P5315
Precision Programmable Transmitters with Galvanic Isolation

- **Precision transmitter for resistance and thermocouple sensors and potentiometers.**
- **Linearized output signal 4 to 20 mA.**
- **Accuracy 0.1% for ranges reduced to the 1/5 of input range (for calibrated range to 0,07 %).**
- **Dual channel version for a DIN rail with exchangeable screw or spring terminals.**
- **Span adjustability from 1% to 100%.**
- **Adjustable by LHPConf handheld configurator or by LHPWinConf program and standard HART modem.**
- **Extended warranty 5 years.**
- **Galvanic isolation 1000 VAC.**
- **Intrinsically safe headmounted version (Ex) II 1GD or (Ex) II (1)GD for a DIN rail.**

Application

Transmitters P5315 H10 and P5315 Lxx are used for conversion of a resistance or voltage temperature signal from a resistance or thermocouple temperature sensor to a linearized current loop output signal 4 to 20 mA. The transmitter type H1x is designed for installation into an industrial sensor head type A or B according to DIN 43729. Transmitters P5315 include galvanic isolation of inputs and outputs and are suitable for also in applications with many measuring points and for thermocouples.

Description

Input signals, switched over according to the input configuration are processed by an A/D transmitter and transformed into a digital signal that is transferred to a micro-computer; according to the preset configuration and after filtration of noise there are calculated all measured variables. These values are then used for calculation of the primary variable (temperature) and according to selected range, the output current is also calculated.

One resistance sensor (two-, three- or four-wire) can be connected to the input. In case of a two-wire connection, entering of a constant value of the loop resistance compensation during configuration of the transmitter can compensate the resistance of input leads. In other cases, the leads resistance is compensated automatically.

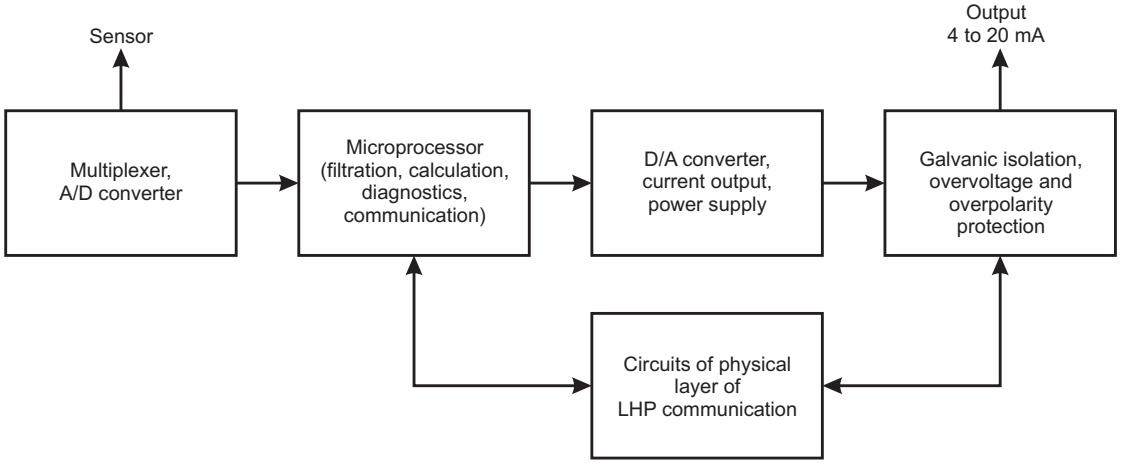
A thermocouple can be also connected to the input. Temperature of the thermocouple cold junction is compensated according to configuration, either by the inner temperature sensor of terminal block, by the entered constant temperature or by external sensor. The inner sensor guarantees maximum accuracy and stability of cold junction temperature measurement of P5315 H10. For accurate measurement of thermocouples by transmitters P5315 Lxx for a DIN rail is needed to use setting for external compensation and use compensation terminal CTB3, respectively CTB4.

In addition to standard resistance sensors, there may be also processed signals of potentiometer positions that are measured in percents. One limit position is 0 % and the other is 100 %, independently on the value of the total resistance. In case there is necessary to measure position of the potentiometer as a resistance, there may be used the configuration for measurement of the resistance.

Output of the transmitter is analogue signal of the current loop 4 to 20 mA. The current output can be also used for testing of the current loop and associated apparatus. Communication is used mostly for configuration of the transmitter and is not designed for distances over approximately 10 m. The transmitter can be set up using a manual configurator LHPConf (HARTConf) or a PC with the program LHPWinfConf and HART modem HARTMod (MH-02) or equivalent communication interface. The transmitter communicates through an own protocol LHP that is partially compatible with the protocol HART, uses the same connection, however, communication is guaranteed only for short distances and there are implemented only few commands. This interface is designed for changes of configuration. Continuous communication may influence accuracy of measurement.

3.4 Block diagram

Transmitter P5315



Technical specifications

Supply voltage:

P5315	11 to 35 VDC
Model EI1 and EI3	11 to 30 VDC

(internally protected against polarity inversion and short-term overvoltage)

Range of ambient temperatures:
-40 to 85 °C

Reference ambient temperature:
23 ± 5 °C

Housing:

Model H10	IP 40, terminals IP 00 after installation to the head the housing is given by the design of the head
Model Lxx	IP 20

Humidity:

Model H10	0 to 100% RH with condensation after installation to the head
Model Lxx	10 to 80% RH without condensation

Connection of wires:

Model H10	Screw terminals for cross section 0.5 to 1.5 mm^2,torque 0.5 Nm.
Model Lxx	Spring or screw terminals for cross section 0.5 to 1.5 m^2, torque 0.5 Nm.

Warm-up time: 5 s
Type of DIN rail: TS35 acc. to DIN 46277

Dimensions (HxWxD):

Model H10	dia. 44 x 24 mm
Model Lxx	107 x 120 x 23 mm

Material of cases:

Model H10	polycarbonate
Model Lxx	polyamide

Weight:

Model H1x	40 g
Model Lxx	100 g

Working position:
arbitrary

Input

Input ranges: see ordering table

Digital accuracy:

Input 0 to 400 Ohm	≤ ± 0.07% SR or ≤ ± 0.06 Ohm or corresponding temperature
Input 0 to 4000 Ohm	≤ ± 0.07% SR or ≤ ± 0.6 Ohm or corresponding temperature
Input -15 to 70 mV	≤ ± 0.07% SR or ≤ ± 0.0015 mV or corresponding temperature

(the greatest value is valid; SR ... Span of set range; accuracy of measured value of digital output LHP)

Input signal:
resistance signal of temperature sensor or potentiometer, voltage signal of thermocouple

Sensor connection:

resistance sensor	two-, three-, four-wire
voltage sensor (TC)	two-wire
potentiometer	three-wire or four-wire
compensation using an external sensor	two-wire

Maximum wire resistance for resistance ranges:
< 20 Ohm (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: < ±0.7 °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 MOhm

Output

Output signal:
two-wire 4 to 20 mA or 20 to 4 mA

Total measurement error on the analog output of P5315:

range 0 to 400 Ohm	≤ ± 0.1% SR or ≤ ± 0.08 Ohm or corresponding temperature
range 0 to 4000 Ohm	≤ ± 0.1% SR or ≤ ± 0.8 Ohm or corresponding temperature

range -15 to 70 mV ≤ ± 0.1% SR or ≤ ± 0.02 mV
or corresponding temperature
range Pt100, Pt1000, Ni100, Ni1000
≤ ± 0,1 % SR or ≤ ± 0,2 °C
range Pt500 ≤ ± 0,1 % SR or ≤ ± 0,4 °C
range TC J, K, T, E, L typ. ≤ ± 0,1 % SR or 0,5 °C
range TC R, S, B, C typ. ≤ ± 0,1 % SR or 2 °C
(the greatest value is valid)

Characteristics:
linear with temperature or linear with input quantity, other upon request

Adjustability of the range:
±1% to ±100% of the input range

Adjustability:
Inside the input range (the given measurement errors apply for suppression of the beginning ≤ 100% of the range)

Time constant (95 %):
adjustable 0.5 to 60 s (2 measurements per second)

Load resistance:
R_L [Ohm] ≤ (UN [V] - 9) / 0.022

Dielectric strength of galvanic isolation of P5315:
1000 VAC (test)

Dielectric strength of between channels P5315 L2x:
2500 VAC (test)

Isolation resistance of galvanic isolation of P5315 :
min. 100 MOhm

Supplementary parameters

Output current limitation:
Signal 3.8 to 20.5 mA acc. to NAMUR NE43
Limitation of error current to approx. 22 mA

Indication of sensor or transmitter error:
Optionally by current > 21 mA or < 3.6 mA
acc. to NAMUR NE43

Supply voltage effect:
≤ ±0.005 % / V

Influence of ambient temperature changes:
range 0 to 400 Ohm (≤ ± 0.1% SR or ≤ ± 0.08 Ohm or corresponding temperature) / 10 °C
range 0 to 4000 Ohm (≤ ± 0.1% SR or ≤ ± 0.8 Ohm or corresponding temperature) / 10 °C
range -15 to 70 mV (≤ ± 0.1% SR or ≤ ± 0.02 mV or corresponding temperature) / 10 °C
(the greatest value is valid)

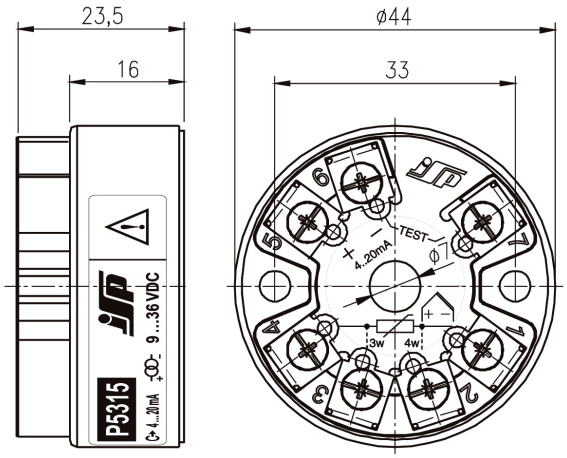
Long-term stability:
≤ ± 0.2 % of the preset range per 2 years

Electromagnetic compatibility:
Radiation and immunity acc. to EN 61326-2-3:2007

MV ... measured value
SR ... span of set range

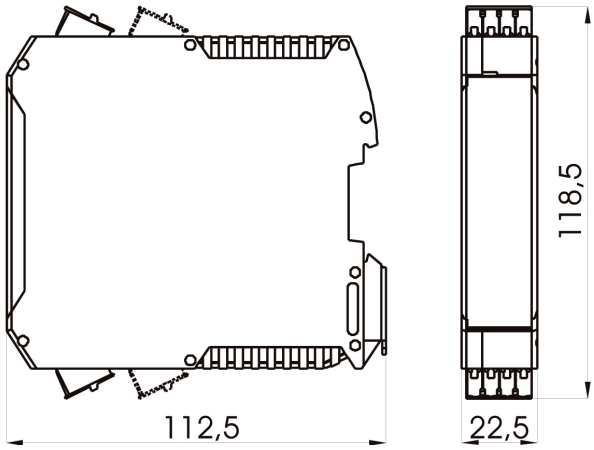
Dimensional drawings

Model P5315 H10

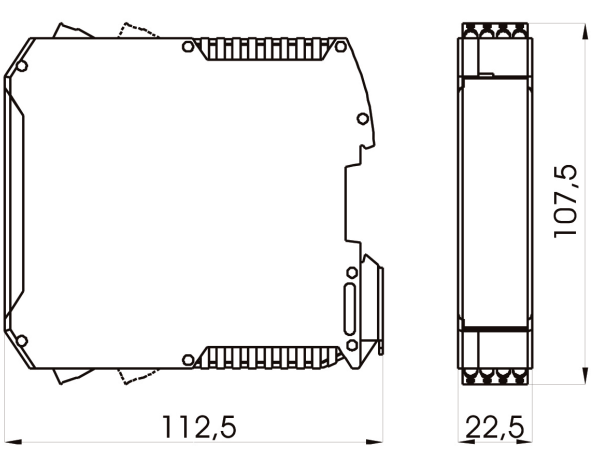


Model P5315 L10/L20

Case with mounted spring terminals

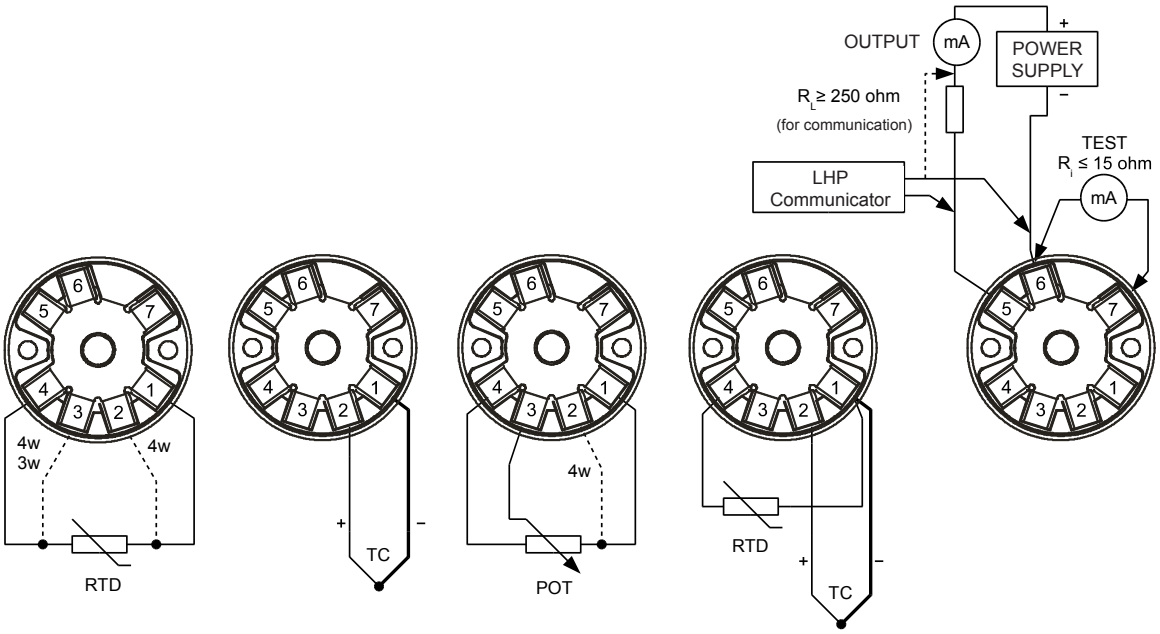


Case with mounted screw terminals



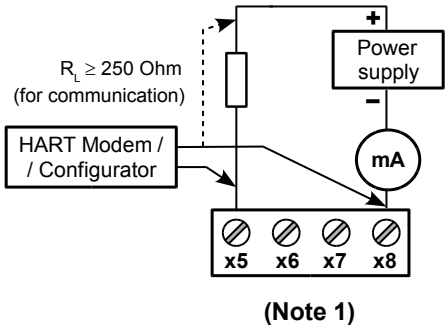
Electrical connection

Model P531x H1x

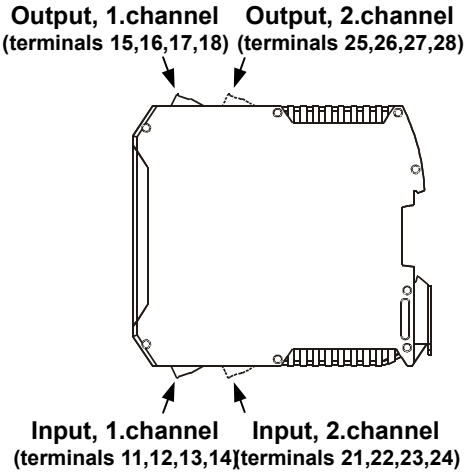


Model P5315 L1x/L

Output:

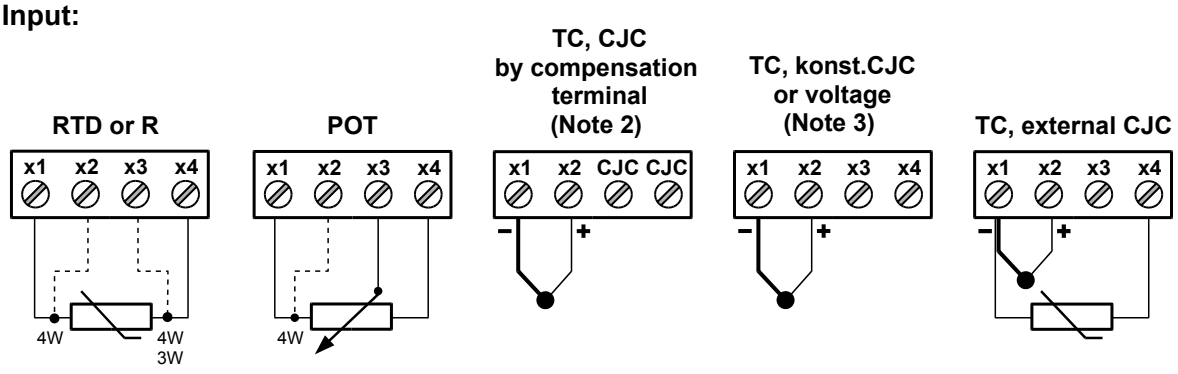


(Note 1)



Model P5315 L1x/L

Input:



	Type	Description
•	**P5315**	**Precision programmable transmitter with LHP communication with galvanic isolation**
	Code	**Version**
•	**H10**	**Into head B according to DIN**
•	**L10**	**Single channel for a rail DIN TS 35 with removable screw terminals (plus compensation terminal CTB3)**
•	**L20**	**Dual channel for a rail DIN TS 35 with removable screw terminals (plus compensation terminals CTB3 and CTB4)**
	Code [1]	**Setting requirements**
•	**NR**	**No requirement for setting of the range and input (preset - C2 R11 RL 0 °C RH 100 °C DP 4s ECH)**
	Code [1]	**Input configuration**
•	**C1**	**Two-wire connection of resistance sensor with constant correction of line resistance ….. Ohm**
•	**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 TC or voltage sensor (without CJC or CJC temperature 0 °C)**
•	**C7**	**Connection of TC (with internal CJC), only for H10**
•	**C8**	**Connection of TC or voltage sensor (with external CJC by Pt1000 sensor or terminal CTB3 / CTB4)**
	Code [1]	**Input range and linearization**
•	**R01**	**Resistance (0 to 400 Ohm) without linearization**
•	**R02**	**Resistance (0 to 4000 Ohm) without linearization**
•	**R03**	**Potentiometer (total resistance 40 to 400 Ohm) without linearization, range given in %, limit positions 0 and 100 %**
•	**R04**	**Potentiometer (total resistance 400 to 4000 Ohm) without linearization, range given in %, limit positions 0 and 100 %**
•	**R05**	**Voltage (-15 to +70 mV) without linearization**
•	**R11**	**Pt100 (-200 to +850 °C), IEC 751, with linearization**
•	**R12**	**Pt500 (-200 to +850 °C), IEC 751, with linearization**
•	**R13**	**Pt1000 (-200 to +850 °C), IEC 751, with linearization**
•	**R14**	**Ni100 (-60 to +250 °C), DIN 43760 , with linearization**
•	**R15**	**Ni1000 (-60 to +250 °C), DIN 43760, with linearization**
•	**R51**	**Thermocouple "J" (-200 to +1200 °C), IEC 584, with linearization**
•	**R52**	**Thermocouple "K" (-200 to +1300 °C), IEC 584, with linearization**
•	**R53**	**Thermocouple "N" (-200 to +1300 °C), IEC 584, with linearization**
•	**R54**	**Thermocouple "R" (-50 to +1700 °C), IEC 584, with linearization**
•	**R55**	**Thermocouple "S" (-50 to +1700 °C), IEC 584, with linearization**
•	**R56**	**Thermocouple "T" (-250 to +400 °C), IEC 584, with linearization**
•	**R57**	**Thermocouple "B" (+100 to +1800 °C), IEC 584, with linearization, range can be set from 0 °C**
•	**R58**	**Thermocouple "E" (-200 to +950 °C), IEC 584, with linearization**
•	**R59**	**Thermocouple "L" (-200 to +900 °C), DIN 43710, with linearization**
•	**R60**	**Thermocouple "C" (0 to +2300 °C), N.I.S.T. Monograph 175, with linearization**
	R91 *	User defined linearization, resistance input, 0 to 400 Ohm
	R92 *	User defined linearization, resistance input, 0 to 4000 Ohm
	R93 *	User defined linearization, potentiometer, total resistance 40 to 400 Ohm, range X given in %, limit positions 0 and 100 %
	R94 *	User defined linearization, potentiometer, total resistance 400 to 4000 Ohm, range X given in %, limit positions 0 and 100 %
	R95 *	User defined linearization, voltage input or TC, -15 to 70 mV
	Code [1]	**Lower range value**
•	**RL** **	**Setting lower value (4 mA) (fill in value and units)**
	Code [1]	**Upper range value**
•	**RH** **	**Setting upper value (20 mA) (fill in value and units)**
	Code [1]	**Set-up damping of output signal**
•	**DP**	**Damping output (fill in number of seconds, standards 4 sec)**
	Code [1]	**Error current selection**
•	**ECL**	**Error output current lower than 3.6 mA**
•	**ECH**	**Error output current higher than 21 mA**
	Code	**Optional version**
	EI1	Intrinsically safe version (Ex) II 1G Ex ia IIC T4-T6 Ga, (Ex) II 1D Ex ia IIIC T106°C Da (only for P5315 H10)
	EI3	Intrinsically safe version (Ex) II (1)G [Ex ia Ga] IIC, (Ex) II (1)D [Ex ia Da] IIIC (only for P5315 Lxx)
•	**EN2**	**Non-incendive design (Ex) II 3G Ex nA [nL] IIC T4 Gc**
	Code	**Calibration**
	KPP5	Transmitter calibration in five equally spaced points of set range
	KPP52	KPP5 calibration for accuracy 0,07 % for ranges from 20 % to 100% of max. range
	Code	**Optional accessories**
•	**TB1**	**Two exchangeable spring terminals, only for P5315 L10**
•	**TB2**	**Four exchangeable spring terminals, only for P5315 L20**
•	**CTB3**	**Compensation terminal for measuring thermocouple sensors, channel No.1 (only for P5315 Lxx)**
•	**CTB4**	**Compensation terminal for measuring thermocouple sensors, channel No.2 (only for P5315 Lxx)**
•	**LHPWinCom**	**Set of configuration program LHPWinConf for PC (supported by WIN98/2000/NT/XP/Vista) and modem HARTMod**
•	**LHPConf**	**Field configurator for LHP transmitters, function of transmitter supply, without charging**
•	**HARTConf**	**HART-USB modem and field communicator for LHP and HART transmitters, function of transmitter supply supplied from USB or accumulator,**
•	**HARTMod**	**Miniature HART modem with galvanic isolation**
•	**USB-RS232C**	**Communication interface for to USB port of the PC**
•	**PT1000A**	**Compensation resistor Pt1000 (-30 to +150 °C) for external compensation of thermocouple**
	S51	Box for wall mounting of one transmitter to explosive atmosphere ((Ex) II 2G Ex d IIC T6,T5 Gb + (Ex) II 2D Ex t IIIC T50/60/80 °C Db)
	S52	Box for wall mounting of one transmitter with LED display to explosive atmosphere ((Ex) II 2G Ex d IIC T6,T5 Gb + (Ex) II 2D Ex t IIIC T50/60/80 °C Db)
•	**S54**	**Box for wall mounting (100x100x58 mm), housing IP 65 (for H1x versions)** [2]
•	**S55**	**Box for wall mounting (170x145x85 mm), housing IP 55 (for L1x versions)** [3]
•	**VH1**	**Cap for head form B for transmitter mounting (for H10 and H11 versions)**
•	**APT1**	**Adapter for flat head**

5 years warranty

Example of order: **P5315 H11 C3 R11 RL 0 °C RH 350 °C DP 4s ECL**
P5315 H10 NR (presetting: C2 R11 RL 0 °C RH 100 °C ECH)

• ... Ex stock version

* ... Linearization chart in required range must be added. ** ... Fill in value and units (for ranges of potentiometer in percent).

[1] … To distinguish setting of second channel write number "2" in front of the code, e.g. 2R11

[2] … Possibility of installing up to two transmitters [3] … Possibility of installing up to three transmitters

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