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Installation guideline VENTEX® explosion isolation valve

Important information

The correct installation position of the valve must comply with the stated alignment (explosion direction) and design (horizontal/vertical) as noted on the nameplate.

The actual installation position must correspond to the marking on the nameplate of the valve, otherwise the correct function of the valve cannot be guaranteed. The relevant data on the nameplate are marked in red on the illustration on the right.

Deviations from the installation position (horizontal / vertical) can be tolerated by up to 5°.

Approved installation distances for the intended use of the VENTEX® explosion isolation valve

The specified installation distances must be strictly met and are valid for all executions of the VENTEX® explosion isolation valve. The values in brackets stand for deviating values in combination with explosion venting or explosion-suppressed application.

Nominal diameter	DN100	DN150	DN200	DN250	DN300	DN400	DN500	DN600
Certificate number	FSA 21 ATEX 1708 X (including 1st Addendum)							
Part number	801100 802100	801150 802150	801200 802200	801250 802250	801300 802300	801400 802400	801500 802500	801600 802600
Pressure shock resistance [barg]	56.7[1)]	18.9[1)]	18.8[1)]	22.5[1)]	14.8[1)]	13[2)]	13[2)]	13[2)]
Maximum allowed air velocity	30 m/s in explosion direction (see chapter «Process air / dust load») 35 m/s against explosion direction (see chapter «Process air / dust load»)							
Organic dust St1/St2	K_{St} ≤ 300 bar*m/s							
Installation distance min. [m] Installation distance max. [m]	2 15	3 15	3 15	3 15	3 15	3.5 (3.8) 12	3.5 (3.8) 12	3.5 (3.8) 12
Organic dust St3	K_{St} ≤ 400 bar*m/s							
Installation distance min. [m] Installation distance max. [m]	2 5	4 (3) 6	4 (3) 6	4 6	4 5	4 5	3.5 5	3.5 5
Metallic dust	K_{St} ≤ 400 bar*m/s							
Installation distance min. [m] Installation distance max. [m]	2 5	4 (3) 6	4 (3) 6	4 6	4 5	4 5	3.5 5	3.5 5
Hybrid mixtures IIA-IIB3	with a gas concentration up to 80% of LEL, K ≤ 400 bar*m/s [3)]							
Installation distance min. [m] Installation distance max. [m]	2 5	2 6	5 6	4 6	3 6	3.5 6	3.8 6	3.5 5
Hybrid mixtures and turbulent gases IIA-IIB3	without limitation of the gas concentration, K ≤ 400 bar*m/s [3)]							
Installation distance min. [m] Installation distance max. [m]	2 5	-	-	-	3 3.5	-	-	3.5 5

[1)] For temperature dependency of the pressure shock resistance see VT0009.
[2)] These values were verified according to EN 14460:2018 chap. 6.3.1ff for the pressure shock resistance of the valve housing (test report no. 2116, Swiss Safety Center AG, STS 0052), since no correspondingly high explosion pressures could be generated in front of the valve in the type tests according to EN 15089:2009. Declared pressure shock resistance in the type test according to EN 15089:
DN400 - 9.9 barg, DN500 - 8.1 barg, DN600 - 9.0 barg. For temperature dependency of the pressure shock resistance see VT0009.
[3)] not allowed in combination with explosion venting, in combination with explosion-suppression permitted as pressure barrier only. We as RICO do not have experience with technical design of explosion suppression systems. It should be the responsibility of the system provider to assess, whether the installation of a VENTEX® is appropriate in each specific case.

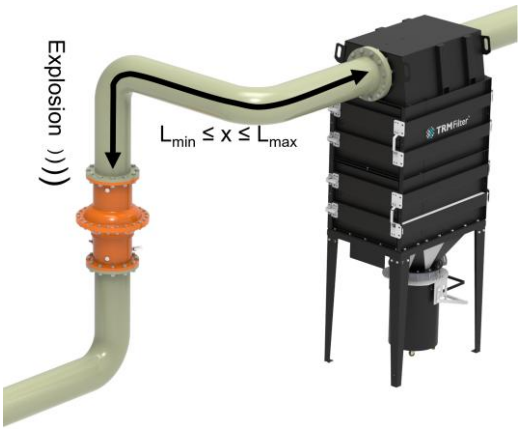
Approved installation distances explicitly in combination with fluidized bed systems

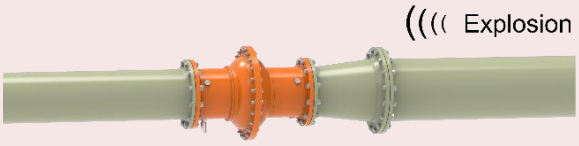
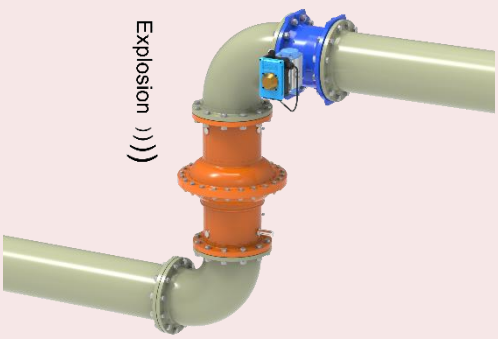
The specified installation distances must be strictly met and apply exclusively to the intended use of the VENTEX® explosion isolation valve in combination with fluidized bed systems. The values in brackets stand for deviating values in combination with explosion venting or explosion-suppressed application.

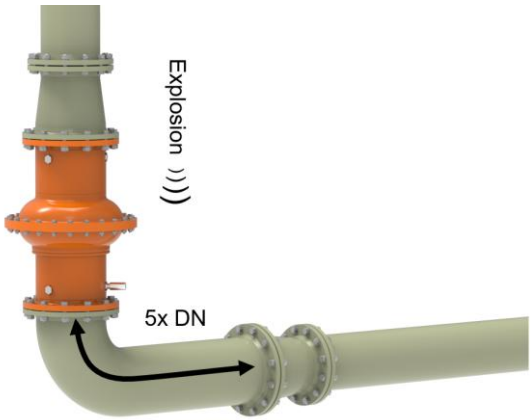
Nominal diameter	DN100	DN150	DN200	DN250	DN300	DN400	DN500	DN600
Certificate number	FSA 21 ATEX 1708 X (including 2nd Addendum)							
Part number	801100 802100	801150 802150	801200 802200	801250 802250	801300 802300	801400 802400	801500 802500	801600 802600
Pressure shock resistance [barg]	56.7[1)]	18.9[1)]	18.8[1)]	22.5[1)]	14.8[1)]	13[2)]	13[2)]	13[2)]
Maximum allowed air velocity	30 m/s in explosion direction (see chapter «Process air / dust load») 35 m/s against explosion direction (see chapter «Process air / dust load»)							
Organic dust St1/St2	K_{St} ≤ 300 bar*m/s							
Inlet valve	Execution CH / CT / CB [4)]							
Installation distance min. [m] Installation distance max. [m]	0.5 (2) 15	0.5 (3) 15	0.5 (3) 15	0.5 (3) 15	0.5 (3) 15	0.5 (3.8) 12	0.5 (3.8) 12	0.5 (3.8) 12
Outlet valve	Execution SH / ST / SB / DH / DV							
Installation distance min. [m] Installation distance max. [m]	2 15	3 15	3 15	3 15	3 15	3.5 (3.8) 12	3.5 (3.8) 12	3.5 (3.8) 12
Organic dust St3	K_{St} ≤ 400 bar*m/s [4)]							
Inlet valve	Execution mandatory CH / CT / CB							
Installation distance min. [m] Installation distance max. [m]	0.5 5	0.5 6	0.5 6	0.5 6	0.5 6	0.5 6	0.5 6	0.5 5
Outlet valve	Execution SH / ST / SB / DH / DV							
Installation distance min. [m] Installation distance max. [m]	2 5	2 6	5 6	4 6	3 6	3.5 6	3.8 6	3.5 5
Hybrid mixtures IIA-IIB3	with a gas concentration up to 120% of LEL, K ≤ 400 bar*m/s [3)]							
Inlet valve	Execution mandatory CH / CT / CB							
Installation distance min. [m] Installation distance max. [m]	0.5 5	0.5 6	0.5 6	0.5 6	0.5 6	0.5 6	0.5 6	0.5 5
Outlet valve	Execution SH / ST / SB / DH / DV							
Installation distance min. [m] Installation distance max. [m]	2 5	2 6	5 6	4 6	3 6	3.5 6	3.8 6	3.5 5

[1)], [2)], [3)] see page 1.
[4)] for execution SH/ST/SB as Inlet valve the installation distances have to be met as stated to the outlet valve.

Mandatory installation specifications

Installation situation	Description	Reasoning
Installation distance from the explosion source	The minimum and maximum installation distance must be measured from the wall of the vessel to the flange of the VENTEX® valve, depending on the medium (see table on page 1). 	The minimum installation distance is necessary so that a minimum pressure can build up in front of the valve and close it. If the installation distance is too short, there is a risk that the valve does not close or does not close in time and flame could pass through. The maximum installation distance is limited by the strength of the valve. Due to the explosion propagation and the associated increase in explosion pressure, an installation distance that is too long would damage the valve and following equipment.

Pipeline in front of the valve in explosion direction	A reduction of the diameter in front of the valve is generally possible, but the cone must be placed directly in front of the valve.  *Example:* *Diameter change from DN120 to DN100* $$\frac{A_2 - A_1}{A_1} = \frac{(100^2 - 120^2)}{120^2} = -0.31$$ *=> Cross-sectional area change of 31%* ✓	If the cross-sectional area (≠ nominal diameter) of the pipe is reduced, the speed of the explosion increases and thus the dynamic pressure in the pipe too. The propagation of the explosion also increases the pressure. Placing the cone directly in front of the valve minimizes this effect. A change of the cross-sectional area (≠ nominal diameter) more than 50% is not allowed in combination with pressure (shock) resistant systems. In combination with vented or explosion-suppressed systems even higher changes of the cross-sectional area are allowed.
	It is generally possible to enlarge the diameter in front of the valve, but the cone must be placed directly in front of the valve. *Example:* *Diameter change from DN160 to DN200* $$\frac{A_2 - A_1}{A_1} = \frac{(200^2 - 160^2)}{160^2} = 0.56$$ *=> Cross-sectional area change of 56%* ✗ *=> Not allowed in combination with vented or explosion-suppressed systems*	With an increase in the cross-sectional area (≠ nominal diameter) in the pipe, the dynamic pressure in the pipe is reduced. In the case of weak explosions, this increases the risk that the explosion pressure on the valve will consequently be too low to lock it. Placing the cone immediately in front of the valve minimizes this effect. A change of the cross-sectional area (≠ nominal diameter) more than 50% is not allowed in combination with vented or explosion-suppressed systems. In combination with explosion (shock) resistant systems even higher changes of the cross-sectional area are allowed.
	System components between the explosion source and the valve are to be avoided. 	The effects and the behaviour of third-party components in the event of an explosion cannot be assessed by RICO. Such installations must be considered individually. Explosion pressure (shock) resistant control butterfly valves are only permitted if they are fully open or fully closed. Intermediate positions in the presence of an explosive atmosphere are not permitted, as this leads to turbulence and thus to an excessive increase of the explosion pressure.

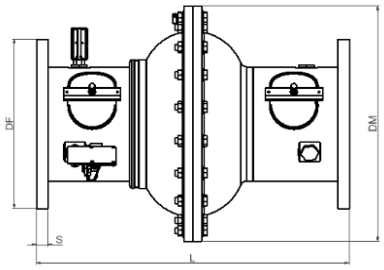
Pipeline after the valve in explosion direction	After the VENTEX®, the pipeline must have the same or a larger diameter over a length of 5 x DN. Pipe constrictions or other flow obstacles such as built-in components are not permitted over this length. Pipe bends within this length are permitted. 	In the event of an explosion, the air column in front of the pressure wave must be able to escape unhindered through the valve and then into the pipe. Strong flow obstacles over a length of 5x DN after the valve can impair the closing behaviour. In the case of built-in components (e.g. control butterfly valves) within this length, it must be operationally guaranteed that they are fully open in the presence of an explosive atmosphere. A pipe expansion behind the valve or free container volumes can reduce the required length. The volume of this pipeline constellation without flow obstacles after the valve must, however, always be at least the volume of a pipeline with a length of 5xDN.
	The pipeline after the valve must be designed to withstand an overpressure of at least 1 bar (PN1). In combination with venting or explosion suppression, this value may be lower but under the responsibility of the system manufacturer.	During the closing process of the valve in the event of an explosion, a brief pressure pulse can pass through the closing valve into the protected pipeline.
Open pipe end	A short piece of pipe must be flanged to the valve, which has to have a length of minimum 0.85m. 	Due to its mass inertia, the pipe section helps to reduce the load on the bolted connections in the event of strong explosions. In combination with venting or explosion-suppression, this is not mandatory, but recommended for reasons of operator safety (crushing hazard) as long as no other protective measures according to ISO 13857 are taken.

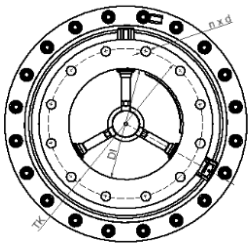
Installation instructions for process conditions and pipeline routing

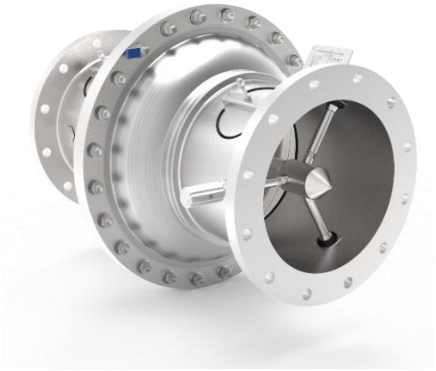
Parameter	Description	Reasoning
Operating temperatures	Minimum operating temperature The VENTEX® can be used for operating temperatures above 5 °C without any problems. Maximum operating temperature The maximum permissible operating temperature depends on the individual configuration of the VENTEX® and is between 120 °C and 300 °C. Ambient temperature The allowable ambient temperature is -20 °C to + 60°C. At ambient temperatures below +5 °C, suitable countermeasures must be taken to prevent the mechanical components from icing over.	At lower temperatures there is a risk that the mechanical components are icing over and no longer move. With suitable countermeasures such as insulation, heated or dried process air, the minimum operating temperature can also be lower, but is definitely limited to -20°C. The Directive 2014/34 / EU is generally only applicable for operating temperatures from -20 °C to + 60 °C. Higher temperatures have a direct influence on the maximum explosion pressure of the medium and on the strength of the equipment and the valve (cf. VT0009).
Process air / Dust load	The maximum allowed flow velocity at the valve is 30 m/s in the direction of explosion and 35 m/s against the direction of explosion The flow velocity in the valve should be ≥12 m/s; the CH / CT / CB versions are designed accordingly with regard to the opening behavior of the closing element The maximum permissible dust load in the valve is 50 g/m^3 Dry process air to avoid condensation The particle size is limited to max. 0.5 mm	The specification for the maximum flow velocity applies at a process temperature of 20°C and a fluid density of 1013 hPa. The values were determined under laboratory conditions at our flow measuring section. The maximum flow velocity should not be fully exhausted when designing the plant in order to still have reserves for plant-specific peculiarities (e.g. opening and closing of bypass flaps, pressure surges due to filter cleaning, etc.). Dust deposits in the explosion protection valve must be avoided in any case. This risk is reduced by adhering to the dust loading limit and flow velocity and avoiding caking due to condensation. With measures taken by the operator, such as reduced maintenance intervals and cleaning of the valve (refer to operating instructions VB0008), the recommended minimum flow velocity can be fallen below. This must be recorded in the system's risk analysis.
Support / Tolerances	It is recommended to support the pipeline directly upstream and downstream of the valve. The accessibility of the inspection openings must remain guaranteed. Due to the tolerances of both the valve and the pipe routing, sensible measures such as the use of compensators or loose flanges etc. should be considered.	This provides easy removing of the valve for revision works. Please consider the axial reaction forces in the event of an explosion as given in VT0010.

Pipeline routing		The VENTEX® explosion protection valve has been intensively tested up to a nominal size of DN400 in a wide variety of installation situations: Various combinations with 1D and 2D pipe bends immediately before and / or after the valve are allowed for a flow speed up to 30 m/s. The presence and placement of pipe bends does not result in any explosion related restrictions. For nominal diameters DN500 and DN600 the following recommendations are valid for normal operating: - Use as large as possible radius' bends (optimal R=3xDN) in front of and after the valve - A straight pipe in front of and behind the valve is preferred (optimal 10xDN)

Connecting dimension, dimensions und weights







Dimension	Abbre-viation	Nominal diameter							
		DN100	DN150	DN200	DN250	DN300	DN400	DN500	DN600
Length	L	S:350 ± 4, D:400 ± 4	500 ± 4	610 ± 4	710 ± 4	780 ± 4	940 ± 6	1300 ± 6	1420 ± 6
Diameter middle flange	DM	260	371	480	550	610	719	818	936
Deviation of diameter middle flange versusTyp 5/6	Δ DM	+45	+56	+63	-	+60	+37	+4	+7
Internal diameter	DI	801: 111.5 802: 109.5	168.5	215	260	320	404	506	602
Connecting flange compatible EN 1092-1 PN10									
Diameter connection flange	DF	220	285	340	395	445	565	670	780
Thickness connection flange	S	15	15	24	26	26	26	30	30
Pitch circle diameter	TK	180	240	295	350	400	515	620	725
Number of holes x diameter	n x d	8 x 18	8 x 22	8 x 22	12 x 22	12 x 22	16 x 26	20 x 26	20 x 30
Connecting flange compatible ASME B16.5 Class 150 (ANSI)									
Diameter connection flange	DF	230	280	345	406	485	595	700	813.5
Thick connection flange	S	15	15	24	24	26	26	30	30
Pitch circle diameter	TK	190.5	241.3	298.4	362	431.8	540	635	749.3
Number of holes x diameter	n x d	8 x 19	8 x 22	8 x 22	12 x 25.4	12 x 25.4	16 x 28.6	20 x 32	20 x 34.9
Weights									
Weight net (approx. kg)		S:18 D 25	29	68	86	99	139	232	295
Gross weight (approx. kg)		S:23 D:30	46	75	96	109	154	257	320

RICO reserves the right to make changes without notice.