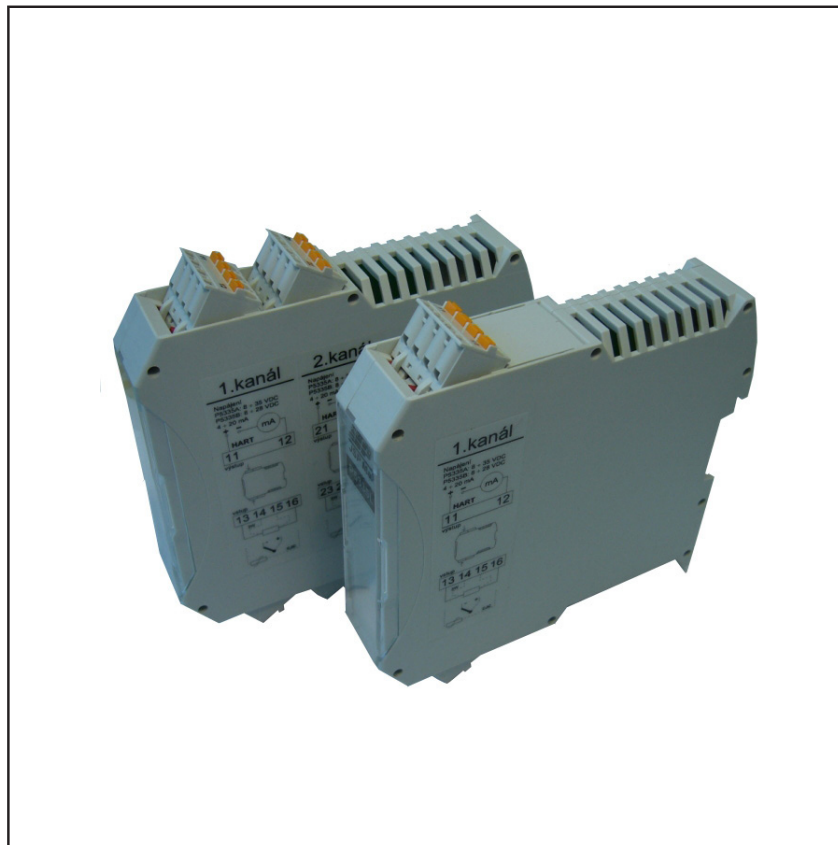


MANUAL

P5335

Universal Single- and Double-channels Transmitters to DIN Rail with HART Communication



- Universal input for all common resistance and thermocouple temperature sensors, linear resistance and mV
- Accuracy 0.05 %
- Measurement of difference or average of two sensors
- Current output signal 4 to 20 mA with HART communication
- Galvanic isolation 1.5 kVAC
- Removable spring or screw terminals
- Width from 12 mm per channel
- High immunity against interference (industrial environment)
- Intrinsically safe version
 - ⊕ Ex II (1) G [Ex ia Ga] IIC,
 - ⊕ Ex II (1) D [Ex ia Da] IIIC

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1. General instructions and information

1.1 Symbols used



Symbol of warning; for safe use it is necessary to proceed according to the instructions



Symbol CE certifies compliance of the product with the respective government directives



Symbol "Output"



Symbol "Power supply"



This product does not belong to public waste and it is subjected to separate collection



The product meets requirements for explosion hazard environment according to the further specification

CJC Cold junction compensation

RTD Resistance temperature sensor

TC Thermocouple temperature sensor

1.2 Safety warnings and cautions



The transmitter must be supplied from a safe voltage source that meets all requirements of the standard EN 61010-1 and must be installed in compliance with local safety requirements and standards. Installation and connection of the product can be done only by qualified workers after getting acquainted with this manual. The instrument cannot be used for other purposes than as specified in this manual. For elimination of risk of injury from electric shock or fire, the maximum operational parameters of the instrument may not be exceeded, particularly range of operating temperature because of exposure to heat from connected or surrounding technological equipment must not be exceeded!

The transmitter should be installed in suitable environment without any direct sunlight, occurrence of dust, high temperatures, mechanical vibrations and shocks and protected against rain and excessive moisture.

1.3 Scope of delivery

With the product is delivered:

- Manual for installation, operation and maintenance
- Certificate of calibration (only with calibrated transmitters)
- Copy of EC certificate on type examination ATEX (only transmitters for explosion hazard environment)

1.4 Description of the delivery and packing

Výrobek je zabalen v ochranném krytu a za předpokladu, identifikačním štítkem se značkou výstupní kontroly. Výrobek nesmí být vystaven přímému déšť, vibrací a rázů při přepravě.

1.5 Storage

The products shall be stored at temperatures from -40 to +80 °C without condensation of water vapours.

1.6 Installation and commissioning

During installation, commissioning, operation and maintenance follow the instructions in chapter 4.

1.7 Spare parts

Any of the compact parts of the product can be also ordered as a spare part if there are not required special procedures or technological operations for the exchange.

1.8 Repairs

Products are repaired by the manufacturer. The products for repair should be sent with description of the fault or defect in a packing that guarantees damping of shocks and vibrations and protects against damage during transport.

1.9 Warranty

Products are covered by a warranty for a period of 5 years from the delivery date on the delivery note. The manufacturer guarantees technical and operational parameters of the products within scope of the applicable documentation. Warranty period is specified with individual items and begins from the day of takeover of the goods by the purchaser or delivery to the carrier. Any claims concerning to defects of the goods together can be filed in writing with the manufacturer within the warranty period and the claimed product shall be presented. The claiming party shall give identification of the product, number of the delivery note and description of the fault or defect.

The manufacturer is not responsible for any defects caused by improper storage, incorrect connection, damages caused by external effects, in particular by effects of factors with excessive values, unqualified installation, improper operation or common wearing.

2. End of service and disposal

2.1 End of service



Dismounting and disposal of the device is possible after disconnecting of power supply voltage.

2.2 Disposal



The product does not contain any environmentally harmful parts. When disposing the packing and destroyed or irreparably damaged product proceed according to the local regulations.

3. Product description

P5335

Universal Single- and Double-channels Transmitters to DIN Rail with HART Communication

- Universal input for all common resistance and thermocouple temperature sensors, linear resistance and mV
- Accuracy 0.05 %
- Measurement of difference or average of two sensors
- Current output signal 4 to 20 mA with HART communication
- Galvanic isolation 1.5 kVAC
- Removable spring or screw terminals
- Width from 12 mm per channel
- High immunity against interference (industrial environment)
- Intrinsically safe version
 - Ex II (1) G [Ex ia Ga] IIC,
 - Ex II (1) D [Ex ia Da] IIIC



3.1 Application

Transmitters P5335 can be used to convert resistance or voltage temperature signals from resistance or thermocouple temperature sensors into linearised current output signals of a current loop 4 to 20 mA with digital communication HART. Transmitters P5335 include galvanic isolation of input and output and can be also used for applications with many measuring points and for thermocouples. High measurement accuracy and the option of calculations of differences or averages from two input sensors predetermine use of the instrument in the most demanding applications.

3.2 Description

The transmitter P5335 can be ordered in two alternatives, single- or double-channel version for installation on a DIN rail. In both alternatives this includes a box with removable terminals. These are available as spring or threaded terminals or threaded terminals with a compensation terminal for measurement of thermocouples (see the ordering table. Individual terminals are fitted with locks for unique determination of position.

Input signals are processed by an A/D converter and converted into a digital signal that is transferred to a microcomputer and according to the preset configuration all the measured values are calculated. These values are then used for further calculation of a primary quantity (temperature) and according to the preset range also the output current. Other quantities are accessible through digital communication HART.

One resistance sensor (two-, three- or four-wire) or two sensors (two-wire) can be connected to the input. Resistance of the input wires of the two-wire connection can be compensated

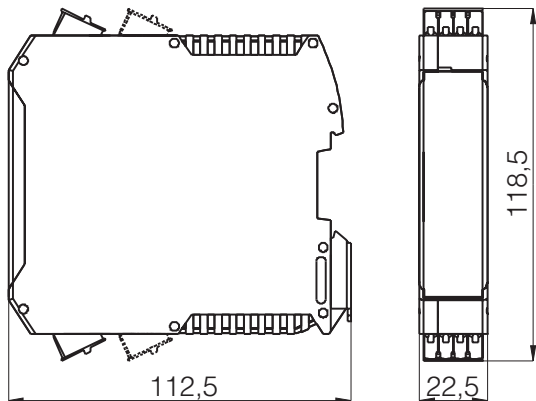
by entering a constant value of the loop resistance when configuring the transmitter, even for two resistance sensors. In other cases the resistance of input wires is compensated automatically. In case of three- and four-wire connection there can be entered the maximal values of resistance of the line and the measured resistance of the line is then compared during measurement. A thermocouple can also be connected to the input. Compensation of temperature of the comparative thermocouple connection is carried out according to the configuration, by a constant temperature of the cold end, external sensor Pt100 or Ni100 or using a compensation terminal for measurement of the thermocouple. The compensation terminal includes a built-in sensor Pt100A and is designed for direct connection of an extension or compensation line. The compensation terminal is included in designs P5335 L10 and L20 and can be ordered independently, separately for each channel (code CTB, see the ordering table).

The transmitter provides analog output signal of the current loop 4 to 20 mA with HART digital communication. The current output can be also used for tests of the current loop and the associated apparatus. The transmitter allows connecting more instruments on one current loop - multidrop mode. For the mode multidrop it is necessary to set and unique address within the range 1 to 15 within the common loop. In this mode the analog output of the transmitter is constant (4 mA) and the measured quantities can be obtained only through digital communication HART.

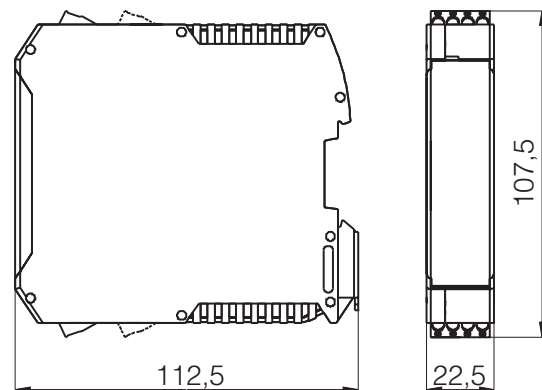
The transmitter can be configured using the tools that are usual for the interface HART. Such configuration can be carried out e.g. using a manual HART configurator or using a PC with a programme and HART modem.

3.3 Dimensional drawings

Case with mounted spring terminals:



Case with mounted screw terminals:



4. Installation, operation and maintenance

4.1 Installation and commissioning

4.1.1 General

After mounting and correct connection, switch on the power supply.
 During the installation of transmitters in environment with higher level of interference, protection of transmitters against interference and induced overvoltage must be ensured. According to the standard engineering practice, it is recommended to separate signal and power wires into separate gutters and use shielded signal cables with twisted wires. In case of outdoor wires, it is necessary to solve the overvoltage protection of the transmitter as a part of overall solution of protecting system from the effects of atmospheric electricity.

4.1.2 Special conditions for use of intrinsically safe version (code E11)

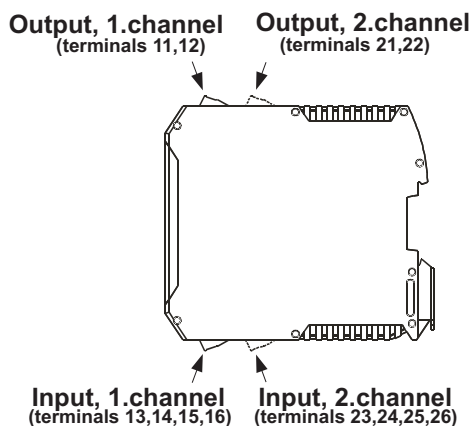
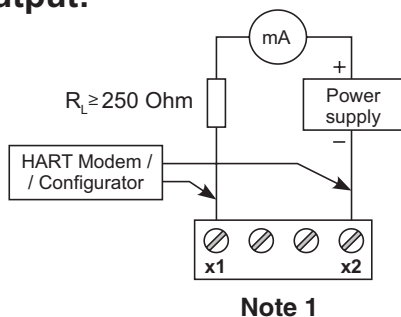
II (1) G [Ex ia Ga] IIC
 II (1) D [Ex ia Da] IIIC



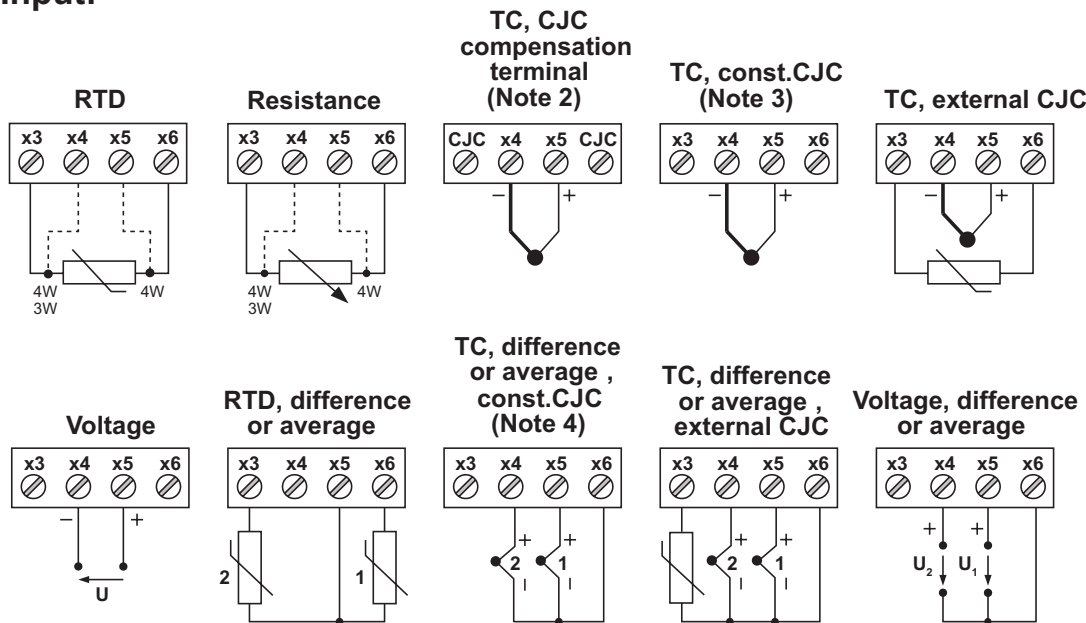
The transmitter P5335 for installation for DIN rail may not be installed in any explosion hazard environment. This restriction also applies to version P5335 Lxx E11. Only input and output wires of the version P5335 Lxx E11 may lead to explosion hazard environment. The transmitter input and output may be connected only to suitable associated apparatus or to simple apparatus complying with the standard EN 60079-14 when respecting the restricting conditions. When installing a transmitter, it is necessary to separate terminals of intrinsically safe circuits by air gaps at least 50 mm from terminals of the circuits that are not intrinsically safe (see EN 60079-11). In case of a double-channel version P5335 L2x E11 both channels shall be included in intrinsically safe circuits.

4.1.3 Electrical connection

Output:



Input:



Note. 1) The symbol "x" in the description of terminal represents a channel number. In case of a single-channel design this symbol "x" is always replaced by "1" an in case of a double-channel design this represents the channel number, i.e. "1" or "2".

Note 2) Connection of the thermocouple to the compensation terminal - the compensation terminal includes a built sensor Pt100A for measurement of temperature of the cold end. When using the compensation terminal it is **necessary** to set a compensation of the cold end **by an external sensor Pt100** in configuration of the transmitter, i.e. by a sensor built-in in the compensation terminal! The compensation terminal is included in the design P5335 L10 a L20 and can also be ordered independently, separately for each channel (code CTB, see the ordering table).

Note 3) This connection can be used **only** for measurement of a thermocouple with constant temperature of the cold end.

Note 4) This connection can be used **only** for measurement of differences of averages of temperatures of thermocouples with constant temperature of the cold end.

4.2 Measurement of thermocouple temperature sensors using transmitter P5335 Lxx for a DIN rail

In configuration of the transmitter P5335 Lxx the thermocouple sensors cannot be measured using internal compensation of the cold end! P5335 Lxx includes a built-in transmitter with terminals and this transmitter would measure temperature of its own terminals that may differ quite considerably from temperature of terminals of the box on the DIN rail.

The following types of compensation of the cold end can be used in case of the transmitter P5335 Lxx:

- compensation by a constant temperature
- compensation by an external sensor

The external compensation sensor measures temperature of the joint where the extension or compensation line changes to a copper line. This change may be located directly in the transmitter terminal, if the extension or compensation line is brought up to the transmitter terminals, or in a remote terminal box that is connected with the transmitter using a copper line. In both cases it is necessary to install the compensation sensor so that it measures temperature of the joint in point of change of the extension or compensation line into the copper line.

- using a compensation terminal

In this case there may be assumed that the extension or compensation line is connected directly to the compensation

terminal of the transmitter (code CTB, see the ordering table). The compensation terminal includes a built-in sensor Pt100A that measures temperature of transition of the extension or compensation line into copper line.

When using the compensation terminal, it is **necessary** to set compensation of the cold end in configuration of the transmitter by an **external sensor Pt100**, i.e. by the sensor built-in in the compensation terminal!

Compensation terminal for measurement of thermocouple temperature sensors

It is a threaded removable terminal that is designed for direct connection o an extension of compensation line. The compensation terminal includes a built-in sensor Pt100A that measures temperature of the terminal, i.e. temperature of transition of the extension or compensation line to a copper line.

The terminal cannot be used for connection of a resistance sensor neither for connection of two thermocouples.

When using a compensation terminal it is **necessary** to set compensation of the cold end in configuration of the transmitter by an **external sensor Pt100**, i.e. by the sensor built-in in the compensation terminal!

The compensation terminal is included in the design P5335 L10 and L20 and can also be ordered independently, separately for each channel (code CTB, see the ordering table).

4.3 Description of setting and configuration using a configurator HARTWinCom

The communicator HARTWinCom consists of a programme HARTWinConf, modem HARTMod (MH-02) and connecting cables. Before use it is necessary to connect the modem PC using the connecting cable, install and start the program HARTWinConf. The program finds the modem on the respective communication port. In case that program reports that the modem is not connected, the respective port can be chosen on the driver panel HART.

The program allows setting of basic parameters of the instrument for all HART instruments. This includes the parameters that are given by the basic set of commands HART and partly by the set of commands of routine practice. For detailed setting of the instrument it is necessary, that the application has a descriptive file available for the given HART and its revision. Configuration can be saved as a file or printed as a "Protocol on setting".

The program also offers some service functions, such as instrument fixed output mode on/off, delete the attribute of a configuration change, etc. A detailed description of setting and control can be found in the instructions manual to the programme.



The transmitter in design E11 can be configured using the communicator HARTConf only if the transmitter, communicator and connected wires are installed in environment without any risk of explosion!

Description of setting and configuration using a manual configurator HARTConf

HARTConf is a manual configurator for setting of basic parameters of instruments with communication HART. A detailed description of setting and control can be found in the instructions manual to the configurator.



The transmitter in design E11 can be configured using the communicator HARTConf only if the transmitter, communicator and connected wires are installed in environment without any risk of explosion!

4.4 Operation and maintenance

Provided that the instrument is installed correctly, the operator can read setting and measured values using a configurator. Setting of the instrument may be changed only if a sudden change of the output current cannot cause any failure of the technological equipment or regulation (switch over the possible regulator to manual control)!

The instrument does not need any maintenance.

5. Product specifications

5.1 Technical specifications

Supply voltage:

standard version	8.0 to 35 VDC
version E11	8.0 to 30 VDC

Range of ambient temperatures:

-40 to +85 °C

Humidity:

< 95 % RH (without condensation)

Working position:

arbitrary

Maximal cross section of wires:

2.5 mm²

Housing:

case without terminals	IP00
case with terminals	IP20

Dimensions:

107 x 120 x 23 mm

Weight (case with terminals):

P5335 L1x	135 g
P5335 L2x	205 g

Case material:

polyamide

Ignitability class:

V0 (according to UL 94)

Reference ambient temperature:

20 to 28 °C

Input

Input signal:

resistance signal of temperature sensor or potentiometer, voltage signal of thermocouple, difference and diameter of resistance signals, difference and diameter of voltage signals

Sensor connection:

Resistance sensor	Two-, three-, four-wire, difference or diameter (two-wire)
Voltage sensor (thermocouple)	Two-wire, difference or diameter (two-wire)
External compensation sensor	Two-wire

Dynamic range of input signal:

22 bit

Max. wire resistance:

5 Ω

Current through resistance sensor:

0.2 mA

Effect of wire resistance (3- / 4- wire):

< 0.002 Ω / Ω

Input resistance:

10 MΩ

Cold junction compensation:

< ±1 °C

External compensation of cold junction with Ni100 or Pt100:

-40 ≤ T_{amb} ≤ 135 °C

Basic ranges:

Type	Minimal value	Maximal value	Minimal Span	Standard
Pt100, Pt1000	-200 °C	850 °C	10 °C	EN 60751
Ni100	-60 °C	250 °C	10 °C	DIN 43760
Thermocouple B	+400 °C	1820 °C	100 °C	IEC 584
Thermocouple E	-100 °C	1000 °C	50 °C	IEC 584
Thermocouple J	-100 °C	1200 °C	50 °C	IEC 584
Thermocouple K	-180 °C	1372 °C	50 °C	IEC 584
Thermocouple L	-100 °C	900 °C	50 °C	DIN 43710
Thermocouple N	-180 °C	1300 °C	50 °C	IEC 584
Thermocouple R	-50 °C	1760 °C	100 °C	IEC 584
Thermocouple S	-50 °C	1760 °C	100 °C	IEC 584
Thermocouple T	-200 °C	400 °C	50 °C	IEC 584
Thermocouple U	-200 °C	600 °C	50 °C	DIN 43710
W3	0 °C	2300 °C	100 °C	ASTM E988-90
W5	0 °C	2300 °C	100 °C	ASTM E988-90
Linear resistance	0 Ohm	7000 Ohm	25 Ohm	
Voltage	-800 mV	800 mV	2.5 mV	

Output

Output signal:

Two-wire current 4 to 20 mA or 20 to 4 mA with HART protocol

Total accuracy (higher value applies):

Input	Basic accuracy	Temperature coefficient
All inputs	$\leq \pm 0.05$ % of span	$\leq \pm 0.005$ % of span / °C
Pt100, Pt1000	$\leq \pm 0.1$ °C	$\leq \pm 0.005$ °C / °C
Ni100	$\leq \pm 0.2$ °C	$\leq \pm 0.005$ °C / °C
TC, type E, J, K, L, N, T, U	$\leq \pm 0.5$ °C	$\leq \pm 0.025$ °C / °C
TC, type B, R, S, W3, W5	$\leq \pm 1$ °C	$\leq \pm 0.1$ °C / °C
Linear resistance	$\leq \pm 0.1$ Ω	$\leq \pm 5$ mΩ / °C
Voltage	$\leq \pm 10$ μV	$\leq \pm 0.5$ μV / °C

Characteristics:

Linear with temperature or linear with input quantity, other upon request

Adjustability of the range:

16 bit

Přestavitelnost rozpětí:

1 % to 100 % of the basic range

Time constant (95 %):

adjustable 1 to 60 s

Minimal output span:

16 mA

Renewal period:

440 ms (660 ms for difference two sensors)

Fixed output:

in the range 4 to 20 mA

Load resistance of output:

$\leq (V_{\text{supply}} - 8) / 0.023$ [Ω]

Output stability:

$< \pm 0.01$ % of span / 100 Ω

Electrical strength of isolation between input and output circuit:

test 1,5 kVAC
constant 50 VAC

Electrical strength between channels (only for double-channel version):

test 2.5 kVAC

5.2 Supplementary parameters

Output current limitation:

Signal 3.8 to 20.5 mA according to NAMUR NE43
Limitation of error current to approximately 23 mA

Supply voltage effects:

< 0.005 % of span / VDC

EMC effects (immunity):

$< \pm 0.1$ % of span

Extended EMC immunity (NAMUR NE21, A criterion, burst):

± 1 % of span

Indication of sensor error:

Optionally by current > 21 mA or < 3.6 mA acc. to NAMUR NE43, or optionally in range 3.5 to 23 mA

Current of sensor at sensor error detection:

33 μA

Sensor error detection:

resistance ranges: if beginning of measure range > 30 Ω or adequate temperature
voltage ranges: if beginning of measure range > 5 mV or adequate temperature

Warming time:

30 s

Error checking EEPROM:

< 10 s

Output signal at EEPROM error:

≤ 3.5 mA

6. Tests, certificates and standards

6.1 Tests and certificates

Electromagnetic compatibility

emission and immunity acc. to EN 61326-1

Intrinsical safety (version EI1)

Ex II (1) G [Ex ia Ga] IIC, Ex II (1) D [Ex ia Da] IIIC

6.2 Standards

Transmitter is designed and manufactured according these standards:

EN 61326-1, EN 60079-0, EN 60079-11, EN 60079-26

6.3 Marking and type tag information

Standard version:

P5335 type number
Model: model
S/No: serial number
Czech Republic country of origin



www.jsp.cz

logo of JSP, s.r.o.
website address

Tag of model EI1 further includes:

Ex II (1) G [Ex ia Ga] IIC
Ex II (1) D [Ex ia Da] IIIC
FTZÚ 08 ATEX 0032
year of manufacture

6.4 Limiting conditions of use of a transmitter in an intrinsically safe version (code EI1)

Output

(current loop, terminals 11, 12 or terminals 21, 22):

$$U_i = 30 \text{ VDC}$$

$$I_i = 120 \text{ mA}$$

$$P_i = 0.84 \text{ W}$$

$$L_i = 10 \text{ }\mu\text{H}$$

$$C_i = 1 \text{ nF}$$

Input for sensor

(terminals 13, 14, 15, 16 or terminals 23, 24, 25, 26):

$$U_o = 9.6 \text{ VDC}$$

$$I_o = 28 \text{ mA}$$

$$P_o = 0.067 \text{ W}$$

$$L_o = 35 \text{ mH}$$

$$C_o = 3.5 \text{ }\mu\text{F}$$

The sensor circuit is not infallibly galvanic isolated from the supply output circuit. However, the galvanic isolation between the circuits is capable of withstanding a test voltage of 500 VAC during 1 minute.

7. Ordering

7.1 Ordering table

Type	Description
• P5335	Single-channel and double-channel universal transmitter for a DIN rail with HART communication
Code	Version
• L10	Single-channel transmitter with removable screw terminals (plus compensation terminal CTB1)
• L11	Single-channel transmitter with removable screw terminals
L12	Single-channel transmitter with removable spring terminals
• L20	Double-channel transmitter with removable screw terminals (plus compensation terminals CTB1 and CTB2)
• L21	Double-channel transmitter with removable screw terminals
L22	Double-channel transmitter with removable spring terminals
Code	Setting requirements
• NR	Without requirements for the range and input setting (preset - Pt100, 3-wire sensor connection, 0 to 100 °C)
• QR	Range and other parameters setting according to configuration sheet DB0998
Code	Calibration
KPP5	Certificate of calibration, transmitter calibration in five equally spaced points in the set range
Code	Optional version
◦ EI1 ¹⁾	ATEX (Ex) II (1) G [Ex ia Ga] IIC, (Ex) II (1) D [Ex ia Da] IIIC
Code	Optional accessories
• CTB1	Compensation terminal for measuring thermocouple sensors, channel No.1
• CTB2	Compensation terminal for measuring thermocouple sensors, channel No.2
• HARTWinCom	Set of PC configuration software HARTWinConf (CZ+EN) and modem HARTMod
• HARTConf	HART-USB modem and field handheld configurator for transmitters with HART and LHP communication, function of transmitter supply, supplied from USB or accumulator, charged from USB
• HARTMod	Miniature HART modem with galvanic isolation

5 years warranty

Example of order: P5335 L10 NR HARTConf


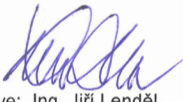
For code QR configuration sheet DB0998 is required to the order.

• ... Ex stock version ° ... Marked version can be dispatched up to 5 working days (with calibration up to two weeks)

¹⁾ ... Transmitter must not be placed in potentially explosive atmospheres. In a potentially explosive atmosphere can lead only input and output wires.

8. Appendix

8.1 Declaration of conformity (explosion hazard environment version - code EI1)

	JSP Industrial Controls	Declaration - PZ9224EN - 2016/04
<u>EU DECLARATION OF CONFORMITY</u>		
We,	JSP, s.r.o. Raisova 547, 506 01 Jičín, Czech Republic VAT No. CZ49286684	
declare under our sole responsibility that		
The Product:	Transmitter HART to DIN Rail	
Type/Model:	P5335, version EI1	
is under the conditions specified in the manual in conformity with the following standards:		
Czech Standards	European Standards	
ČSN EN 61326-1:2013	EN 61326-1:2013	
ČSN EN 60079-0:2013	EN 60079-0:2012	
ČSN EN 60079-11:2012	EN 60079-11:2012	
ČSN EN 60079-26:2007	EN 60079-26:2007	
and following directives:		
Czech Directives	European Directives	
117/2016 Sb. as amended	2014/30/EU as amended	
116/2016 Sb. as amended	2014/34/EU as amended	
481/2012 Sb. as amended	2011/65/EU as amended	
Physical Technical Testing Institute (FTZÚ), Notified Body No. 1026, Registration No. (VAT) CZ00577880, Pikartská 7, 716 07 Ostrava - Radvanice, Czech Republic, tested the product and issued: EC-Type Examination Certificate No. FTZÚ 08 ATEX 0032 and supplement No. 1, Date of Issue 17.6.2013.		
Place of Issue: Jičín		
Date of Issue: 20. 4. 2016	Name and Signature of the Manufacturer's Representative: Ing. Jiří Lenděl Function: Managing Director of the Company	
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JSP Industrial Controls



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Your Supplier: