Safety instructions
c-FM-us / c-CSA-us
VEGAPULS C 21, C 22, C 23

Dust-Ignitionproof
Non-Incendive
Encapsulation

Document ID: 64735

VEGA

- Certificate of Conformity Kanada: FM20CA0015X, USA: FM20US0038X (Document ID: 62421)
- Certificate of Conformity CSA 20CA80043162X (VEGAPULS C 21, C 23), CSA 80043162 (VEGAPULS C 22) (Document ID: 62422)

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Safety instructions
VEGAPULS C 21, C 22, C 23

Dust-Ignitionproof
Non-Incendive
Encapsulation
Two-wire 4 … 20 mA/HART
Four-wire Modbus

Document ID: 64735

Contents

Supplementary documentation:

- Operating Instructions VEGAPULS C 21, C 22, C 23
- Certificate of Conformity Kanada: FM20CA0015X, USA: FM20US0038X (Document ID: 62421)

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1 Area of applicability

These safety instructions apply to the VEGAPULS of type series:

- VEGAPULS C 21
- VEGAPULS C 22
- VEGAPULS C 23

With the electronics versions:

- H - Two-wire 4 … 20 mA/HART
- W - Four-wire Modbus

According to Certificate of Conformity Canada: FM20CA0015X, USA: FM20US0038X (certificate number on the type label) and for all instruments with safety instruction 64735.

The classification as well as the respective standards are stated in the Certificate of Conformity.

Type of protection marking:

H - Two-wire 4 … 20 mA/HART

- VEGAPULS C 21, C 23
  - Cl I Div 2 Gp ABCD T4 Ta=-20 … +80 °C, Cl Zn 1 AEx/Ex ib mb IIC T4 Gb,
  - Zn 20, AEx/Ex ta IIIC T121°C Da Ta-20 … +67 °C
  - Zn 21, AEx/Ex tb IIIC T134°C Db Ta-20 … +80 °C
  - Cl II Div 1, Gp EFG Cl III T4 Ta=-20 … +80 °C
- VEGAPULS C 22
  - Cl I Div 2 Gp ABCD T4 Ta=-20 … +80 °C,
  - Cl II Div 1, Gp EFG Cl III T4 Ta=-20 … +80 °C

W - Four-wire Modbus

- VEGAPULS C 21, C 23
  - Cl I Div 2 Gp ABCD T4 Ta=-20 … +80 °C, Cl Zn 1 AEx/Ex ib mb IIC T4 Gb,
  - Zn 20, AEx/Ex ta IIIC T142°C Da Ta-20 … +67 °C
  - Zn 21, AEx/Ex tb IIIC T155°C Db Ta-20 … +80 °C
  - Cl II Div 1, Gp EFG Cl III T4 Ta=-20 … +80 °C
- VEGAPULS C 22
  - Cl I Div 2 Gp ABCD T4 Ta=-20 … +80 °C,
  - Cl II Div 1, Gp EFG Cl III T4 Ta=-20 … +80 °C

2 Device configuration/-properties

The detailed device configurations can be retrieved using the serial number search on our homepage.

Move to "www.vega.com" and enter in the search field the serial number of your instrument.

Alternatively, you can find all via your smartphone:

- Download the VEGA Tools app from the "*Apple App Store*", "*Google Play Store*" or "*Baidu Store*"
- Scan the DataMatrix code on the type label of the instrument or
- Enter the serial number manually in the app

3 General information

The VEGAPULS C 21, C 22, C 23 in ignition protection type encapsulation "m" are used for detection of the distance between medium surface and sensor by means of high frequency, electromagnetic waves in the GHz range.

The electronics uses the running time of the signals reflected by the medium surface to calculate the distance to the medium surface.

The VEGAPULS C 21, C 22, C 23 consist of an electronics housing, a process connection element and a sensor or an antenna.

Zone application:
The VEGAPULS C 21, C 23 are suitable for applications in hazardous atmospheres of all combustible materials of explosion groups IIA, IIB, IIC and IIIA, IIIB, IIIC.

The VEGAPULS C 21, C 23 are suitable for applications requiring EPL Gb instruments.

The VEGAPULS C 21, C 23 are suitable for applications requiring EPL Da instruments.

The VEGAPULS C 21, C 23 are suitable for applications requiring EPL Da/Db instruments.

Division application:
The VEGAPULS C 21, C 22, C 23 are suitable for applications in hazardous atmospheres of all combustible materials of explosion groups A, B, C, D and dust groups E, F, G.

The VEGAPULS C 21, C 22, C 23 are suitable for applications requiring Division 2 (NI) and Division 1 equipment for dust explosion protection (DIP).

4 Application area

EPL Gb instrument
The VEGAPULS C 21, C 23 with the mechanical fixing element are installed in hazardous areas of zone 1 requiring EPL Gb instruments.

EPL Da instrument
The VEGAPULS C 21, C 23 with the mechanical fixing element are installed in hazardous areas of zone 20 requiring EPL Da instruments.

EPL Da/Db instrument
The VEGAPULS C 21, C 23 with mechanical fixing element are installed in hazardous areas of zone 21 requiring EPL Db instruments. The mechanical fixing element, process connection element is installed in the separating wall, which separates areas requiring EPL Db or EPL Da instruments. The sensor measuring system is installed in hazardous areas of zone 20 requiring EPL Da instruments.

Division 1 instruments
The VEGAPULS C 21, C 22, C 23 with the mechanical fixing element are installed in dust-explosive areas (DIP) requiring Division 1 instruments.

Division 2 instruments
The VEGAPULS C 21, C 22, C 23 with the mechanical fixing element are installed in explosive areas requiring Division 2 instruments.

5 Special operating conditions

Specific conditions of use:
For electrical and thermal data refer to the general product information.

The equipment shall be installed and maintained such that hazards caused by electrostatic discharge are excluded and that there is a low risk of mechanical danger.

The equipment shall be wired using the NPT threads identified on the enclosure using the 1 NPT threads for Zones or either the 1 NPT or ½ NPT threads for Divisions, and in accordance with the applicable area electrical code. The integral cable shall be mechanically protected and terminated in a suitably rated terminal or junction facility.

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Electrostatic charging (ESD)
You can find the details in chapter "*Electrostatic charging (ESD)*" of these safety instructions.

Ambient temperature
You can find the details in chapter "*Thermal data*" of these safety instructions.

6 Additional instructions for safe operation

- For process pressures outside the standard atmospheric conditions of 80 kPa (0.8 bar) to 110 kPa (1.1 bar) additional requirements can be valid.

Connection conditions
- Supply via energy-limiting circuit according to IEC 61010-1, chapter 9.4, e.g. via a Class 2 power supply unit
- For fixed installation, the connecting cable is suitable for an operating temperature range of -40 … +80 °C. The temperature at the connection cable may be +90 °C for max. 10000 operating hours.
- For flexible installation, the connecting cable is suitable for an operating temperature range of -25 … +80 °C. The temperature at the connection cable may be +90 °C for max. 10000 operating hours.
- If necessary, a suitable overvoltage arrester can be connected in front of the VEGAPULS C 21, C 22, C 23

7 Important information for mounting and maintenance

General instructions
The following requirements must be fulfilled for mounting, electrical installation, setup and maintenance of the instrument:
- The staff must be qualified according the respective tasks
- The staff must be trained in explosion protection
- The staff must be familiar with the respectively valid regulations, e.g. planning and installation acc. to CEC or NEC
- Make sure when working on the instrument (mounting, installation, maintenance) that there is no explosive atmosphere present, the supply circuits should be voltage-free, if possible
- The instrument has to be mounted according to the manufacturer specifications, the Certificate of Conformity and the valid regulations and standards
- Modifications on the instrument can influence the explosion protection and hence the safety, therefore repairs are not permitted to be conducted by the end user
- Modifications must only be carried out by employees authorized by VEGA company
- Use only approved spare parts

Mounting
Keep in mind for instrument mounting
- Mechanical damage on the instrument must be avoided
- Mechanical friction must be avoided
- If the device is used as a separating wall device, the operator must observe the applicable installation regulations.
- Installation of the equipment is possible in Zone 2 or Zone 22 based on ratings for Division 2, Zone 1, and/or Zone 21 as specified as permissible by the applicable area electrical codes
- Only approved adapters must be used for connection to conduits
- Only the 1 or ½ NPT threads are suitable for connection to conduits

Maintenance
To ensure the functionality of the device, periodic visual inspection is recommended for:

- Secure mounting
- No mechanical damages or corrosion
- Worn or otherwise damaged cables
- No loose connections of the line connections, equipotential bonding connections
- Correct and clearly marked cable connections

8 Electrostatic charging (ESD)

Take note in case of danger of electrostatic charges:

- Avoid friction on the surfaces
- Do not dry clean the surfaces

The instruments must be mounted/installed in such a way that the following can be ruled out:

- electrostatic charges during operation, maintenance and cleaning.
- process-related electrostatic charges, e.g. by measuring media flowing past

The warning on the type label indicates danger:

- WARNING - POTENTIAL ELECTROSTATIC CHARGING HAZARD – SEE INSTRUCTIONS
- AVERTISSEMENT – DANGER POTENTIEL DE CHARGES ELECTROSTATIQUES – VOIR INSTRUCTION

- For media with a conductivity smaller than 10^{-8} S/m applies:
  - The level measuring instrument must not be used in highly charge generating processes, e.g. mechanical friction and separation processes, spraying of electrons, etc.
  - In particular, the level measuring instrument must not be mounted in a pneumatic conveying flow
- In the case of extremely flammable dusts with a minimum ignition energy (MIE) of less than 3 mJ, the device must not be used in areas where intensive electrostatic charging processes can be expected

9 Electrical data

Electronics H, 4 …20 mA/HART

Supply and signal circuit:	
Two-wire connection cable and shielding Supply [+] brown Supply [-] blue Shielding: black	In ignition protection type Dust-Ignitionproof and Non-Incendive
	Supply via a circuit with limited power (max. 100 W, see operating instructions), e.g. a class 2 power supply unit common in North America U = 12 … 35 V, non-intrinsically safe U_m = 35 V
Power consumption	< 1 W
The shielding (black) must be earthed on the supply side.	

Electronics W, Modbus

Supply and signal circuit:	
Four-wire connection cable and shielding Supply [+] brown Supply [-] blue Modbus [+] black Modbus [-] white Shielding: black, thick	In ignition protection type Dust-Ignitionproof and Non-Incendive Supply via a circuit with limited power (max. 100 W, see operating instructions), e.g. a class 2 power supply unit common in North America U = 8 … 30 V, non-intrinsically safe U_m = 30 V
Power consumption	< 1 W
The shielding (black) must be earthed on the supply side.	

10 Thermal data

Operation in an explosive gas atmosphere:

Temperature class	Permissible process temperature range at the antenna in Zone 1 (EPL Gb) or in Division 2	Permissible ambient temperature range on the electronics housing in zone 1 (EPL Gb) or in Division 2
T4 … T1	-20 … +80 °C	-20 … +80 °C

Operation in explosive dust atmospheres: Dust explosion protection (Division)

Electronics	Permissible process temperature range on the instrument in Division 1 or 2	Permissible ambient temperature range on the electronics housing in Division 1 or 2	Max. surface temperature in Division 1 or 2
Two-wire 4 … 20 mA/ HART	-20 … +80 °C	-20 … +80 °C	T4
Four-wire Modbus	-20 … +80 °C	-20 … +80 °C	T4

Operation in an explosive dust atmosphere Zone 20 (EPL Da), Zone 20/21 (EPL Da/Db):

Electronics	Permissible process temperature range on the instrument in zone 20 (EPL Da)	Permissible ambient temperature range on the electronics housing in zone 20 (EPL Da)	Max. surface temperature in zone 20
Two-wire 4 … 20 mA/ HART	-20 … +67 °C	-20 … +67 °C	+121 °C
Four-wire Modbus	-20 … +67 °C	-20 … +67 °C	+142 °C

Operation in an explosive dust atmosphere Zone 21 (EPL Db):

Electronics	Permissible process temperature range on the instrument in zone 21 (EPL Db)	Permissible ambient temperature range on the electronics housing in zone 21 (EPL Db)	Max. surface temperature in zone 21
Two-wire 4 … 20 mA/ HART	-20 … +80 °C	-20 … +80 °C	+134 °C

Electronics	Permissible process temperature range on the instrument in zone 21 (EPL Db)	Permissible ambient temperature range on the electronics housing in zone 21 (EPL Db)	Max. surface temperature in zone 21
Four-wire Modbus	-20 … +80 °C	-20 … +80 °C	+155 °C

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Safety instructions
VEGAPULS C 21, C 22, C 23

Dust-Ignitionproof
Non-Incendive
Encapsulation
Two-wire 4 … 20 mA/HART
Four-wire Modbus

Document ID: 64735

Contents

Supplementary documentation:

- Operating Instructions VEGAPULS C 21, C 22, C 23
- Certificate of Conformity CSA 20CA80043162X (VEGAPULS C 21, C 23), CSA 80043162 (VEGAPULS C 22) (Document ID: 62422)

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1 Area of applicability

These safety instructions apply to the VEGAPULS of type series:

- VEGAPULS C 21
- VEGAPULS C 22
- VEGAPULS C 23

With the electronics versions:

- H - Two-wire 4 … 20 mA/HART
- W - Four-wire Modbus

According to Certificate of Conformity CSA 20CA80043162X (VEGAPULS C 21, C 23), CSA 80043162 (VEGAPULS C 22) (certificate number on the type label) and for all instruments with safety instruction 64735.

The classification as well as the respective standards are stated in the Certificate of Conformity.

Type of protection marking:

H - Two-wire 4 … 20 mA/HART

- VEGAPULS C 21, C 23
  - Cl I Div 2 Gp ABCD T4 Ta=-20 … +80 °C, Cl I Zn 1 AEx/Ex ib mb IIC T4 Gb,
  - Zn 20, AEx/Ex ta IIIC T121°C Da Ta-20 … +67 °C
  - Zn 21, AEx/Ex tb IIIC T134°C Db Ta-20 … +80 °C
  - Cl II Div 1, Gp EFG Cl III T4 Ta=-20 … +80 °C
- VEGAPULS C 22
  - Cl I Div 2 Gp ABCD T4 Ta=-20 … +80 °C,
  - Cl II Div 1, Gp EFG Cl III T4 Ta=-20 … +80 °C

W - Four-wire Modbus

- VEGAPULS C 21, C 23
  - Cl I Div 2 Gp ABCD T4 Ta=-20 … +80 °C, Cl I Zn 1 AEx/Ex ib mb IIC T4 Gb,
  - Zn 20, AEx/Ex ta IIIC T142°C Da Ta-20 … +67 °C
  - Zn 21, AEx/Ex tb IIIC T155°C Db Ta-20 … +80 °C
  - Cl II Div 1, Gp EFG Cl III T4 Ta=-20 … +80 °C
- VEGAPULS C 22
  - Cl I Div 2 Gp ABCD T4 Ta=-20 … +80 °C,
  - Cl II Div 1, Gp EFG Cl III T4 Ta=-20 … +80 °C

2 Device configuration/-properties

The detailed device configurations can be retrieved using the serial number search on our homepage.

Move to "www.vega.com" and enter in the search field the serial number of your instrument.

Alternatively, you can find all via your smartphone:

- Download the VEGA Tools app from the "*Apple App Store*", "*Google Play Store*" or "*Baidu Store*"
- Scan the DataMatrix code on the type label of the instrument or
- Enter the serial number manually in the app

3 General information

The VEGAPULS C 21, C 22, C 23 in ignition protection type encapsulation "m" are used for detection of the distance between medium surface and sensor by means of high frequency, electromagnetic waves in the GHz range.

The electronics uses the running time of the signals reflected by the medium surface to calculate the distance to the medium surface.

The VEGAPULS C 21, C 22, C 23 consist of an electronics housing, a process connection element and a sensor or an antenna.

Zone application:
The VEGAPULS C 21, C 23 are suitable for applications in hazardous atmospheres of all combustible materials of explosion groups IIA, IIB, IIC and IIIA, IIIB, IIIC.

The VEGAPULS C 21, C 23 are suitable for applications requiring EPL Gb instruments.

The VEGAPULS C 21, C 23 are suitable for applications requiring EPL Da instruments.

The VEGAPULS C 21, C 23 are suitable for applications requiring EPL Da/Db instruments.

Division application:
The VEGAPULS C 21, C 22, C 23 are suitable for applications in hazardous atmospheres of all combustible materials of explosion groups A, B, C, D and dust groups E, F, G.

The VEGAPULS C 21, C 22, C 23 are suitable for applications requiring Division 2 (NI) and Division 1 equipment for dust explosion protection (DIP).

4 Application area

EPL Gb instrument
The VEGAPULS C 21, C 23 with the mechanical fixing element are installed in hazardous areas of zone 1 requiring EPL Gb instruments.

EPL Da instrument
The VEGAPULS C 21, C 23 with the mechanical fixing element are installed in hazardous areas of zone 20 requiring EPL Da instruments.

EPL Da/Db instrument
The VEGAPULS C 21, C 23 with mechanical fixing element are installed in hazardous areas of zone 21 requiring EPL Db instruments. The mechanical fixing element, process connection element is installed in the separating wall, which separates areas requiring EPL Db or EPL Da instruments. The sensor measuring system is installed in hazardous areas of zone 20 requiring EPL Da instruments.

Division 1 instruments
The VEGAPULS C 21, C 22, C 23 with the mechanical fixing element are installed in dust-explosive areas (DIP) requiring Division 1 instruments.

Division 2 instruments
The VEGAPULS C 21, C 22, C 23 with the mechanical fixing element are installed in explosive areas requiring Division 2 instruments.

5 Special operating conditions

Specific conditions of use:
For electrical and thermal data refer to the general product information.

The equipment shall be installed and maintained such that hazards caused by electrostatic discharge are excluded and that there is a low risk of mechanical danger.

The equipment shall be wired using the NPT threads identified on the enclosure using the 1 NPT threads for Zones or either the 1 NPT or ½ NPT threads for Divisions, and in accordance with the applicable area electrical code. The integral cable shall be mechanically protected and terminated in a suitably rated terminal or junction facility.

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Electrostatic charging (ESD)
You can find the details in chapter "*Electrostatic charging (ESD)*" of these safety instructions.

Ambient temperature
You can find the details in chapter "*Thermal data*" of these safety instructions.

6 Additional instructions for safe operation

In the case when an explosive atmosphere occurs the assessment of the equipment is based on the following atmospheric conditions:

- temperature -20 °C to +60 °C (in the process) and
- pressure 80 kPa (0,8 bar) to 110 kPa (1,1 bar); and
- air with normal oxygen content, typically 21 % v/v

Connection conditions

- Supply via energy-limiting circuit according to IEC 61010-1, chapter 9.4, e.g. via a Class 2 power supply unit
- For fixed installation, the connecting cable is suitable for an operating temperature range of -40 … +80 °C. The temperature at the connection cable may be +90 °C for max. 10000 operating hours.
- For flexible installation, the connecting cable is suitable for an operating temperature range of -25 … +80 °C. The temperature at the connection cable may be +90 °C for max. 10000 operating hours.
- If necessary, a suitable overvoltage arrester can be connected in front of the VEGAPULS C 21, C 22, C 23

7 Important information for mounting and maintenance

General instructions
The following requirements must be fulfilled for mounting, electrical installation, setup and maintenance of the instrument:

- The staff must be qualified according the respective tasks
- The staff must be trained in explosion protection
- The staff must be familiar with the respectively valid regulations, e.g. planning and installation acc. to CEC or NEC
- Make sure when working on the instrument (mounting, installation, maintenance) that there is no explosive atmosphere present, the supply circuits should be voltage-free, if possible
- The instrument has to be mounted according to the manufacturer specifications, the Certificate of Conformity and the valid regulations and standards
- Modifications on the instrument can influence the explosion protection and hence the safety, therefore repairs are not permitted to be conducted by the end user
- Modifications must only be carried out by employees authorized by VEGA company
- Use only approved spare parts

Mounting
Keep in mind for instrument mounting

- Mechanical damage on the instrument must be avoided
- Mechanical friction must be avoided
- If the device is used as a separating wall device, the operator must observe the applicable installation regulations.
- Installation of the equipment is possible in Zone 2 or Zone 22 based on ratings for Division 2, Zone 1, and/or Zone 21 as specified as permissible by the applicable area electrical codes

- Only approved adapters must be used for connection to conduits
- Only the 1 or ½ NPT threads are suitable for connection to conduits

Maintenance

To ensure the functionality of the device, periodic visual inspection is recommended for:

- Secure mounting
- No mechanical damages or corrosion
- Worn or otherwise damaged cables
- No loose connections of the line connections, equipotential bonding connections
- Correct and clearly marked cable connections

8 Electrostatic charging (ESD)

Take note in case of danger of electrostatic charges:

- Avoid friction on the surfaces
- Do not dry clean the surfaces

The instruments must be mounted/installed in such a way that the following can be ruled out:

- electrostatic charges during operation, maintenance and cleaning.
- process-related electrostatic charges, e.g. by measuring media flowing past

The warning on the type label indicates danger:

- WARNING - POTENTIAL ELECTROSTATIC CHARGING HAZARD – SEE INSTRUCTIONS
- AVERTISSEMENT – DANGER POTENTIEL DE CHARGES ELECTROSTATIQUES – VOIR INSTRUCTION

- For media with a conductivity smaller than 10^{-8} S/m applies:
  - The level measuring instrument must not be used in highly charge generating processes, e.g. mechanical friction and separation processes, spraying of electrons, etc.
  - In particular, the level measuring instrument must not be mounted in a pneumatic conveying flow
- In the case of extremely flammable dusts with a minimum ignition energy (MIE) of less than 3 mJ, the device must not be used in areas where intensive electrostatic charging processes can be expected

9 Electrical data

Electronics H, 4 …20 mA/HART

Supply and signal circuit:	
Two-wire connection cable and shielding	In ignition protection type Dust-Ignitionproof and Non-Incendive
Supply [+] brown Supply [-] blue Shielding: black	Supply via a circuit with limited power (max. 100 W, see operating instructions), e.g. a class 2 power supply unit common in North America U = 12 … 35 V, non-intrinsically safe U_m = 35 V
Power consumption	< 1 W
The shielding (black) must be earthed on the supply side.	

Electronics W, Modbus

Supply and signal circuit:	
Four-wire connection cable and shielding Supply [+] brown Supply [-] blue Modbus [+] black Modbus [-] white Shielding: black, thick	In ignition protection type Dust-Ignitionproof and Non-Incendive Supply via a circuit with limited power (max. 100 W, see operating instructions), e.g. a class 2 power supply unit common in North America U = 8 … 30 V, non-intrinsically safe U_m = 30 V
Power consumption	< 1 W
The shielding (black) must be earthed on the supply side.	

10 Thermal data

Operation in an explosive gas atmosphere:

Temperature class	Permissible process temperature range at the antenna in Zone 1 (EPL Gb) or in Division 2	Permissible ambient temperature range on the electronics housing in zone 1 (EPL Gb) or in Division 2
T4 … T1	-20 … +80 °C	-20 … +80 °C

Operation in explosive dust atmospheres: Dust explosion protection (Division)

Electronics	Permissible process temperature range on the instrument in Division 1 or 2	Permissible ambient temperature range on the electronics housing in Division 1 or 2	Max. surface temperature in Division 1 or 2
Two-wire 4 … 20 mA/ HART	-20 … +80 °C	-20 … +80 °C	T4
Four-wire Modbus	-20 … +80 °C	-20 … +80 °C	T4

Operation in an explosive dust atmosphere Zone 20 (EPL Da), Zone 20/21 (EPL Da/Db):

Electronics	Permissible process temperature range on the instrument in zone 20 (EPL Da)	Permissible ambient temperature range on the electronics housing in zone 20 (EPL Da)	Max. surface temperature in zone 20
Two-wire 4 … 20 mA/ HART	-20 … +67 °C	-20 … +67 °C	+121 °C
Four-wire Modbus	-20 … +67 °C	-20 … +67 °C	+142 °C

Operation in an explosive dust atmosphere Zone 21 (EPL Db):

Electronics	Permissible process temperature range on the instrument in zone 21 (EPL Db)	Permissible ambient temperature range on the electronics housing in zone 21 (EPL Db)	Max. surface temperature in zone 21
Two-wire 4 … 20 mA/ HART	-20 … +80 °C	-20 … +80 °C	+134 °C

Electronics	Permissible process temperature range on the instrument in zone 21 (EPL Db)	Permissible ambient temperature range on the electronics housing in zone 21 (EPL Db)	Max. surface temperature in zone 21
Four-wire Modbus	-20 … +80 °C	-20 … +80 °C	+155 °C

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