C520/C520X / R520/R520X HANDBOOK

HART COMMUNICATION PROTOCOL

SIL2 Compatible

CE

Ex

5 YEAR WARRANTY

INOR

INOR SPECIALISTS IN INDUSTRIAL TEMPERATURE MEASUREMENT

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1.1 Intended use

The C520 is an intelligent, universal HART-compatible two-wire in-head transmitter for temperature, resistance or voltage measurements in an industrial environment. It has a Non-Incendive approval for use in potentially explosive atmosphere Zone 2 and Division 2.
The C520 is optionally available in an intrinsically safe version for installation in potentially explosive atmospheres. These devices are labeled with the X symbol – C520X and are approved for use in Zone 0, 1 and 2 and Division 1 and 2.
The C520/C520X is intended for installation in a B connection head or larger according to DIN-43729.

The R520 is an intelligent, universal HART-compatible two-wire rail-mount transmitter for temperature, resistance or voltage measurements in an industrial environment. It is approved for Non-Incendive use in Zone 2 and Division 2.
The R520 is optionally available in an intrinsically safe version for installation in potentially explosive atmospheres. These devices are labeled with the X symbol – R520X. The IPAQ R520X is approved for installation in Zone 1 and 2 while the input can be connected to Zone 0. Also Installation in Division 1 is possible.
The R520/R520X is intended for installation on a top-hat rail according to DIN EN 50022.

ATTENTION!

Responsibility for the use of the device with regard to suitability, intended use and area of application lies solely with the user.
The manufacturer shall not be liable for damage resulting from improper use or use for other than the intended purpose.

1.2 Product liability and guarantee

Use for other than the intended purpose or improper installation and operation may lead to loss of the guarantee. The guarantee shall likewise be void if the device is damaged or its function otherwise impaired.
Inor Process AB hereby guarantees that the product will be free of material and workmanship defects for a period of five (5) years from the date of delivery ("limited guarantee"). This limited guarantee refers to repairs or exchanges, and is only valid for the first end user of the product.
The "General conditions of sale" forming the basis of the purchase contract are also applicable.

1.3 Certifications

1.3.1 Certifications IPAQ C520X

ATEX: Approval ITS 09 ATEX 26304X

CE 0539  II 1G Ex ia IIC T4 to T6

USA: FM approval *(PENDING)*IS / I / 1, 2 / A-D / T4 to T6; cntl dwg 88DRW00025; Entity
I / 0, 1, 2 / AEx ia IIC T4 to T6; cntl dwg 88DRW00025; Entity

Canada:	FM approval *(PENDING)*	IS / I / 1, 2 / A-D / T4 to T6; cntl dwg 88DRW00025; Entity I / 0, 1, 2 / Ex ia / IIC / T4 to T6; cntl dwg 88DRW00025; Entity

1.3.2 Certifications IPAQ C520

ATEX: Approval ITS 09 ATEX 26305X

	CE Ex II 3G	Ex nL IIC T4 to T6
USA:	FM approval *(PENDING)*	NI / I, II / 2 / A-G / T4 to T6; cntl dwg 88DRW00025; Entity I / 2 / AEx nA IIC T4 to T6; cntl dwg 88DRW00025; Entity
Canada:	FM approval *(PENDING)*	NI / I, II / 2 / A-G / T4 to T6; cntl dwg 88DRW00025; Entity I / 2 / Ex nL / IIC / T4 to T6; cntl dwg 88DRW00025; Entity

1.3.3 Certifications IPAQ R520X

ATEX: *(PENDING)*

	CE Ex II 2/1G	II 2 /1 G Ex ia IIC T4-T6
USA:	FM approval *(PENDING)*	IS CL I, DIV 1, Groups A – D; Class I, Zone 1 & 2, AEx ia
Canada:	FM approval *(PENDING)*	Class I, Div. 1 per Intrinsic Safety, CL I, Zone 1 & 2, Ex ia Ex ia IIC Ex ia IIC T4-T6

1.3.4 Certifications IPAQ R520

ATEX: *(PENDING)*

	CE Ex II 3G	Ex nL IIC T4-T6
USA:	FM approval *(PENDING)*	NI CL I, DIV 2, GP A – D Class I, Zone 2, AEx nC
Canada:	FM approval *(PENDING)*	Class I, Division 2 CL I, Zone 2, Ex nL Ex nL IIC Ex nL IIC T4-T6

1.3.5 SIL Certifications

Compliance: Functional safety acc. to IEC 61508
Safety Integrity Level: SIL 2
For details, we refer to the separate document: *SIL – Safety Manual.*

1.3.6 EC directive compliances

The measuring device complies with the statutory requirements of the following EC directives:
EMC - Directive 2004/108/EC
ATEX - Directive 94/9/EC

The manufacturer's Declaration of Conformity can be viewed and downloaded from INOR website **www.inor.com.**
Select Download and Documentation.

Inor Process AB certifies successful testing of the product by applying the CE mark.

1.4 Manufacturer's safety instructions

The measuring device has been built and tested in accordance with the current state of the art, and complies with the relevant safety standards.
However, dangers may arise from improper use or use for other than the intended purpose.
For this reason, observe all of the safety instructions in this document carefully.

1.4.1 Notes about the documentation

In addition to the safety rules and industrial safety regulations in this documentation, national and regional safety rules and industrial safety regulations must also be observed.

1.4.2 Symbol conventions

For greater clarity, the following symbols are used in this documentation:

DANGER!, WARNING!, ATTENTION!, CAUTION!

This symbol indicates general dangers.
All warnings must always be observed. Even partial failure on your part to observe them can lead to serious damage to health, damage to the device or to the user's system components.

DANGER!

This symbol is used to identify dangers when working with electric current.
Work on the device's electrical and electronic components may only be performed by qualified personnel with the appropriate training.

DANGER!

This symbol indicates dangers in areas with potentially explosive atmospheres, for example those which may arise during installation and operation of explosion-proof devices.

Special regulations apply for use in areas with potentially explosive atmospheres; these must always be observed in order to ensure safe use in such areas. Installation, set-up, operation and maintenance of the device may only be performed by qualified persons with training in explosion protection.

Important note!, Note!, Information!

This symbol identifies important notes and information for working with the device.

Legal note!

This symbol identifies references to legal and normative regulations.

Action

This symbol identifies all instructions for actions; the actions must be performed by the user in the specified sequence.

Effect

This symbol identifies all of the important effects of the previous actions.

2.1 General Description

The C520/C520X / R520/R520X are intelligent two-wire universal transmitters for measurement with up to two user programmable channels in single, differential, average, minimum or maximum mode.

The C520/C520X / R520/R520X are intended for

- Temperature measurements with single or dual resistance thermometers
- Temperature measurements with single or dual thermocouples
- Temperature measurements with one resistance thermometers and one thermocouple
- Temperature difference measurements with resistance thermometers
- Measurements with potentiometers
- Voltage measurements in a range -10...1000 mV

To increase reliability and stability of the system, C520/R520 transmitters have dual sensor inputs. The dual sensor inputs enable new safety features such as sensor redundancy and sensor drift monitoring.

C520/R520 are certified by EXIDA according to IEC 61508 for use in SIL 2 rated Safety Instrumented Systems (SIS). For safety instructions see the safety manual.

The C520/R520 are Non-Incendive versions for use in areas with potentially explosive atmospheres, Zone 2 and Division 2.

The C520X/R520X are Intrinsically Safe versions for use in areas with potentially explosive atmospheres, Zone 0, 1 and 2 and Division 1 and 2.

The C520/C520X are designed for installation in a B connection head according to DIN 43729 or larger.

The R520/R520X are designed for installation on a top-hat rail according to DIN EN 50022.

The two wire universal C520/C520X / R520/R520X transmitters are HART® 5 and 6-compatible. Configuration of the C520/R520 transmitters is possible with

- HART® 5 and 6 protocol via 4...20 mA output circuit
- HART® 5 and 6 handheld terminal
- The graphic user interface DTM
- The third part PC software with a FSK modem for HART® 5 and 6 communication
- PC configuration software ConSoft with PC Configuration Kit - ICON

The PC configuration software ConSoft is used for configuration, display and documentation. The current ConSoft version is available for downloading on our website **www.inor.com**.

2.2 Identification

The transmitter can be identified by the information in the label, see below.

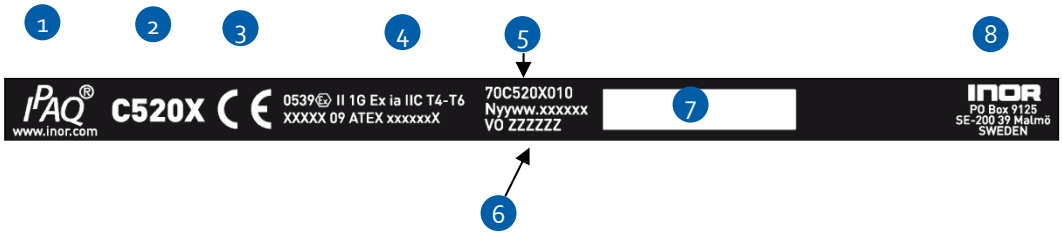


Figure 1: Round label - IPAQ C520X can be used in Category 1, 2 and 3, Zones 0, 1 and 2, Divisions 1 and 2

1 Family name
2 Model name of transmitter
3 CE mark (EC conformity)
4 Technical data (see Chapters 1.3.1, 6.2.3 and 6.2.4 user manual for information)
5 Ordering code (Part No)
6 Serial number and batch number
7 Printable field, sensor configuration
8 Manufacturer of transmitter and address

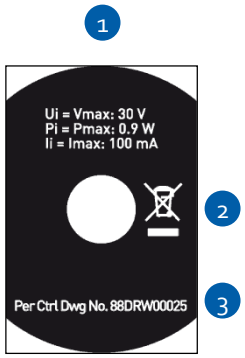
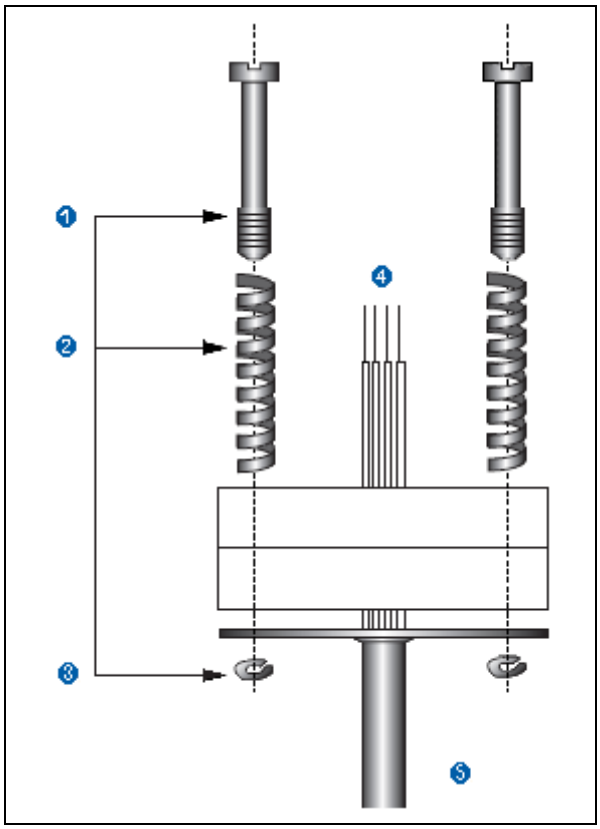


Figure 2: Bottom label - IPAQ C520X

1 Electrical data for output (see Chapter 6.2.3 user manual for information)
2 An electronic/electric device waste marking (see Chapter 7.2 user manual for information)
3 Control drawing number

3.1 Installation of the C520/C520X

The C520/C520X is intended for installation in DIN B connection heads or larger. The large Ø 7 mm / 0.28 inch center hole (see Chapter 6.1.3) facilitates the electrical connection of the measurement sensor and the installation.



1 Screw, M4
2 Spring
3 Lock washer
4 Pt100
5 Protective tube

Figure 3: Connection head installation kit 70ADA00017

ATTENTION!

The C520 transmitter may not be installed in potentially explosive areas other than Zone 2 and Division 2. In other potentially explosive areas, the C520X must be used.
The transmitter C520X must be supplied by an intrinsically safe power supply unit or Zener barrier placed outside of the potentially explosive zone. For Zone 2/Div 2 applications a Class 2 power supply placed in safe area is needed.

ATTENTION!

The C520X transmitter must be installed in a housing with the protection rating IP 20 or better according to EN 60 529 / IEC 60529.
IPAQ C520 must be mounted in an enclosure with at least IP 54 according to EN 60 529 / IEC 60529 for use in Zone 2 or Division 2.

IMPORTANT NOTE!

Ambient temperature considerations

The C520/C520X temperature transmitter has been developed for an ambient temperature range from -40 to 85 °C (-40 to +185 °F). Please also note that the ambient temperature is also dependent on the temperature category in Section 6.1.5 and 6.2.4, Ex data of the ambient temperature.

The process temperature is also transferred to the transmitter housing via the protective tube. If the process temperature is close to or exceeds the maximum specified process temperature, then the temperature in the transmitter housing can rise above the maximum permissible ambient temperature. Always check that the ambient temperature where the transmitter is installed is always within the permissible range. One way to decrease heat transfer via the protective tube is to make the protective tube longer or in general to install the transmitter farther away from the heat source. The same safety measures can be taken if the temperature is below the specified minimum temperature.

3.2 Installing the R520/R520X

The R520 / R520X transmitter is intended for installation on a top-hat rail according to DIN EN 50022.

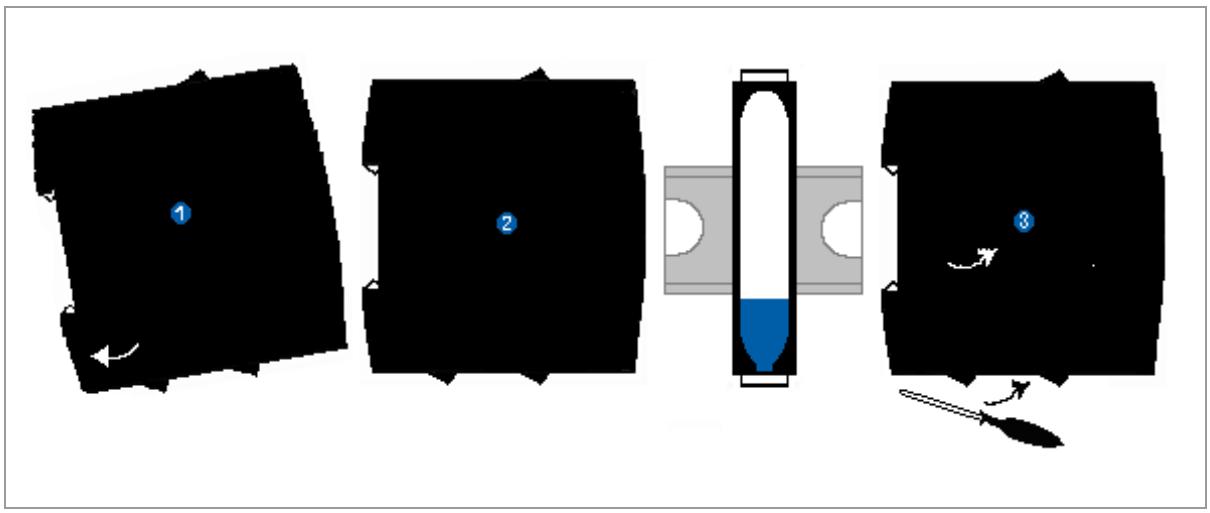


Figure 4: Rail installation

1 Fix the upper part of the transmitter onto the rail

2 Press the lower part of the transmitter against the rail.

3 To remove the transmitter, use a screwdriver to bend the locking device using a small screwdriver. Carefully pull the transmitter in the forward direction.

4.1 Safety instructions

ATTENTION!

Any work on the device may only be performed by trained and qualified personnel. The regional industrial safety and other safety regulations must always be observed.

ATTENTION!

Observe the national regulations for electrical installations!
Any work on the electrical connections may only be performed in the de-energized state.
Observe the voltage specifications on the rating plate!
Observe the relevant installation regulations in your country!
The transmitter is protected against polarity reversal. No damage will occur to the device if the polarity of the supply voltage is switched. The output will then indicate o mA.

ATTENTION!

When connecting devices with an Ex certificate, the corresponding chapters and the instructions in this manual must be observed.
The transmitter must be supplied with an intrinsically safe power supply unit or Zener barrier outside of the potentially explosive zone.

4.2 The C520/C520X connections

The input and output signals and the power supply must be connected in accordance with the following illustrations. The transmitter is easy to install with the Inor connection head installation kit (see ordering information Chapter 7.1). To avoid measuring errors, all cables must be connected properly and the screws tightened correctly.

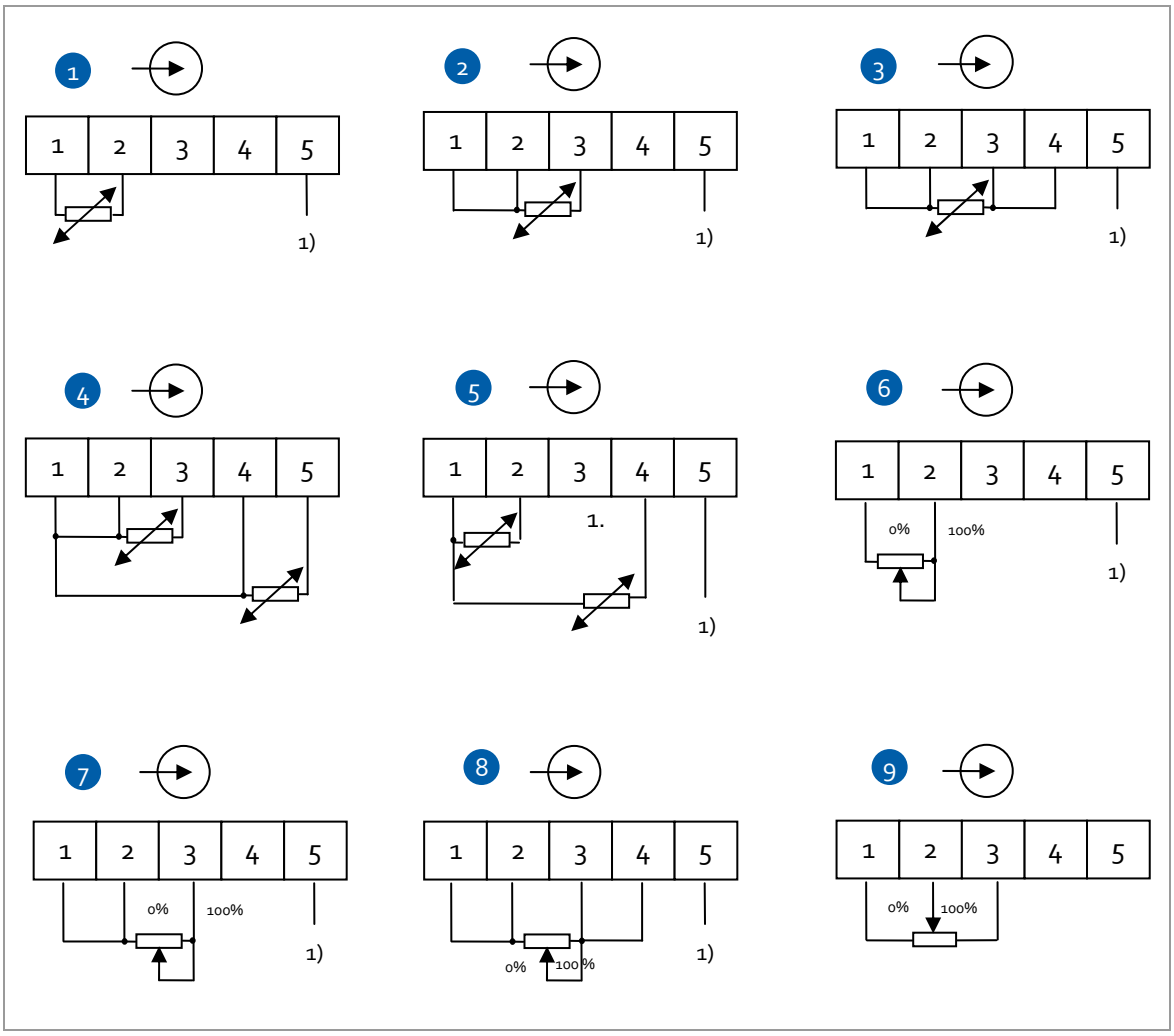


Figure 5: Installation diagram, RTD resistance and potentiometer measurement C520/C520X

1 Pt100...Pt1000, Ni100, Ni120, Cu10 2-wire connection
2 Pt100...Pt1000, Ni100, Ni120, Cu10 3-wire connection
3 Pt100...Pt1000, Ni100, Ni120, Cu10 4-wire connection
4 RTD, redundant sensor elements 2 x 3-wire connection
5 RTD, redundant sensor elements 2 x 2-wire connection
6 Resistance, 2-wire connection
7 Resistance, 3-wire connection
8 Resistance, 4-wire connection
9 Potentiometer, 3-wire connection

1) SmartSense wire

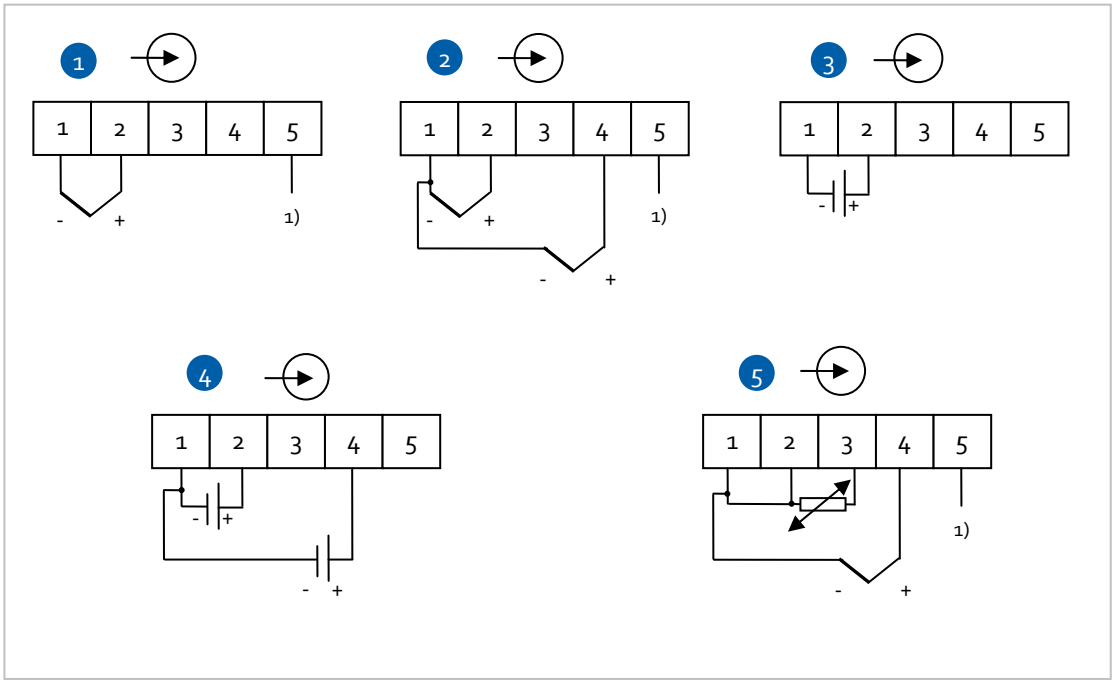


Figure 6 Installation diagram, Thermocouple and voltage measurement C520/C520X

1 Thermocouple
2 Thermocouple, redundant sensor elements
3 Voltage
4 Voltage, redundant sensor elements
5 Thermocouple, with remote reference junction compensation

1) SmartSense wire

4.3 Connection diagram C520

ATTENTION!

To enable HART communication, the output circuit must have an output load of at least 250 Ω.

ATTENTION!

C520 is a Category 3 equipment and the transmitter may not be operated in areas with potentially explosive atmospheres other than Zone 2 and Division 2!

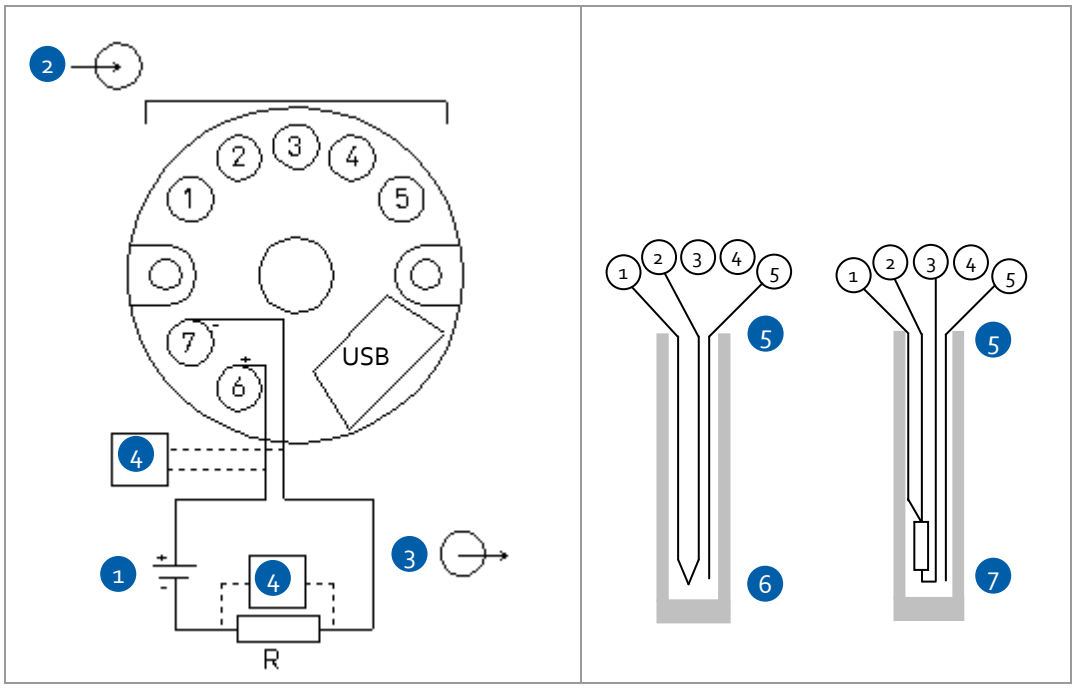


Figure 7: C520 connection

1 Voltage supply 10...36 VDC (terminals 6,7)
2 Input
3 Output
4 Modem
5 SmartSense temperature sensor
6 Thermocouple
7 Pt100 3 wire connection

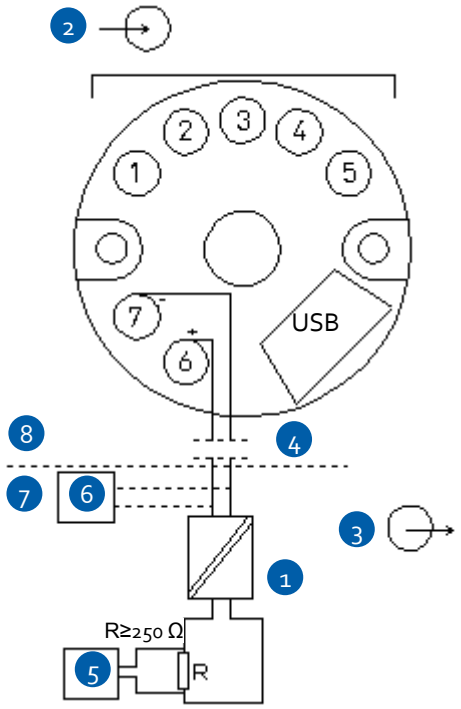
NOTE!

The HART modem is connected parallel to the output load or parallel to the output of the transmitter (see Figure 7).

ATTENTION!

IPAQ C520 may be operated in areas with potentially explosive atmospheres (Zone 2 and Division 2) if the power supply has a protection ensuring that the power supply terminals of the transmitter are limited to transients not exceeding 140% of the rated power supply.

4.4 Connection diagram C520X



1 Zener barrier or voltage supply 10...30 VDC (intrinsically safe)
2 Input
3 Output
4 See "cable length"
5 Modem
6 Modem / Ex-tested
7 Safe area
8 Potentially explosive area

Figure 8: C520X connection

NOTE!

The HART modem is connected parallel to the output load or parallel to the output of the transmitter (see Figure 8).

ATTENTION!

The transmitter may be operated in areas with potentially explosive atmospheres if the voltage supply is ensured by means of an appropriate power supply unit or a Zener barrier!

ATTENTION!

In potentially explosive areas only Ex approved HART modems may be used. The safety instructions for operation in potentially explosive areas must be observed.

ATTENTION!

In order to ensure reliable HART communication with C520X, the maximum cable length of the output circuit must be observed (see Chapter 4.8)

4.5 The R520/R520X connections

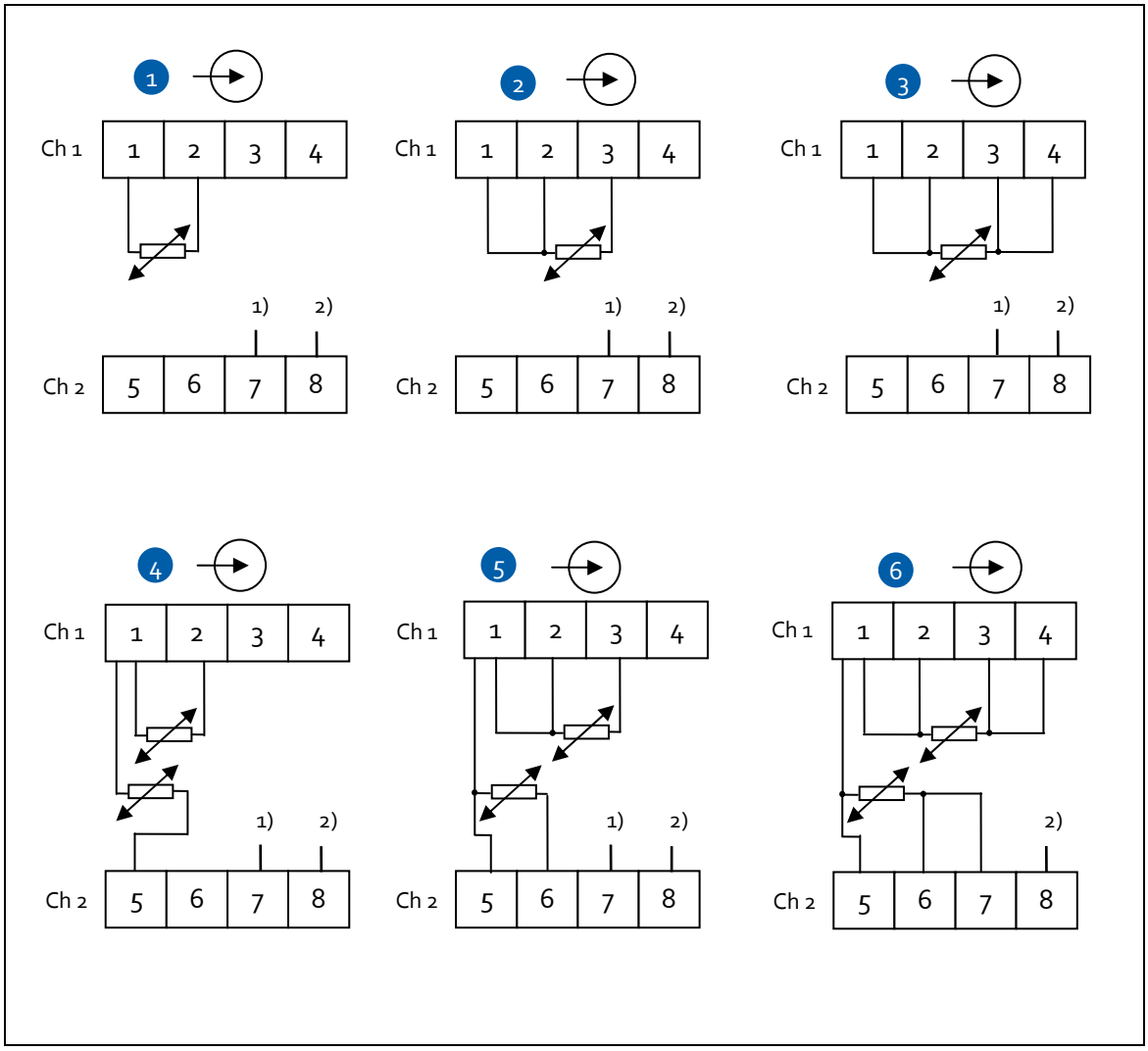


Figure 9: Installation diagram, RTD connections for R520/R520X

1) SmartSense wire
2) GND (input/output cable screens)

1 Pt100...Pt1000, Ni100, Ni120, Cu10 2-wire connection Ch 1

2 Pt100...Pt1000, Ni100, Ni120, Cu10 3-wire connection Ch 1

3 Pt100...Pt1000, Ni100, Ni120, Cu10 4-wire connection Ch 1

4 RTD, redundant sensor elements 2 x 3-wire connection Ch 1+ Ch 2

5 RTD, redundant sensor elements 2 x 2-wire connection Ch 1+ Ch 2

6 RTD, redundant sensor elements 2 x 4-wire connection Ch 1+ Ch 2

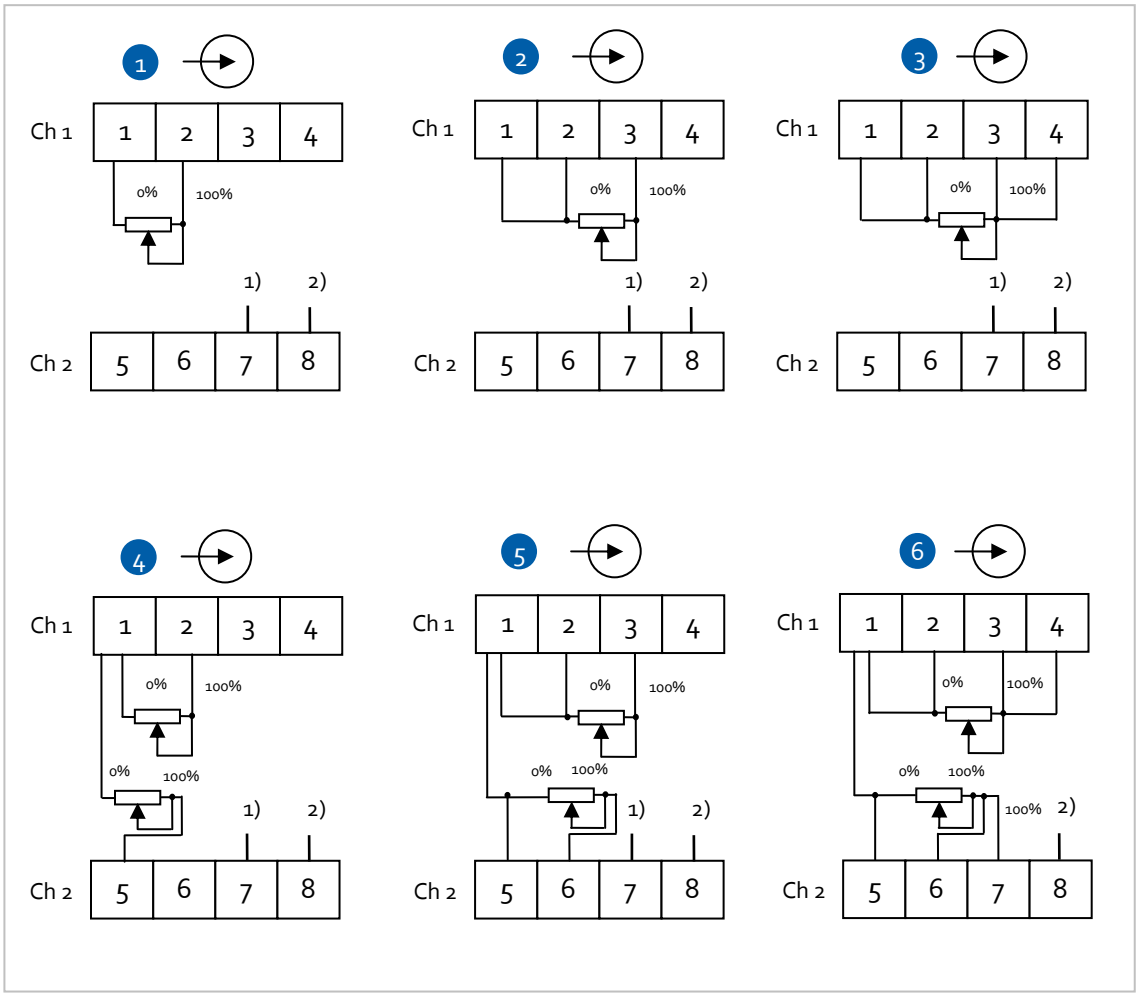


Figure 10: Installation diagram, Resistance connections for R520/R520X

2) GND (input/output cable screens)

1 Resistance, 2-wire connection Ch 1

2 Resistance, 3-wire connection Ch 1

3 Resistance, 4-wire connection Ch 1

4 Dual resistance, 2-wire connection on Ch 1 and Ch2

5 Dual resistance, 3-wire connection on Ch 1 and Ch2

6 Dual resistance, 4-wire connection on Ch 1 and Ch2

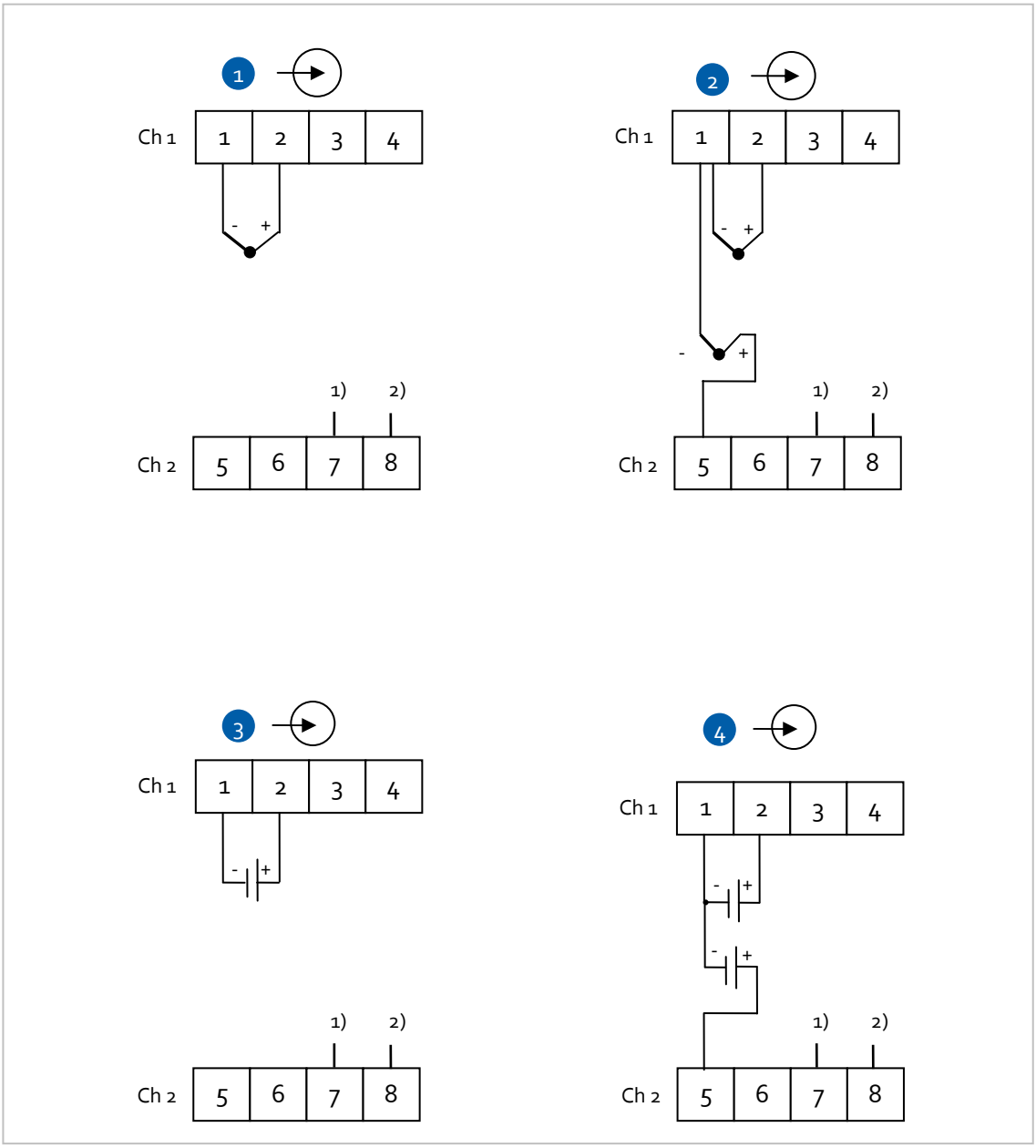


Figure 11 Installation diagram, thermocouple and voltage connections for R520/R520X

1) SmartSense wire
2) GND (input/output cable screens)

1 Thermocouple
2 Thermocouple, redundant sensor elements
3 Voltage
4 Voltage, redundant sensor elements

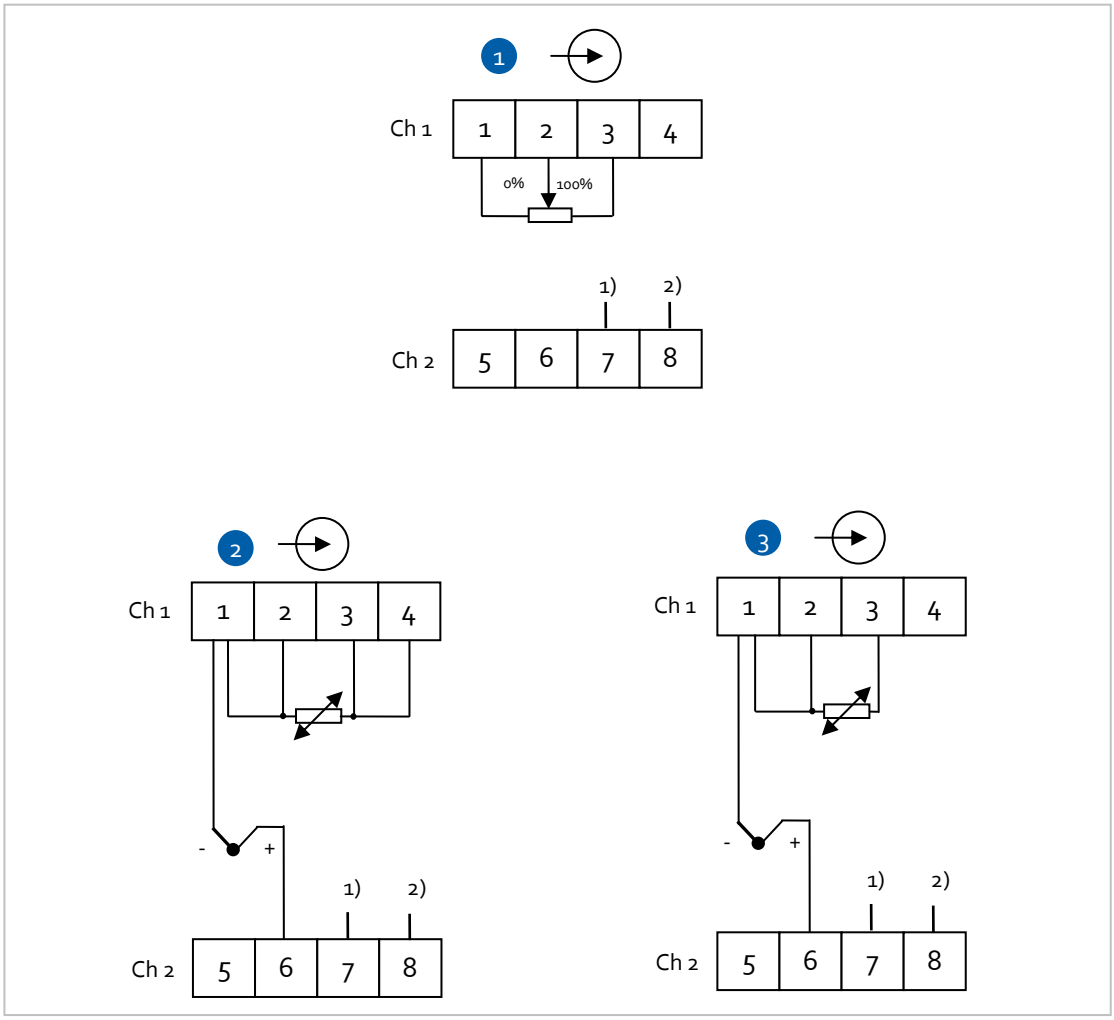


Figure 12 Installation diagram, potentiometer and combined thermocouple and RTD connections for R520/R520X

1) SmartSense wire
2) GND (input/output cable screens)

1 Potentiometer 3-wire connection

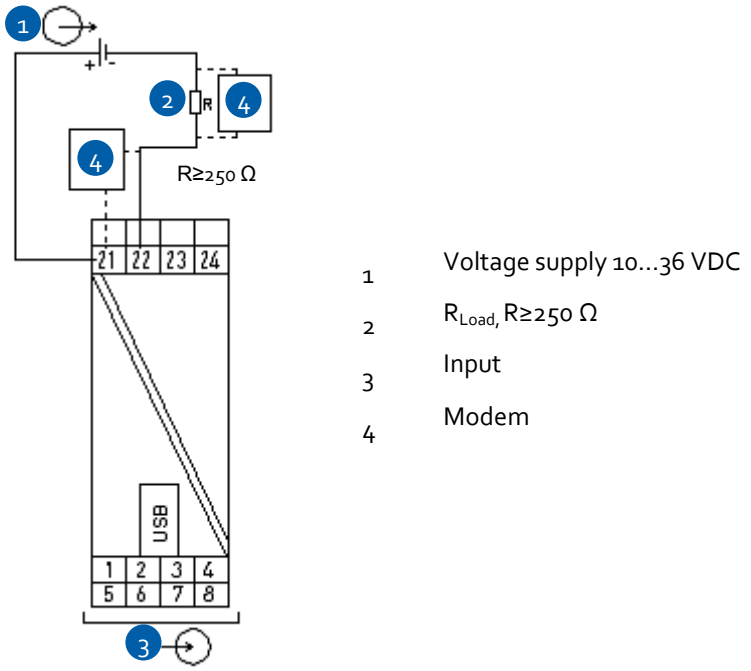
2 Thermocouple and redundant 4-wire RTD elements

3 Thermocouple with 3-wire RTD elements as external CJC

4.6 Connection diagram, R520

ATTENTION!

IPAQ R520 is a Category 3 equipment and may only be installed in an area with a potentially explosive atmosphere Zone 2 / Division 2 or it may be installed in safe area and connected to a sensor located in an area with a potentially explosive atmosphere Zone 2 / Division 2!



1 Voltage supply 10...36 VDC

2 $R_{Load,}$ R≥250 Ω

3 Input

4 Modem

Figure 13: R520 connection diagram

NOTE!

The HART modem is connected parallel to the output load or parallel to the output of the transmitter (see Figure 13).

4.7 Connection diagram, R520X (Approval PENDING)

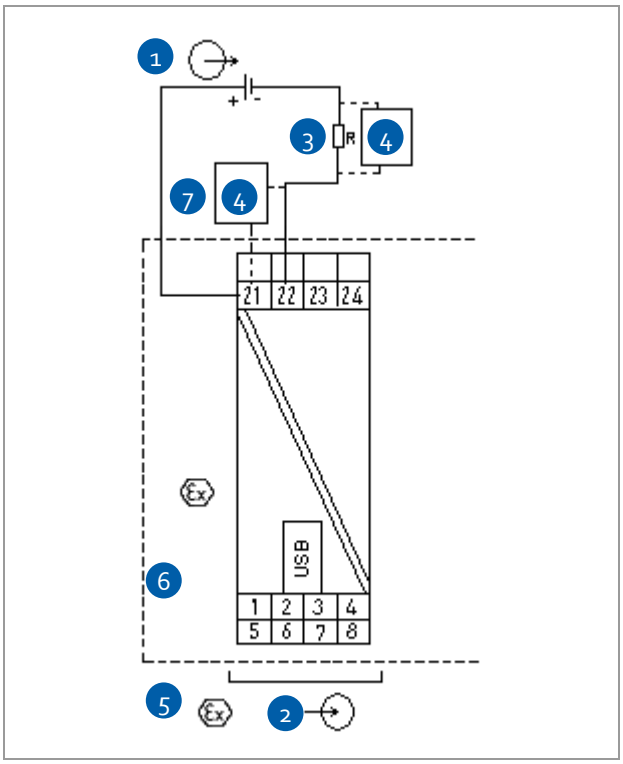


Figure 14: R520X connection diagram

1 Voltage supply 10...30 VDC (intrinsically safe - terminals 21,22)

2 Input (intrinsically safe)

3 R_{Load} (intrinsically safe)

4 Modem / Ex (intrinsically safe)

5 Classified hazardous area (Potentially explosive area e.g. Zone 0, 1 or 2)

6 Classified hazardous area (Potentially explosive area e.g. Zone 1 or 2)

7 Safe area

4.8 Cable length

In order to ensure reliable HART communication with C520/R520, the maximum cable length of the output circuit must be observed.

ATTENTION!

In the Ex version, please note that the maximum cable length is determined by a resistance, an inductance and a capacitance of the cable. The total capacitance and inductance of the cable must be within the limits for the transmitter described in the Ex certificate.

To calculate the maximum cable length for the output circuit, determine the total resistance of the output loop (load resistance plus the approximate cable resistance). Find out the capacitance of the cable being used. In the tables below you can find the maximum cable length based on the typical values for 1 mm2 cables. CN is the abbreviation for Capacitance Number which is multiple of 5000 pF present in the device.

Field device	Cable insulation		
	PVC	Polyethylene	Polyethylene foam
1 (CN = 1)	600 m	1100 m	2000 m
10 multidrop (CN = 1)	500 m	900 m	1600 m
10 multidrop (CN = 4,4)	85 m	150 m	250 m

Table 1 Maximum length for typical 1 mm^2 cables

Insulation	Capacitance
PVC	300 - 400 pF/m
Polyethylene	150 - 200 pF/m
Polyethylene foam	75 - 100 pF/m

Conductors			Resistance (both conductors in serie)
Area	Diameter	AWG	
2.0 mm^2	1.6 mm	14	17 Ω/km
1.3 mm^2	1.3 mm	16	28 Ω/km
1.0 mm^2	1.15 mm	17	36 Ω/km
0.8 mm^2	1.0 mm	18	45 Ω/km
0.5 mm^2	0.8 mm	20	70 Ω/km
0.3 mm^2	0.6 mm	22	110 Ω/km
0.2 mm^2	0.5 mm	24	160 Ω/km

Table 2 Cable parameters

For multiple connections (Multidrop see the Figures 16), the following formula shall be used:

$$L = \frac{65 \times 10^6}{R \times C} \times \frac{(Cn \times 5000 + 10000)}{C}$$

L: Cable length (m)

R: Load resistance (incl. The resistance of any zener barrier) + cable resistance (Ω)

C: Cable capacitance/meter (pF/m)

Cn: Number of C520/R520 transmitters in the loop

Cable length can be changed to ft. The capacitance has to be specified in pF/ft.

5.1 C520/R520 in HART network

Communication mode supported by C520/R520 transmitters is a master-slave mode.

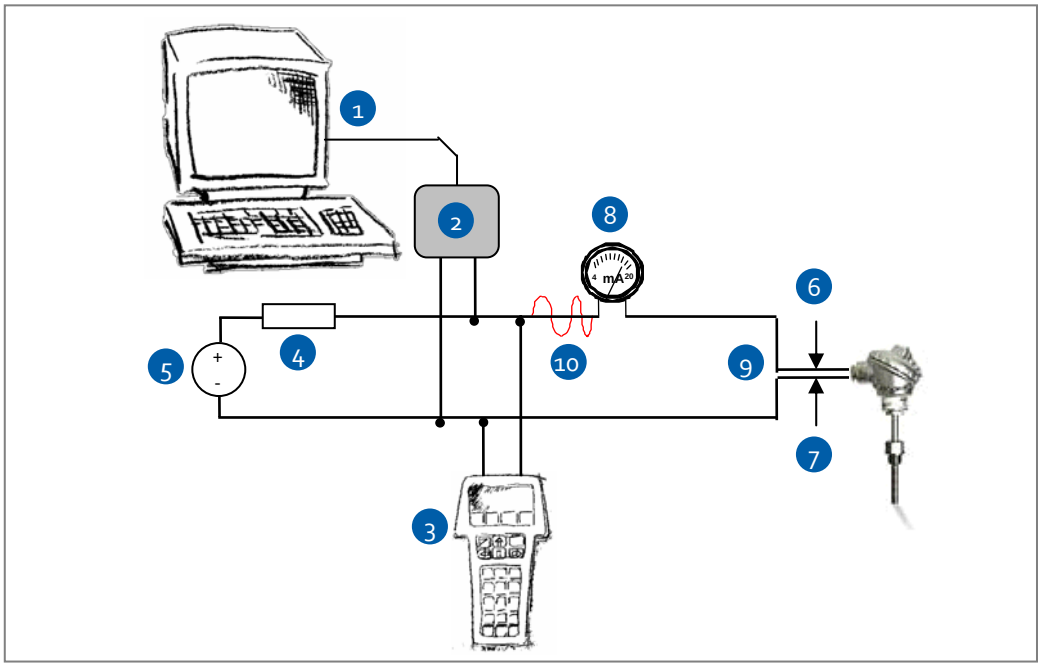


Figure 15: C520 Point-point Analog / Digital mode

1 Primary Master
2 HART modem
3 Secondary master
4 Load ≥ 250Ω
5 DC power supply
6 Terminal 6
7 Terminal 7
8 Milliamperemeter Load ≥ 250Ω
9 4...20 mA
10 HART

Figure 15 shows a point-to-point connection between the C520/R520 and the HART master equipment. The instrument's current output may be active or passive.

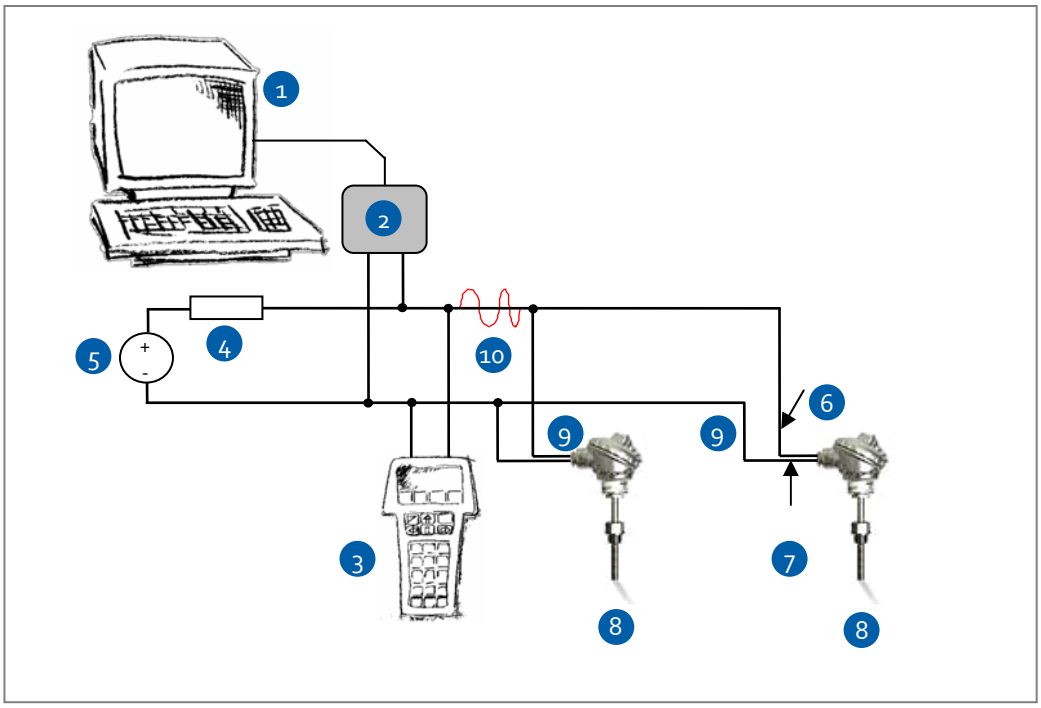


Figure 16: C520 in a multipoint connection (multidrop mode) with up to 64 devices in parallel

1 Primary Master
2 HART modem
3 Secondary master
4 Load ≥ 250Ω
5 DC power supply
6 Terminal 6
7 Terminal 7
8 C520 or R520 Loop Current Mode disabled up to 64 slaves can be connected
9 4 mA
10 HART

Figure 16 shows a multipoint connection (multidrop) with up to 64 devices (C520/R520 or other HART® equipment) in parallel. The instrument's current outputs must be passive.

Burst mode is not supported.

5.2 Configuration of the C520/C520X / R520/R520X

ATTENTION!

Only an Ex approved HART modem located in safe area may be connected to a transmitter placed in potentially explosive area.

In the table below are the factory settings of the C520/C520X / R520/R520X transmitters.

The transmitters are delivered with either a factory settings or configured according to customers' specifications.

Menu	Designation	Parameter	Factory setting
Device Root menu			
-> Sensors	**-> -> Channel 1**	Type of sensor 1	RTD Pt100 α=0.003850
		Number of wires	3
		PV Lower range value	0
		PV Upper range value	100
		Digital units	°C
		Lock Code	Unlocked
		Damping value	4 s
		Line frequency	55
		Isolation Resistance monitoring	Off
		Sensor Break (Off/Down scale/Up scale)	Off
		Sensor Short circuit (Off/Down scale/Up scale)	Off
		Sensor Drift (Off/Down scale/Up scale)	Off
		Single Sensor failure indication	Off
	-> -> Channel 2	Type of sensor 2	None
		Number of wires	2
		PV Lower range value	
		PV Upper range value	
		Digital units	°C
		Lock Code	Unlocked
		Damping value	4 s
		Line frequency	55
		Isolation Resistance monitoring	Off
		Sensor Break (Off/Down scale/Up scale)	Off
		Sensor Short circuit (Off/Down scale/Up scale)	Off
		Sensor Drift (Off/Down scale/Up scale)	Off
		Single Sensor failure indication	Off
		Single Sensor failure indication	Off

Table 3 The factory settings for C520/C520X / R520/R520X transmitters

5.3 Configuration of the C520/C520X / R520/R520X

The C520/C520X / R520/R520X transmitters can be configured with:

1. Either a PC based configuration software ConSoft version 1.2.0.0 or higher and a USB interface version 1.2.03 or higher (see figure 12 for connection) via USB port on the PC (for more information see the user instructions for ConSoft and USB interface) or
2. a handheld communicator (secondary master) as a field communicator FC 375 software version 3.0
3. the instrument management softwares (primary master):
   3.1. Smart Device Configurator SDC-625 ,
   3.2. Process Device Manager (PDM) Revision 6.0 SP1, SP2, SP3 from Siemens,
   3.3. Asset Management Solutions – AMS Revisions 7.0, 8.0, 9.0 and
   Field Device manager (FDM) Revision 310 from Honeywell.

5.3.1 Configuration of the C520/C520X / R520/R520X with ConSoft

The ConSoft is a PC based graphical user interface for configuration of the C520/C520X / R520/R520X transmitters. The PC configuration software ConSoft is used for configuration, display and documentation.
The current software versions of ConSoft and USB drivers for ICON are available for downloading on our website **www.inor.com**.

Proper connection of the transmitters with a PC requires an INOR USB Interface (see figure 17 for connection of the C520/C520X transmitters and figure 18 for connection of the R520/R520X transmitters).

ATTENTION!

Make sure the area is safe before connecting the INOR USB Interface ICON-X to the transmitter.

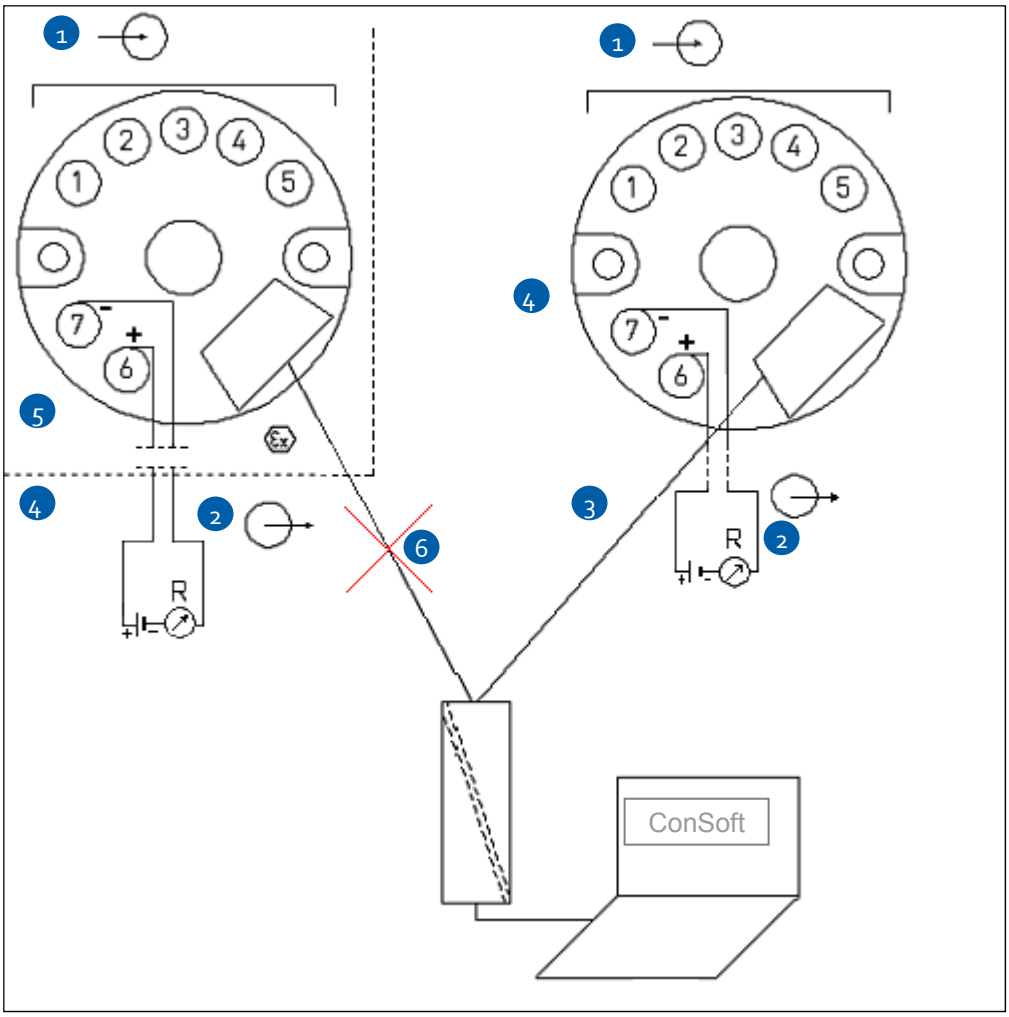


Figure 17: Connection during configuration of C520/C520X

1 Input (Intrinsically safe)

2 Output Voltage supply (Intrinsically safe terminals 6 and 7) and RLoad (intrinsically safe)

3 Communication with ICON-X and a PC software ConSoft

4 Safe area

5 Classified hazardous area (Potentially explosive area e.g. Zone 0, 1 or 2)

6 Connection to ICON-X and a PC software ConSoft is not permitted if C520X is placed in the classified hazardous area (Potentially explosive area)

7 Connection to the voltage supply during configuration with ICON-X and a PC software ConSoft not needed

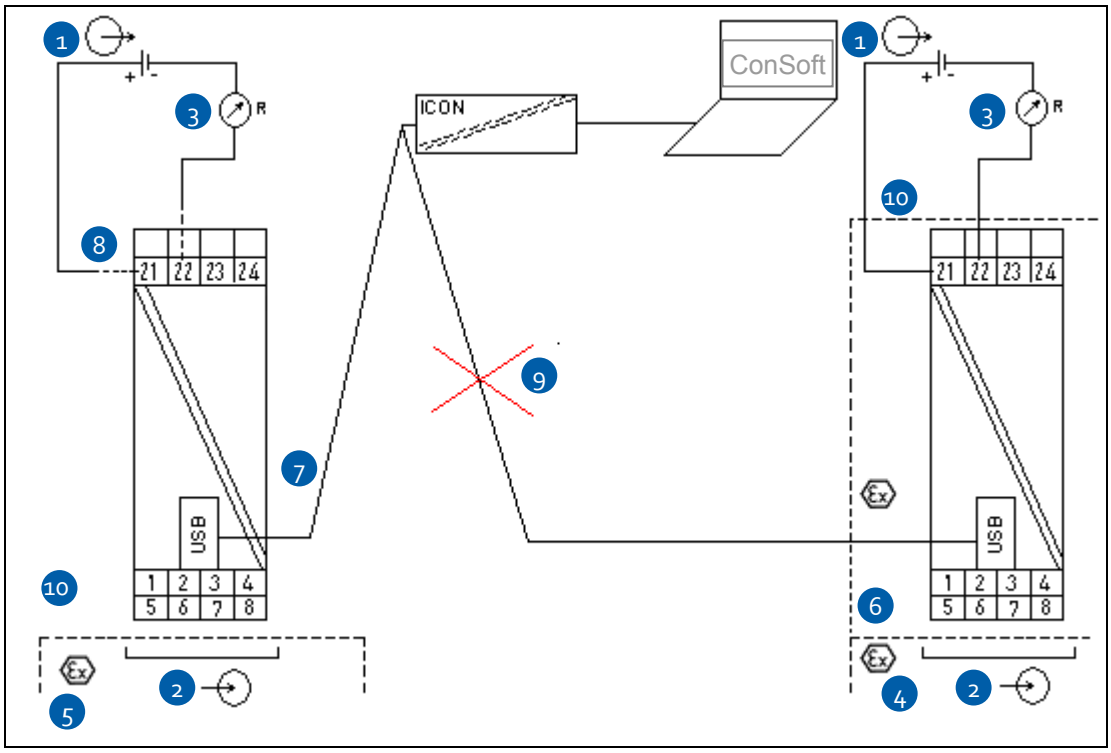


Figure 18: R520X connection to ICON and ConSoft during configuration

1 Voltage supply 10...30 VDC (intrinsically safe - terminals 21,22)

2 Input (intrinsically safe)

3 R_{Load} (intrinsically safe)

4 Classified hazardous area (Potentially explosive area e.g. Zone 0)

5 Classified hazardous area (Potentially explosive area e.g. Zone 0, 1 or 2)

6 Classified hazardous area (Potentially explosive area e.g. Zone 1 or 2)

7 Communication with ICON-X and a PC software ConSoft

8 Connection to the voltage supply during configuration with ICON-X and a PC software ConSoft not needed

9 Connection to ICON-X and a PC software ConSoft is not permitted if R520X is placed in the classified hazardous area

10 Safe area

5.3.2 Configuration of the C520/R520 with a handheld communicator FC 375

The Field communicator 375 (FC 375) is a handheld communicator from Emerson Process Management for configuring HART and Foundation Fieldbus devices. To be able to configure the C520/R520 with the FC 375 you need a device description file. The device driver is possible to download from http://www.inor.com/.

The C520/R520 HART device description has to be installed on the FC 375, otherwise the user will work with the transmitter as generic device loosing opportunity to control entire C520/R520. For installing DD on the FC 375 the 'Easy Upgrade Programming Utility' is needed and the FC375 must have a System Card with 'Easy Upgrade' option (see details in the '375 Field Communicator User's Manual').
For proper connection of transmitters with the handheld communicator - see the figures 7 and 13 for connection of the C520/R520 transmitters.
To configure C520X/R520X (the transmitters for areas with potentially explosive atmospheres) see the figures 8 and 14.

5.3.3 Instrument management softwares

Transmitters can be configured via the PC software as AMS (Asset Management System) and Simatic PDM.

The Asset Management Solutions Device Manager (AMS) is a PC application from Emerson Process Management for configuring and managing HART and Foundation Fieldbus devices. For adaptation to different devices AMS uses Device Descriptions (DD).

The C520/C520X/R520/R520X Device Description has to be installed on the AMS System a so called Installation Kit C520/R520 HART AMS is needed (available as download on the internet or on USB memory stick).
For installing the DD with the Installation Kit refer to the "AMS Intelligent Device Manager Books Online" section "Basic AMS Functionality /Device Configurations / Installing Device Types / Procedures /Install device types from media". Please read also the "readme.txt", which is also contained in the Installation Kit.

AMS supports the EDDL Process Variables Root Menu, the Diagnostic Root Menu and the Device Root Menu for online access to the device.

The Process Device Manager (PDM) is a PC application from Siemens for configuring HART and PROFIBUS devices. For adaptation to different devices PDM uses Device Descriptions (DD).

The C520/ C520X/R520/R520X Device Description has to be installed on the PDM System a so called Device Install C520/R520 HART PDM is needed (available as download on the internet or on USB memory stickM).
For installing the DD on PDM refer to the "PDM Manual" section 13:"Integrating Devices".
Please read also the "readme.txt", which is also contained in the Device Install.

PDM supports the EDDL Process Variables Root Menu, the Diagnostic Root Menu and the Device Root Menu for online access to the device. Furthermore it supports the Offline Root Menu for offline configuration.

5.4 Current output and HART dynamic/device variables

The C520/C520X / R520/R520X transmitters handle up to seven measurement-related HART device variables. These variables depend on the device's sensor configuration see the table 4 for more information.

HART Device Variable	Notes
Channel 1	
Channel 2	
Difference 1-2	valid if both channels are equipped with sensors and of the same type
Difference 2-1	valid if both channels are equipped with sensors and of the same type
Minimum	valid if both channels are equipped with sensors and of the same type
Maximum	valid if both channels are equipped with sensors and of the same type
Average	valid if both channels are equipped with sensors and of the same type

Table 4 The HART dynamic variables for C520/C520X / R520/R520X transmitters

5.5 Factory calibration of the C520/C520X / R520/R520X

The C520/C520X / R520/R520X transmitters are delivered with a factory configuration Pt100 (α = 0.00385), 3-wire connection 0-100 °C / 32 – 212 °F or configured according to customer's requirements (See the Table 3 for more information).

Due to the long-term drift of max ± 0.01 °C or ± 0.01 % of span per year, a recalibration of the transmitter is normally not needed. Should you for any reason require the recalibration, the transmitter must be returned to the factory.

6.1 C520 specifications

6.1.1 Technical data

Technical data	Designation	Value
Input	Pt100 (α=0.00385) IEC 60751	-200 ... +850 °C / -328 to 1562 °F
	Pt100 (α=0.003916) JIS C 1604-81	-200 ... +850 °C / -328 to 1562 °F
	Pt X (α=0.00385) IEC 60751	Corresponding to max 4000 Ω
	Ni 100 (α=0.006180) DIN 43760	-60 ... +250 °C / -76 to 482 °F
Edison curve 7	Ni 120 (α=0.006720)	-60 ... +250 °C / -76 to 482 °F
	Ni 1000 (α=0.006180) DIN 43760	-60 ... +250 °C / -76 to 482 °F
Edison copper winding No.15	Cu 10 (α=0.004274)	-50 ... +200 °C / -58 to 392 °F
	Potentiometer	0...4000 Ω
	Thermocouples	Types: B, C, D, E, J, K, L, N, R, S, T, U
	Voltage	-10...1000 mV
	Sensor current	~ 0.4 mA
	Sensor wire resistance	20 Ω/wire for 2-wire connection 25 Ω/wire for 3-wire connection
	Minimum span	10 Ω / 10 °C / 2 mV
Monitoring	Sensor break function	Off, Upscale or downscale[1)]
	Sensor short-circuit	Off, Upscale, downscale[1)]
	Sensor Drift	Off, Upscale, downscale[1)]
Output	Temperature linear for RTD & TC	4 ... 20 mA, 20...4 mA or customized
	Response time	Single input approx. 300 ms, dual input approx. 600 ms
	Permissible load	660 Ω @ 24 VDC incl. 250 Ω loop resistance
Ambient temperature	Operation and storage	-40 ... 85 °C / -40 to +185 °F
Humidity		5 to 95 % RH
Vibrations		Acc. To IEC 68-2-6, Test Fc, 10 g
Shock		Acc. To IEC-60068-2-31, test Ec
EMC	Standards	EN 61326, NAMUR NE21
(EMC Directive 2004/108/EC)	Immunity performance	ESD, Radiated EM-field: Criteria A Surge: ~0.5% of span
Galvanic isolation		1500 VAC, 1 min
Power supply	C520	10 ... 36 VDC, polarity protected
Typical accuracy	For more information see RTD and T/C accuracy table 10	Max. of ±0.01 °C/ ±0.02 °F or +/- 0.005% of span per K
Connection head		DIN B or larger

[1)] Upscale (≥21.0 mA) or downscale (≤3.6 mA)

Table 5: C520 specifications

6.1.2 Output load diagram

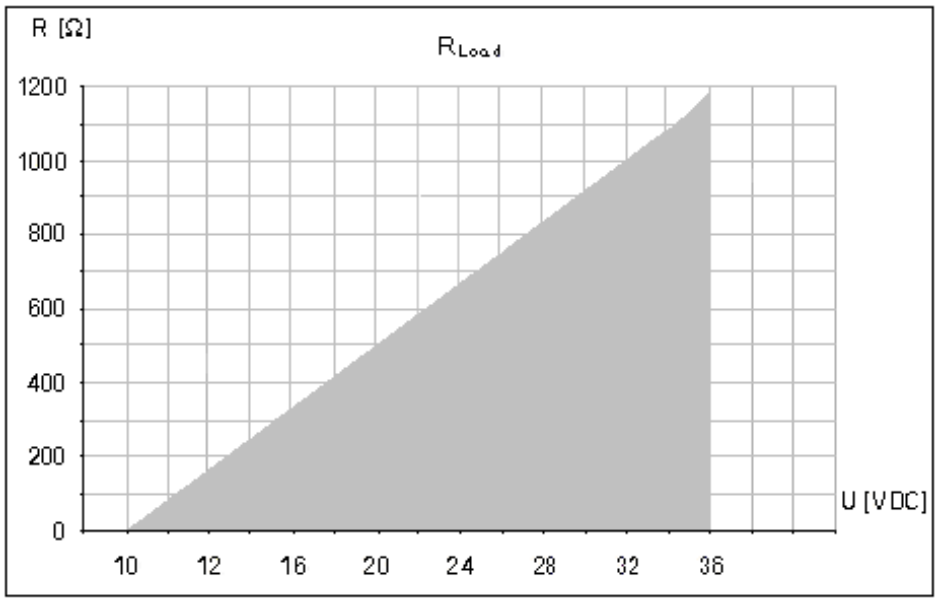


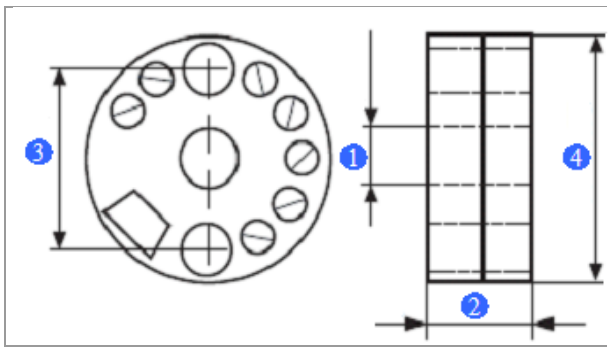
Figure 19: C520 output load diagram

Formula for the maximum permissible output load: C520 permissible R_{Load} (Ω) = (U-10)/0.022

R Total output load [Ω]

U Power supply [VDC]

6.1.3 Dimensions



	Dimension [mm]	Dimension [inch]
1	imen	imens
2	18.5	0.72
3	33	1.30
4	44.5	1.75

Figure 20: C520 dimensions

6.1.4 Output and input data

Output terminals 6, 7		Input terminals 1, 2, 3, 4, 5	
$U_i = V_{MAX}$:	≤ 36 VDC	$U_O = U_{OC}$:	≤ 3.3 VDC
$I_i = I_{MAX}$:	N / A	$I_O = I_{SC}$:	≤ 1.8 mA
$P_i = P_{MAX}$:	N / A	P_O:	≤ 1.5 mW
L_i:	10 µH	L_O:	25 mH
C_i:	12.1 nF	C_O:	50 µF

Table 6: Output and input data, C520

6.1.5 Ambient temperature data for areas with potentially explosive atmospheres

Temperature class	Ambient temperature
T6	-40°C ≤ Ta ≤ +65°C / 40°F ≤ Ta ≤ +149°F
T5	-40°C ≤ Ta ≤ +80°C / 40°F ≤ Ta ≤ +176°F
T4	-40°C ≤ Ta ≤ +85°C / -40°F ≤ Ta ≤ +185°F

Table 7: Ambient temperature data, C520

6.2 C520X specifications

6.2.1 Technical data

Technical data	Designation	Value
Input	Pt100 (α=0.00385) IEC 60751	-200 ... +850 °C / -328 to 1562 °F
	Pt100 (α=0.003916) JIS C 1604-81	-200 ... +850 °C / -328 to 1562 °F
	Pt X (α=0.00385) IEC 60751	Corresponding to max 4000 Ω
	Ni 100 (α=0.006180) DIN 43760	-60 ... +250 °C / -76 to 482 °F
Edison curve 7	Ni 120 (α=0.006720)	-60 ... +250 °C / -76 to 482 °F
	Ni 1000 (α=0.006180) DIN 43760	-60 ... +250 °C / -76 to 482 °F
Edison copper winding No.15	Cu 10 (α=0.004274)	-50 ... +200 °C / -58 to 392 °F
	Potentiometer	0...4000 Ω
	Thermocouples	Types: B, C, D, E, J, K, L, N, R, S, T, U
	Voltage	-10...1000 mV
	Sensor current	~ 0.4 mA
	Sensor wire resistance	20 Ω/wire for 2-wire connection 25 Ω/wire for 3-wire connection
	Minimum span	10 Ω / 10 °C / 2 mV
Monitoring	Sensor break function	Off, Upscale or downscale[1)]
	Sensor short-circuit	Off, Upscale, downscale[1)]
	Sensor Drift	Off, Upscale, downscale[1)]
Output	Temperature linear for RTD & TC	4 ... 20 mA, 20...4 mA or customized
	Response time	Single input approx. 300 ms, dual input approx. 600 ms
	Permissible load	660 Ω @ 24 VDC incl. 250 Ω loop resistance
Ambient temperature	Operation and storage	See Table 8
Humidity		5 to 95 % RH
Vibrations		Acc. To IEC 68-2-6, Test Fc, 10 g
Shock		Acc. To IEC-60068-2-31, test Ec
EMC	Standards	EN 61326, NAMUR NE21
(EMC Directive 2004/108/EC)	Immunity performance	ESD, Radiated EM-field: Criteria A Surge: ~0.5 % of span
Galvanic isolation		1500 VAC, 1 min
Power supply	C520X	10 ... 30 VDC, polarity protected
Typical accuracy	For more information see RTD and T/C accuracy table 10	Max. of ±0.01 °C/ ±0.02 °F or +/- 0.005 % of span per K
Connection head		DIN B or larger

1) Upscale (≥21.0 mA) or downscale (≤3.6 mA)
Table 8: C520 X specifications

6.2.2 Output load diagram

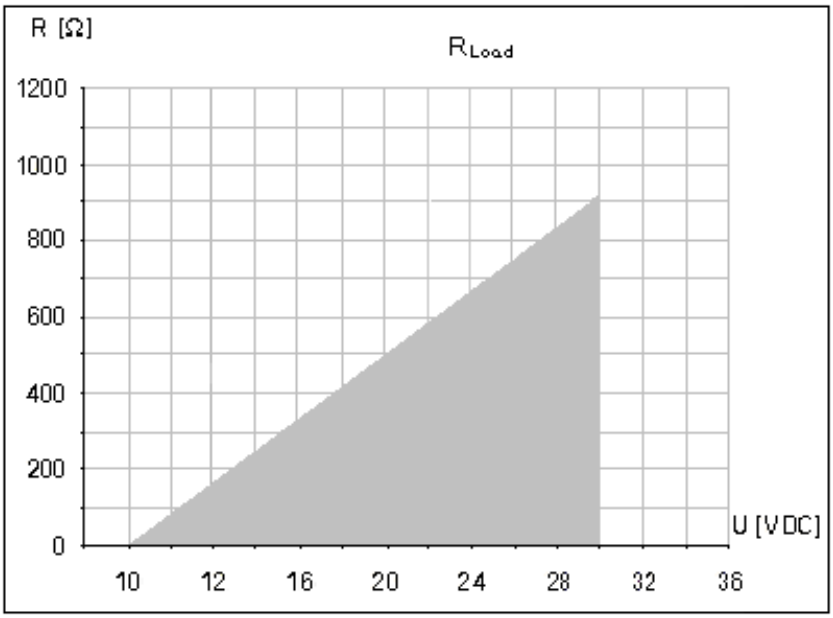
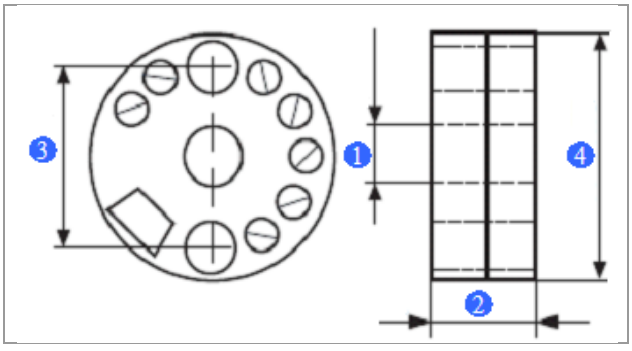


Figure 21: C520X output load diagram

Formula for the maximum permissible output load: C520X permissible R_{Load} (Ω) = (U-10)/0.022

R Total output load [Ω]
U Power supply [VDC]

6.2.3 Dimensions



	Dimension [mm]	Dimension [inch]
1	imen	imens
2	18.5	0.72
3	33	1.30
4	44.5	1.75

Figure 22: C 520X dimensions

6.2.4 Output and input data

Output terminals 6, 7		Input terminals 1, 2, 3, 4, 5	
$U_i = V_{MAX}$:	≤ 30 VDC	$U_o = V_{OC}$:	≤ 6.6 VDC
$I_i = I_{MAX}$:	≤ 100 mA	$I_o = I_{SC}$:	≤ 26.4 mA
$P_i = P_{MAX}$:	≤ 900 mW	P_o:	≤ 46 mW
L_i:	10 µH	L_o:	25 mH
C_i:	~ 12.1 nF	C_o:	11 µF

Table 9: Electrical data for outputs-inputs of C 520X

6.2.5 Ambient temperature data for areas with potentially explosive atmospheres

Temperature class	Ambient temperature
T6	-40°C ≤ Ta ≤ +60°C / 40°F ≤ Ta ≤ +140°F
T5	-40°C ≤ Ta ≤ +75°C / 40°F ≤ Ta ≤ +167°F
T4	-40°C ≤ Ta ≤ +85°C / 40°F ≤ Ta ≤ +185°F

Table 10: C520X temperature data

6.3 R520 specifications

6.3.1 Technical data

Technical data	Designation	Value
Input	Pt100 (α=0.00385) IEC 60751	-200 ... +850 °C / -328 to 1562 °F
	Pt100 (α=0.003916) JIS C 1604-81	-200 ... +850 °C / -328 to 1562 °F
	Pt X (α=0.00385) IEC 60751	Corresponding to max 4000 Ω
	Ni 100 (α=0.006180) DIN 43760	-60 ... +250 °C / -76 to 482 °F
Edison curve 7	Ni 120 (α=0.006720)	-60 ... +250 °C / -76 to 482 °F
	Ni 1000 (α=0.006180) DIN 43760	-60 ... +250 °C / -76 to 482 °F
Edison copper winding No.15	Cu 10 (α=0.004274)	-50 ... +200 °C / -58 to 392 °F
	Potentiometer	0...4000 Ω
	Thermocouples	Types: B, C, D, E, J, K, L, N, R, S, T, U
	Voltage	-10...1000 mV
	Sensor current	~ 0.4 mA
	Sensor wire resistance	20 Ω/wire for 2-wire connection 25 Ω/wire for 3-wire connection
	Minimum span	10 Ω
Monitoring	Sensor break function	Off, Upscale or downscale[1)]
	Sensor short-circuit	Off, Upscale, downscale[1)]
	Sensor Drift	Off, Upscale, downscale[1)]
Output	Temperature linear for RTD & TC	4 ... 20 mA, 20...4 mA or customized
	Response time	Single input approx. 300 ms, dual input approx. 600 ms
	Permissible load	660 Ω @ 24 VDC incl. 250 Ω loop resistance
Ambient temperature	Operation and storage	-20 ... 70 °C / -4 to +158 °F
Humidity		5 to 95 % RH
Vibrations		Acc. To IEC 68-2-6, Test Fc, 5 g
Shock		Acc. To IEC-60068-2-31, test Ec
EMC	Standards	EN 61326, NAMUR NE21
(EMC Directive 2004/108/EC)	Immunity performance	ESD, Radiated EM-field: Criteria A Surge: ~0.5 % of span
Galvanic isolation		1500 VAC, 1 min
Power supply	R520	10 ... 36 VDC, polarity protected
Typical accuracy	For more information see RTD and T/C accuracy table 10	Max. of ±0.01 °C/ ±0.02 °F or +/- 0.005 % of span per K
Mounting		DIN rail EN 50022

[1)] Upscale (≥21.0 mA) or downscale (≤3.6 mA)

Table 11: R520 specifications

6.3.2 Output load diagram

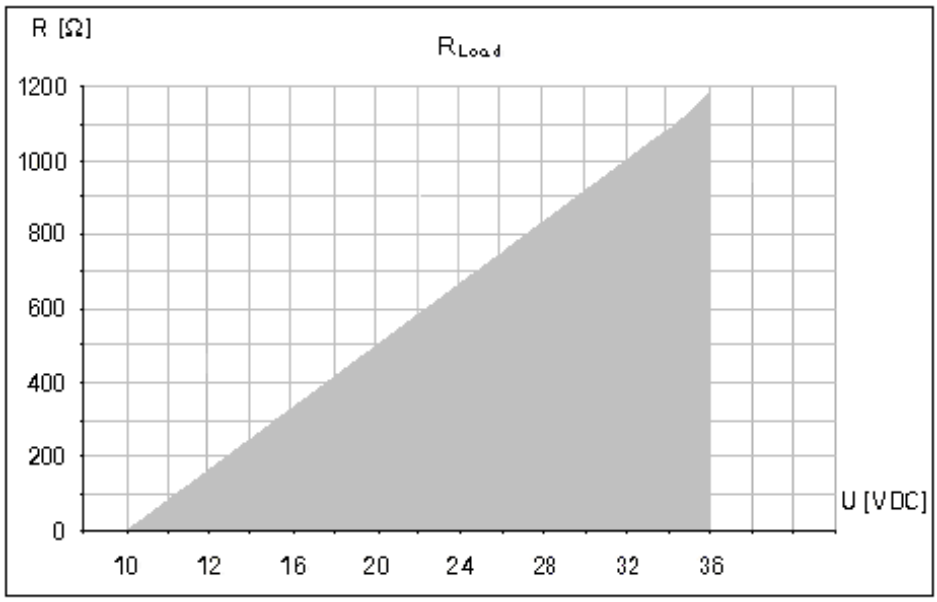
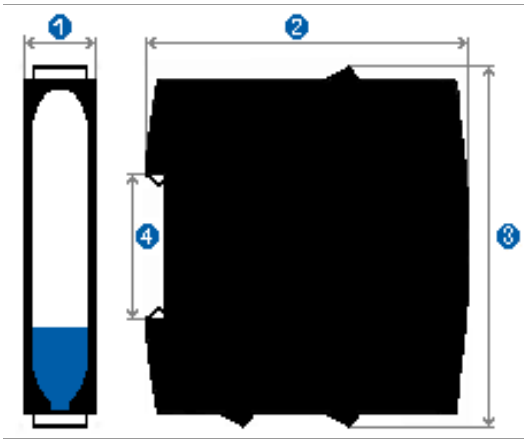


Figure 23: R520 output load diagram

Formula for the maximum permissible output load: R520 permissible R_{Load} (Ω) = (U-10)/0.022

R Total output load [Ω]
U Power supply [VDC]

6.3.3 Dimensions



	Dimension [mm]	Dimension [inch]
1	17.5	0.69
2	81.3	3.2
3	83	3.27
4	35	1.38

Figure 24: R520 dimensions

6.3.4 Output and input data

Output terminals 21,22		Input terminals 1 to 8	
$U_i = V_{MAX}$:	≤ 36 VDC	$U_O = U_{OC}$:	≤ 3.3 VDC
$I_i = I_{MAX}$:	N / A	$I_O = I_{SC}$:	≤ 1.8 mA
$P_i = P_{MAX}$:	N / A	P_O:	≤ 1.5 mW
L_i:	10 µH	L_O:	25 mH
C_i:	12.1 nF	C_O:	50 µF

Table 12: Output and input data, R520

6.3.5 Ambient temperature data for areas with potentially explosive atmospheres

Temperature class	Ambient temperature
T6	-20°C ≤ Ta ≤ +65°C / -4°F ≤ Ta ≤ +149°F
T5	-20°C ≤ Ta ≤ +70°C / -4°F ≤ Ta ≤ +158°F
T4	-20°C ≤ Ta ≤ +70°C / -4°F ≤ Ta ≤ +158°F

Table 13: Ambient temperature data, R520

6.4 R520X specifications

6.4.1 Technical data

Technical data	Designation	Value
Input	Pt100 (α=0.00385) IEC 60751	-200 ... +850 °C / -328 to 1562 °F
	Pt100 (α=0.003916) JIS C 1604-81	-200 ... +850 °C / -328 to 1562 °F
	Pt X (α=0.00385) IEC 60751	Corresponding to max 4000 Ω
	Ni 100 (α=0.006180) DIN 43760	-60 ... +250 °C / -76 to 482 °F
Edison curve 7	Ni 120 (α=0.006720)	-60 ... +250 °C / -76 to 482 °F
	Ni 1000 (α=0.006180) DIN 43760	-60 ... +250 °C / -76 to 482 °F
Edison copper winding No.15	Cu 10 (α=0.004274)	-50 ... +200 °C / -58 to 392 °F
	Potentiometer	0...4000 Ω
	Thermocouples	Types: B, C, D, E, J, K, L, N, R, S, T, U
	Voltage	-10...1000 mV
	Sensor current	~ 0.4 mA
	Sensor wire resistance	20 Ω/wire for 2-wire connection 25 Ω/wire for 3-wire connection
	Minimum span	10 Ω / 10 °C / 2 mV
Monitoring	Sensor break function	Off, Upscale or downscale[1)]
	Sensor short-circuit	Off, Upscale, downscale[1)]
	Sensor Drift	Off, Upscale, downscale[1)]
Output	Temperature linear for RTD & TC	4 ... 20 mA, 20...4 mA or customized
	Response time	Single input approx. 300 ms, dual input approx. 600 ms
	Permissible load	660 Ω @ 24 VDC incl. 250 Ω loop resistance
Ambient temperature	Operation and storage	See Table 16
Humidity		5 to 95 % RH
Vibrations		Acc. To IEC 68-2-6, Test Fc, 5 g
Shock		Acc. To IEC-60068-2-31, test Ec
EMC	Standards	EN 61326, NAMUR NE21
(EMC Directive 2004/108/EC)	Immunity performance	ESD, Radiated EM-field: Criteria A Surge: ~0.5 % of span
Galvanic isolation		1500 VAC, 1 min
Power supply	R520X	10 ... 30 VDC, polarity protected
Typical accuracy	For more information see RTD and T/C accuracy table 10	Max. of ±0.01 °C/ ±0.02 °F or +/- 0.005 % of span per K
Mounting		DIN rail EN 50022

1) Upscale (≥21.0 mA) or downscale (≤3.6 mA)

Table 14: R520X specifications

6.4.2 Output load diagram

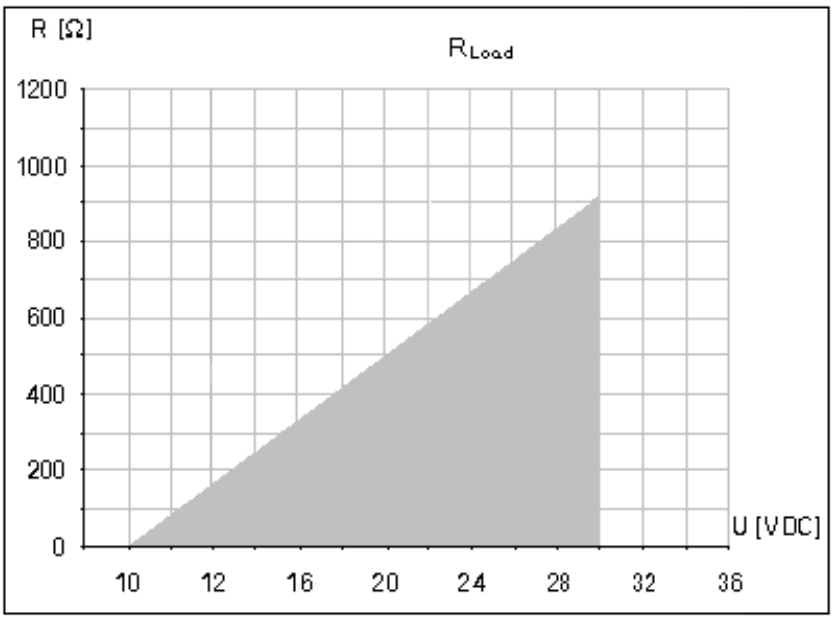
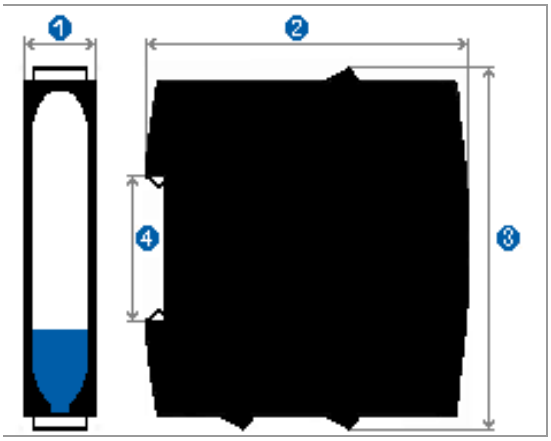


Figure 25: R520X output load diagram

Formula for the maximum permissible output load: R520X permissible R_{Load} (Ω) = (U-10)/0.022

R Total output load [Ω]
U Power supply [VDC]

6.4.3 Dimensions



	Dimension [mm]	Dimension [inch]
1	17.5	0.69
2	81.3	3.2
3	83	3.27
4	35	1.38

Figure 26: R520X dimensions

6.4.4 Output and input data

Output terminals 21, 22		Input terminals 1 to 8	
$U_i = V_{MAX}$:	≤ 30 VDC	$U_o = V_{OC}$:	≤ 6.6 VDC
$I_i = I_{MAX}$:	≤ 100 mA	$I_o = I_{SC}$:	≤ 26.4 mA
$P_i = P_{MAX}$:	≤ 900 mW	P_o:	≤ 46 mW
L_i:	10 µH	L_o:	25 mH
C_i:	~ 12.1 nF	C_o:	11 µF

Table 15: Electrical data for outputs-inputs of R 520X

6.4.5 Ambient temperature data for areas with potentially explosive atmospheres

Temperature class	Ambient temperature
T6	-20°C ≤ Ta ≤ +60°C / -4°F ≤ Ta ≤ +140°F
T5	-20°C ≤ Ta ≤ +70°C / -4°F ≤ Ta ≤ +158°F
T4	-20°C ≤ Ta ≤ +70°C / -4°F ≤ Ta ≤ +158°F

Table 16: R520X temperature data

6.5 RTD and T/C accuracy table for C520/C520X / R520/R520X transmitters

CJC error not included.
Conformance level 95% (2σ)

Input type	Temp. range	Min span	Accuracy Max of:	Temp. influence (Dev. fr. ref.temp. 20°C)
RTD Pt100	-200 to +1000°C	10°C	±0.10°C or ±0.05% of span	±0.005% of span per K
RTD Pt1000	-200 to +850°C	10°C	±0.10°C or ±0.05% of span	±0.005% of span per K
RTD PtX 1)	Corr. to max 4kΩ	10°C	±0.10°C or ±0.05% of span	±0.005% of span per K
RTD Ni100	-60 to +250°C	10°C	±0.10°C or ±0.05% of span	±0.005% of span per K
RTD Ni120	-60 to +250°C	10°C	±0.10°C or ±0.05% of span	±0.005% of span per K
RTD Cu10	-200 to +260°C	83°C	±1.5°C or ±0.1% of span	±0.01% of span per K
T/C type B	+400 to +1800°C	700°C	±1°C or ±0.1% of span	±0.005% of span per K
T/C type C	0 to +2315°C	200°C	±1°C or ±0.1% of span	±0.005% of span per K
T/C type D	0 to +2315°C	200°C	±1°C or ±0.1% of span	±0.005% of span per K
T/C type E	-200 to +1000°C	50°C	±0.25°C or ±0.1% of span	±0.005% of span per K
T/C type J	-200 to +1000°C	50°C	±0.25°C or ±0.1% of span	±0.005% of span per K
T/C type K	-200 to +1350°C	50°C	±0.25°C or ±0.1% of span	±0.005% of span per K
T/C type L	-200 to +900°C	50°C	±0.25°C or ±0.1% of span	±0.005% of span per K
T/C type N	-100 to +1300°C	100°C	±0.25°C or ±0.1% of span	±0.005% of span per K
T/C type N	-250 to -100°C		±1°C	±0.05% of span per K
T/C type R	-50 to +1750°C	300°C	±1°C or ±0.1% of span	±0.005% of span per K
T/C type S	-50 to +1750°C	300°C	±1°C or ±0.1% of span	±0.005% of span per K
T/C type T	-200 to +400°C	50°C	±0.25°C or ±0.1% of span	±0.005% of span per K
T/C type U	-200 to +600°C	100°C	±0.25°C or ±0.1% of span	±0.005% of span per K

Table 17: RTD and T/C accuracy table for the C520/C520X / R520/R520X transmitters

7.1 Ordering information

Designation		Order No.
C520		70C5200010
C520, SIL 2 compatible		70C5200S10
C520X		70C520X010
C520X, SIL 2 compatible		70C520XS10
R520		70R5200010
R520, SIL 2 compatible		70R5200S10
R520X	PENDING	70R520X010
R520X, SIL 2 compatible	PENDING	70R520XS10
ICON, PC configuration kit (USB-connection)		70CFGUS001
ICON-X, Ex-approved PC configuration kit (USB-connection)	PENDING	70CFGUSX01
HART PC modem (USB-connection)		70MEM00003
Head mounting kit		70ADA00017
DIN-rail adapter		70ADA00015
Connection head installation kit		70ADA00011
Configuration ex works		70CAL00001

Table 18: Ordering information

7.2 Disposal

To address proper recovery, recycling, and disposal of customer end-of-life electronic equipment that is consistent with legislative or regulatory requirements, product and packaging materials should be dispose according with the respective waste treatment and disposal regulations of the region or country to which the instrument is supplied.

This product should not be mixed with other kind of scrap, after usage.
It should be handled as an electronic/electric device.

7.3 Maintenance

The C520/C520X / R520/R520X are completely encapsulated, therefore there are no components, which could be repaired or replaced.

7.4 Product liability and guarantee

Use of IPAQ C220 / C220X for other than the intended purpose or improper installation and operation may lead to loss of the guarantee. The guarantee shall likewise be void if the device is damaged or its function otherwise impaired.

INOR Process AB, or any other affiliated company within the INOR Group (hereinafter jointly referred to as "INOR"), hereby warrants that the Product will be free from defects in materials or workmanship for a period of five (5) years from the date of delivery ("Limited Warranty"). This Limited Warranty is limited to repair or replacement at INOR's option and is effective only for the first end-user of the Product. Upon receipt of a warranty claim, INOR shall respond within a reasonable time period as to its decision concerning:

1 Whether INOR acknowledges its responsibility for any asserted defect in materials or workmanship; and, if so,

2 the appropriate cause of action to be taken (i.e. whether a defective product should be replaced or repaired by INOR).

This Limited Warranty applies only if the Product:

1 is installed according to the instructions furnished by INOR;

2 is connected to a proper power supply;

3 is not misused or abused; and

4 there is no evidence of tampering, mishandling, neglect, accidental damage, modification or repair without the approval of INOR or damage done to the Product by anyone other than INOR.

This Limited Warranty is provided by INOR and contains the only express warranty provided.

INOR SPECIFICALLY DISCLAIMS ANY EXPRESS WARRANTY NOT PROVIDED HEREIN AND ANY IMPLIED WARRANTY, GUARANTEE OR REPRESENTATION AS TO SUITABILITY FOR ANY PARTICULAR PURPOSE, PERFORMANCE, QUALITY AND ABSENCE OF ANY HIDDEN DEFECTS, AND ANY REMEDY FOR BREACH OF CONTRACT, WHICH BUT FOR THIS PROVISION, MIGHT ARISE BY IMPLICATION, OPERATION OF LAW, CUSTOM OF TRADE OR COURSE OF DEALING, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. EXCEPT AS PROVIDED HEREIN, INOR FURTHER DISCLAIMS ANY RESPONSIBILITY FOR LOSSES, EXPENSES, INCONVENIENCES, SPECIAL, DIRECT, SECONDARY OR CONSEQUENTIAL DAMAGES ARISING FROM OWNERSHIP OR USE OF THE PRODUCT.

Products that are covered by the Limited Warranty will either be repaired or replaced at the option of INOR. Customer pays freight to INOR, and INOR will pay the return freight by post or other "normal" way of transport. If any other type of return freight is requested, customer pays the whole return cost.

7.5 Support

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