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- UK** ▶ PR electronics A/S offers a wide range of analogue and digital signal conditioning modules for industrial automation. The product range includes Isolators, Displays, Ex Interfaces, Temperature Transmitters, and Universal Modules. 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 Signalverarbeitungsmodulen 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!

# HART<sup>®</sup> TRANSPARENT REPEATER

## 9106B

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## WARNING

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.**



## WARNING

Do not open the front plate of the device as this will cause damage to the connector for the display / programming front PR 4501. This device contains no DIP-switches or jumpers.

## 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.



**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 according to the ATEX directive for use in connection with installations in explosive areas. See installation drawings in appendix.

## SAFETY INSTRUCTIONS

### DEFINITIONS

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

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.

## **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.preelectronics.com](http://www.preelectronics.com)**

The use of stranded wires is not permitted for mains wiring except when wires are fitted with cable ends.

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

The device is provided with field wiring terminals and shall be supplied from a Power Supply having double / reinforced insulation. A power switch shall be easily accessible and close to the device. The power switch shall be marked as the disconnecting unit for the device.

For installation on Power Rail 9400 the power is supplied by Power Control Unit 9410.

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.

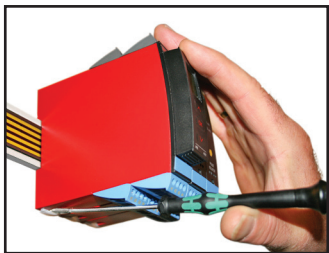
## **CLEANING**

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

## **LIABILITY**

To the extent 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 9000**



**Picture 1:**

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

# EC DECLARATION OF CONFORMITY

As manufacturer

**PR electronics A/S**

**Lerbakken 10**

**DK-8410 Rønde**

hereby declares that the following product:

**Type: 9106B**

**Name: HART® transparent repeater**

is in conformity with the following directives and standards:

The EMC Directive 2004/108/EC and later amendments

**EN 61326-1 : 2006**

For specification of the acceptable EMC performance level, refer to the electrical specifications for the device.

The Low Voltage Directive 2006/95/EC and later amendments

**EN 61010-1 : 2001**

The ATEX Directive 94/9/EC and later amendments

**EN 60079-0:2009, EN 60079-11:2007, EN 60079-15:2005,**

**EN 60079-26:2007, EN 61241-11:2006**

**ATEX certificate: DEKRA 11ATEX0244 X**

Notified body

**DEKRA Certification B.V. (0344)**

**Utrechtseweg 310, 6812 AR Arnhem**

**P.O. Box 5185, 6802 ED Arnhem**

**The Netherlands**

Rønde, 10 March 2012



Kim Rasmussen  
Manufacturer's signature

# HART® TRANSPARENT REPEATER

## 9106B

- *24 VDC supply via power rail or connectors*
- *Active and passive mA input*
- *Active or passive output via the same two terminals*
- *Splitter function - 1 in and 2 out*
- *SIL2/SIL3 Full Assessment and certified acc. to IEC 61508*

### Application

- 9106B is a 1- or 2-channel isolated 1:1 repeater barrier for intrinsic safety applications.
- The device supplies 2-wire SMART transmitters and can also be used for 2-wire SMART current sources. HART & BRAIN protocols are supported and are transferred bi-directionally.
- 9106B can be mounted in the safe area or in zone 2 / Cl. 1, div. 2 and receive signals from zone 0, 1, 2 and zone 20, 21, 22 including mining / Class I/II/III, Div. 1, Gr. A-G.
- The PR 4501 displays the process value for each channel and can be used to define high and low limits for detection of loop current level. If these limits are exceeded, the status relay will activate.
- In the 1-channel version the status relay can be used as a simple limit switch.
- Ex splitter application - 1 input and 2 outputs.
- In the dual channel version the 9106B can be implemented in a SIL3 loop.

### Advanced features

- The PR 4501 detachable display and the green and red front LEDs indicate operation status for each channel.
- A tag number can be defined for each channel.
- Monitoring of error events and cable breakage on input via the individual status relay and/or a collective electronic signal via the power rail.

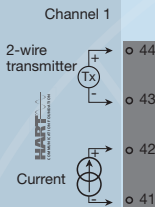
### Technical characteristics

- High galvanic isolation of 2.6 kVAC.
- Fast response time <5 msec.
- High accuracy better than 0.1%.
- 2-wire transmitter supply >16 V.



# APPLICATIONS

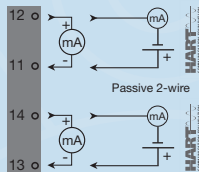
Input signals:



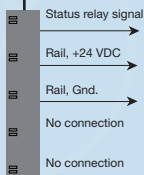
Output signals:

Analogue, 4...20 mA

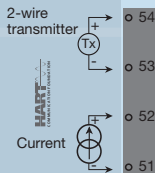
Channel 1



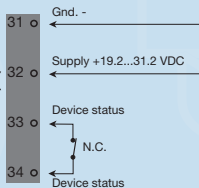
Power rail



Channel 2



Power connection:



**Zone 0, 1, 2,  
20, 21, 22, M1 &  
Cl. I/II/III, Div. 1  
gr. A-G**

Same power rail as above

**Zone 2 & Cl. 1, Div. 2, gr. A-D  
or Safe Area**



# PR 4501 DISPLAY / PROGRAMMING FRONT



## Functionality

The simple and easily understandable menu structure and the explanatory help texts guide you effortlessly and automatically through the configuration steps, thus making the product very easy to use. Functions and configuration options are described in the section "Configuration / operating the function keys".

## Mounting / installation

- 4501 is a detachable display that can be mounted on the 9106B front for programming and signal monitoring.

## Application

- Communications interface for modification of operational parameters in 9106B.
- When mounted in the process, the display shows process values and device status.

## Technical characteristics

- LCD display with 4 lines:
  - Line 1 (H=5.57 mm) shows status for each channel (OK or error).
  - Line 2 (H=3.33 mm) shows loop current in mA for channel 1 or tag no.
  - Line 3 (H=3.33 mm) shows loop current in mA for channel 2 or tag no.
  - Line 4 shows communications status.
- In order to protect the configuration against unauthorised changes, access to the menus can be blocked by a password.

## Order codes for 9106B:

Type	Barrier version	Unit channels
<b>9106B</b>	U <sub>o</sub> = 28 V . . . . : 1	Single . . . . . : A
	U <sub>o</sub> = 25.6 V . . . : 2	Double . . . . . : B

## Accessories:

<b>4501 = Display / programming front</b> <b>9400 = Power rail</b> <b>9404 = Module stop for rail</b> <b>9410 = Power control unit</b> <b>9420 = Power supply 24 V / 120 W - Ex nAC</b>
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## Environmental conditions:

Specifications range..... -20°C to +60°C  
Storage temperature ..... -20°C to +85°C  
Calibration temperature..... 20...28°C  
Relative humidity ..... < 95% RH (non-cond.)  
Protection degree..... IP20  
Installation in pollution degree 2 & overvoltage category II.

## Mechanical specifications:

Dimensions (HxWxD)..... 109 x 23.5 x 104 mm  
Dimensions (HxWxD) w/ 4501 display ..... 109 x 23.5 x 116 mm  
Weight approx. .... 250 g  
DIN rail type..... DIN EN 60715 - 35 mm  
Wire size ..... 0.13...2.08 mm<sup>2</sup> /  
AWG 26...14 stranded wire  
Screw terminal torque ..... 0.5 Nm

## Common electrical specifications:

Supply voltage..... 19.2...31.2 VDC  
Fuse..... 1.25 A SB / 250 VAC  
Max. consumption..... ≤ 3 W (2 channels)  
Max. internal power dissipation ..... ≤ 2 W (2 channels)

**Isolation - test / working:**

Input to any.....	2.6 kVAC / 300 VAC reinforced isolation
Analogue output to supply .....	2.6 kVAC / 300 VAC reinforced isolation
Status relay to supply.....	1.5 kVAC / 150 VAC reinforced isolation

**SMART bi-directional communication**

frequency range .....	0.5...7.5 kHz
Signal / noise ratio .....	> 60 dB
Response time (0...90%, 100...10%).....	< 5 msec
Effect of supply voltage change on output (nom. 24 VDC) .....	< ±10 µA

<b>Accuracy values</b>		
Input	Absolute accuracy	Temperature coefficient
mA	≤ ±16 µA	≤ ±1.6 µA / °C

EMC immunity influence .....	< ±0.5% of span
Extended EMC immunity: NAMUR NE 21, A criterion, burst .....	< ±1% of span

**Current input:**

Measurement range .....	3.5...23 mA
2-wire transmitter supply (terminal 44...43 and 54...53):	
9106B1x (U <sub>O</sub> =28 VDC) .....	>16 V / 20 mA
9106B2x (U <sub>O</sub> =25.6 VDC) .....	>15 V / 20 mA
Sensor error detection:	
Loop break 4...20 mA.....	< 1 mA
Input voltage drop:	
Supplied unit.....	< 4 V @ 23 mA
Non-supplied unit.....	< 6 V @ 23 mA

**Ex barrier data:**

B1x: .....	U <sub>O</sub> = 28 V I <sub>O</sub> = 93 mA P <sub>O</sub> = 0.65 W
B2x: .....	U <sub>O</sub> = 25.6 V I <sub>O</sub> = 100 mA P <sub>O</sub> = 0.64 W

**Current output:**

Signal range .....	3.5...23 mA
Load (max.).....	20 mA / 600 $\Omega$ / 12 VDC
Load stability.....	$\leq$ 0.01% of span / 100 $\Omega$
Current limit.....	$\leq$ 28 mA

**Passive 2-wire output installation:**

Max. external 2-wire supply.....	26 VDC
Max. load resistance [ $\Omega$ ] .....	$(V_{\text{supply}} - 3.5) / 0.023$ A
Effect of external 2-wire supply voltage variation .....	$< 0.005\%$ of span / V

\*of span = normal measurement range 4...20 mA

**Status relay output terminal 33-34:**

Relay function.....	N.C.
Programmable low setpoint .....	0...29.9 mA
Programmable high setpoint.....	0...29.9 mA
Hysteresis for setpoints.....	0.1 mA
Max. voltage.....	110 VDC / 125 VAC
Max. current .....	0.3 ADC / 0.5 AAC
Max. voltage - hazardous installation .....	32 VDC / 32 VAC
Max. current - hazardous installation.....	1 ADC / 0.5 AAC

**Approvals:**

EMC 2004/108/EC ..... EN 61326-1  
LVD 2006/95/EC..... EN 61010-1  
c UL us, Standard for Safety ..... UL 61010-1  
GOST R

**Marine:**

Det Norske Veritas, Ships & Offshore ..... Stand. f. Certific. No. 2.4

**I.S. / Ex:**


ATEX 94/9/EC..... DEKRA 11ATEX0244 X  
IECEX..... IECEX DEK 11.0084X  
c FM us ..... 0003044327-C  
GOST Ex

**Functional Safety:**

SIL2 Certified & Fully Assessed acc. to IEC 61508  
SFF> 60% - type A component  
SIL3 Applicable through redundant structure (HFT=0)

## Visualisation in 4501 of hardware / software error

Readout at hardware error		
Error search	Readout	Cause
Communications test 4501 / 9106B	NO.CO	Connection error
EEProm error - check configuration	FL.ER	Configuration error or crc mismatch, recovery configuration is loaded
User error	II !, II !	Loop limit exceeded
User error	II !, II !	Loop error
EEProm error - check configuration	EE.ER / IE.ER	Invalid configuration (CRC or data)
Hardware error	SU.ER	Supply error
Hardware error	RA.ER	RAM error
Hardware error	FL.ER	Flash error
Hardware error	IN.ER	Initialization error
Hardware error	C1.ER	Hardware error - channel 1
Hardware error	C2.ER	Hardware error - channel 2
Hardware error	DE.ER	General error

! All error indications in the display flash once per second. The help text explains the error. In case of cable fault the backlight also flashes. This can be reset by pressing the  key.

Errors affecting both channels are shown as error on channel 1 - and the line showing channel 2 is blank.

Hardware error can be reset in two ways. Either step through the menus (if the other channel is to stay in operation) or power cycle the device.

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