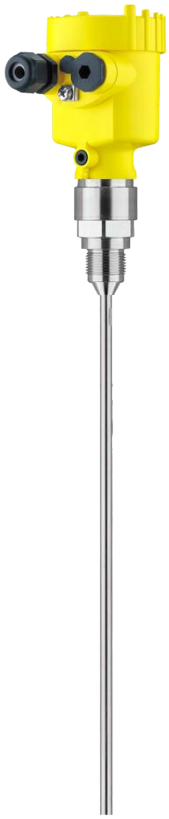
Safety instructions
VEGAFLEX FX8*(*).CD/ P****H/A/I/B/U*****



CSA No. 2515397 (LR 108043)

Ex d [ia] IIC Gb; Class I Zone 1 AEx d [ia] IIC Gb

CL I, DIV 1, GR A,B,C,D

CL II, DIV 1, GR E,F,G

CL III

Document ID: 46265

Contents

46265-EN-150429

Please note:

These safety instructions are part of the documentation:

- 41824 - VEGAFLEX 81 - 4 … 20 mA/HART - Two-Wire
- 42279 - VEGAFLEX 81 - 4 … 20 mA/HART - Two-Wire - Coaxial Measuring Probe
- 41825 - VEGAFLEX 81 - 4 … 20 mA/HART - Four-Wire
- 42280 - VEGAFLEX 81 - 4 … 20 mA/HART - Four-Wire - Coaxial Measuring Probe
- 41828 - VEGAFLEX 81 - Modbus
- 42283 - VEGAFLEX 81 - Modbus - Coaxial Measuring Probe
- 41829 - VEGAFLEX 82 - 4 … 20 mA/HART - Two-Wire
- 41830 - VEGAFLEX 82 - 4 … 20 mA/HART - Four-Wire
- 41833 - VEGAFLEX 82 - Modbus
- 41834 - VEGAFLEX 83 - 4 … 20 mA/HART - Two-Wire
- 41839 - VEGAFLEX 83 - 4 … 20 mA/HART - Two-Wire - Polished Version
- 41835 - VEGAFLEX 83 - 4 … 20 mA/HART - Four-Wire
- 41840 - VEGAFLEX 83 - 4 … 20 mA/HART - Four-Wire - Polished Version
- 41838 - VEGAFLEX 83 - Modbus
- 41843 - VEGAFLEX 83 - Modbus - Polished Version
- 41844 - VEGAFLEX 86 - 4 … 20 mA/HART - Two-Wire
- 42284 - VEGAFLEX 86 - 4 … 20 mA/HART - Two-Wire - Coaxial Measuring Probe
- 41845 - VEGAFLEX 86 - 4 … 20 mA/HART - Four-Wire
- 42285 - VEGAFLEX 86 - 4 … 20 mA/HART - Four-Wire - Coaxial Measuring Probe
- 41848 - VEGAFLEX 86 - Modbus
- 42288 - VEGAFLEX 86 - Modbus

- 49453 - CSA Certificate 2515397 (LR 108043)

46265-EN-150429

1 Area of applicability

These safety instructions apply to Guided Wave Radar series VEGAFLEX FX8*(*).CD/P****H/A/I/B/U***** according to CSA Certificate 2515397 (LR 108043)and for all instruments with the number of the safety instructions (46265) on the type label.

2 General information

The VEGAFLEX FX8*(*).CD/P****H/A/I/B/U***** level measuring instruments as guided radar sensors are used to detect the distance between product surface and sensor by means of high-frequency microwave pulses in the GHz range. The instrument emits high-frequency microwave pulses, which are guided down a measuring cable or rod. The electronics uses the running time of the signals reflected by the product surface to calculate the distance to the product surface.

The VEGAFLEX FX8*(*).CD/P****H/A/I/B/U***** consist of an electronics housing with an "Ex-d" connection compartment with integrated two-wire or four-wire barrier and an "Ex-i" connection compartment with integrated electronics module, a process connection element and a sensor, the measuring cable or measuring rod. The indicating and adjustment module can also be mounted in the "Ex-i" connection compartment.

The VEGAFLEX FX8*(*).CD/P****H/A/I/B/U***** are suitable for applications in hazardous atmospheres of all combustible materials of explosion group IIA, IIB and IIC, for applications requiring EPL-Ga/Gb or EPL-Gb instruments. The products to be measured can also be combustible liquids, gases, mists or vapours.

If the VEGAFLEX FX8*(*).CD/P****H/A/I/B/U***** are installed and operated in hazardous areas, the general Ex installation regulations IEC 60079-14 as well as these safety instructions must be observed.

The operating instructions as well as the installation regulations or standards that apply for explosion protection of electrical systems must generally be observed.

The installation of explosion-endangered systems must always be carried out by qualified personnel.

Hazardous locations designation
Intrinsically Safe

- Ex d [ia] IIC Gb; Class I Zone 1 AEx d [ia] IIC Gb
- CL I, DIV 1, GP A,B,C,D
- CL II, DIV 1, GP E,F,G
- CL III

3 Technical data

Electrical data
The VEGAFLEX FX8*(*).CD/P****H/A/I/B/U***** are designed with intrinsically and non-intrinsically safe circuits.

Non-intrinsically safe circuits
The non-intrinsically safe circuits are connected to terminals in the explosions proof connection compartment.

VEGAFLEX FX8*(*).CD/P**H/A***** (Electronics 4 … 20 mA/HART - Two-wire)**

Power supply and signal circuit: (terminals 1[+], 2[-] in the explosion proof connection compartment)	U = 14 … 36 V DC Um = 253 V

VEGAFLEX FX8*(*).CD/P****I***** (Electronics 4 … 20 mA/HART - Four - wire)	
Power supply circuit: (terminals 1[+], 2[-] in the explosion proof connection compartment)	U = 9.6 … 48 V DC U = 20 … 42 V AC Um = 253 V
Active signal circuit: (terminals 5[+ active], 7[- common] in the explosion proof connection compartment)	Iout = 4 … 20 mA with superimposed HART signal Um = 60 V
Passive signal circuit: (terminals 6[+ passive], 7[- common] in the explosion proof connection compartment)	Iin = 4 … 20 mA with superimposed HART signal Um = 60 V

VEGAFLEX FX8*(*).CD/P****B***** (Electronics 4 … 20 mA/HART - Four - wire)	
Power supply and signal circuit: (terminals 1[+], 2[-] in the explosion proof connection compartment)	U = 90 … 253 V AC Um = 253 V
Active signal circuit: (terminals 5[+ active], 7[- common] in the explosion proof connection compartment)	Iout = 4 … 20 mA with superimposed HART signal Um = 60 V
Passive signal circuit: (terminals 6[+ passive], 7[- common] in the explosion proof connection compartment)	Iin = 4 … 20 mA with superimposed HART signal Um = 60 V

VEGAFLEX FX8*(*).CD/P****U***** (Electronics ModBus)	
Power supply circuit: (terminals 1[+], 2[-] in the explosion proof connection compartment)	U = 8 … 32 V DC Um = 253 V AC
Signal circuit: (terminals MB[+], MB[-] in the explosion proof connection compartment)	Umax = 5 V DC Um = 253 V AC/DC
USB signal circuit: (USB connector in the explosion proof connection compartment)	Umax = 5 V Um = 253 V AC/DC

Intrinsically safe circuits

The intrinscially safe cicuits are connected to terminals in the intrinsically safe connection compartment.

VEGAFLEX FX8*(*).CD/P**H/A***** (Electronics 4 … 20 mA/HART - Two-wire)**

Indicating and adjustment circuit: (terminals 5, 6, 7, 8 in electronics compartment)	In ignition protection type intrinsic safety Ex ia Only for connection to the intrinsically safe supply and signal cuitcuit of the corresponding external indicating and adjustment unit VEGADIS 61/81. The regulations for the interconnection of intrinsically safe circuits between VEGAFLEX FX8*(*).FD****H/A***** and the external indication and adjustment unit are complied with if the total inductance and total capacity of the connection cable between VEGAFLEX FX8*(*).FD****H/A***** and the external indication and adjustment unit L_{cable} = 100 µH and C_{cable} = 1.98 µF are not exceeded. The indication and adjustment module integrated in VEGAFLEX FX8*(*).FD****H/A***** and the connected interface converter are taken into account. In case of using the display connection cable between the VEGAFLEX FX8*(*).FD****H/A***** and the display VEGADIS 61/81 delivered from VEGA, the following parameters has to be considered: $L_i´$ = 0.62 µH/m $C_{i\ wire/wire}´$ = 132 pF/m $C_{i\ wire/screen}´$ = 208 pF/m

VEGAFLEX FX8*(*).CD/P**H/A/I/B/U*****

Circuit of the indicating and adjustment module: (spring contacts in the intrinsically safe connection compartment)	In ignition protection type intrinsic safety Ex ia IIC Only for connection to the indicating and adjustment module PLICSCOM.

The intrinsically safe circuits are not free-of-ground.

The metallic parts of VEGAFLEX FX8*(*).CD/P****H/A/I/B/U***** are electrically connected with the internal and external earth terminals.

4 Application conditions

The max. permissible ambient temperatures depending on the temperature classes are specified in the following tables.

EPL-Ga/Gb instrument

Temperature class	Temperature on the sensor (measuring cable, rod)	Ambient temperature on the electronics
T6	-20 … +60 °C	-50 … +46 °C
T5, T4, T3, T2, T1	-20 … +60 °C	-50 … +60 °C

For applications requiring EPL-Ga/Gb instruments the process pressure of the media must be between 0.8 … 1.1 bar. If the VEGAFLEX FX8*(*).CD/P****H/A/I/B/U***** are operated at temperatures higher than those specified in the above table, please make sure through appropriate measures that there is no danger of ignition from the hot surfaces. The maximum temperature on the electronics/housing should not exceed the values specified in the above table. The application conditions during operation in areas with no explosive mixtures are stated in the manufacturer information.

EPL-Gb / Division 1 instrument

Temperature class	Temperature on the sensor (measuring cable, rod)	Ambient temperature on the electronics
T6	-60 … +85 °C	-50 … +46 °C
T5	-60 … +100 °C	-50 … +60 °C
T4	-60 … +135 °C	-50 … +60 °C
T3	-60 … +200 °C	-50 … +60 °C
T2	-60 … +300 °C	-50 … +60 °C
T1	-60 … +450 °C	-50 … +60 °C

If the VEGAFLEX FX8*(*).CD/P****H/A/I/B/U***** are operated at temperatures higher than those specified in the above table, please make sure through appropriate measures that there is no danger of ignition from the hot surfaces. The maximum temperature on the electronics/housing should not exceed the values specified in the above table. The permissible operating temperatures and pressures are stated in the manufacturer information.

VEGAFLEX FX86*(*).CD/P**H/A/B/I/U*****, low temperature version down to -196 °C**

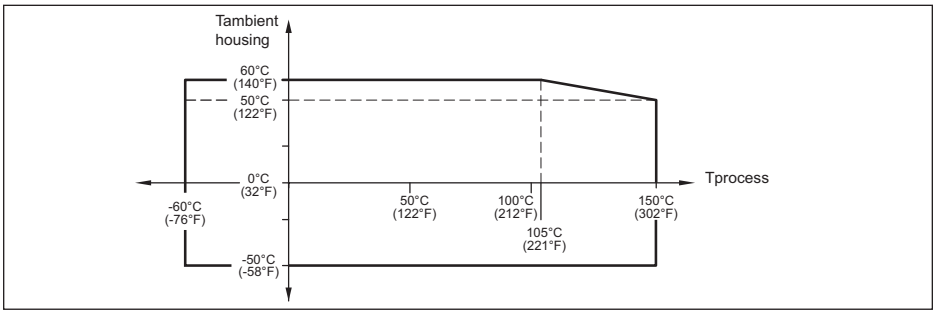
EPL-Gb / Division 1 instrument

Temperature class	Temperature on the sensor (measuring cable, rod)	Ambient temperature on the electronics
T6	-196 … +85 °C	-50 … +46 °C
T5	-196 … +100 °C	-50 … +60 °C
T4	-196 … +135 °C	-50 … +60 °C
T3	-196 … +200 °C	-50 … +60 °C
T2	-196 … +300 °C	-50 … +60 °C
T1	-196 … +450 °C	-50 … +60 °C

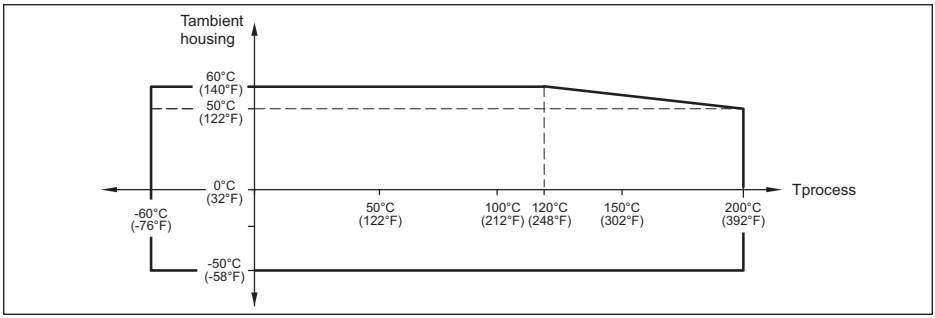
If the VEGAFLEX FX86*(*).CD/P****H/A/B/I/U***** are operated at temperatures higher than those specified in the above table, please make sure through appropriate measures that there is no danger of ignition from the hot surfaces. The maximum temperature on the electronics/housing should not exceed the values specified in the above table. The permissible operating temperatures and pressures are stated in the manufacturer information.

Temperature derating for process temperatures up to +150 °C, +200 °C, +250 °C, +280 °C and -196 °C

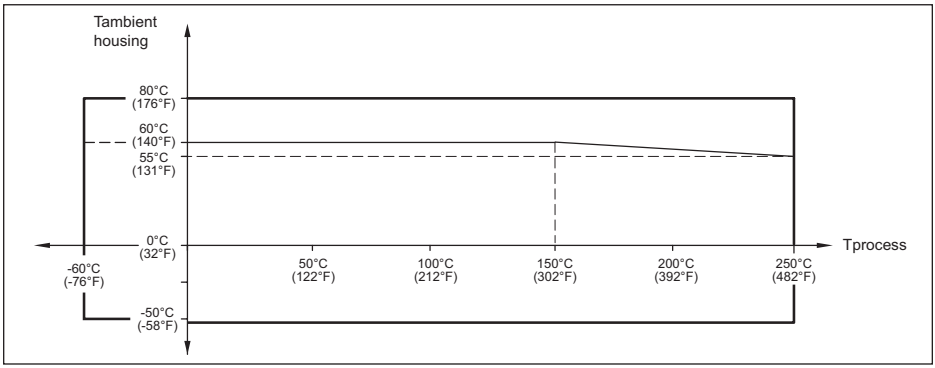
Versions for process temperatures up to +150 °C



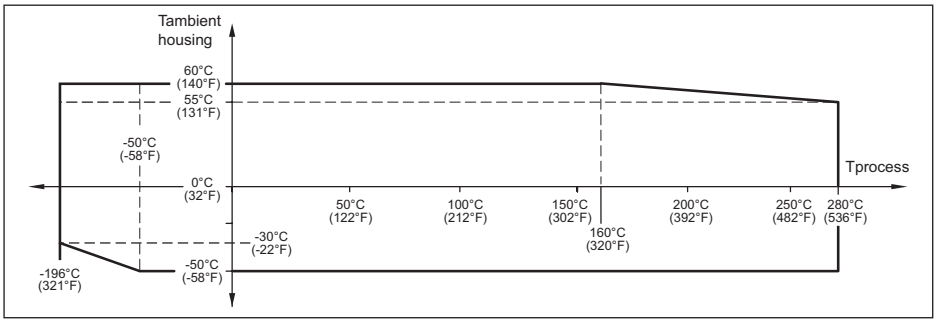
Versions for process temperatures up to +200 °C



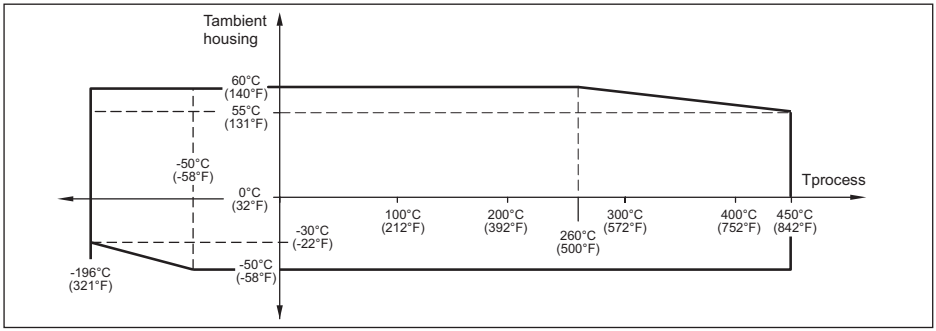
Versions for process temperatures up to +250 °C



Versions for process temperatures up to +280 °C



Versions for process temperatures down to -196 °C



5 Protection against static electricity

The VEGAFLEX FX8*(*).CD/P****H/A/I/B/U***** in versions with electrostatically chargeable plastic parts, such as e.g. metal housing with inspection window or connection cable with the separated version, have a caution label pointing out the safety measures that must be taken with regard to electrostatic charges during operation.

Caution: Plastic parts! Danger of static charge!

- Avoid friction
- No dry cleaning
- Do not mount in areas with flowing, non-conductive products

6 Installation of the sensors

When used as EPL-Ga/Gb instruments, the sensors of VEGAFLEX FX8*(*).CD/P****H/A/I/B/U***** should be mounted such that the measuring cable/rod is effectively secured against bending or touching the vessel wall, under consideration of other vessel installations and flow conditions in the vessel. This applies especially to measuring probes over 3 m long.

7 XX. versions with exchangeable cable or rod probe; versions with probe length "Length 0"

The following must be taken into account for VEGAFLEX FX8*(*).CD/P****H/A/I/B/U***** versions with exchangeable cable or rod probe and for VEGAFLEX FX8*(*).CD/P****H/A/I/B/U***** versions probe length "Length 0":

- On certified VEGAFLEX FX8*(*).CD/P****H/A/I/B/U***** only original VEGA cable or rod probes must be mounted
- When mounting cable or rod probes, the torques specified in the respecitive operating instruction manuals must be maintained
- The mechanical connection must be ensured

8 Grounding

The explosion proof connection compartment of VEGAFLEX FX8*(*).CD/P****H/A/I/B/U***** includes a safety barrier without galvanic separation. For safety reasons, the intrinsically safe circuit must be grounded. The external or internal ground connection terminal on the housing serves for this purpose, it has to be connected with the potential equalization of the explosion hazardous area.

9 Impact and friction sparks

The VEGAFLEX FX8*(*).CD/P****H/A/I/B/U***** in aluminium versions must be mounted in such a way that sparks from impact and friction between aluminium and steel (except stainless steel, if the presence of rust particles can be excluded) cannot occur.

10 Material resistance

The VEGAFLEX FX8*(*).CD/P****H/A/I/B/U***** must only be used in media against which the materials of the wetted parts are sufficiently resistant.

11 Mounting with external indicating unit VEGADIS 61 or VEGADIS 81

The intrinsically safe signal circuit between VEGAFLEX FX8*(*).FD****H/A***** and the external indicating unit VEGADIS 61 or VEGADIS 81 should be set up without grounding. The required insulation voltage is > 500 V AC. When using VEGA connection cable, this requirement is fulfilled.

12 Type and size of the threads for the "Ex-d" cable entries

The "Ex-d" connection compartment of VEGAFLEX FX8*.CD/P****H/A/B/I/U**M** comes with M20 x 1.5 threads for the cable entries or closing screws.

The "Ex-d" connection compartment of VEGAFLEX FX8*.CD/P****H/A/B/I/U**N** comes with ½-14 NPT threads for the cable entries or closing screws.

13 Tensile force on the measuring cable/ rod

The permissible tensile force is

- VEGAFLEX FX81.CD/P****H/A/B/I/U*****
  - Diameter 4 mm: F = 2.5 kN
  - Diameter 2 mm: F = 1.5 kN
- VEGAFLEX FX82.CD/P****H/A/B/I/U*****
  - Diameter 4 mm: F = 12 kN
  - Diameter 6 mm coated: F = 8 kN
  - Diameter 6 mm: F = 30 kN
  - Diameter 11 mm coated: F = 30 kN

46265-EN-150429

- VEGAFLEX FX83.CD/P****H/A/B/I/U*****
  - Diameter 4 mm: F = 2 kN
- VEGAFLEX FX86.CD/P****H/A/B/I/U*****
  - Diameter 4 mm: F = 2.5 kN
  - Diameter 2 mm: F = 1.5 kN

14 Ignition protection type explosion proof enclosure

The terminals for connecting to the operating voltage, i.e. signal circuits, are integrated in the connection compartment according to protection type explosion proof enclosure "d".

The gap between housing and cover is a flameproof gap.

The explosion proof connection compartment is provided with a M20 x 1.5 or ½-14 NPT thread for connection to a certified "Conduit" system or for mounting of a certified explosion proof cable entry (only for zones applications). Cable entries of simple construction may not be used. When connecting to a "Conduit" system the appropriate seal facility must be located directly on the explosion proof connection compartment.

Unused openings must be sealed accordingly.

Before opening or in case of the lid of the explosion proof connection compartment is open (e. g. during connection or service work), make sure that either the supply line is voltage free or no explosive atmosphere is present.

The flameproof terminal box of this equipment must be provided with cable entries and filter plugs resp. condits which are certified according to CAN/CSA E 60079-0: 02 and CAN/CSA E 60079-1: 07.

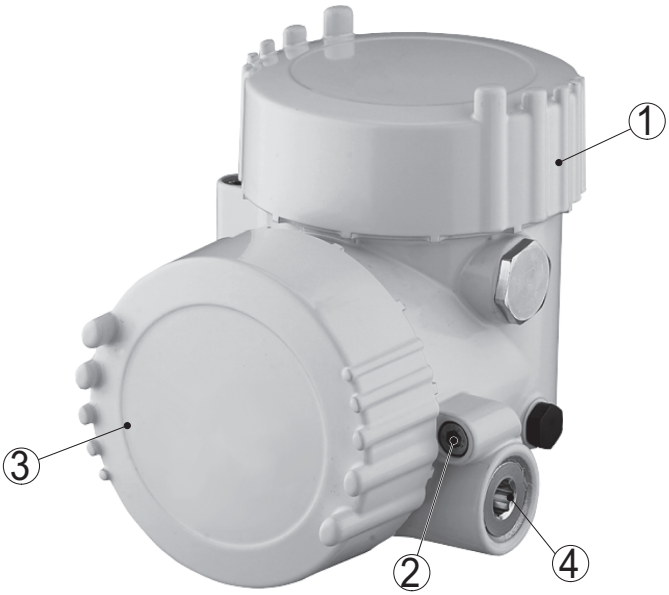
The connection cables, the cable entries and filter plugs resp. the conduits have to be suitable for the lowest ambient temperature.

When wiring the connection line to the explosion proof connection compartment, it must be sufficiently secured against damage.

The cover of the explosion proof connection compartment must be screwed in completely before commissioning and secured by screwing out the lid locking screw all the way to the stop.

The cover of the explosion proof connection compartment with the caution label "Do not … is present" and the cover of the intrinsically safe connection compartment without caution label must not be exchanged. The covers must be mounted on the corresponding connection compartments.

Double chamber housing with explosion proof connection compartment



1 *Intrinsically safe connection compartment with electronics module*
2 *Locking screw of the cover*
3 *Explosion proof connection compartment with integrated barrier*

15 Installation Diagram

Installation Control Diagram

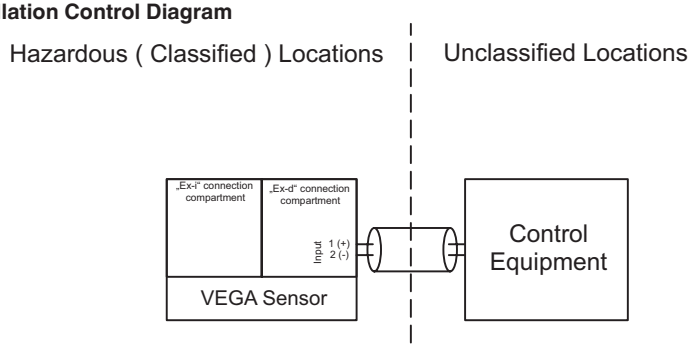


Fig. 8: VEGAFLEX FX8(*).CD/P****H/A***** (Electronics 4 … 20 mA/HART - Two-wire)*

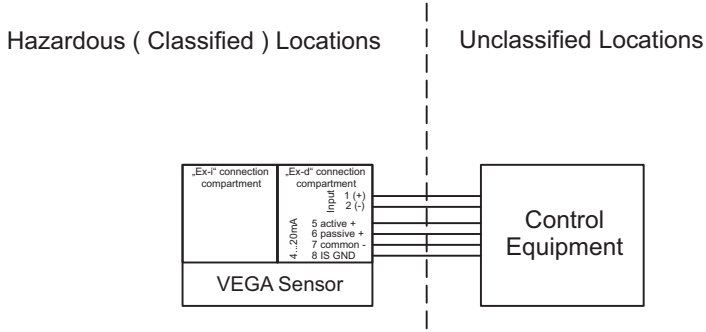


Fig. 9: VEGAFLEX FX8(*).CD/P****I/B***** (Electronics 4 … 20 mA/HART - Four - wire)*

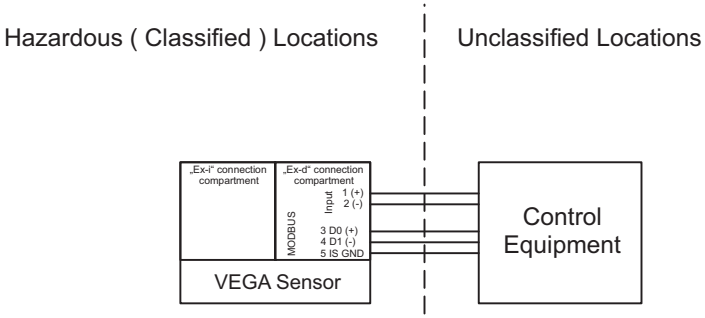


Fig. 10: VEGAFLEX FX8(*).CD/P****U***** (Electronics ModBus)*

General

The Intrinsic Safety Entity concept allows the interconnection of two intrinsically safe devices FM Approved and CSA Certified when installed in Canada with entity parameters not specifically examined in combination as a system when:

Dust-tight conduit seal shall be used when installed in Class II and Class III environments.

U_O or V_{OC} or $V_t \leq V_{max}$

I_O or I_{SC} or $I_t \leq I_{max}$

$P_O \leq P_i$

C_a or $C_O \geq C_{cable}$

L_a or $L_O \geq L_{cable}$

Dust-tight conduit seal shall be used when installed in Class II and Class III environments.

For Division 1 Installations the configuration of Field Device must be FM Approved / CSA Certified under Entity Concept.

The Field Device manufacurer's installation drawing shall be followed when installing this equipment.

Division 1 Installation requirements must be complied with if one or more of the following are located in a Division 1 hazardous location: Sensor, Probe or Field Device.

WARNING: Substitution of components may impair suitability for hazardous locations.

WARNING: Do not open when an explosive atmosphere is present.

Barriers and instruments to carry same Agency Approval.

Control Equipment
For Division 1 installations, Control equipment shall not use or generate more than 253 Vrms or Vdc.

Associated Apparatus
For Divisiion 2 installations, the Sensor shall be installed in accordance with the National Electrical Code ® (ANSI/NFPA 70) or Canadian Electrical Code, CSA C22.1 Part 1 Appendix F for Division 2 wiring methods.

For Zone 1 Installations, the terminal marked sign "*earth*" shall be grounded per ANSI/NFPA 70 article 504.50 or CSA C22.1 Part 1 Appendix F F3.2.2 and the Field Device wiring shall be segregated from the supply wiring.

VEGA Sensor
For Division 2 Installations, the Sensor shall be installed in accordance with the National Electrical Code ® (ANSI/NFPA 70) or Canadian Electrical Code, CSA C22.1 Part 1 Appendix F for Zone 0/1 wiring methods.

The VEGA Sensor is a VEGAFLEX FX8*(*).CD/P****H/A/I/B/U*****.

For 2 wire: Pins 1 & 2 are for power supply / signal output.

For 4 wire: Pins 1 & 2 are for power supply, pins 3 & 4 are for signal output.

VEGAFLEX FX8*(*).CD/P****H/A***** (Electronics 4 … 20 mA/HART - Two-wire)

Power supply and signal circuit: (terminals1[+], 2[-] in the explosion proof connectioncompartment)

U = 14 … 36 V DC

Um = 253 V

VEGAFLEX FX8*(*).CD/P****I***** (Electronics 4 … 20 mA/HART - Four - wire)

Power supply circuit: (terminals 1[+], 2[-] inthe explosion proof connection compartment)

U = 9.6 … 48 V DC

U = 20 … 42 V AC

Um = 253 V

Active signal circuit: (terminals 5[+ active], 7[-common] in the explosion proof connectioncompartment)

Iout = 4 … 20 mA with superimposed HART signal

Um = 60 V

Passive signal circuit: (terminals 6[+ passive],7[- common] in the explosion proofconnection compartment)

Iin = 4 … 20 mA with superimposed HART signal

Um = 60 V

VEGAFLEX FX8*(*).CD/P****B***** (Electronics 4 … 20 mA/HART - Four - wire)

Power supply circuit: (terminals 1[+], 2[-] inthe explosion proof connection compartment)

U = 90 … 253 V AC

Um = 253 V

Active signal circuit: (terminals 5[+ active], 7[-common] in the explosion proof connectioncompartment)

Iout = 4 … 20 mA with superimposed HART signal

Um = 60 V

Passive signal circuit: (terminals 6[+ passive],7[- common] in the explosion proofconnection com-

partment)

Iin = 4 … 20 mA with superimposed HART signal

Um = 60 V

VEGAFLEX FX8*(*).CD/P****U***** (Electronics ModBus)

Power supply circuit: (terminals 1[+], 2[-] in the explosion proof connection compartment)

U = 8 … 32 V DC

Um = 253 V AC

Signal circuit: (terminals MB[+], MB[-] in theexplosion proof connection compartment)

Umax = 5 V DC

Um = 253 V AC/DC

USB signal circuit: (USB connector in theexplosion proof connection compartment)

Iin = 4 … 20 mA with superimposed HART signal

Um = 60 V

Sensor Supply Cable

VEGA Display

The VEGA Display is a VEGADIS 61 or VEGADIS 81.

The VEGA Display is a VEGADIS 61 or VEGADIS 81 is only applicable with VEGAFLEX FX8*(*). CD/P****H/A***** (Electronics 4 … 20 mA/HART - Two-wire)

The configuration of Field Device must be FM Approved / CSA Certified under Entity Concept.

The Field Device manufacurer's installation drawing shall be followed when installing this equipment.

For Division 2 Installations, the Sensor shall be installed in accordance with the National Electrical Code ® (ANSI/NFPA 70) or Canadian Electrical Code, CSA C22.1 Part 1 Appendix F for Division 2 wiring methods.

Division 1 installations should be in accordance with ANSI/ISA RP12.06.01 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code ® (ANSI/NFPA 70) or Canadian Electrical Code.

For Division 1 Installations, the terminal marked sign "*earth*" shall be grounded per ANSI/NFPA 70 article 504.50 or CSA C22.1 Part 1 Appendix F F3.2.2 and the Field Device wiring shall be segregated from the supply wiring.

For Division 2 Installations, the Field Device shall be installed in accordance with the National Electrical Code ® (ANSI/NFPA 70) or Canadian Electrical Code, CSA C22.1 Part 1 Appendix F for Division 2 wiring methods including Nonincendive Field Wiring whne using the parameters shown.

Display Cable

The regulations for the interconnection of intrinsically safe circuits between VEGAFLEX FX8*(*).CD/P****H/A***** and the external indication and adjustment unit are complied with if the total inductance and total capacity of the connection cable between VEGAFLEX FX8*(*).CD/P****H/A***** and the external indication and adjustment unit L_{cable} = 100 µH and C_{cable} = 1.98 µF are not exceeded.

The indication and adjustment module integrated in VEGAFLEX FX8*(*).CD/P****H/A***** and the connected interface converter are taken into account.

In case of using the display connection cable delivered from VEGA between the VEGAFLEX FX8*(*).CD/P****H/A***** and the display VEGADIS 61 or VEGADIS 81 the following parameters has to be considered:

$L_i' = 0.62$ µH/m

$C_{i\ wire/wire}' = 132\ pF/m$

$C_{i\ wire/screen}' = 208\ pF/m$

Printing date:

All statements concerning scope of delivery, application, practical use and operating conditions of the sensors and processing systems correspond to the information available at the time of printing.
Subject to change without prior notice

© VEGA Grieshaber KG, Schiltach/Germany 2015

46265-EN-150429

VEGA Grieshaber KG
Am Hohenstein 113
77761 Schiltach
Germany

Phone +49 7836 50-0
Fax +49 7836 50-201
E-mail: info.de@vega.com
www.vega.com