

P5310

Programmable Transmitter with LHP Communication

- One type of transmitter for all regular resistance and thermoelectric sensors
- Linearized output signal 4 to 20 mA, LHP Protocol
- Accuracy up to 0.1 % of set range (see formula)
- Rangeability 1 to 100 % of input range
- Reranging by a PC software LHPConf and standard HART interface
- Meet harsh industrial requirements and EMC standards according to EN 61326-1/A1



Application

P5310 transmitters convert a resistance or a voltage signal from a temperature sensor into a current, linear output signal of 4 to 20 mA current loop modulated by LHP Protocol. The input signal is converted by an A/D converter to a digital signal, which is converted by a microprocessor to a primary value (temperature) according to the configuration parameters and then to an output current according to the set range.

A resistance sensor can be connected in a two-, three- or four-wire connection. Lead resistance is fully compensated by the four-wire connection. The three-wire connection must have all leads to the sensor with identical resistance values. With the two-wire connection of a resistance sensor the lead resistance can be compensated by entering a constant resistance value in a configuration sheet with the order or by a set-up program.

A voltage sensor (a thermocouple) should be connected in a two-wire connection. A temperature compensation of cold junction is either internal (by measuring of terminal board temperature), external or by entered constant temperature. The sensor, which is used, guarantees a maximum accuracy and stability of comparative temperature measurement.

A potentiometer position is measured in percent. The start position is 0 % and the end position is 100 % independently of the total resistance value. After consultation with the manufacturer and on certain conditions it is possible to measure also a potentiometer with value out of the specified input range. If it were necessary to measure a position of the potentiometer as resistance it is possible to use a connection for measuring of resistance.

Transmitter communicates with LHP Protocol that is partly compatible with HART protocol, uses the same type of connection but communication is guaranteed only on short distance (max 10 m) and implements limited choice of universal commands.

Communication with the transmitter requires a MH-02 or similar HART communication interface and a PC with LHPConf configuration software installed.

Specifications

Supply Voltage:	9 to 36 V DC
Operating Temperature Range:	-40 to +85 °C
Reference Temperature:	23 ± 5 °C
Typical Time Values:	
Warm-up Time:	5 s
Reprogramming of Range:	5 s
Reprogramming of Sensor Type:	15 s
Housing:	IP 40, terminals IP 00 (after headmounting according to the head)
Humidity:	0 to 100 % RH with condensation (after head-mounting)
Wire connection:	screw terminals, square 0,5 to 1,5 mm ² (AWG 16 to 20), torque 0,5 Nm
Suitable head type:	B type of DIN 43729 standard
Weight:	40 g
Dimensions:	Ø 44 x 24 mm
Material of Boxes:	Polycarbonate
Working position:	any position
Warranty:	3 years

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Input:

Input ranges: See Table 1

Digital Accuracy:

Input 0 to 400 Ω	≤ ± 0.05% SR or ≤ ± 0.08 Ω or corresponding temperature
Input 0 to 4000 Ω	≤ ± 0.05% SR or ≤ ± 0.8 Ω or corresponding temperature
Input -15 to 70 mV	≤ ± 0.05% SR or ≤ ± 0.02 mV corresponding temperature

(the greatest value is valid; SR ... Span of set range)

Input Signal:

Resistance signal of temperature sensor or potentiometer,
Voltage signal of thermocouple

Sensor Connection:

Resistance Ranges	Two-, three-, four-wire
Voltage Range	Two-wire
Potentiometer	Three-wire or four-wire

Maximum Wire Resistance for Resistance Ranges:

20 Ω (each connecting wire)

Current through Resistance Sensor:

< 0.15 mA

Input Overloading:

max 24 VDC or max 18 mA between any inputs (max 60 s)

Cold Junction Compensation Error:

< ±1 °C

Effect of Wire Resistance for Resistance Ranges:

Two-wire Connection
Can be compensated by constant value

Three-wire Connection
No effect with identical values of wire resistance

Four-wire Connection
No effect with specified wire resistance range

Input Resistance:

> 10 MΩ

Output:

Output Signal:

Two-wire 4 to 20 mA

Current Output Total Error:

≤ ± 0.05% SR + Digital Accuracy

SR ... Span of set range

Effect of Supply Voltage:

≤ ± 0.002 % of span/V

Effect of Ambient Temperature:

Input 0 to 400 Ω	(≤ ± 0.1% SR or ≤ ± 0.08 Ω or corresponding temperature) / 10 °C
Input 0 to 4000 Ω	(≤ ± 0.1% SR or ≤ ± 0.8 Ω or corresponding temperature) / 10 °C
Input -15 to 70 mV	(≤ ± 0.1% SR or ≤ ± 0.2 mV corresponding temperature) / 10 °C

(the greatest value is valid)

Long-term Stability:

≤ ± 0.1 % SR / 2 years

Transfer Function:

Linear with temperature or linear with input value

Range of Span Setting:

±1 to ±100 % of input range span

Start Setting:

Within input range, see Table 1

Damping (95 %):

Adjustable 0.5 to 60 s (2 measurements per second)

Load Resistance:

$R_L [\Omega] \leq (U_N [V] - 9) / 0.022$

Sensor Break Indication:

Output: Selectable, >21 mA or <3.6 mA according to NAMUR NE43

Output Current Limit:

Approximately 3.8 to 20.5 mA signal according to NAMUR NE43
Error current limit ca 22 mA

EMC (Electromagnetic compatibility):

According to EN 61326-1:98/A1:99

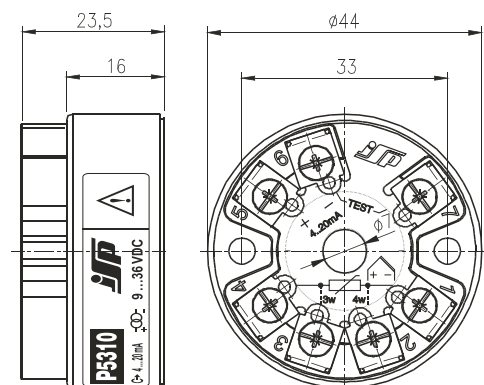
Configuration Software Requirements:

IBM PC compatible computer with MS Windows 98/NT/2000/XP operating system, LHPConf configuration software with HART modem interface (MH-02), power supply 24V and resistor 250 Ω. Transmitter communicate with LHP protocol that is partly compatible with HART protocol, uses the same type of connection but communication is guaranteed only for short distance (max. 10 m) and implements only basic commands.

Table 1.

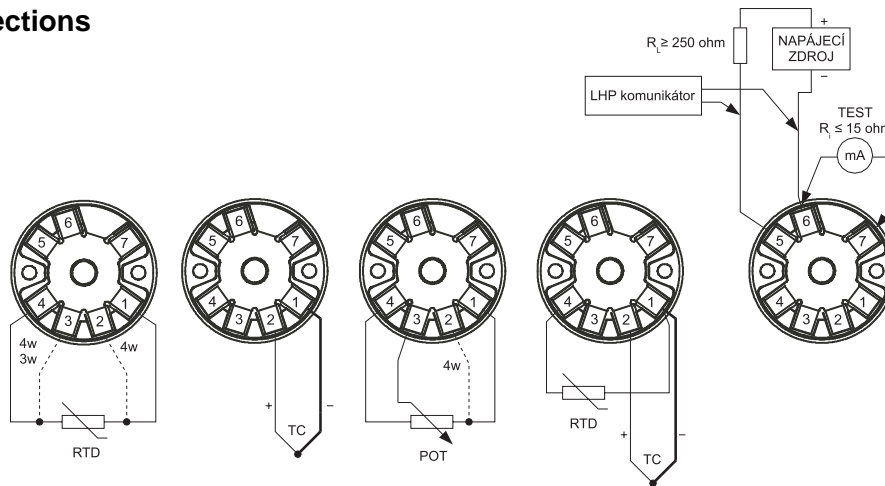
Configuration of Input	Linearization Standard	Input Range	Minimum Span
Resistor		0 to 400 Ω	4 Ω
Resistor		0 to 4000 Ω	40 Ω
Potentiometer Max. 400 Ω		0 to 100 %	1%
Potentiometer Max. 4000 Ω		0 to 100 %	1%
Voltage		-15 to 60 mV	0.75 mV
Pt100	IEC 751	-200 to 850 °C	11 °C
Pt500	IEC 751	-200 to 850 °C	11 °C
Pt1000	IEC 751	-200 to 850 °C	11 °C
Ni100	DIN 43760	-60 to 250 °C	4 °C
Ni1000	DIN 43760	-60 to 250 °C	4 °C
Thermocouple B	IEC 584	100 to 1800 °C	18 °C
Thermocouple E	IEC 584	-200 to 800 °C	12 °C
Thermocouple J	IEC 584	-200 to 1000 °C	12 °C
Thermocouple K	IEC 584	-200 to 1300 °C	15 °C
Thermocouple L	DIN 43710	-200 to 900 °C	11 °C
Thermocouple N	IEC 584	-200 to 1300 °C	15 °C
Thermocouple R	IEC 584	-50 to 1700 °C	18 °C
Thermocouple S	IEC 584	-50 to 1700 °C	18 °C
Thermocouple T	IEC 584	-250 to -400 °C	7 °C

Dimensional Drawings



P5310 Programmable Transmitter with LHP Communication

Electrical Connections



Type	Description
P5310 →	Universal Programmable Transmitter with LHP Protocol (without Galvanic Isolation)
Code	Version
H10	Mounting on Thermometer Head Form B according to DIN, Universal for RTDs and Thermocouples
H11 →	Mounting on Thermometer Head Form B according to DIN, for RTDs Only (Codes R01 to R04, R11 to R15)
L10	Narrow Version of Rail Mounted Transmitter, DIN Rail TS 35, Universal for RTDs and Thermocouples (availability in July 2005)
L11	Narrow Version of Rail Mounted Transmitter, DIN Rail TS 35, for RTDs Only (Codes R01 to R04, R11 to R15) (availability in July 2005)
Code	Sensor Connection
NR	Presetting of Range and Input (R11 C2 RL 0 °C RH 100 °C ECH)
Code	Input Setting
C1	Two-wire Connection of Resistance Sensor
C2 →	Three-wire Connection of Resistance Sensor
C3	Four-wire Connection of Resistance Sensor
C4	Connection of Potentiometer without Wire Resistance Compensation (Max. Range 0 to 100 %)
C5	Connection of Potentiometer with Wire Resistance Compensation (Max. Range 0 to 100 %)
C6	Connection of Voltage Sensor or T/C without CJC (CJC Temperature 0 °C)
C7	Connection of T/C with Internal CJC
C8	Connection of T/C with External CJC by Pt1000 sensor
Code	Input Setting
R01 →	Resistance (0 to 400 Ω) without Linearization
R02	Resistance (0 to 4000 Ω) without Linearization
R03	Potentiometer (Total Resistance 40 to 400 Ω) without Linearization
R04	Potentiometer (Total Resistance 400 to 4000 Ω) without Linearization
R05	Voltage (-15 to 70 mV) without Linearization
R11	Pt100 IEC 751 (-200 to 850 °C) with Linearization
R12	Pt500 IEC 751 (-200 to 850 °C) with Linearization
R13	Pt1000 IEC 751 (-200 to 850 °C) with Linearization
R14	Ni100 DIN 43760 (-60 to 250 °C) with Linearization
R15	Ni1000 DIN 43760 (-60 to 250 °C) with Linearization
R51	Thermocouple "J" IEC 584 (-200 to 1200 °C) with Linearization
R52	Thermocouple "K" IEC 584 (-200 to 1300 °C) with Linearization
R53	Thermocouple "N" IEC 584 (-200 to 1300 °C) with Linearization
R54	Thermocouple "R" IEC 584 (-50 to 1700 °C) with Linearization
R55	Thermocouple "S" IEC 584 (-50 to 1700 °C) with Linearization
R56	Thermocouple "T" IEC 584 (-250 to 400 °C) with Linearization
R57	Thermocouple "B" IEC 584 (100 to 1800 °C) with Linearization from 0 °C
R58	Thermocouple "E" IEC 584 (-200 to 950 °C) with Linearization
R59	Thermocouple "L" DIN 43710 (-200 to 900 °C) with Linearization
R60	Thermocouple "C" N.I.S.T. Monograph 175 (0 to 2300 °C) with Linearization
R90*	Customer Linearization
Code	Setting Range
RL ** →	Start of Range (4 mA) (Fill in Value and Units)
RH ** →	End of Range (20 mA) (Fill in Value and Units)
Code	Error Current Selection
ECL →	Error Current below (< 3.6 mA)
ECH	Error Current above (> 21 mA)
Code	Optional Version
E11	Intrinsically Safe Version II 2(1)G EEx ia IIC T4 (availability in September 2005)
E12	Non Incendive Version II 3G EEx nA II T4 (availability in September 2005)
Code	Optional Accessories
LHPCom	Set of PC Configuration Software LHPCConf (for WIN98/2000/NT/XP) and MH-02 Interface (See Data Sheet No. 80)
LHPCConf	PC Configuration Software LHPCConf (for WIN98/2000/NT/XP)
MH-02	HART Modem with Galvanic Isolation (See Data Sheet No. 325)
USB-RS232C	Communication Interface for to USB Port of the PC
PT1000A	Compensation Resistor Pt1000 (-30 to 150 °C) for External Compensation of Thermocouple
VH1	Cap for Head B for Mounting of Transmitter (H10 and H11 Versions)
APT1	Adapter for Straight Head

Example of Order: P5310 H11 C2 R01 RL 0 °C RH 350 °C ECL VH1
P5310 H11 NR (Presetting: R11 C2 RL 0 °C RH 100 °C ECH)

3-year Warranty

* ... Ex Stock Version

* Linearization Chart in Required Range Must Be Added

** Fill in Value and Units (for Ranges of Potentiometr in Percent)