Type	Version
5116	Standard.....: A ATEX Ex and FM.....: B

***NB!** Please remember to order CJC connectors type 5910/5910Ex for TC inputs with internal CJC

Electrical specifications

Environmental conditions

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

Mechanical specifications

Dimensions (HxBxD).....	109 x 23.5 x 130 mm
Weight.....	235 g
Max. wire size.....	1 x 2.5 mm ² stranded wire
Mounting on DIN rail type.....	DIN 46277
Screw terminal torque	0.5 Nm
Vibration.....	IEC 60068-2-6 : 2007
2...13.2 Hz	±1 mm
13.2...100 Hz.....	±0.7 g

Common specifications

Supply voltage, universal.....	21.6...253 VAC, 50...60 Hz or 19.2...300 VDC
Internal consumption	≤ 2 W
Max. consumption.....	≤ 3 W
Fuse.....	400 mA SB / 250 VAC
Isolation voltage, test / operation.....	3.75 kVAC / 250 VAC
Communications interface	Loop Link
Signal / noise ratio	Min. 60 dB (0...100 kHz)
Updating time:	
Temperature / ±mV input.....	115 ms
mA / V / mV input.....	75 ms

Response time (0...90%, 100...10%), programmable:

Temperature / \pm mV input.....	400 ms to 60 s
mA / V / mV input.....	250 ms to 60 s
Signal dynamics, input.....	22 bit
Signal dynamics, output	16 bit

Accuracy, the greater of the general and basic values:

General values		
Input type	Absolute accuracy	Temperature coefficient
All	$\leq \pm 0.05\%$ of span	$\leq \pm 0.01\%$ of span / $^{\circ}\text{C}$

Basic values		
Input type	Basic accuracy	Temperature coefficient
mA	$\leq \pm 4 \mu\text{A}$	$\leq \pm 0.4 \mu\text{A} / ^{\circ}\text{C}$
Volt	$\leq \pm 10 \mu\text{V}$	$\leq \pm 1 \mu\text{V} / ^{\circ}\text{C}$
RTD	$\leq \pm 0.2^{\circ}\text{C}$	$\leq \pm 0.01^{\circ}\text{C} / ^{\circ}\text{C}$
Lin. resistance	$\leq \pm 0.1 \Omega$	$\leq \pm 10 \text{m}\Omega / ^{\circ}\text{C}$
TC type: E, J, K, L, N, T, U	$\leq \pm 1^{\circ}\text{C}$	$\leq \pm 0.05^{\circ}\text{C} / ^{\circ}\text{C}$
TC type: B, R, S, W3, W5, LR	$\leq \pm 2^{\circ}\text{C}$	$\leq \pm 0.2^{\circ}\text{C} / ^{\circ}\text{C}$

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

Auxiliary supplies:

Reference voltage	2.5 VDC $\pm 0.5\%$ / 15 mA
2-wire supply (pin 54...52)	28...16.5 VDC / 0...20 mA

Electrical specifications, temperature input, terminal 41, 42, 43 and 44

Max. offset 50% of selected max. value

TC input:

Type	Min. temperature	Max. temperature	Min. span	Standard
B	+400°C	+1820°C	200°C	IEC584
E	-100°C	+1000°C	50°C	IEC584
J	-100°C	+1200°C	50°C	IEC584
K	-180°C	+1372°C	50°C	IEC584
L	-100°C	+900°C	50°C	DIN 43710
N	-180°C	+1300°C	100°C	IEC584
R	-50°C	+1760°C	200°C	IEC584
S	-50°C	+1760°C	200°C	IEC584
T	-200°C	+400°C	50°C	IEC584
U	-200°C	+600°C	75°C	DIN 43710
W3	0°C	+2300°C	200°C	ASTM E988-90
W5	0°C	+2300°C	200°C	ASTM E988-90
LR	-200°C	+800°C	50°C	GOST 3044-84

Sensor error current..... Nom. 30 μ A

CJC..... < $\pm 1^\circ$ C

Sensor error detection..... Yes

RTD and linear resistance input

Type	Min. value	Max. value	Min. span	Standard
Pt100	-200°C	+850°C	25°C	IEC 751
Ni100	-60°C	+250°C	25°C	DIN 43760
Lin. R	0 Ω	5000 Ω	30 Ω	-----

Cable resistance per wire 10 Ω
(max. 50 Ω with less accuracy)

Sensor current..... Nom. 0.2 mA

Effect of sensor cable resistance

(3- / 4-wire)..... < 0.002 Ω / Ω

Sensor error detection..... Yes

mV input:

Measurement range..... -2500...+2500 mV

Min. measurement range (span)..... 5 mV

Input resistance..... > 5 M Ω

Electrical specifications, mA / V input, terminal 51, 52, 53 and 54

Max. offset 50% of selected max. value

Current input:

Measurement range..... 0...100 mA

Min. measurement range (span) 4 mA

Input resistance:

Supplied unit Nom. 10 Ω + PTC 10 Ω

Non-supplied unit..... $R_{SHUNT} = \infty$, $V_{DROP} < 6 V$

Sensor error detection:

loop error on 4...20 mA signals..... Yes

Voltage input

Measurement range..... 0...250 VDC

Min. measurement range (span) 5 mVDC

Input resistance ≤ 2.5 VDC Nom. 10 M Ω

> 2.5 VDC Nom. 5 M Ω

Potentiometer input via 2.5 V ref.

Potentiometer min. 170 Ω

Electrical specifications - OUTPUT

Max. offset 50% of selected max. value

Current output

Signal range 0...20 mA

Min. signal range (span) 10 mA

Load (max.) 20 mA / 600 Ω / 12 VDC

Load stability $\leq 0.01\%$ of span / 100 Ω

Current limit ≤ 28 mA

Voltage output

Signal range 0...10 VDC

Min. signal range (span) 500 mV

Load (min.) 500 k Ω

2-wire 4...20 mA output

Signal range 4...20 mA

Load stability $\leq 0.01\%$ of span / 100 Ω

Load resistance..... $\leq (V_{supply} - 3.5) / 0.023 A [\Omega]$

Max. external 2-wire supply 29 VDC

Effect of external 2-wire supply

voltage variation..... $< 0.005\%$ of span / V

Sensor error detection and loop error on 4...20 mA

Programmable 0...23 mA


NAMUR NE43 Upscale 23 mA

NAMUR NE43 Downscale 3.5 mA

Relay outputs

Max. voltage	250 VRMS
Max. current.....	2 A / AC
Max. AC power	500 VA
Max. current at 24 VDC.....	1 A
Sensor error detection.....	Break / Make / Hold / None

Ex / I.S. approval - 5116B

KEMA 04ATEX1316 X.....	 II (1) GD
	[EEx ia] IIC
Applicable for zone	0, 1, 2, 20, 21 or 22

Ex / I.S. data for 5116B

U_m	: 253 V
U_m , Loop Link	: 60 V

Ex / I.S. data for temperature / bipolar mV input

Terminal 41, 42, 44 and 43

U_0	: 7.5 V
I_0	: 2.2 mA
P_0	: 4.2 mW
C_0	: 6 μ F
L_0	: 1.0 H

Ex / I.S. data for unipolar mA / V input:

Terminal 51, 52 and 53

U_0	: 7.5 V
I_0	: 2.2 mA
P_0	: 4.2 mW
C_0	: 6 μ F
L_0	: 1.0 H

Ex / I.S. data when using 2-wire supply / reference voltage

Terminal 51, 52, 53 and 54

U_0	: 28 V
I_0	: 93 mA
P_0	: 650 mW

	IIC	IIB	IIA
C_0 :	75 nF	645 nF	2 μ F
L_0 :	3 mH	16 mH	31 mH

Approvals

EMC 2004/108/EC	EN 61326-1
LVD 2006/95/EC.....	EN 61010-1
PELV/SELV	IEC 364-4-41 and EN 60742
UL, Standard for Safety.....	UL 61010-1
EAC TR-CU 020/2011.....	EN 61326-1

Marine approval

Det Norske Veritas, Ships & Offshore Standard for Certification No. 2.4

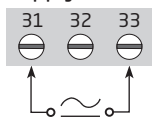
I.S. / Ex

ATEX 94/9/EC.....	KEMA 04ATEX1316 X
FM	3023092
EAC Ex TR-CU 012/2011	RU C-DK.GB08.V.00410

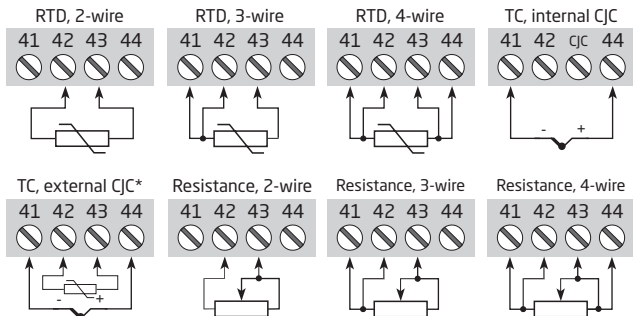
Of span = of the currently selected measurement range

CONNECTIONS

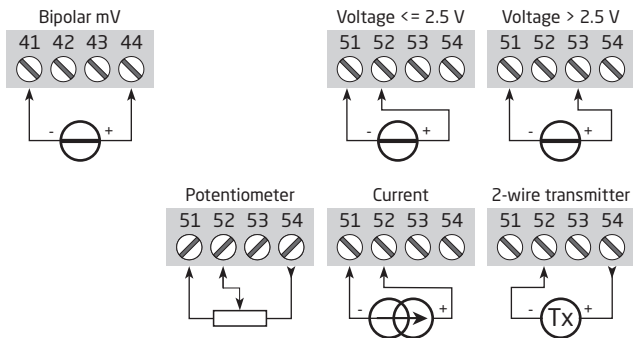
Supply:



Inputs:

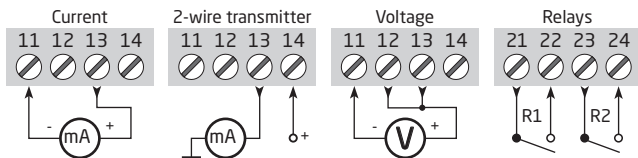


* If the device is reconfigured from temperature measurement with CJC connector to analogue measurement, the CJC connector must be demounted.

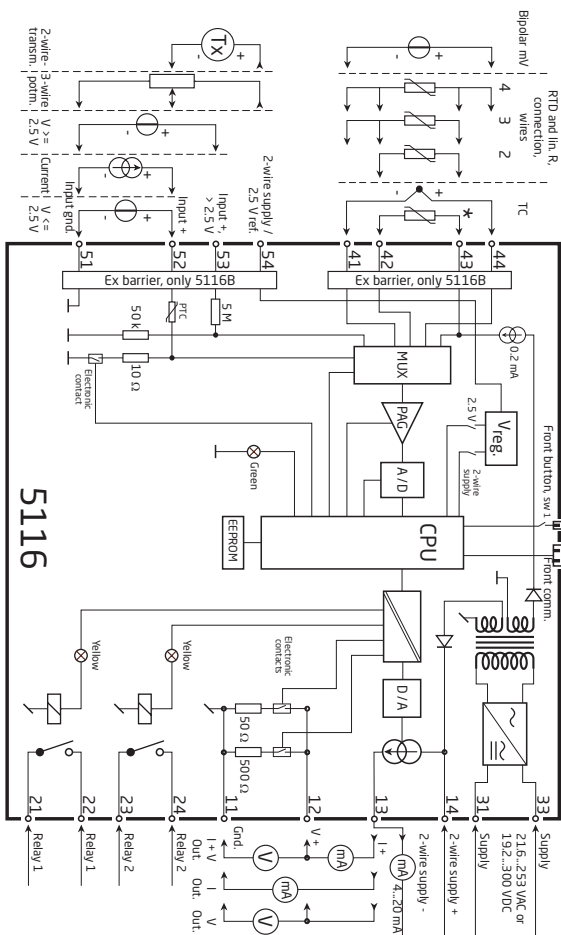


CONNECTIONS

Outputs:



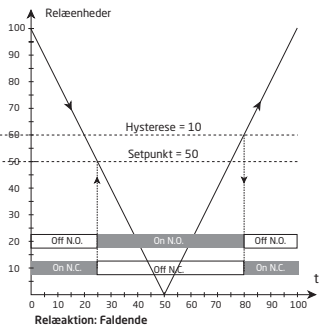
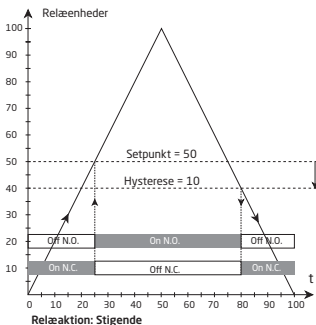
BLOCK DIAGRAM



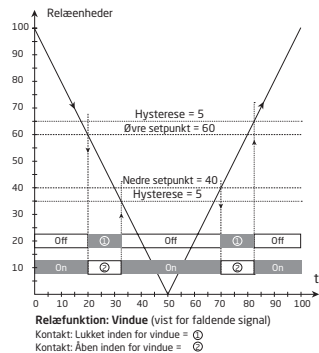
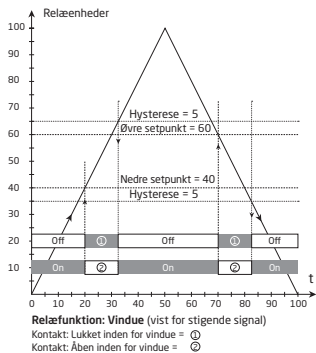
* Accessories: CJC connectors type 5910 / 5910 EX

5116

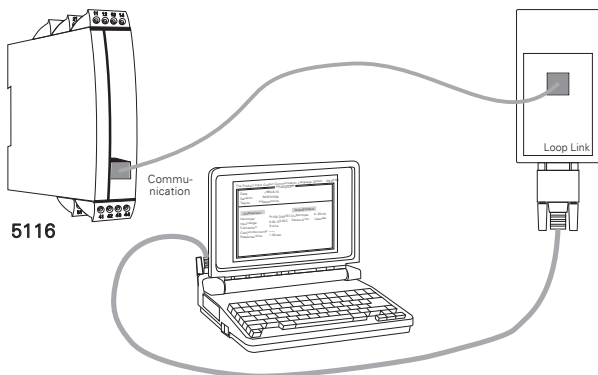
Graphic depiction of relay actions Increasing / Decreasing



Graphic depiction of relay action Window



5116 CONNECTION TO LOOP LINK



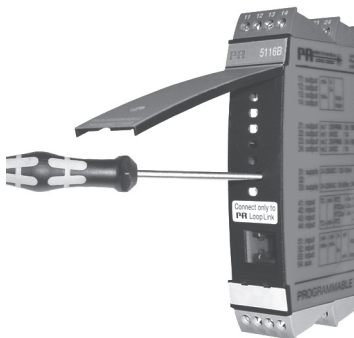
For connection of 5116B to Loop Link, please observe the instructions for intrinsically safe installation.

ACTIVATION OF THE PROCESS CALIBRATION BUTTON

Open the front cover and activate the switch with a pointed object, e.g. a small screwdriver.

The switch is placed a little to the right of the LEDs.

For further instructions see the description of the process calibration function on page 20.



Configuration of relay 1 & 2 in PRreset

Parameter	Value	Description
Type	Off	No relay function
	Setpoint	Relay changes state at a limit on the span
	Setpoint window	Relay changes state inside a range of the span
	Sensor error indication	Only works for sensor error
	Power indication	Relay is active when power is on
Relay units for Relay 1 and Relay 2	% of input span	0...100% of input span
	Input units	E.g. °C, mV and mA
	% of output span	0...100% of output span
	Output units	mA and V
Setpoint	From min. to max. of relay units	Setpoint limit
Setpoint LOW (setpoint window only)	From min. to max. of relay units	Lower setpoint in setpoint window
Setpoint HIGH (setpoint window only)	From min. to max. of relay units	Higher setpoint in setpoint window
Hysteresis	From 0.1...99.9% of relay units	Difference between setpoint value and reset value. At setpoint window the hysteresis is outside the window.
On-delay	0..3600 s	Time from the signal crosses the setpoint threshold until the relay activates. Time is reset at setpoint crossing.
Off-delay	0..3600 s	Time from the signal crosses the hysteresis threshold until the relay deactivates. Time is reset at hysteresis crossing.
Action	Increasing	Activates at increasing signal
	Decreasing	Activates at decreasing signal
Contact	Normally open (N.O.)	Contact state before limit is reached
	Normally closed (N.C.)	Contact state before limit is reached
	Open inside window	Relay deactivated inside setpoint window
	Closed inside window	Relay activated inside setpoint window
Sensor error detection	Contact open	Relay deactivated
	Contact closed	Relay activated
	Hold	Relay state as before sensor error occurred
	Off	No relay function

Process calibration 0% and 100% or only 0% (not for RTD and TC input)

When the option "0% and 100% calibration" is actively configured in PReset it is possible to make the following process calibrations. Please note: Input 0% and 100% should be chosen higher than the process-calibrated span.

Process calibration 0% and 100%

1. Apply the actual 0% value.
2. Open the front cover, activate sw. 1 and wait until the green LED lights constantly.
3. Apply the actual 100% value.
4. Activate sw. 1. The LED will start flashing again.

The input on PReTrans 5116 has now been scaled according to the actual process values.

When the option "0% calibration" is actively configured in PReset it is possible to make the following process calibration.

0% process calibration

1. Apply the actual 0% value.
2. Open the front cover and activate sw. 1.

The input on PReTrans 5116 has now been scaled according to the actual process values.

ERROR FUNCTIONS

Error reason	Hardware error indication		
	Value on analogue output	Relay contacts / Yellow LEDs	Green LED
No power supply	0 mA / 0 V	Contacts open / LEDs Off	Constantly Off
Sensor error	As configured	As configured	Blinking at 1...2 Hz
RAM checksum check failed *)	0 mA / 0 V	Contacts open / LEDs Off	Constantly On
EEPROM checksum check failed	0 mA / 0 V	Contacts open / LEDs Off	Constantly On
Main program stopped	0 mA / 0 V	Contacts open / LEDs Off	Constantly On
DAC / relay program stopped	0 mA / 0 V	Contacts open / LEDs Off	Depends on input **)
*) Error can be reset by power cycling the device or sending a new configuration. **) The green LED is controlled by the main processor.			

APPENDIX

FM CONTROL DRAWING NO. 5116QF01

Control Drawing 5116QF01

Hazardous (Classified) Location

Class I, Division 1, Group A,B,C,D
 Class II, Division 1 Group E, F, G
 Class III, Division 1
 Class I, Zone 0 and 1, Group IIC, IIB, IIA
 Class II, Zone 20 and 21

Unclassified Location
 or

Hazardous (Classified) Location
 Class I, Division 2, Group A,B,C,D
 Class I, Zone 2, Group IIC, IIB, IIA

Simple Apparatus or
 Intrinsically safe apparatus
 with entity parameters:

$$V_{max} (U_i) \geq V_t (U_o)$$

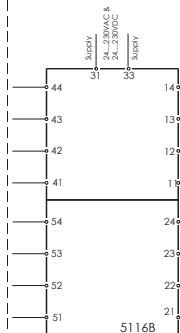
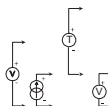
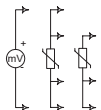
$$I_{max} (I_i) \geq I_t (I_o)$$

$$P_i \geq P_o$$

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

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

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



Terminal	Voc (V)	Isc (mA)	Po (mW)	La (mH)			Ca (μF)		
				A,B	C,E	D,F,G	A,B	C,E	D,F,G
				IIC	IIB	IIA	IIC	IIB	IIA
41,42,43,44	7.5	2.2	4.2	1000	1000	1000	6	36	445
51,52,53	7.5	2.2	4.2	1000	1000	1000	6	36	445
51,52,53,54	28	93.0	650	3	16	31	0.075	0.645	2

Installation notes:

- 1) The maximum non hazardous location voltage is 250Vac/dc.
- 2) The installation shall be in accordance with the National Electrical Code NFPA 70, Articles 504 and 505.
- 3) 5116B is galvanic isolated and does not require grounding
- 4) For Installation in Div 2 or Zone 2 the 5116B must be installed in an enclosure according to ANSI/ISA S82.
- 5) Install in Pollution degree 2 or better
- 6) Use 60 / 75 °C Copper Conductors with Wire Size AWG: (26 – 14).
- 7) Warning: Substitution of components may impair intrinsic safety.

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Displays Programmable displays with a wide selection of inputs and outputs for display of temperature, volume and weight, etc. Feature linearization, scaling, and difference measurement functions for programming via PReset software.



Ex interfaces Interfaces for analog and digital signals as well as HART signals between sensors / I/P converters / frequency signals and control systems in Ex zone 0, 1 & 2 and for some devices in zone 20, 21 & 22.



Isolation Galvanic isolators for analog and digital signals as well as HART signals. A wide product range with both loop-powered and universal isolators featuring linearization, inversion, and scaling of output signals.






























Temperature A wide selection of transmitters for DIN form B mounting and DIN rail devices with analog and digital bus communication ranging from application-specific to universal transmitters.



Universal PC or front programmable devices with universal options for input, output and supply. This range offers a number of advanced features such as process calibration, linearization and auto-diagnosis.



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