



Safety instructions

Radar sensor

VEGAPULS 6X

Nonincendive

Two-wire 4 ... 20 mA/HART



Document ID: 66228



VEGA

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Supplementary documentation:

- Operating Instructions VEGAPULS 6X
- Quick setup guide VEGAPULS 6X
- Certificate of Conformity CSA 22 CA 80127301 (Document ID: 66229)
- SIL Safety Manual (Document ID: 66494)
- Further related documentation is available by entering the serial number of the device in the search field on "www.vega.com"

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1 Scope

These safety instructions apply to the VEGAPULS 6X of type series:

- PS6X(*).2*W**B/T/F/C*****H/A*E/J*****

With the electronics versions:

- H - Two-wire 4 ... 20 mA/HART
- A - Two-wire 4 ... 20 mA/HART with overvoltage arrester

According to Certificate of Conformity CSA 22 CA 80127301 (certificate number on the type label) and for all instruments with safety instruction 66228.

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

Type of protection marking:

- CI I, Div 2, Gp ABCD T6...T1;
- CI II, Div 2 Gp FG, T*°C; CI III;
- Dual Seal
- Ta = -40 ... +60 °C

2 Type code specification

In the following, all versions are called VEGAPULS 6X. If parts of these safety instructions refer only to certain versions, then these will be mentioned explicitly with their type code.

VEGAPULS 6X with type code PS6X(*).a-b-c-de-f-g-hi-j-k-l-m-no-p-q-r-s-t-u

a	Generation
2	Second generation

b	Application
*	One-digit code for preselection, not relevant for approval

c	Radar technology
W	80 GHz

de	Process fitting / Material
XX	universal, plastic horn antenna / PP/PBT
XC	Mounting strap, length: 170 mm / 316L/316L
XD	Mounting strap, length: 300 mm / 316L/316L
**	Other process fittings that comply with national or international standards

f	Antenna version
B	Plastic horn antenna
T	Thread with integrated antenna system
F	Flange with plastic plating
C	Flange with lens antenna

g	Additional equipment
X	without

g	Additional equipment
K	with rinsing air connection
V	with purging connection with reflux valve
1	Antenna system DD-lacquered

hi	Material / Seal / Process temperature
AA	PEEK/FKM (SHS FPM 70C3 GLT) / -40 ... +150 °C
AB	PEEK/FKM (SHS FPM 70C3 GLT) / -40 ... +200 °C
AC	PEEK/FKM (Kalrez 6230) / -15 ... +150 °C
AD	PEEK/FKM (Kalrez 6230) / -15 ... +250 °C
AE	PEEK/FKM (Kalrez 6375) / -20 ... +150 °C
AF	PEEK/FKM (Kalrez 6375) / -20 ... +250 °C
AG	PEEK/FKM (Perlast G75B) / -15 ... +150 °C
AH	PEEK/FKM (Perlast G75B) / -15 ... +250 °C
AJ	PEEK/FKM (Perlast G74S) / -15 ... +150 °C
AK	PEEK/FKM (Perlast G74S) / -15 ... +250 °C
AL	PEEK/EPDM (COG AP302) / -40 ... +150 °C (for lens antennas)
AL	PEEK/EPDM (A+P 70.10-02) / -55 ... +150 °C (for threaded version)
AT	PP/PP / -40 ... +80 °C
AU	PP/FKM (SHS FPM 70C3 GLT) / -40 ... +80 °C
AV	PP/EPDM (COG AP310) / -40 ... +80 °C
AW	PTFE/PTFE / -60 ... +150 °C
A4	PTFE/PTFE / -60 ... +200 °C
AX	PTFE/PTFE / -196 ... +200 °C
AY	PTFE (8 mm)/PTFE / -60 ... +150 °C
A5	PTFE (8 mm)/PTFE / -60 ... +200 °C
AZ	PTFE (8 mm)/PTFE / -196 ... +200 °C
A2	PFA (8 mm)/PFA / -60 ... +150 °C
A3	PFA (8 mm)/PFA / -60 ... +200 °C

j	Housing / Protection
A	Aluminium single chamber / IP66/IP68 (0.2 bar)
H	Special colour Aluminium single chamber / IP66/IP68 (0.2 bar)
D	Aluminium double chamber / IP66/IP68 (0.2 bar)
S	Special colour Aluminium double chamber / IP66/IP68 (0.2 bar)
V	Stainless steel single chamber (precision casting) / IP66/IP68 (0.2 bar)
W	Stainless steel double chamber / IP66/IP68 (0.2 bar)
8	Stainless steel single chamber (electropolished) / IP66/IP68 (0.2 bar)

k	Cable entry / Connection
D	M20 x 1.5 / Blind plug
1	M20 x 1.5 / without
N	½ NPT / Blind plug
Q	½ NPT / without
*	Other certified connection or cable gland suitable for the application

l	Display, adjustment or radio module
X	without display, adjustment or radio module, standard lid
A	Display and adjustment module PLICSCOM
F	without display, adjustment or radio module, lid with inspection window
B	Display/adjustment module PLICSCOM, laterally mounted
K	Display/adjustment module PLICSCOM, with Bluetooth
L	Display/adjustment module PLICSCOM, laterally mounted; with Bluetooth

m	Electronics
H	Two-wire 4 ... 20 mA/HART
A	Two-wire 4 ... 20 mA/HART with overvoltage arrester

no	Explosion protection
*A	Nonincendive

p	Functional safety SIL (IEC 61508)
X	without
*	with

q	IT Security (IEC 62443-4-2)
X	without
*	with

r	Overfill protection
X	without
*	with

s	Food/pharmaceutical certificate
X	without
*	with

t	Ship approval
X	without
*	with

u	Secondary Line of Defense
X	without
S	with

3 Application area

Division - The VEGAPULS 6X are suitable for applications Division 2

Application area of VEGAPULS 6X (electronics version H):

Type code	Explosion group	Type of protection marking
Electronics version "H" - Two-wire 4 ... 20 mA/HART		
PS6X(*) .2*W**B/T/F/C*****H* A*****	Groups A, B, C, D, F, G	Cl I, Div 2, Gp ABCD T6...T1; Cl II, Div 2 Gp FG, T°C; Cl III; Dual Seal Ta = -40 ... +60 °C

Application area of VEGAPULS 6X (electronics version A):

Type code	Explosion group	Type of protection marking
Electronics version "A" - Two-wire 4 ... 20 mA/HART with overvoltage arrester		
PS6X(*) .2*W**B/T/F/C*****A* A*****	Groups A, B, C, D, F, G	Cl I, Div 2, Gp ABCD T6...T1; Cl II, Div 2 Gp FG, T°C; Cl III; Dual Seal Ta = -40 ... +60 °C

Environmental designation:

Housing Type	Electronic	Model	Dual Seal	Protection
Aluminium and stainless steel (casted) single champer housing	H	A, H, V	no	IP66/68 (0.2bar), TYPE 4X/6P
Stainless steel (electro polished) single champer housing	H	8	no	IP66/68 (0.2bar), TYPE 4X/6P
Aluminium and stainless steel (casted) double champer housing	H, A	D, S, W	yes	IP66/68 (0.2bar), TYPE 4X/6P

ANSI/UL 50E, CSA C22.2 No. 94.2, NEMA ratings

VEGAPULS 6X without overvoltage arrester: PS6X(*) .2*W***H*******

The voltage resistance against ground is min. 500 V_{eff}.

VEGAPULS 6X with overvoltage arrester: PS6X(*) .2*W***A*******

The built-in overvoltage arrester type Bourns 2036-60 has the following characteristic values:

DC Sparkover = 600 V ± 20 % @ 100 V/s

Impulse Sparkover = 850 V @ 100 V/μs

Impulse Sparkover = 1100 V @ 1000 V/μs

Further characteristic data can be found in the data sheet of the Bourns 2036-60.

The voltage resistance against ground is min. $340 V_{\text{eff}}$.

4 Specific conditions of use ("X" identification)

The following list describes the special operating conditions of VEGAPULS 6X.

- In the application as category 1/2 instrument, the following applies to radar sensors VEGAPULS 6X in the versions with Aluminium/Titanium:
 - Installation must be carried out in such a way that the generation of sparks as a result of impact and friction processes between Aluminium/Titanium and steel is excluded. This excludes stainless steel without rust particles.
- Certain components of the radar sensor VEGAPULS 6X can charge electrostatically. These include: Plastic housings, non-grounded metal parts, plastic antennas. For details, refer to chapter " *Electrostatic charge (ESD)*" of these safety instructions.
- To avoid the risk of electrostatic charging of metal parts, the VEGAPULS 6X must be connected to the potential equalization (transition resistance $\leq 1 \text{ M}\Omega$).
- All parts of VEGAPULS 6X in contact with the medium must only be used in such a medium against which the materials are sufficiently resistant.
- VEGAPULS 6X with rinsing connection: It must be ensured that the IP67 degree of protection is provided at the connection to the reflux valve when used as category 1/2 equipment. After removing the reflux valve or the rinsing facility on the refülux valve, the opening must be closed with a suitable screw plug so that the IP67 degree of protection is maintained.
- VEGAPULS 6X with swivelling holder: It must be ensured that the IP67 degree of protection is maintained when operating as category 1/2 equipment after aligning the antenna using the swivelling holder and after screwing on the tension flange.
- Ambient temperature
 - You can find the details in chapter " *Thermal data*" of these safety instructions.

5 Installation

- The installation of the device must only be carried out by qualified personnel.
- The staff must be trained in explosion protection and familiar with the relevant valid regulations.
- Make sure when working on the instrument that there is no explosive atmosphere present. The supply circuits should be voltage-free, if possible.
- Install the instrument in accordance with the manufacturer specification and the applicable national regulations, e.g. planning and installation in accordance with IEC/EN 60079-14.
- The devices must be integrated into the local potential equalization.
- If grounding of the cable screening is necessary, this must be carried out acc. to the valid standards and regulations, e.g. acc. to IEC/EN 60079-14.
- Close the housing lid (s) up to the stop before starting operating, to ensure the IP protection rating specified on the type label.

For device category 2 the following process pressures are applicable depending on the antenna version:

	Approval	Process pressure
Plastic horn antenna, with inspection window	Nonincendive	Compression flange -1 ... +2 bar Adapter flange -1 ... +1 bar
Thread with integrated horn antenna, with inspection window	Nonincendive	-1 ... +40 bar
Flange with encapsulated antenna system, with inspection window	Nonincendive	-1 ... +25 bar

	Approval	Process pressure
Flange with lens antenna, with inspection window	Nonincendive	-1 ... +3 bar

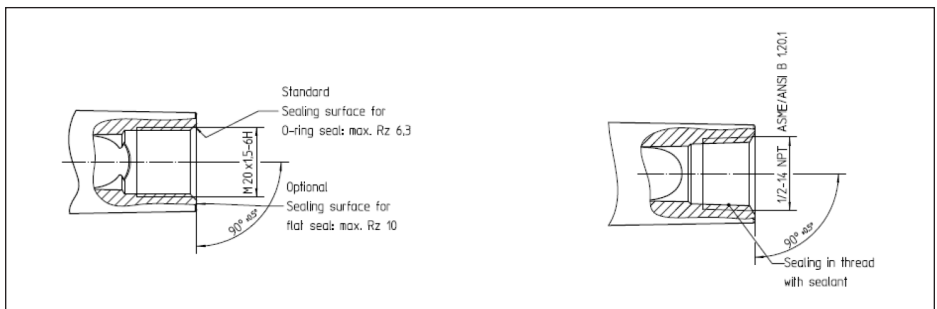
Cable glands, threaded openings

Type	Thread	Cable diameter [mm]	Torques [Nm]
Hummel EXIOS A2F 1.608.2003.50	M20 x 1.5	6 ... 12 mm	8
Hummel EXIOS A2F 1.608.1203.70	½ NPT	6 ... 12 mm	8
Hummel EXIOS MZ 1.6Z5.2000.51	M20 x 1.5	9 ... 13 mm	8
Hummel EXIOS MZ 1.6Z5.1200.70	½ NPT	9 ... 13 mm	8

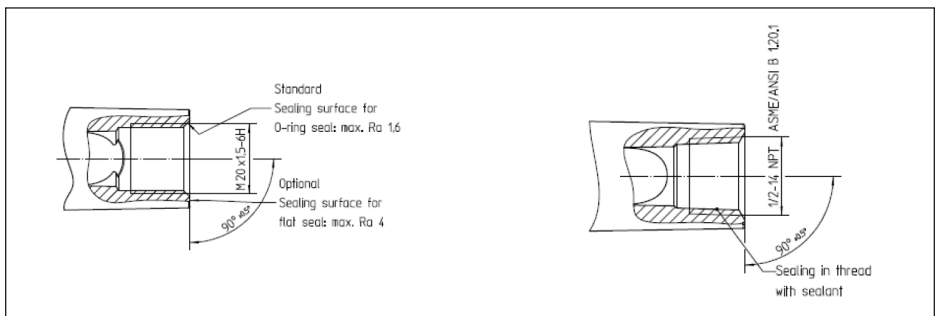
The specified torques are test torques and can only be regarded as reference values. The manufacturer's mounting instructions provided must be observed.

If suitable cable glands or cable insertion possibilities not included in the scope of supply are used, these must be compatible with the threaded openings.

Aluminium housing with M20 x 1.5 thread, ½ NPT thread



Stainless-steel housing (fine cast) with M20 x 1.5 thread, ½ NPT thread



Flameproof enclosure "d"

- The terminals for connecting the operating voltage or signal circuits are integrated in the connection compartment with type of protection flameproof enclosure "d"
- The thread gaps between housing and cover as well as between threaded fitting and container are flameproof joints
- It is not allowed to repair the flameproof joints.

- Cable, wire entries and closing screws must be certified acc. to ignition protection type Flame-proof enclosures "d". Cable, wire entries and closing screws of simple design must not be used.
- Separately certified cable and wire entries can determine the permissible ambient temperature range or the temperature classes
- Only one threaded adapter is allowed per thread, when using a closing screw, threaded adapters are not allowed

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

The parts of the VEGAPULS 6X being in contact with flammable media during operation must be included in the periodic overpressure test of the plant.

6 Operation

- Do not operate the device outside the electrical and thermal specifications given in this safety instruction
- Modifications on the instrument can influence the explosion protection and hence the safety
- Modifications must only be carried out by employees authorized by VEGA
- Note the relation between process temperature on the sensor/antenna and the permissible ambient temperature on the electronics housing. For permissible temperatures, see the respective temperature tables. See chapter " *Thermal data*".
- The information on mechanical wear in the operating instructions must be observed
- The continuous operating temperature of the connection cable must be suitable for the temperature range of the application
- Only original spare parts or spare parts approved for the purpose may be used for repairs
- The VEGAPULS 6X must be connected via suitable cable gland or conduit systems that are in conformity with the requirements of IEC/EN 60079-1 paragr. 13.1 and 13.2 and provided with a separate type approval certificate. when connecting the VEGAPULS 6X to conduit systems, the corresponding sealing facility must be connected directly to the housing. Unused openings must be covered according to IEC 60079-1 section 11.9. Keep the type and size of the threads in mind: A warning label with the respective thread name is in the area of the respective thread
- Unused openings must be covered according to IEC/EN 60079-1 section 11.9. The red thread or/dust covers screwed in when the instruments are shipped (depending on the version) must be removed before setup and replaced by cable entries or closing screws suitable for the respective ignition protection type and IP protection.
- The connection cable of VEGAPULS 6X has to be wired fix and in such a way that damages can be excluded
- Lids must not be opened if there is a hazardous atmosphere. The housing lids are marked with the warning label:

WARNING -- DO NOT OPEN WHEN AN EXPLOSIVE
ATMOSPHERE IS PRESENT

AVERTISSEMENT -- NE PAS OUVRIR SI UNE
ATMOSPHÈRE EXPLOSIVE PEUT ÊTRE PRÉSENTE

7 Electrostatic charging (ESD)

In case of instrument versions with electrostatically chargeable plastic parts, the danger of electrostatic charging and discharging must be taken into account!

The following parts can charge and discharge:

- Lacquered housing version or alternative special lacquering
- Plastic housing, plastic housing parts
- Plastic process fittings
- Plastic-coated process fittings and/or plastic-coated sensors
- Connection cable for separate versions
- Type label

Take note in case of danger of electrostatic charges:

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

The instruments must be 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 label indicates danger:

WARNING -- POTENTIAL ELECTROSTATIC CHARGING
HAZARD -- SEE INSTRUCTIONS

AVERTISSEMENT -- DANGER POTENTIEL DE CHARGES
ÉLECTROSTATIQUES -- VOIR INSTRUCTIONS

8 Electrical data

For the VEGAPULS 6X in type of protection Nonincendive applies:

Power supply and signal circuit: terminals 1[+], 2[-]

The following values must be observed or taken into account:

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 DC

Indicating and adjustment circuit: terminals 5, 6, 7, 8

For connection to the circuit of the associated external indicating unit VEGADIS 81 (BVS 13 ATEX E 054).

Indication and adjustment circuit: spring contacts

Only for connection to the display and adjustment module PLICSCOM.

9 Thermal data

The approval (FM 21 CA 0082 X) is valid under the following conditions:

- Compliance with the temperature ranges for the various versions as indicated in the tables below.
- Pressure: 80 kPa (0.8 bar) to 110 kPa (1.1 bar), and
- Air with an oxygen content of 21 % (v/v)

Additional measures are required for operation of the VEGAPULS 6X outside these conditions.

The operation of the VEGAPULS 6X outside the above conditions is the sole responsibility of the operator.

The thermal measurements for determining the following temperature tables were carried out for process temperatures above +150 °C with insulation. Thermal measurements up to +150 °C were carried out without insulation.

Data sheets of the insulation used:

		SiBa 20/150a/ALU50	SiBa/-a
Data sheet extract insulation		Aluminium foil embossed Basalt/silica compound fleece	Basalt/silica compound fleece
General technical data		SiBa 20/150a/ALU50 is a mechanically bonded needlefelt based on a mixture of endless drawn basalt fibres and silica fibres, laminated with an aluminium foil (thickness approx. 50 µm).	It is a mechanically bonded needlefelt based on a mixture of continuously drawn basalt fibres (approx. 70 %) and silica fibres (approx. 30 %).
Thickness	[mm]	approx. 20	approx. 20
Grammage	[kg/m ²]	approx. 3	approx. 3
Bulk density	[kg/m ³]	approx. 150	approx. 150
Heat resistance in the long term	[°C]	up to 700 Radiant heat on aluminium max. 250	up to 700
Heat resistance in the short term	[°C]	up to 700	up to 700
Cold resistance	[°C]	up to -40	up to -40
Heat conductivity	[W/mK]	0.05 (at 200 °C) 0.15 (at 600 °C)	0.05 (at 200 °C) 0.15 (at 600 °C)
Vibration behaviour		Resistant	Resistant
Physiological behaviour		Harmless	Harmless
Toxicological behaviour		Not dangerous	Not dangerous
Filament diameter	[µm]	> 6	> 6
Flammability		Fire-proof	Fire-proof

For measurements with insulation, a layer thickness of 8 cm SiBa 20/150a was applied. Looking from the surface of the tank, a 6 cm layer of SiBa 20/150a was first applied. A 2 cm layer of SiBa 20/150a/ALU50 was then finally applied on top of this layer.

Max. temperature of VEGAPULS 6X when used in explosive atmospheres:

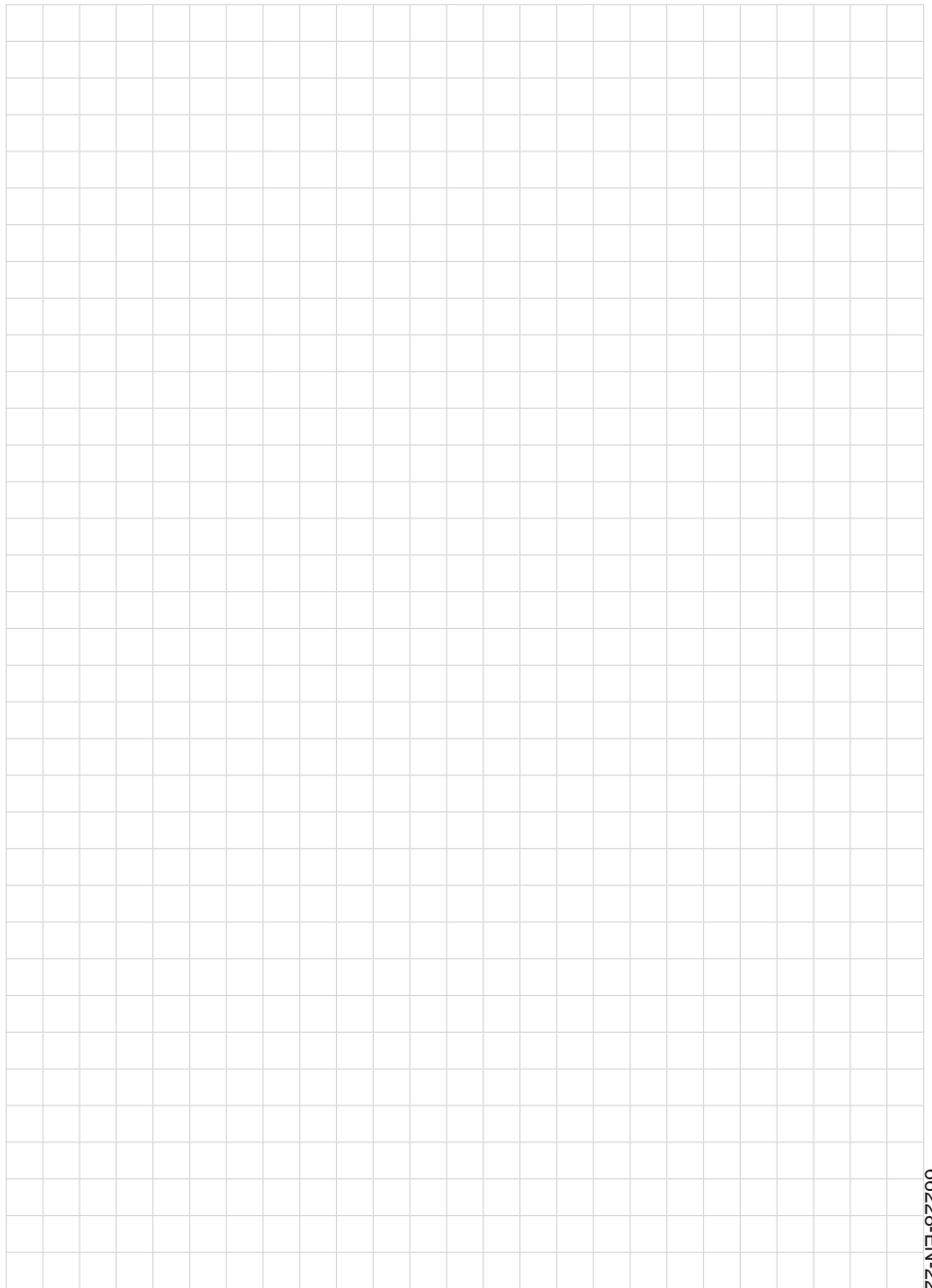
Max. permissible ambient temperature:	-40 ... +60 °C
Maximum surface temperature of any surface for class III that can come in contact with the atmosphere	+165 °C

Permissible temperatures

hi	Material / Seal / Process temperature
AA	PEEK/FKM (SHS FPM 70C3 GLT) / -40 ... +150 °C
AB	PEEK/FKM (SHS FPM 70C3 GLT) / -40 ... +200 °C
AC	PEEK/FKM (Kalrez 6230) / -15 ... +150 °C
AD	PEEK/FKM (Kalrez 6230) / -15 ... +250 °C
AE	PEEK/FKM (Kalrez 6375) / -20 ... +150 °C
AF	PEEK/FKM (Kalrez 6375) / -20 ... +250 °C
AG	PEEK/FKM (Perlast G75B) / -15 ... +150 °C
AH	PEEK/FKM (Perlast G75B) / -15 ... +250 °C
AJ	PEEK/FKM (Perlast G74S) / -15 ... +150 °C
AK	PEEK/FKM (Perlast G74S) / -15 ... +250 °C
AL	PEEK/EPDM (COG AP302) / -40 ... +150 °C (for lens antennas)
AL	PEEK/EPDM (A+P 70.10-02) / -55 ... +150 °C (for threaded version)
AT	PP/PP / -40 ... +80 °C
AU	PP/FKM (SHS FPM 70C3 GLT) / -40 ... +80 °C
AV	PP/EPDM (COG AP310) / -40 ... +80 °C
AW	PTFE/PTFE / -60 ... +150 °C
A4	PTFE/PTFE / -60 ... +200 °C
AX	PTFE/PTFE / -196 ... +200 °C
AY	PTFE (8 mm)/PTFE / -60 ... +150 °C
A5	PTFE (8 mm)/PTFE / -60 ... +200 °C
AZ	PTFE (8 mm)/PTFE / -196 ... +200 °C
A2	PFA (8 mm)/PFA / -60 ... +150 °C
A3	PFA (8 mm)/PFA / -60 ... +200 °C

Permissible ambient/operating/process temperature of the sensor in dependency on the gasket or antenna used.







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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

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VEGA Grieshaber KG
Am Hohenstein 113
77761 Schiltach
Germany

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