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
  Ⓟ II (1) G [Ex ia Ga] IIC,
  Ⓡ II (1) D [Ex ia Da] IIIIC

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.

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
then 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.
Technical specifications

Supply voltage:
- standard version 8.0 to 35 VDC
- version EI1 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:
Resistive 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:

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

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

Total accuracy (higher value applies):

<table>
<thead>
<tr>
<th>Input</th>
<th>Basic accuracy</th>
<th>Temperature coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>All inputs</td>
<td>≤ ±0.05 % of span</td>
<td>≤ ±0.005 % / °C</td>
</tr>
<tr>
<td>Pt100, Pt1000</td>
<td>≤ ±0.1 °C</td>
<td>≤ ±0.005 °C / °C</td>
</tr>
<tr>
<td>Ni100</td>
<td>≤ ±0.2 °C</td>
<td>≤ ±0.005 °C / °C</td>
</tr>
<tr>
<td>TC, type E, J, K, L, N, T, U</td>
<td>≤ ±0.5 °C</td>
<td>≤ ±0.025 °C / °C</td>
</tr>
<tr>
<td>TC, type B, R, S, W3, W5</td>
<td>≤ ±1 °C</td>
<td>≤ ±0.1 °C / °C</td>
</tr>
<tr>
<td>Linear resistance</td>
<td>≤ ±0.1 Ω</td>
<td>≤ ±5 mΩ / °C</td>
</tr>
<tr>
<td>Voltage</td>
<td>≤ ±10 μV</td>
<td>≤ ±0.5 μV / °C</td>
</tr>
</tbody>
</table>

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:
≤ (V_supply - 8) / 0.023 [Ω]

Dimensional drawings

Case with mounted spring terminals:

Case with mounted screw terminals:
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Electrical connection

Output:

![Diagram of electrical connection]

Input:

![Diagram of electrical connection]

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.

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<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P5335</strong></td>
<td>Single-channel and double-channel universal transmitter for a DIN rail with HART communication</td>
</tr>
<tr>
<td><strong>L10</strong></td>
<td>Single-channel transmitter with removable screw terminals (plus compensation terminal CTB1)</td>
</tr>
<tr>
<td><strong>L11</strong></td>
<td>Single-channel transmitter with removable screw terminals</td>
</tr>
<tr>
<td><strong>L12</strong></td>
<td>Single-channel transmitter with removable spring terminals</td>
</tr>
<tr>
<td><strong>L20</strong></td>
<td>Double-channel transmitter with removable screw terminals (plus compensation terminals CTB1 and CTB2)</td>
</tr>
<tr>
<td><strong>L21</strong></td>
<td>Double-channel transmitter with removable screw terminals</td>
</tr>
<tr>
<td><strong>L22</strong></td>
<td>Double-channel transmitter with removable spring terminals</td>
</tr>
</tbody>
</table>

**Code Settings**

- **NR** Without requirements for the range and input setting (preset - Pt100, 3-wire sensor connection, 0 to 100 °C)
- **OR** Range and other parameters setting according to configuration sheet DB0998

**Code Calibration**

- **KPPS** Certificate of calibration, transmitter calibration in five equally spaced points in the set range
- **ET** ATEX (Ex) II (1) G (Ex ia Ga) IIIC, (Ex) II (1) D (Ex ia Ds) III C

**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

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

5 years warranty