



Universal smart fully isolated converter with HART protocol to DIN rail

PRUDUCT MANUAL

Type IPAQ R520/ R520S/ R520X/ R520XS

APPLICATION

- To convert a resistance or thermoelectric sensor signal to a unified output signal 4 to 20 mA or 20 to 4 mA with digital signal (HART 6 protocol)
- For rail mounting according to EN 60715 ed. 2 (DIN rail TS 35)
- For explosive conditions in areas Zone 2, Zone 1 and Zone 0 pursuant to EN 60079-10 in case of using the converter R520X, R520XS
- safety certification according to IEC 61508-2 SIL2 (version R520S, R520XS)
- For the environment, where mechanical resistance is required pursuant to EN 60068-2-6 (class AH2) and seismic capability of the electrical equipment of the safety system of the nuclear power stations pursuant to IEC 980 (MVZ level SL-2).

DESCRIPTION

On the front side of the converter there is a terminals for connecting a PC (configuration unit). Terminals for connecting the sensor supply / evaluation are disposed in upper and lower parts.

The converter is powered from an external source and is equipped with polarity protection and EMC circuits. The converter is resistant to sensor interruption and short circuit. Converter is equipped with galvanic isolation, sensor error correction and the whole system, adjustable output function at sensor interruption and short-circuit, and signaling of low insulation resistance of the sensor (when using a sensor with a separate conductor).

The converter is set up by PC using ConSoft software and USB configuration modem (separately supplied, no power required for programming) or via HART communicator.

TECHNICAL DATA

Intrinsically safe version pursuant to EN 60079-0 and EN 60079-11 (version R520X, R520XS):

Ex II 2(1)G Ex ia [ia Ga] IIC T6 ...T4 Gb

Intrinsically safe circuit parameters:

Output (terminals 6 and 7):	Input (terminals 1 to 5):
$U_i \leq 30 \text{ V DC}$	$U_o \leq 6,6 \text{ V DC}$
$I_i \leq 100 \text{ mA}$	$I_o \leq 27,3 \text{ mA}$
$P_i \leq 900 \text{ mW}$	$P_o \leq 46 \text{ mW}$
$L_i: 10 \mu\text{H}$	$L_o: 25 \text{ mH}$
$C_i: 12,1 \text{ nF}$	$C_o: 581 \text{ nF}$

Zero point: anywhere in the limited range

Galvanic isolation: 1500 V AC/ 1 min

Ingress Protection pursuant to EN 60529: IP 20 / IP 00

Weight: approx. 70 g

Terminals type: screw, wire cross section 1,5 mm²

Sensor current Pt100: -0,3 mA

Input impedance T/C: >10 MΩ

Maximum wire resistance:

- Measuring resistance
 - o 20 Ω / wire for 2-wire connection
 - o 50 Ω / wire for 3 and 4-wire connection
- Thermocouple
 - o 10000 Ω (loop including thermocouple)

Measuring range:

Measuring resistance: 2, 3, 4 wire connection

- Pt100 ($\alpha=0.00385 \text{ [K}^{-1}\text{]}$) -200...+850°C
- Pt_x 10 ≤ x ≤ 1000 ($\alpha=0.00385 \text{ [K}^{-1}\text{]}$) customer range
- Pt100 ($\alpha=0.003916 \text{ [K}^{-1}\text{]}$) -200...+850°C
- Ni100 -60...+250°C
- Ni120 -60...+250°C
- Ni1000 -50...+180°C
- Cu10 -50...+200°C

Potentiometer / resistance: 2, 3, 4 wire connection

100...4000 Ω

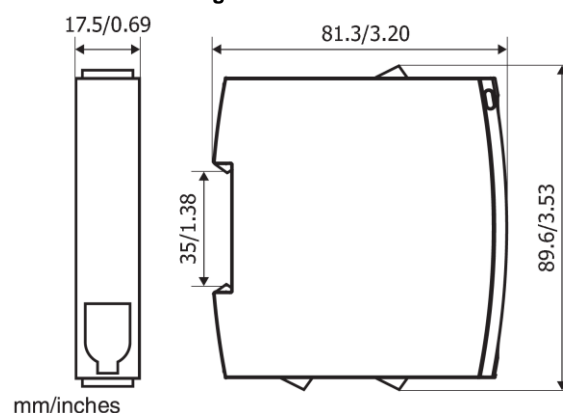
Thermocouple: B, C, D, E, J, K, N, R, S, T

Input mV/V: -10...+1000 mV / -10...+100 V

Output mA: 4 - 20 mA or 20 - 4mA,
temperature and customer adjustable



Dimensional drawing



OPERATION CONDITIONS

Ambient temperature:

R520	-20 to +70 °C
R520X	-20 to +50 °C (T6)
	-20 to +65 °C (T5)
	-20 to +70 °C (T4)

Relative ambient humidity:

5 to 95 % without condensation

Vibrations pursuant to EN 60068-2-6: up to 10G

Converter power supply:

R520	from source SELV
R520X	from intrinsically safe source Ex ia

Type of power supply:

R520	10 - 36 V / DC
R520X	10 - 30 V / DC

Stabilization time: 10 minutes

Electromagnetic compatibility EMC:

Emissions and resistance comply with the standard EN 61326-1 criterion A and EN 61326-3-1

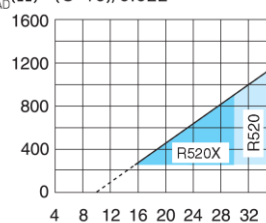
Load resistance of current output signal:

$$R_{ZC \text{ max}} = \frac{U_n - 8}{0,022} [\Omega, V] \quad R_{ZC} = R_Z + R_V [\Omega]$$

where $R_{ZC \text{ max}}$... the maximum total load resistance R_{ZC}
 U_n ... the supply voltage of the power supply
 R_V ... the wire resistance in the power loop
 R_Z ... the load resistance

Output load diagram:

$$R_{LOAD} [\Omega] = (U - 10) / 0.022$$



METROLOGICAL DATA

Input signal:

- from a resistance sensor Pt100 pursuant to EN 60715 in 2, 3 or 4-wire connection, $\alpha = 0,00385$ [K-1]
- from thermocouple B, J, K, N, S, T pursuant to EN 60584-1
- other input signals see www.inor.com

Double input signals:

- from two resistance sensors Pt100 pursuant to IEC 60751 in 2, 3 or 4-wire connection, $\alpha = 0,00385$ [K-1]
- from two thermocouples B, J, K, N, S, T pursuant to IEC 60584-1

enable alternative outputs:

- measured value of the sensor 1 or 2
- calculated values from the sensor 1 and 2
 - o difference T1 – T2 or T2 – T1
 - o diameter 0,5x (T1 + T2)
 - o minimum value of values T1 and T2
 - o maximum value of values T1 and T2
 - o redundancy T1 or T2 in case of sensor failure

Output signal:

4 to 20 mA or 20 to 4mA with digital signal (HART 6 protocol), linear with temperature

Sensor break and short-circuit sensor (adjustable):

≤ 3,6 mA or >21 mA

Detection of low insulation resistance of the sensor:

adjustable minimum insulation resistance

Detection of deviation between two sensors:

adjustable maximum deviation value

Long-term stability: ±0,05% form range in 5 years

Response time: 300ms simple input

600ms double input

Typical accuracy: 0.05 % from measuring range max ±0,1°C

CERTIFICATION:

Version R520X and R520XS

Non-explosiveness Ex ia [ia Ga] IIC T6-T4 Gb,

EU-Type Examination Certificate pursuant to the 2014/34/EU, KIWA 14ATEX0023 X

SIL2 Certificate pursuant to the IEC 61508-2

INOR 08/11-47 R002 V2R1 Exida FMEDA report

Configuration kit ICON-X

- Non-explosiveness Ex II (1)G [Ex ia Ga] IIC
EU-Type Examination Certificate pursuant to the 2014/34/EU, KIWA 16 ATEX 0011 X

CONVERTERS ORDERIN NUMBERS

R520	70R5200010
R520, SIL 2 compatible	70R5200S10
R520X	70R520X010
R520X, SIL 2 compatible	70R520XS10
PC configuration kit (UBS) ICON	70CFGUS001
PC configuration kit (UBS) ICON-X	70CFGUSX01
HART PC modem (UBS)	70MEM00003
Configuration	70CAL00001

CONVERTER SETTING

The converter is set up by PC using ConSoft software and USB configuration modem (separately supplied, no power required for programming) or via HART communicator.

If an ICON-X certified interface is used, the converter can be connected to a sensor that is located in a **explosive atmosphere**.

Without using a USB configuration modem, the converter requires power to be programmed, for communication, $R_{zc} = \text{min. } 250 \Omega$ and $U_n = \text{min. } 15,5 \text{ V DC}$ (according to load characteristics).

Maximum cable length calculation:

$$L_{\text{max}} = \frac{65 \times 10^6}{R_{zc} \times C} [\Omega, \text{pF/m, m}] \quad R_{zc} = R_z + R_v [\Omega]$$

L – cable length

R_{zc} – total load resistance

R_v – wire resistance in the power loop

R_z – load resistance

C – cable capacity

Table 1 - Maximum cable length for typical cable values 1 mm²

Cable insulation	PVC	PE	XLPE
Maximum cable length [m]	600	1100	2000

INSTALLATION AND CONNECTION

MECHANICAL MOUNTING

The device is mounted on a standard EN 60715 rail (TS 35 DIN rail) or on a wall using a bracket.

ELECTRICAL CONNECTION

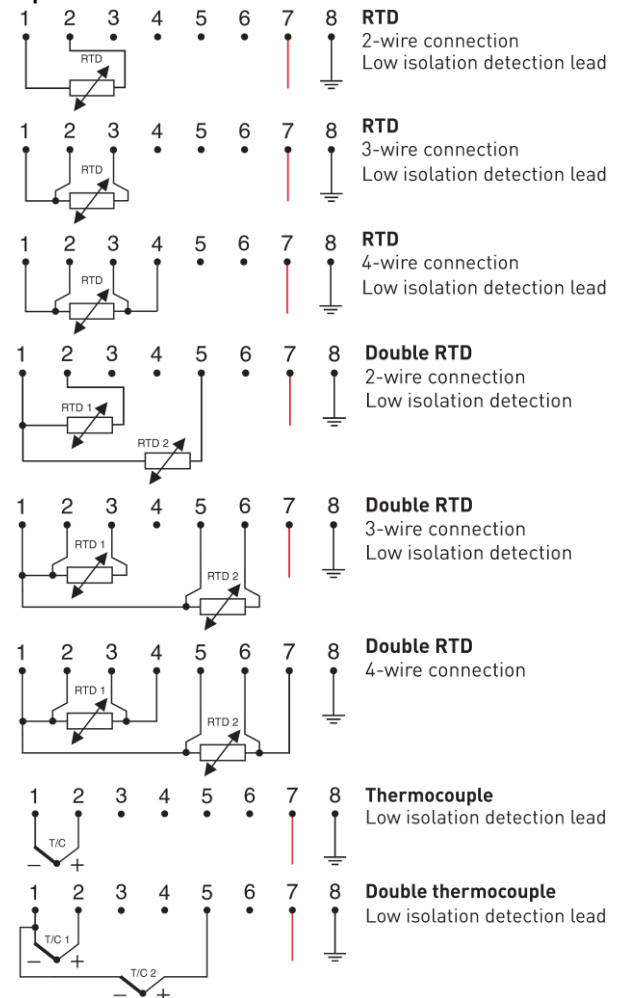
The electrical connection may be only realized by qualified workers.

Connect the input, output and power supply according to the wiring diagram. Thermocouples (T / C) must be connected either directly to the input terminals or by means of an extension, respectively compensating wires.

CONVERTER INSTALLATION IN CONDITIONS WITH EXPLOSIVE GAS ATMOSPHERE

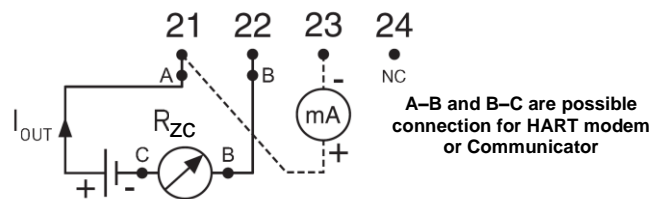
Only R520X and R520XS converters can be installed in an explosive gas atmosphere. An intrinsically safe power supply approved for powering intrinsically safe equipment must always be used.

Input connections:



RTD - measuring resistance T/C – thermocouple

Output connections:



STORAGE

The converters may be stored on conditions corresponding to the set of combinations of classes IE 11/1K3 pursuant to EN 60721-3-1 (i.e. in places with temperature between -5 to 45 °C and humidity between 5 to 95%, without a special threat of an attack with biological agents, with vibrations of small significance and not situated close to sources of dust and sand).

More information at www.inor.com

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