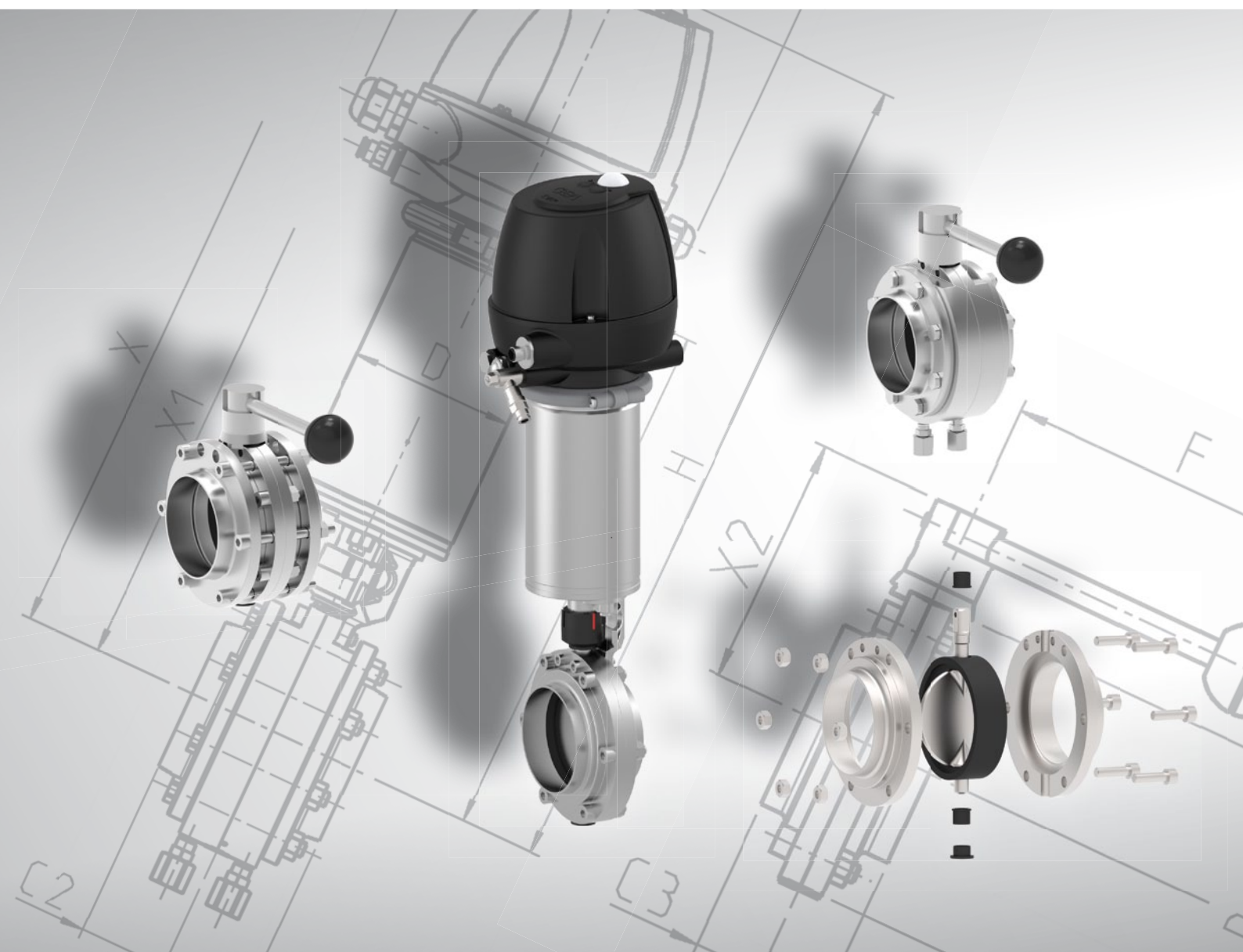




GEA Tuchenhausen Butterfly Valves T-smart

Business Line Hygienic Valve Technology

Catalog 2015

Legal notice

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GEA Tuchenhausen GmbH

Am Industriepark 2 – 10, 21514 Büchen, Germany

Registered office: Büchen, Court of Registration: Lübeck, HRB 836 SB

Management office: Dipl.-Kfm. Franz Bürmann

Sales tax identification number: DE 812589019

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Whether it's dairy, beer, viscous food-stuffs or fine-chemical products – product quality and profitability are what counts in the end. This is precisely what the GEA Flow Components business unit stands for – a specialist with many years of experience for everything that flows.

The GEA Group

GEA Group Aktiengesellschaft is one of the largest suppliers for the food processing industry. As an international technology group, the Company focuses on process technology and components for sophisticated production processes.

The GEA Flow Components business unit

As a technology leader, the GEA Flow Components business unit develops and produces well-engineered process components and services for smooth production processes in the treatment of liquid products.

The business unit is comprised of GEA Tuchenhausen in Germany, GEA Aseptomag in Switzerland and GEA Breconcherry in Great Britain as well as further sites in France, Poland, China, India, Canada and the USA.



Four business lines – for everything that flows

The product range of the GEA Flow Components business unit includes hygienic and aseptic valve technology, hygienic pumps and cleaning technology, particularly for the brewing, beverages, dairy and food industries, as well as for the pharmaceutical, health care, biotechnology and fine-chemicals industries.

Hygienic valves and components from GEA Tuchenhausen form the core component of matrix-piped process plants. For aseptic processes, which require components with the highest levels of sterility, GEA Aseptomag produces aseptic valves and systems that meet specific requirements.

The hygienic pump range from GEA Tuchenhausen also belongs to the business unit's range of solutions. This includes non-self priming and self-priming centrifugal pumps, as well as rotary piston pumps. Rounding off this range of solutions, GEA Breconcherry offers cleaning technology especially developed for the sustainable conservation of valuable resources.

The GEA Flow Components business unit focuses on major process solutions for the food processing, pharmaceutical and biotechnology manufacturing industries with leading hygienic and aseptic valve technology, pumps and cleaning technology.



Hygienic Valve Technology

GEA Tuchenhausen



Hygienic Pump Technology

GEA Tuchenhausen



Cleaning Technology

GEA Breconcherry



Aseptic Valve Technology

GEA Aseptomag



GEA Tuchenhausen products are based on future-oriented company and product design principles that include an obligation to economic viability, sustainability and service.



Your investment pays off

The current generation of GEA Tuchenhausen butterfly valves provide users with considerable cost savings. Compact actuators and efficient control technology keep energy consumption as low as possible.

Carefully designed flow paths free from dead corners minimize product loss. Long-life gaskets reduce operating costs. Consumption of time, water and resources is considerably reduced, with a positive impact on staff and process productivity.

Your investment in modern process technology from GEA Tuchenhausen thus provides special advantages to pay off in the shortest time.

Efficient

High product quality

Reduced consumption of energy, water and cleaning media

Saves time in maintenance and cleaning



You score in terms of ecology

Lower consumption of energy, water and chemicals means less load on environment and climate.

On many markets, ecological criteria and the quality seals introduced for them increasingly determine retail assortment planning and what consumers will buy.

Users of GEA Tuchenhausen products will not only be at an advantage due to production processes which have proven to be environmentally friendly but also as a result of their maximum hygiene and care when processing their products.

This helps users to fulfil their own commitment to sustainable working methods – the best way towards a secure future!

Our support is your advantage

Plant designers and engineering companies appreciate the benefits offered by GEA Tuchenhausen: not only can they profit from a range of highly efficient products, they can also use the individually tailored engineering support available from GEA Tuchenhausen. Extensive digital tools are available to support our customers already before our products go into operation, from technical drawings to 3D models.

Maintenance service offers which protect your investment enable that the necessary service work on GEA Tuchenhausen components can be carried out with just minor interruptions in production processes individually tailored to the customer's requirements.

Sustainable

Less load on climate and environment

Environmental orientation production methods

Maximum hygiene and care in product processing

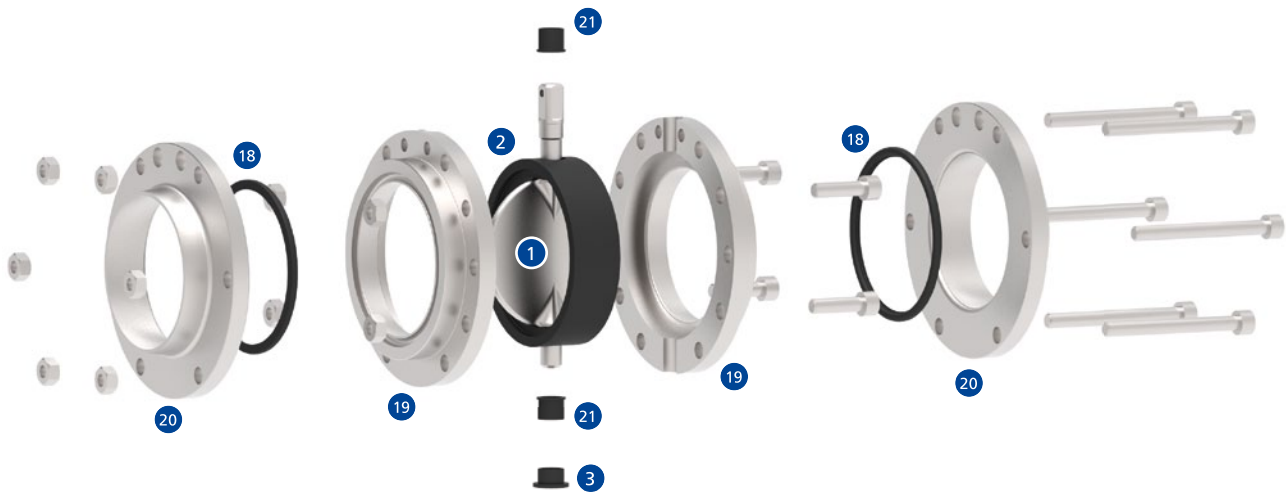
Service-oriented

Individual engineering support

Minimum production interruptions

Tailor-made service concepts

Butterfly Valves T-smart 7



1 Butterfly valve disk

2 Butterfly valve gasket

3 Plug

18 VARIVENT® O-ring

19 Body flanges (intermediate flange with O-ring groove)

20 Welding flange (outside flange)

21 Bearings

Butterfly valves in the new T-smart 7 series provide a complete range of variants to serve any application. They are used as cost-effective shut-off elements on valve blocks, panels and pipe fences for product and cleaning.

The T-smart 7 series offers the benefits of good hygienic design, higher ease of assembly, shorter assembly and maintenance times and thus higher production uptimes.

The Butterfly Valves T-smart 7 are characterized by their hygienic design without dome and sump. The product flow meets little resistance, product areas drain automatically and cleaning proceeds efficiently.

Significant product features

Robust valve disk

Low switching torque

One-piece flange design

Selection of 2 metallic product wetted materials

Product wetted parts in AISI 304 (1.4301) or AISI 316L (1.4404)

Vacuum-proof

Pneumatic actuators

For narrow mounting situations and low air consumption the pneumatic actuators have been made even more compact. The gap-free design ensures optimum cleanability and fulfils highest demands to hygiene.

Torque maxima towards both end positions enable application on both normally closed and normally open valves. Metallic stops ensure exact disk positioning. There are air-to-spring and air-to-air variants.

The integrated T.VIS® interface also safely accommodates optional accessories – booster cylinder, two-position stop and limit stop. The internal pneumatic system reduces the risk of failures, being without external tubing.

All actuators are by default applicable for Ex zones. Compliance of any electric accessories with Ex regulations must be ensured.



Features

Compact, hygienic design

Metallic stops

Torque maxima towards both end positions

Air-to-spring and air-to-air variants available

Integrated T.VIS® interface

2 actuator dimensions available

- DN 15 to DN 100 and ½" OD to 4" OD
- DN 125 and DN 150

Actuator bracket

The new actuator bracket can be attached to the flanges more easily because of its one-sided design and integrated threads for the mounting screws.

Two integrated proximity switch holders are located at a 45° angle above one of the two flanges. Turning the bracket 180° places the switches above the other side. This means one side of the valve is always free from structures mounted on top, thus allowing free access to male flanges, for example.

The switches are plugged into half-open holders on the side, which allows for easy mounting since the counter nuts only need to be loosened, not removed.



Intermediate flange variant

The intermediate flange variant offers simple plant extension even during operation while the butterfly valve safely shuts off the process from the atmosphere.

The intermediate flange variant comes as an open design. By screw-by-screw re-clamping, an outside flange can be separated from the inside flange during system operation, so it can be welded to a system extension unit. Upon installation of the extension unit this process is reversed and both parts are again connected.

As before, the actuator is mounted on the inner flanges, as a result of which the valve insert can be removed conveniently without the actuator having to be dismantled first. Apertures in the outer flanges allow the actuator to be mounted or changed at any time without removing the valve from the process line.

The additional intermediate flange seals are built in the proven VARIVENT® seal design.



The open flange design permits a screw-by-screw re-clamping from four to three flanges during operation in order for the removed outer flange to be welded, for example, onto a piping extension.

Gaskets

The vacuum-proof gasket has been completely redeveloped and offers maximum stability and service life. The double-sided valve disk bearing provides a defined seal compression and lowest switch torque. Each nominal size between DN 25 and DN 150, or 1" OD and 4" OD, has its own seal seat geometry. Gaskets of nominal sizes DN 15, DN 20 and ½" OD and ¾" OD are based on the geometry of the 1" OD valve.



Gaskets with decisive advantages

- Low torque
- Double-sided valve disk bearing
- Long service-life
- Vacuum-proof
- Selection of FDA-approved seal materials
 - EPDM
 - FKM
 - HNBR
 - VMQ

Technical advantages T-smart 788

- Simple valve servicing
- System extension at the valve during process operation
- Actuator exchange at the valve in the piping
- Intermediate flange seals built in the proven VARIVENT® seal design

Selection of dimensions and connection fittings

Flange variant												
Code	Nominal diameter	DN	15	20	25	40	50	65	80	100	125	150
8	Intermediate flange V		•	•	•	•	•	•	•	•	•	•
1	Welded flange S		•	•	•	•	•	•	•	•	•	•
2	Male flange G (DIN 11851)				•	•	•	•	•	•	•	•
4	Liner K (DIN 11851)				•	•	•	•	•	•	•	•
3	Clamp flange C (DIN 32676, ISO 2852)				•	•	•	•	•	•		

Flange variant										
Code	Nominal diameter	OD	½"	¾"	1"	1 ½"	2"	2 ½"	3"	4"
8	Intermediate flange V		•	•	•	•	•	•	•	•
1	Welded flange S		•	•	•	•	•	•	•	•
2	Male flange G (based on DIN 11851)				•	•	•	•	•	•
2	Male flange SMS (SMS 1146)				•	•	•	•	•	•
4	Liner K (based on DIN 11851)				•	•	•	•	•	•
3	Clamp flange C (DIN 32676, ISO 2852)				•	•	•	•	•	•



8 (T-smart 788)



1 (T-smart 711)



2 (T-smart 722)



4 (T-smart 714)



3 (T-smart 733)

Pipe classes

Dimensions of weld connections comply with the following standards:

- **Metric:** Outside diameter acc. to DIN 11850, series II, DIN 11866, series A
- **Inch OD:** Outside diameter acc. to BS 4825
- **Inch SMS:** Outside diameter acc. to SMS 1146

Surfaces

Product wetted surfaces are by default finished to $Ra \leq 0.8 \mu m$. Higher-quality surfaces finished to $Ra \leq 0.4 \mu m$ are optionally available.

Non product wetted surfaces (flanges) are metal blank.

Materials

Product wetted parts of the Butterfly Valves T-smart 7 are built in AISI 304 (1.4301) or AISI 316L (1.4404). Other materials are available on request, e.g. for applications handling aggressive media.

For detailed information regarding properties of the materials consult the “**Material properties**” table.

Test report and inspection certificate

Flanges and disks of the Butterfly Valves T-smart 7 are available with test report 2.2 or inspection certificate 3.1 in compliance with EN 10204 (on request).

Seal materials

Product wetted seals are EPDM (default), HNBR, FKM or VMQ.

Mixing components of our seal materials are included in the FDA “**White List**” and comply with the “**FOOD and DRUG**” (FDA) regulations 21 CFR Part 177.2600 and 21 CFR 177.1550: “Rubber Articles intended for repeated use”.

The resistance of the sealing material depends on the type and temperature of the medium conveyed. The contact time can negatively affect the service life of the seals.

For detailed information regarding properties of the seal materials consult the “**Seal material properties**” table.

Conditions for operation

Butterfly Valves T-smart 7 can be operated at ambient temperatures from 0 to 45 °C (32 to 113 °F). The proximity switches are approved for ambient temperatures from –20 to 80 °C (–4 to 176 °F). The Butterfly Valves T-smart 7 can be operated in outdoor areas. However, they need to be protected from frost in those areas or must be de-iced before switching.

Butterfly Valves T-smart 7 must be mounted stress-free. Horizontal lateral forces, e.g. thermal pipe elongation, cannot be compensated for in the valve, which makes damages to the valve a possibility. In such cases, suitable measures to compensate the elongation are recommended, such as using a VARICOMP® expansion compensator.

The clearance required for mounting and demounting Butterfly Valves T-smart is listed together with the respective technical data and dimensions.

Control air

The control air pressure is min. 4.8 bar, max. 8 bar. For lower control air pressure, a booster cylinder can be applied. The quality of the control air must comply with the requirements acc. to ISO 8573-1:2010:

ISO 8573-1:2010	
Particle content	Quality class 6
	Particle size max. 5 µm
	Particle density max. 5 mg/m ³
Water content	Quality class 4
	Max. dew point 3 °C
	For operation locations in higher regions or at low ambient temperatures, the dew point must be re-calculated accordingly.
Oil content	Quality class 3
	Max. 1 mg oil for 1 m ³ air, ideally oil-free

Actuator selection

The modular concept of the Butterfly Valves T-smart 7 allows for a variety of actuator variants to be fitted. Different manual and pneumatic actuators are available.

The pneumatic actuators are optimized for long-term operation and are maintenance-free. To prevent damages in the pipe-work, the closing speed of the pneumatic actuators can be reduced per air throttle.

For partial opening or closure an optional limit stop and a two-step cylinder are available.

Feedback signal

Proximity switches of M12×1 size indicate the positions "open" and/or "closed". The actuator bracket for pneumatic actuators has two sensor casings, an optional and retro-fittable proximity switch holder is available for standard manual actuators.

All pneumatic actuators can be fitted with the proven T.VIS® control top with all options.

Material properties

Material number	Short name	Similar materials			PREN*	Major alloying elements (% in mass)			
						Cr (Chromium)	Ni (Nickel)	Mo (Molybdenum)	C max (Carbon)
AISI 304	X5CrNi18-10	1.4301	BS 304S15	SS2332	18	17.5–19.5	8.0–10.5	-	0.07
AISI 316L	X2 CrNiMo 17-12-2	1.4404	BS 316S11	SS2348	25	16.5–18.5	10.0–13.0	2.0–2.5	0.03

* Pitting Resistance Equivalent Number = % Cr + 3.3 × (% Mo + 0.5W) + 20N

Gasket material properties

Seal material			EPDM	FKM	HNBR	VMQ
(general operation temperature)			–40 to 135 °C* –40 to 275 °F*	–10 to 200 °C* 14 to 392 °F*	–25 to 140 °C* –13 to 284 °F*	–50 to 200 °C* –58 to 392 °F*
Medium	Concentration	At approved operation temperature				
Caustics	≤ 3 %	to 80 °C	+	O	+	O
	≤ 5 %	to 40 °C	+	O	O	O
	≤ 5 %	to 80 °C	+	–	–	O
	> 5 %		O	–	–	O
Inorganic acids**	≤ 3 %	to 80 °C	+	+	+	O
	≤ 5 %	to 80 °C	O	+	O	O
	> 5 %	to 100 °C	–	+	–	O
Water		to 80 °C	+	+	+	+
Steam		to 135 °C	+	O	O	O
Steam, app. 30 min		to 150 °C	+	O	–	O
Fuels/hydrocarbons			–	+	O	–
Product with fat content	≤ 35 %		+	+	+	O
	> 35 %		–	+	+	O
Oils			–	+	+	O

+ = good resistance
O = reduced service life
– = not resistant

Other applications on request
* Depending on installation circumstances
** Inorganic acids such as carbonic, nitric or sulphide acid



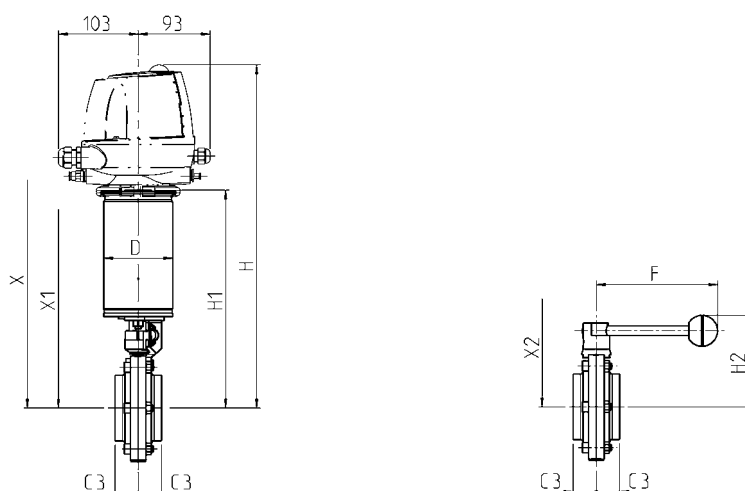
Technical data standard variant

Product wetted materials	AISI 304
Non product wetted materials	AISI 304
Product wetted gasket material	EPDM
Ambient temperature	0 to 45 °C
Control air pressure	4.8 to 8 bar
Max. product pressure	10 bar
Product wetted surface	Ra 0.8 µm
Non product wetted surface	Metal blank
Pneumatic Actuator	Air-to-spring

Certificates



*The CE-marking is valid for a T-smart Butterfly Valve with pneumatic actuator.



	Pipe	Actuator		Dimensions			Removal space			Flange width	Valve	
Nominal size	Ø [mm]	Ø D [mm]	F [mm]	H [mm]	H1 [mm]	H2 [mm]	X [mm]	X1 [mm]	X2 [mm]	C3 [mm]	KVS [m³/h]	Weight (without actuator) [kg]
DN 15	19 × 1.5	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	25	On request	0.7
DN 20	23 × 1.5	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	25	On request	0.7
DN 25	29 × 1.5	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	25	21	0.6
DN 40	41 × 1.5	88.9	116	418.5	256.5	86.5	438.5	276.5	106.5	25	72	0.8
DN 50	53 × 1.5	88.9	116	427.0	265.0	95.0	447.0	285.0	115.0	25	130	1.2
DN 65	70 × 2.0	88.9	116	434.5	272.5	103.0	454.5	292.5	123.0	25	250	1.5
DN 80	85 × 2.0	88.9	160	440.5	278.5	114.5	460.5	298.5	134.5	30	340	2.0
DN 100	104 × 2.0	88.9	160	456.5	294.5	128.0	476.5	314.5	148.0	30	750	2.5
DN 125	129 × 2.0	114.3	220	472.0	310.0	146.0	492.0	330.0	166.0	35	1100	5.4
DN 150	154 × 2.0	114.3	220	486.0	324.0	159.0	506.0	344.0	180.0	40	1800	6.9
OD ½"	12.7 × 1.6	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	25	On request	0.8
OD ¾"	19.05 × 1.6	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	25	On request	0.8
OD 1"	25.4 × 1.6	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	25	23	0.7
OD 1 ½"	38.1 × 1.6	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	25	87	0.8
OD 2"	50.8 × 1.6	88.9	116	428.0	266.0	96.0	448.0	286.0	116.0	25	170	1.1
OD 2 ½"	63.5 × 1.6	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	25	240	1.5
OD 3"	76.2 × 1.6	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	30	400	1.8
OD 4"	101.6 × 2.0	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	30	880	2.8

Position	Description of order code			
1	Valve type			
	7	Butterfly Valve		
2	Flange connection			
	11	Weld connection/weld connection		
3	Pipe standard			
	0	OD	1	DN
4	Nominal size			
	012	OD ½"	015	DN 15
	075	OD ¾"	020	DN 20
	010	OD 1"	025	DN 25
	112	OD 1 ½"	040	DN 40
	200	OD 2"	050	DN 50
	212	OD 2 ½"	065	DN 65
	300	OD 3"	080	DN 80
	400	OD 4"	100	DN 100
			125	DN 125
			150	DN 150
	5	Product wetted material		
1		AISI 304 (1.4301)		
2		AISI 316L (1.4404)		
6	Product wetted gasket material			
	0	EPDM		
	1	HNBR		
	2	FKM		
	6	VMQ		
7	Actuator type			
	0	Manual actuator		
	1	Pneumatic for T.VIS®		
	2	Pneumatic incl. 2 proximity switch holders		
	5	Manual actuator stepless		
	6	Manual actuator with scissors handle (up to OD 4"/DN 100)		
8	Air connection			
	0	Without		
	1	Metric (only for actuator type 2)		
	2	Inch (only for actuator type 2)		
	3	Metric with air throttle (only for actuator type 2)		
	4	Inch with air throttle (only for actuator type 2)		
9	Fail position of valve			
	0	Closed		
	1	Open		
	2	Air-to-air (actuator types 1 and 2 only)		
10	Accessories			
	0	Without		
	1	Extension piece +80 mm		
	2	Lockable bracket incl. 4 proximity switch holders (actuator type 0 only)		
	3	Limit stop (actuator types 1 and 2 only)		
	5	Two-position stop (actuator type 2 only)		
	7	Booster cylinder (actuator types 1 and 2 only)		
11	Product wetted surface			
	0	0.8 µm		
	1	0.4 µm		
12	Certificate			
	0	Without		
	1	Test report 2.2		
	2	Inspection certificate 3.1		
	3	Certificates 2.2 and 3.1		
13	ATEX approval			
	0	No		
	1	Yes		

The code is composed as follows, depending on the chosen configuration:

Position	1	2	3		4	5		6	7	8	9		10	11	12	13	
Code	7	1	1	-			-					-					+ and feedback systems, see section 3



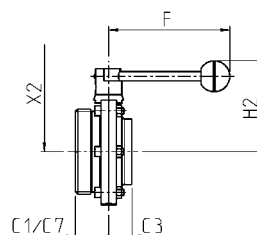
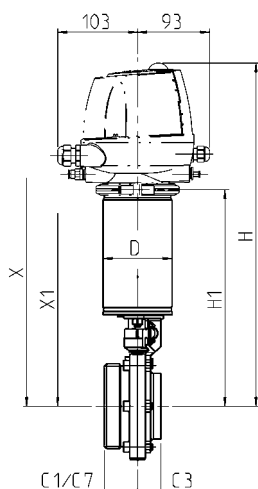
Technical data standard variant

Product wetted materials	AISI 304
Non product wetted materials	AISI 304
Product wetted gasket material	EPDM
Ambient temperature	0 to 45 °C
Control air pressure	4.8 to 8 bar
Max. product pressure	10 bar
Product wetted surface	Ra 0.8 µm
Non product wetted surface	Metal blank
Pneumatic Actuator	Air-to-spring

Certificates



*The CE-marking is valid for a T-smart Butterfly Valve with pneumatic actuator.



	Pipe	Actuator		Dimensions			Removal space			Flange width		Valve	
Nominal size	Ø [mm]	Ø D [mm]	F [mm]	H [mm]	H1 [mm]	H2 [mm]	X [mm]	X1 [mm]	X2 [mm]	C1 [mm]	C3 [mm]	KVS [m³/h]	Weight (without actuator) [kg]
DN 25	29 × 1.5	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	35	25	21	0.8
DN 40	41 × 1.5	88.9	116	418.5	256.5	86.5	438.5	276.5	106.5	35	25	72	1.1
DN 50	53 × 1.5	88.9	116	427.0	265.0	95.0	447.0	285.0	115.0	35	25	130	1.5
DN 65	70 × 2.0	88.9	116	434.5	272.5	103.0	454.5	292.5	123.0	38	25	250	1.9
DN 80	85 × 2.0	88.9	160	440.5	278.5	114.5	460.5	298.5	134.5	43	30	340	2.5
DN 100	104 × 2.0	88.9	160	456.5	294.5	128.0	476.5	314.5	148.0	43	30	750	3.2
DN 125	129 × 2.0	114.3	220	472.0	310.0	146.0	492.0	330.0	166.0	55	35	1100	6.8
DN 150	154 × 2.0	114.3	220	486.0	324.0	159.0	506.0	344.0	180.0	80	40	1800	9.0

OD 1"	25.4 × 1.6	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	47	25	23	0.8
OD 1 ½"	38.1 × 1.6	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	47	25	87	1.0
OD 2"	50.8 × 1.6	88.9	116	428.0	266.0	96.0	448.0	286.0	116.0	48	25	170	1.4
OD 2 ½"	63.5 × 1.6	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	50	25	240	1.9
OD 3"	76.2 × 1.6	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	55	30	400	2.2
OD 4"	101.6 × 2.0	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	60	30	880	3.5

	Pipe	Actuator		Dimensions			Removal space			Flange width		Valve	
Nominal size	Ø [mm]	Ø D [mm]	F [mm]	H [mm]	H1 [mm]	H2 [mm]	X [mm]	X1 [mm]	X2 [mm]	C7 [mm]	C3 [mm]	KVS [m³/h]	Weight (without actuator) [kg]
SMS 1"	25.4 × 1.6	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	36	25	23	0.8
SMS 1 ½"	38.1 × 1.6	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	41	25	87	1.0
SMS 2"	50.8 × 1.6	88.9	116	428.0	266.0	96.0	448.0	286.0	116.0	41	25	170	1.4
SMS 2 ½"	63.5 × 1.6	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	45	25	240	1.9
SMS 3"	76.2 × 1.6	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	45	30	400	2.2
SMS 4"	101.6 × 2.0	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	51	30	880	3.5

Position	Description of order code					
1	Valve type					
	7	Butterfly Valve				
2	Flange connection					
	21	Male/weld connection				
3	Pipe standard					
	0	OD	1	DN	7	SMS
4	Nominal size					
	010	OD 1"	025	DN 25	010	OD 1"
	112	OD 1 ½"	040	DN 40	112	OD 1 ½"
	200	OD 2"	050	DN 50	200	OD 2"
	212	OD 2 ½"	065	DN 65	212	OD 2 ½"
	300	OD 3"	080	DN 80	300	OD 3"
	400	OD 4"	100	DN 100	400	OD 4"
			125	DN 125		
			150	DN 150		
	5	Product wetted material				
1		AISI 304 (1.4301)				
2		AISI 316L (1.4404)				
6	Product wetted gasket material					
	0	EPDM				
	1	HNBR				
	2	FKM				
	6	VMQ				
7	Actuator type					
	0	Manual actuator				
	1	Pneumatic for T.VIS®				
	2	Pneumatic incl. 2 proximity switch holders				
	5	Manual actuator stepless				
	6	Manual actuator with scissors handle (up to OD 4"/DN 100)				
8	Air connection					
	0	Without				
	1	Metric (only for actuator type 2)				
	2	Inch (only for actuator type 2)				
	3	Metric with air throttle (only for actuator type 2)				
	4	Inch with air throttle (only for actuator type 2)				
9	Fail position of valve					
	0	Closed				
	1	Open				
	2	Air-to-air (actuator types 1 and 2 only)				
10	Accessories					
	0	Without				
	1	Extension piece +80 mm				
	2	Lockable bracket incl. 4 proximity switch holders (actuator type 0 only)				
	3	Limit stop (actuator types 1 and 2 only)				
	5	Two-position stop (actuator type 2 only)				
	7	Booster cylinder (actuator types 1 and 2 only)				
11	Product wetted surface					
	0	0.8 µm				
	1	0.4 µm				
12	Certificate					
	0	Without				
	1	Test report 2.2				
	2	Inspection certificate 3.1				
	3	Certificates 2.2 and 3.1				
13	ATEX approval					
	0	No				
	1	Yes				

The code is composed as follows, depending on the chosen configuration:

Position	1	2	3		4	5		6	7	8	9		10	11	12	13	
Code	7	2	1	-			-					-					+ Code for control and feedback systems, see section 3



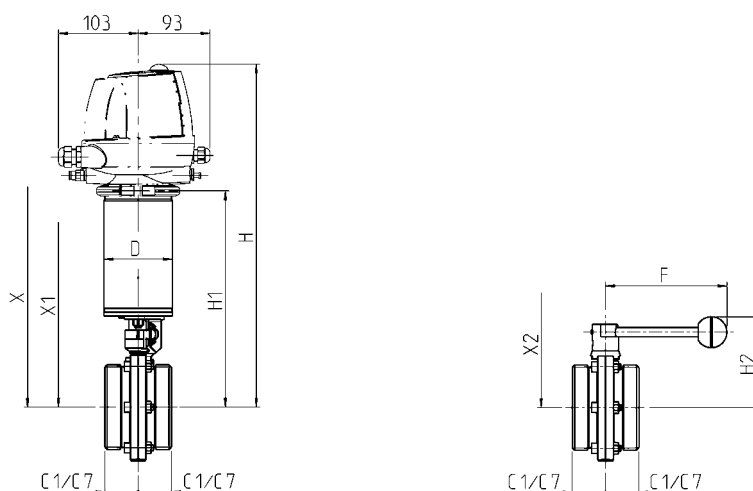
Technical data standard variant

Product wetted materials	AISI 304
Non product wetted materials	AISI 304
Product wetted gasket material	EPDM
Ambient temperature	0 to 45 °C
Control air pressure	4.8 to 8 bar
Max. product pressure	10 bar
Product wetted surface	Ra 0.8 µm
Non product wetted surface	Metal blank
Pneumatic Actuator	Air-to-spring

Certificates



*The CE-marking is valid for a T-smart Butterfly Valve with pneumatic actuator.



	Pipe	Actuator		Dimensions			Removal space			Flange width	Valve	
Nominal size	Ø [mm]	Ø D [mm]	F [mm]	H [mm]	H1 [mm]	H2 [mm]	X [mm]	X1 [mm]	X2 [mm]	C1 [mm]	KVS [m³/h]	Weight (without actuator) [kg]
DN 25	29 × 1.5	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	35	21	1.0
DN 40	41 × 1.5	88.9	116	418.5	256.5	86.5	438.5	276.5	106.5	35	72	1.3
DN 50	53 × 1.5	88.9	116	427.0	265.0	95.0	447.0	285.0	115.0	35	130	1.8
DN 65	70 × 2.0	88.9	116	434.5	272.5	103.0	454.5	292.5	123.0	38	250	2.4
DN 80	85 × 2.0	88.9	160	440.5	278.5	114.5	460.5	298.5	134.5	43	340	3.1
DN 100	104 × 2.0	88.9	160	456.5	294.5	128.0	476.5	314.5	148.0	43	750	3.9
DN 125	129 × 2.0	114.3	220	472.0	310.0	146.0	492.0	330.0	166.0	55	1100	8.1
DN 150	154 × 2.0	114.3	220	486.0	324.0	159.0	506.0	344.0	180.0	80	1800	11.0

OD 1"	25.4 × 1.6	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	47	23	0.9
OD 1 ½"	38.1 × 1.6	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	47	87	1.1
OD 2"	50.8 × 1.6	88.9	116	428.0	266.0	96.0	448.0	286.0	116.0	48	170	1.6
OD 2 ½"	63.5 × 1.6	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	50	240	2.2
OD 3"	76.2 × 1.6	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	55	400	2.6
OD 4"	101.6 × 2.0	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	60	880	4.2

	Pipe	Actuator		Dimensions			Removal space			Flange width	Valve	
Nominal size	Ø [mm]	Ø D [mm]	F [mm]	H [mm]	H1 [mm]	H2 [mm]	X [mm]	X1 [mm]	X2 [mm]	C7 [mm]	KVS [m³/h]	Weight (without actuator) [kg]
SMS 1"	25.4 × 1.6	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	36	23	0.9
SMS 1 ½"	38.1 × 1.6	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	41	87	1.1
SMS 2"	50.8 × 1.6	88.9	116	428.0	266.0	96.0	448.0	286.0	116.0	41	170	1.6
SMS 2 ½"	63.5 × 1.6	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	45	240	2.2
SMS 3"	76.2 × 1.6	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	45	400	2.6
SMS 4"	101.6 × 2.0	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	51	880	4.2

Position	Description of order code					
1	Valve type					
	7	Butterfly Valve				
2	Flange connection					
	22	Male/male				
3	Pipe standard					
	0	OD	1	DN	7	SMS
4	Nominal size					
	010	OD 1"	025	DN 25	010	OD 1"
	112	OD 1 ½"	040	DN 40	112	OD 1 ½"
	200	OD 2"	050	DN 50	200	OD 2"
	212	OD 2 ½"	065	DN 65	212	OD 2 ½"
	300	OD 3"	080	DN 80	300	OD 3"
	400	OD 4"	100	DN 100	400	OD 4"
			125	DN 125		
			150	DN 150		
	5	Product wetted material				
1		AISI 304 (1.4301)				
2		AISI 316L (1.4404)				
6	Product wetted gasket material					
	0	EPDM				
	1	HNBR				
	2	FKM				
	6	VMQ				
7	Actuator type					
	0	Manual actuator				
	1	Pneumatic for T.VIS®				
	2	Pneumatic incl. 2 proximity switch holders				
	5	Manual actuator stepless				
	6	Manual actuator with scissors handle (up to OD 4"/DN 100)				
8	Air connection					
	0	Without				
	1	Metric (only for actuator type 2)				
	2	Inch (only for actuator type 2)				
	3	Metric with air throttle (only for actuator type 2)				
	4	Inch with air throttle (only for actuator type 2)				
9	Fail position of valve					
	0	Closed				
	1	Open				
	2	Air-to-air (actuator types 1 and 2 only)				
10	Accessories					
	0	Without				
	1	Extension piece +80 mm				
	2	Lockable bracket incl. 4 proximity switch holders (actuator type 0 only)				
	3	Limit stop (actuator types 1 and 2 only)				
	5	Two-position stop (actuator type 2 only)				
	7	Booster cylinder (actuator types 1 and 2 only)				
11	Product wetted surface					
	0	0.8 µm				
	1	0.4 µm				
12	Certificate					
	0	Without				
	1	Test report 2.2				
	2	Inspection certificate 3.1				
	3	Certificates 2.2 and 3.1				
13	ATEX approval					
	0	No				
	1	Yes				

The code is composed as follows, depending on the chosen configuration:

Position	1	2	3		4	5		6	7	8	9		10	11	12	13	
Code	7	2	2	-			-					-					+ Code for control and feedback systems, see section 3



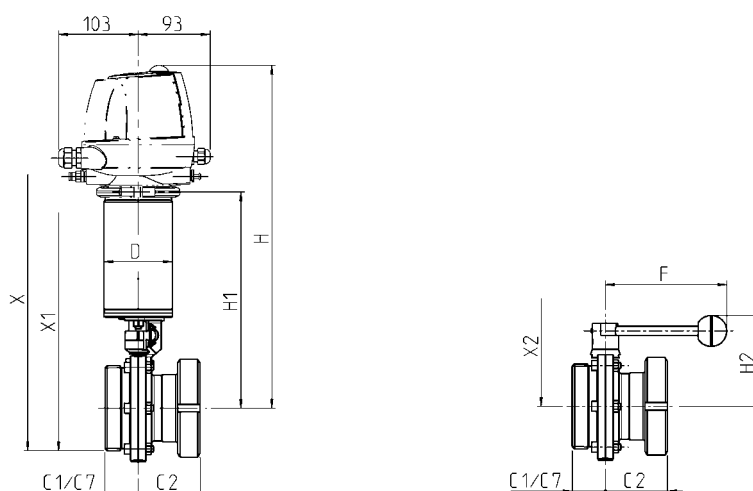
Technical data standard variant

Product wetted materials	AISI 304
Non product wetted materials	AISI 304
Product wetted gasket material	EPDM
Ambient temperature	0 to 45 °C
Control air pressure	4.8 to 8 bar
Max. product pressure	10 bar
Product wetted surface	Ra 0.8 µm
Non product wetted surface	Metal blank
Pneumatic Actuator	Air-to-spring

Certificates



*The CE-marking is valid for a T-smart Butterfly Valve with pneumatic actuator.



	Pipe	Actuator		Dimensions			Removal space			Flange width		Valve	
Nominal size	Ø [mm]	Ø D [mm]	F [mm]	H [mm]	H1 [mm]	H2 [mm]	X [mm]	X1 [mm]	X2 [mm]	C1 [mm]	C2* [mm]	KVS [m³/h]	Weight (without actuator) [kg]
DN 25	29 × 1.5	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	35	47	21	1.2
DN 40	41 × 1.5	88.9	116	418.5	256.5	86.5	438.5	276.5	106.5	35	51	72	1.6
DN 50	53 × 1.5	88.9	116	427.0	265.0	95.0	447.0	285.0	115.0	35	53	130	2.2
DN 65	70 × 2.0	88.9	116	434.5	272.5	103.0	454.5	292.5	123.0	38	57	250	3.2
DN 80	85 × 2.0	88.9	160	440.5	278.5	114.5	460.5	298.5	134.5	43	67	340	4.2
DN 100	104 × 2.0	88.9	160	456.5	294.5	128.0	476.5	314.5	148.0	43	74	750	5.5
DN 125	129 × 2.0	114.3	220	472.0	310.0	146.0	492.0	330.0	166.0	55	69	1100	9.9
DN 150	154 × 2.0	114.3	220	486.0	324.0	159.0	506.0	344.0	180.0	80	77	1800	13.5

OD 1"	25.4 × 1.6	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	47	47	23	1.0
OD 1 ½"	38.1 × 1.6	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	47	51	87	1.4
OD 2"	50.8 × 1.6	88.9	116	428.0	266.0	96.0	448.0	286.0	116.0	48	53	170	1.9
OD 2 ½"	63.5 × 1.6	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	50	57	240	2.8
OD 3"	76.2 × 1.6	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	55	67	400	3.3
OD 4"	101.6 × 2.0	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	60	74	880	5.3

	Pipe	Actuator		Dimensions			Removal space			Flange width		Valve	
Nominal size	Ø [mm]	Ø D [mm]	F [mm]	H [mm]	H1 [mm]	H2 [mm]	X [mm]	X1 [mm]	X2 [mm]	C7 [mm]	C2* [mm]	KVS [m³/h]	Weight (without actuator) [kg]
SMS 1"	25.4 × 1.6	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	36	47	23	1.0
SMS 1 ½"	38.1 × 1.6	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	41	51	87	1.4
SMS 2"	50.8 × 1.6	88.9	116	428.0	266.0	96.0	448.0	286.0	116.0	41	53	170	1.9
SMS 2 ½"	63.5 × 1.6	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	45	57	240	2.8
SMS 3"	76.2 × 1.6	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	45	67	400	3.3
SMS 4"	101.6 × 2.0	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	51	74	880	5.3

* Flange width C2 measures from center line to liner end

Position	Description of order code					
1	Valve type					
	7	Butterfly Valve				
2	Flange connection					
	24	Male/liner				
3	Pipe standard					
	0	OD	1	DN	7	SMS
4	Nominal size					
	010	OD 1"	025	DN 25	010	OD 1"
	112	OD 1 ½"	040	DN 40	112	OD 1 ½"
	200	OD 2"	050	DN 50	200	OD 2"
	212	OD 2 ½"	065	DN 65	212	OD 2 ½"
	300	OD 3"	080	DN 80	300	OD 3"
	400	OD 4"	100	DN 100	400	OD 4"
			125	DN 125		
			150	DN 150		
	5	Product wetted material				
1		AISI 304 (1.4301)				
2		AISI 316L (1.4404)				
6	Product wetted gasket material					
	0	EPDM				
	1	HNBR				
	2	FKM				
	6	VMQ				
7	Actuator type					
	0	Manual actuator				
	1	Pneumatic for T.VIS®				
	2	Pneumatic incl. 2 proximity switch holders				
	5	Manual actuator stepless				
	6	Manual actuator with scissors handle (up to OD 4"/DN 100)				
8	Air connection					
	0	Without				
	1	Metric (only for actuator type 2)				
	2	Inch (only for actuator type 2)				
	3	Metric with air throttle (only for actuator type 2)				
	4	Inch with air throttle (only for actuator type 2)				
9	Fail position of valve					
	0	Closed				
	1	Open				
	2	Air-to-air (actuator types 1 and 2 only)				
10	Accessories					
	0	Without				
	1	Extension piece +80 mm				
	2	Lockable bracket incl. 4 proximity switch holders (actuator type 0 only)				
	3	Limit stop (actuator types 1 and 2 only)				
	5	Two-position stop (actuator type 2 only)				
	7	Booster cylinder (actuator types 1 and 2 only)				
11	Product wetted surface					
	0	0.8 µm				
	1	0.4 µm				
12	Certificate					
	0	Without				
	1	Test report 2.2				
	2	Inspection certificate 3.1				
	3	Certificates 2.2 and 3.1				
13	ATEX approval					
	0	No				
	1	Yes				

The code is composed as follows, depending on the chosen configuration:

Position	1	2	3		4	5		6	7	8	9		10	11	12	13	
Code	7	2	4	-			-					-					+ Code for control and feedback systems, see section 3



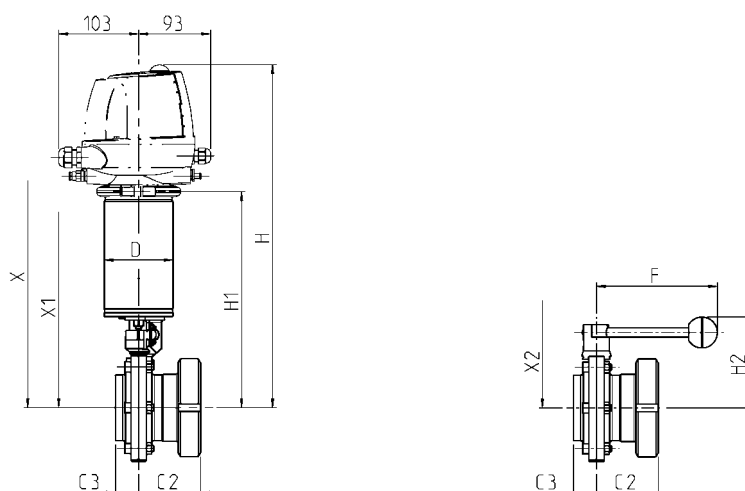
Technical data standard variant

Product wetted materials	AISI 304
Non product wetted materials	AISI 304
Product wetted gasket material	EPDM
Ambient temperature	0 to 45 °C
Control air pressure	4.8 to 8 bar
Max. product pressure	10 bar
Product wetted surface	Ra 0.8 µm
Non product wetted surface	Metal blank
Pneumatic Actuator	Air-to-spring

Certificates



*The CE-marking is valid for a T-smart Butterfly Valve with pneumatic actuator.



	Pipe	Actuator		Dimensions			Removal space			Flange width		Valve	
Nominal size	Ø [mm]	Ø D [mm]	F [mm]	H [mm]	H1 [mm]	H2 [mm]	X [mm]	X1 [mm]	X2 [mm]	C3 [mm]	C2* [mm]	KVS [m³/h]	Weight (without actuator) [kg]
DN 25	29 × 1.5	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	25	47	21	0.9
DN 40	41 × 1.5	88.9	116	418.5	256.5	86.5	438.5	276.5	106.5	25	51	72	1.3
DN 50	53 × 1.5	88.9	116	427.0	265.0	95.0	447.0	285.0	115.0	25	53	130	1.9
DN 65	70 × 2.0	88.9	116	434.5	272.5	103.0	454.5	292.5	123.0	25	57	250	2.8
DN 80	85 × 2.0	88.9	160	440.5	278.5	114.5	460.5	298.5	134.5	30	67	340	3.6
DN 100	104 × 2.0	88.9	160	456.5	294.5	128.0	476.5	314.5	148.0	30	74	750	4.9
DN 125	129 × 2.0	114.3	220	472.0	310.0	146.0	492.0	330.0	166.0	35	69	1100	8.5
DN 150	154 × 2.0	114.3	220	486.0	324.0	159.0	506.0	344.0	180.0	40	77	1800	11.5

OD 1"	25.4 × 1.6	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	25	47	23	0.9
OD 1 ½"	38.1 × 1.6	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	25	51	87	1.2
OD 2"	50.8 × 1.6	88.9	116	428.0	266.0	96.0	448.0	286.0	116.0	25	53	170	1.7
OD 2 ½"	63.5 × 1.6	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	25	57	240	2.4
OD 3"	76.2 × 1.6	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	30	67	400	2.9
OD 4"	101.6 × 2.0	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	30	74	880	4.6

	Pipe	Actuator		Dimensions			Removal space			Flange width		Valve	
Nominal size	Ø [mm]	Ø D [mm]	F [mm]	H [mm]	H1 [mm]	H2 [mm]	X [mm]	X1 [mm]	X2 [mm]	C3 [mm]	C2* [mm]	KVS [m³/h]	Weight (without actuator) [kg]
SMS 1"	25.4 × 1.6	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	25	47	23	0.9
SMS 1 ½"	38.1 × 1.6	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	25	51	87	1.2
SMS 2"	50.8 × 1.6	88.9	116	428.0	266.0	96.0	448.0	286.0	116.0	25	53	170	1.7
SMS 2 ½"	63.5 × 1.6	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	25	57	240	2.4
SMS 3"	76.2 × 1.6	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	30	67	400	2.9
SMS 4"	101.6 × 2.0	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	30	74	880	4.6

* Flange width C2 measures from center line to liner end

Position	Description of order code					
1	Valve type					
	7	Butterfly Valve				
2	Flange connection					
	14	Weld connection/liner				
3	Pipe standard					
	0	OD	1	DN	7	SMS
4	Nominal size					
	010	OD 1"	025	DN 25	010	OD 1"
	112	OD 1 ½"	040	DN 40	112	OD 1 ½"
	200	OD 2"	050	DN 50	200	OD 2"
	212	OD 2 ½"	065	DN 65	212	OD 2 ½"
	300	OD 3"	080	DN 80	300	OD 3"
	400	OD 4"	100	DN 100	400	OD 4"
			125	DN 125		
			150	DN 150		
	5	Product wetted material				
1		AISI 304 (1.4301)				
2		AISI 316L (1.4404)				
6	Product wetted gasket material					
	0	EPDM				
	1	HNBR				
	2	FKM				
	6	VMQ				
7	Actuator type					
	0	Manual actuator				
	1	Pneumatic for T.VIS®				
	2	Pneumatic incl. 2 proximity switch holders				
	5	Manual actuator stepless				
	6	Manual actuator with scissors handle (up to OD 4"/DN 100)				
8	Air connection					
	0	Without				
	1	Metric (only for actuator type 2)				
	2	Inch (only for actuator type 2)				
	3	Metric with air throttle (only for actuator type 2)				
	4	Inch with air throttle (only for actuator type 2)				
9	Fail position of valve					
	0	Closed				
	1	Open				
	2	Air-to-air (actuator types 1 and 2 only)				
10	Accessories					
	0	Without				
	1	Extension piece +80 mm				
	2	Lockable bracket incl. 4 proximity switch holders (actuator type 0 only)				
	3	Limit stop (actuator types 1 and 2 only)				
	5	Two-position stop (actuator type 2 only)				
	7	Booster cylinder (actuator types 1 and 2 only)				
11	Product wetted surface					
	0	0.8 µm				
	1	0.4 µm				
12	Certificate					
	0	Without				
	1	Test report 2.2				
	2	Inspection certificate 3.1				
	3	Certificates 2.2 and 3.1				
13	ATEX approval					
	0	No				
	1	Yes				

The code is composed as follows, depending on the chosen configuration:

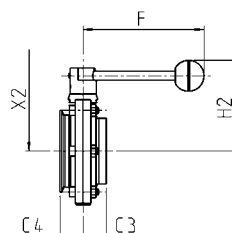
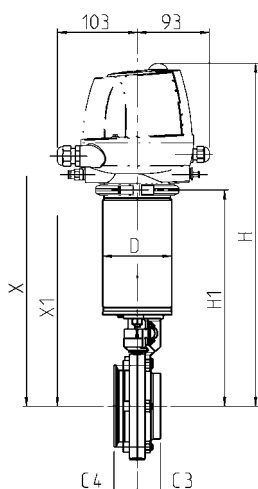
Position	1	2	3	4	5	6	7	8	9	10	11	12	13	Code for control + and feedback systems, see section 3
Code	7	1	4											



Technical data standard variant

Standards	DN OD	DIN 32676 ISO 2852
Product wetted materials	AISI 304	
Non product wetted materials	AISI 304	
Product wetted gasket material	EPDM	
Ambient temperature	0 to 45 °C	
Control air pressure	4.8 to 8 bar	
Max. product pressure	10 bar	
Product wetted surface	Ra 0.8 µm	
Non product wetted surface	Metal blank	
Pneumatic Actuator	Air-to-spring	
Certificates	  	

*The CE-marking is valid for a T-smart Butterfly Valve with pneumatic actuator.



	Pipe	Actuator		Dimensions			Removal space			Flange width		Valve	
Nominal size	Ø [mm]	Ø D [mm]	F [mm]	H [mm]	H1 [mm]	H2 [mm]	X [mm]	X1 [mm]	X2 [mm]	C3 [mm]	C4 [mm]	KVS [m³/h]	Weight (without actuator) [kg]
DN 25	29 × 1.5	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	25	40	21	0.8
DN 40	41 × 1.5	88.9	116	418.5	256.5	86.5	438.5	276.5	106.5	25	30	72	0.9
DN 50	53 × 1.5	88.9	116	427.0	265.0	95.0	447.0	285.0	115.0	25	30	130	1.2
DN 65	70 × 2.0	88.9	116	434.5	272.5	103.0	454.5	292.5	123.0	25	30	250	1.7
DN 80	85 × 2.0	88.9	160	440.5	278.5	114.5	460.5	298.5	134.5	30	30	340	2.1
DN 100	104 × 2.0	88.9	160	456.5	294.5	128.0	476.5	314.5	148.0	30	30	750	2.6
OD 1"	25.4 × 1.6	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	25	40	23	0.9
OD 1 ½"	38.1 × 1.6	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	25	30	87	0.8
OD 2"	50.8 × 1.6	88.9	116	428.0	266.0	96.0	448.0	286.0	116.0	25	30	170	1.2
OD 2 ½"	63.5 × 1.6	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	25	30	240	1.5
OD 3"	76.2 × 1.6	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	30	30	400	1.9
OD 4"	101.6 × 2.0	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	30	30	880	3.0

Position	Description of order code			
1	Valve type			
	7	Butterfly Valve		
2	Flange connection			
	31	Clamp flange/weld connection		
3	Pipe standard			
	0	OD	1	DN
4	Nominal size			
	010	OD 1"	025	DN 25
	112	OD 1 ½"	040	DN 40
	200	OD 2"	050	DN 50
	212	OD 2 ½"	065	DN 65
	300	OD 3"	080	DN 80
	400	OD 4"	100	DN 100
	5	Product wetted material		
1		AISI 304 (1.4301)		
2		AISI 316L (1.4404)		
6	Product wetted gasket material			
	0	EPDM		
	1	HNBR		
	2	FKM		
	6	VMQ		
7	Actuator type			
	0	Manual actuator		
	1	Pneumatic for T.VIS®		
	2	Pneumatic incl. 2 proximity switch holders		
	5	Manual actuator stepless		
	6	Manual actuator with scissors handle (up to OD 4"/DN 100)		
8	Air connection			
	0	Without		
	1	Metric (only for actuator type 2)		
	2	Inch (only for actuator type 2)		
	3	Metric with air throttle (only for actuator type 2)		
	4	Inch with air throttle (only for actuator type 2)		
9	Fail position of valve			
	0	Closed		
	1	Open		
	2	Air-to-air (actuator types 1 and 2 only)		
10	Accessories			
	0	Without		
	1	Extension piece +80 mm		
	2	Lockable bracket incl. 4 proximity switch holders (actuator type 0 only)		
	3	Limit stop (actuator types 1 and 2 only)		
	5	Two-position stop (actuator type 2 only)		
	7	Booster cylinder (actuator types 1 and 2 only)		
11	Product wetted surface			
	0	0.8 µm		
	1	0.4 µm		
12	Certificate			
	0	Without		
	1	Test report 2.2		
	2	Inspection certificate 3.1		
	3	Certificates 2.2 and 3.1		
13	ATEX approval			
	0	No		
	1	Yes		

The code is composed as follows, depending on the chosen configuration:

Position	1	2	3		4	5		6	7	8	9		10	11	12	13	
Code	7	3	1	-			-					-					+ Code for control and feedback systems, see section 3



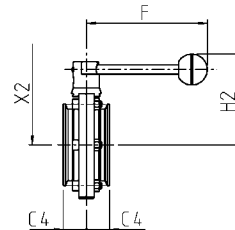
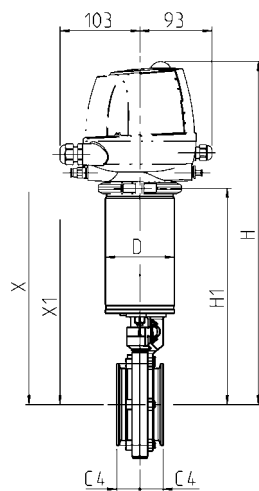
Technical data standard variant

Standards	DN OD	DIN 32676 ISO 2852
Product wetted materials	AISI 304	
Non product wetted materials	AISI 304	
Product wetted gasket material	EPDM	
Ambient temperature	0 to 45 °C	
Control air pressure	4.8 to 8 bar	
Max. product pressure	10 bar	
Product wetted surface	Ra 0.8 µm	
Non product wetted surface	Metal blank	
Pneumatic Actuator	Air-to-spring	

Certificates



*The CE-marking is valid for a T-smart Butterfly Valve with pneumatic actuator.



	Pipe	Actuator		Dimensions			Removal space			Flange width	Valve	
Nominal size	Ø [mm]	Ø D [mm]	F [mm]	H [mm]	H1 [mm]	H2 [mm]	X [mm]	X1 [mm]	X2 [mm]	C4 [mm]	KVS [m³/h]	Weight (without actuator) [kg]
DN 25	29 × 1.5	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	40	21	1.0
DN 40	41 × 1.5	88.9	116	418.5	256.5	86.5	438.5	276.5	106.5	30	72	0.9
DN 50	53 × 1.5	88.9	116	427.0	265.0	95.0	447.0	285.0	115.0	30	130	1.3
DN 65	70 × 2.0	88.9	116	434.5	272.5	103.0	454.5	292.5	123.0	30	250	1.9
DN 80	85 × 2.0	88.9	160	440.5	278.5	114.5	460.5	298.5	134.5	30	340	2.3
DN 100	104 × 2.0	88.9	160	456.5	294.5	128.0	476.5	314.5	148.0	30	750	2.7
OD 1"	25.4 × 1.6	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	40	23	1.1
OD 1 ½"	38.1 × 1.6	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	30	87	0.9
OD 2"	50.8 × 1.6	88.9	116	428.0	266.0	96.0	448.0	286.0	116.0	30	170	1.3
OD 2 ½"	63.5 × 1.6	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	30	240	1.6
OD 3"	76.2 × 1.6	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	30	400	2.0
OD 4"	101.6 × 2.0	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	30	880	3.1

Position	Description of order code			
1	Valve type			
	7	Butterfly Valve		
2	Flange connection			
	33	Clamp flange/clamp flange		
3	Pipe standard			
	0	OD	1	DN
4	Nominal size			
	010	OD 1"	025	DN 25
	112	OD 1 ½"	040	DN 40
	200	OD 2"	050	DN 50
	212	OD 2 ½"	065	DN 65
	300	OD 3"	080	DN 80
	400	OD 4"	100	DN 100
	5	Product wetted material		
1		AISI 304 (1.4301)		
2		AISI 316L (1.4404)		
6	Product wetted gasket material			
	0	EPDM		
	1	HNBR		
	2	FKM		
	6	VMQ		
7	Actuator type			
	0	Manual actuator		
	1	Pneumatic for T.VIS®		
	2	Pneumatic incl. 2 proximity switch holders		
	5	Manual actuator stepless		
	6	Manual actuator with scissors handle (up to OD 4"/DN 100)		
8	Air connection			
	0	Without		
	1	Metric (only for actuator type 2)		
	2	Inch (only for actuator type 2)		
	3	Metric with air throttle (only for actuator type 2)		
	4	Inch with air throttle (only for actuator type 2)		
9	Fail position of valve			
	0	Closed		
	1	Open		
	2	Air-to-air (actuator types 1 and 2 only)		
10	Accessories			
	0	Without		
	1	Extension piece +80 mm		
	2	Lockable bracket incl. 4 proximity switch holders (actuator type 0 only)		
	3	Limit stop (actuator types 1 and 2 only)		
	5	Two-position stop (actuator type 2 only)		
	7	Booster cylinder (actuator types 1 and 2 only)		
11	Product wetted surface			
	0	0.8 µm		
	1	0.4 µm		
12	Certificate			
	0	Without		
	1	Test report 2.2		
	2	Inspection certificate 3.1		
	3	Certificates 2.2 and 3.1		
13	ATEX approval			
	0	No		
	1	Yes		

The code is composed as follows, depending on the chosen configuration:

Position	1	2	3		4	5		6	7	8	9		10	11	12	13	
Code	7	3	3	-			-					-					+ Code for control and feedback systems, see section 3



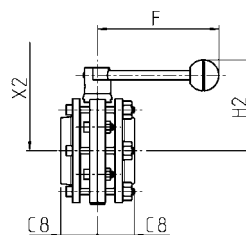
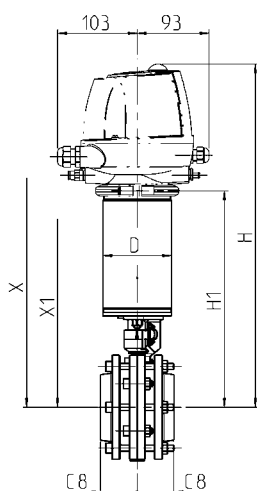
Technical data standard variant

Product wetted materials	AISI 304
Non product wetted materials	AISI 304
Product wetted gasket material	EPDM
Ambient temperature	0 to 45 °C
Control air pressure	4.8 to 8 bar
Max. product pressure	10 bar
Product wetted surface	Ra 0.8 µm
Non product wetted surface	Metal blank
Pneumatic Actuator	Air-to-spring

Certificates



*The CE-marking is valid for a T-smart Butterfly Valve with pneumatic actuator.



	Pipe	Actuator		Dimensions			Removal space			Flange width	Valve	
Nominal size	Ø [mm]	Ø D [mm]	F [mm]	H [mm]	H1 [mm]	H2 [mm]	X [mm]	X1 [mm]	X2 [mm]	C8 [mm]	KVS [m³/h]	Weight (without actuator) [kg]
DN 15	19 × 1.5	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	47.5	On request	1.6
DN 20	23 × 1.5	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	47.5	On request	1.6
DN 25	29 × 1.5	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	47.5	21	1.5
DN 40	41 × 1.5	88.9	116	418.5	256.5	86.5	438.5	276.5	106.5	47.5	72	1.8
DN 50	53 × 1.5	88.9	116	427.0	265.0	95.0	447.0	285.0	115.0	47.5	130	2.4
DN 65	70 × 2.0	88.9	116	434.5	272.5	103.0	454.5	292.5	123.0	47.5	250	3.2
DN 80	85 × 2.0	88.9	160	440.5	278.5	114.5	460.5	298.5	134.5	47.5	340	3.8
DN 100	104 × 2.0	88.9	160	456.5	294.5	128.0	476.5	314.5	148.0	47.5	750	4.7
DN 125	129 × 2.0	114.3	220	472.0	310.0	146.0	492.0	330.0	166.0	55.0	1100	8.7
DN 150	154 × 2.0	114.3	220	486.0	324.0	159.0	506.0	344.0	180.0	60.0	1800	12.2
OD ½"	12.7 × 1.6	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	47.5	On request	1.6
OD ¾"	19.05 × 1.6	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	47.5	On request	1.6
OD 1"	25.4 × 1.6	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	47.5	23	1.6
OD 1 ½"	38.1 × 1.6	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	47.5	87	1.7
OD 2"	50.8 × 1.6	88.9	116	428.0	266.0	96.0	448.0	286.0	116.0	47.5	170	2.3
OD 2 ½"	63.5 × 1.6	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	47.5	240	3.1
OD 3"	76.2 × 1.6	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	47.5	400	3.5
OD 4"	101.6 × 2.0	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	47.5	880	5.3

Position	Description of order code			
1	Valve type			
	7	Butterfly Valve		
2	Flange connection			
	88	Intermediate flange variant		
3	Pipe standard			
	0	OD	1	DN
4	Nominal size			
	012	OD ½"	015	DN 15
	075	OD ¾"	020	DN 20
	010	OD 1"	025	DN 25
	112	OD 1 ½"	040	DN 40
	200	OD 2"	050	DN 50
	212	OD 2 ½"	065	DN 65
	300	OD 3"	080	DN 80
	400	OD 4"	100	DN 100
			125	DN 125
			150	DN 150
5	Product wetted material			
	1	AISI 304 (1.4301)		
	2	AISI 316L (1.4404)		
6	Product wetted gasket material			
	0	EPDM		
	1	HNBR		
	2	FKM		
	6	VMQ		
7	Actuator type			
	0	Manual actuator		
	1	Pneumatic for T.VIS®		
	2	Pneumatic incl. 2 proximity switch holders		
	5	Manual actuator stepless		
	6	Manual actuator with scissors handle (up to OD 4"/DN 100)		
8	Air connection			
	0	Without		
	1	Metric (only for actuator type 2)		
	2	Inch (only for actuator type 2)		
	3	Metric with air throttle (only for actuator type 2)		
	4	Inch with air throttle (only for actuator type 2)		
9	Fail position of valve			
	0	Closed		
	1	Open		
	2	Air-to-air (actuator types 1 and 2 only)		
10	Accessories			
	0	Without		
	1	Extension piece +80 mm		
	2	Lockable bracket incl. 4 proximity switch holders (actuator type 0 only)		
	3	Limit stop (actuator types 1 and 2 only)		
	5	Two-position stop (actuator type 2 only)		
	7	Booster cylinder (actuator types 1 and 2 only)		
11	Product wetted surface			
	0	0.8 µm		
	1	0.4 µm		
12	Certificate			
	0	Without		
	1	Test report 2.2		
	2	Inspection certificate 3.1		
	3	Certificates 2.2 and 3.1		
13	ATEX approval			
	0	No		
	1	Yes		

The code is composed as follows, depending on the chosen configuration:

Position	1	2	3		4	5		6	7	8	9		10	11	12	13	
Code	7	8	8	-			-					-					+ Code for control and feedback systems, see section 3

**Manual actuator**

Material	AISI 304 and phenolic resin (ball head)
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Dimensions

Nominal size	OD/SMS DN	½" – 2 ½" 15–65	3" – 4" 80–100	125–150
Length of lever		116 mm	160 mm	220 mm
Weight		0.3 kg	0.4 kg	0.4 kg
Article No.		224-001054	224-001055	224-001056

**Pneumatic actuator for T.VIS®**

Actuator type	Air-to-spring	Air-to-air
Material	AISI 304	AISI 304
Ambient temperature	0 to 45 °C	0 to 45 °C
Control air pressure	4.8 to 8 bar	4.8 to 8 bar
Surface	Metal blank	Metal blank

Dimensions

Nominal size	OD/SMS DN	½" – 2 ½" 15–65	3" – 4" 80–100	125–150
Ø Cylinder pipe Air-to-spring Air-to-air		88.9 mm 88.9 mm	88.9 mm 88.9 mm	114.3 mm 88.9 mm
H		223.0 mm	223.0 mm	223.0 mm
Weight Air-to-spring Air-to-air		4.1 kg 2.9 kg	4.1 kg 2.9 kg	5.5 kg 2.9 kg
Article No.	Air-to-spring Air-to-air	224-001503 224-001504	224-001505 224-001506	224-001509 224-001508

**Pneumatic actuator**

See entry for: Pneumatic actuator for T.VIS®

Dimensions

Nominal size	OD/SMS DN	½" – 2 ½" 15–65	3" – 4" 80–100	125–150
Ø Cylinder pipe Air-to-spring Air-to-air		88.9 mm 88.9 mm	88.9 mm 88.9 mm	114.3 mm 88.9 mm
Ø Connecting plate Air-to-spring Air-to-air		97 mm 97 mm	97 mm 97 mm	114.3 mm 97 mm
H		223.0 mm	223.0 mm	223.0 mm
Weight Air-to-spring Air-to-air		4.1 kg 2.9 kg	4.1 kg 2.9 kg	5.5 kg 2.9 kg
Article No.	Air-to-spring Air-to-air	224-001503 224-001504	224-001505 224-001506	224-001509 224-001508

**Manual actuator stepless**

Material	AISI 304
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Dimensions

Nominal size	OD/SMS DN	½" – 2 ½" 15–65	3" – 4" 80–100	125–150
Length of lever		109 mm	154 mm	154 mm
Weight		0.6 kg	0.6 kg	0.6 kg
Article No.		224-000235	224-000236	224-000237

**Manual actuator scissors handle**

Material	AISI CF-8
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Dimensions

Nominal size	OD/SMS DN	½" – 2 ½" 15–65	3" – 4" 80–100
Length of lever		162 mm	162 mm
Weight		0.5 kg	0.5 kg
Article No.		224-000544	224-000545

Position	Description of order code			
1	Valve type			
	7 Butterfly Valve			
2	Flange connection			
	99 Actuator only			
3	Pipe standard			
	0 OD	1 DN	7 SMS	
4	Nominal size			
	012 OD ½"	015 DN 15		
	075 OD ¾"	020 DN 20		
	010 OD 1"	025 DN 25	010 OD 1"	
	112 OD 1 ½"	040 DN 40	112 OD 1 ½"	
	200 OD 2"	050 DN 50	200 OD 2"	
	212 OD 2 ½"	065 DN 65	212 OD 2 ½"	
	300 OD 3"	080 DN 80	300 OD 3"	
	400 OD 4"	100 DN 100	400 OD 4"	
		125 DN 125		
		150 DN 150		
5	Product wetted material			
	9 Not applicable			
6	Product wetted gasket material			
	9 Not applicable			
7	Actuator type			
	0 Manual actuator			
	1 Pneumatic for T.VIS®			
	2 Pneumatic incl. 2 proximity switch holders			
	5 Manual actuator stepless			
	6 Manual actuator with scissors handle (up to OD 4"/DN 100)			
8	Air connection			
	0 Without			
	1 Metric (only for actuator type 2)			
	2 Inch (only for actuator type 2)			
	3 Metric with air throttle (only for actuator type 2)			
	4 Inch with air throttle (only for actuator type 2)			
9	Fail position of valve			
	0 Closed			
	1 Open			
	2 Air-to-air (actuator types 1 and 2 only)			
10	Accessories			
	0 Without			
	1 Extension piece +80 mm			
	2 Lockable bracket incl. 4 proximity switch holders (actuator type 0 only)			
	3 Limit stop (actuator types 1 and 2 only)			
	5 Two-position stop (actuator type 2 only)			
	7 Booster cylinder (actuator types 1 and 2 only)			
11	Product wetted surface			
	9 Not applicable			
12	Certificate			
	0 Without			
13	ATEX approval			
	0 No			
	1 Yes			

The code is composed as follows, depending on the chosen configuration:

Position	1	2	3		4	5		6	7	8	9		10	11	12	13	
Code	7	9	9	-		9	-	9				-		9	0		+ Code for control and feedback systems, see section 3



Extension piece

To encapsulate the valve together with the pipe the actuator interface needs to be relocated to the outside. The extension piece for all actuator types shifts the actuator 80 mm to the outside.

Technical data				
Material		AISI 304		
Surface		Metal blank		
Dimensions				
Nominal size	OD / SMS DN	½" – 2 ½"	3" – 4"	
		15–65	80–100	125–150
H		80 mm	80 mm	80 mm
Weight		0.8 kg	0.8 kg	0.8 kg
Article No.		224-001241	224-001242	224-001243



Lockable bracket incl. 4 proximity switch holders

The fit-on bracket offers two horizontal and two vertical mounting options, which means up to eight different configurations for mounting proximity in M12×1 size. The bracket also features an eyelet to fit a padlock in order to secure the mechanical standard manual actuator in closed valve position. The depicted padlock is merely an example.

Technical data				
Material		PA12		
Dimensions				
Nominal size	OD / SMS DN	½" – 2 ½"	3" – 4"	
		15–65	80–100	125–150
Weight		36 g	42 g	42 g
Article No.		224-001057	224-001058	224-001058



Limit stop

The mechanically adjustable limit stop is used to limit the stroke length of a butterfly valve. Both the opening and the closing stroke can be adjusted individually and separately.

Technical data				
Material		AISI 304		
Surface		Metal blank		
Dimensions				
Nominal size	OD / SMS DN	½" – 2 ½"	3" – 4"	
		15–65	80–100	125–150
H		182 mm	182 mm	182 mm
Weight		1.5 kg	1.5 kg	1.5 kg
Article No.		224-001249	224-001249	224-001249



Limit stop for control and feedback system

The mechanically adjustable limit stop is used to limit the stroke length of a butterfly valve. Both the opening and the closing stroke can be adjusted individually and separately. This variant includes the T.VIS® connection for mounting a control and feedback system.

Technical data				
Material		AISI 304		
Surface		Metal blank		
Dimensions				
Nominal size	OD / SMS DN	½" – 2 ½"	3" – 4"	
		15–65	80–100	125–150
H (without T.VIS®)		103 mm	103 mm	103 mm
Weight		1.7 kg	1.7 kg	1.7 kg
Article No.		224-001250	224-001250	224-001250



Two-position stop

Using a two-position stop, a pneumatically controlled valve can be driven – in addition to the opened and closed position – into one partial opening position with individually adjustable mechanical stop. Actuation is accomplished through a second air connection. The installation of a control and feedback system on the two-position stop is not possible.

Technical data				
Material		AISI 304		
Surface		Metal blank		
Dimensions				
Nominal size	OD / SMS DN	½" – 2 ½" 15 – 65	3" – 4" 80 – 100	125 – 150
H		225 mm	225 mm	225 mm
Weight		3.3 kg	3.3 kg	3.3 kg
Article No.		224-001017	224-001017	224-001017



Booster cylinder

The booster cylinder is used for enlarging the piston surface area that allows to open the valve with a lower air pressure.

Technical data				
Material		AISI 304		
Surface		Metal blank		
Dimensions				
Nominal size	OD / SMS DN	½" – 2 ½" 15–65	3" – 4" 80–100	125–150
H		95 mm	95 mm	95 mm
Weight		2.3 kg	2.3 kg	2.3 kg
Requested control air pressure (min.)		3 bar/44 psi	3 bar/44 psi	3.5 bar/50 psi
Article No.		224-001258	224-001258	224-001258

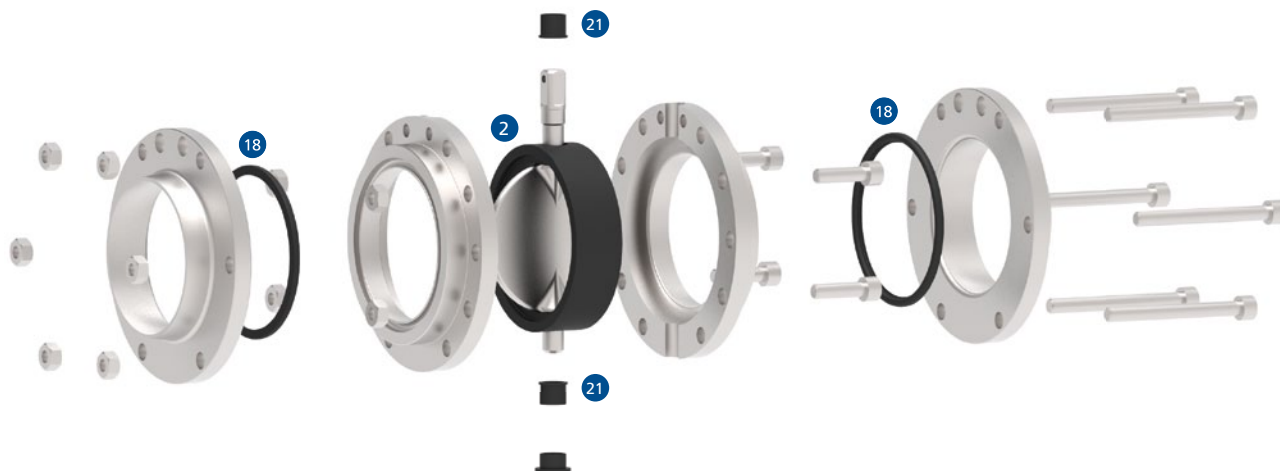
Seal kits for Butterfly Valves T-smart 711, 721, 722, 724, 714, 731, 733



Included in the seal kit		
Position	Quantity	Designation
2	1	Butterfly valve gasket
21	2	Bearings

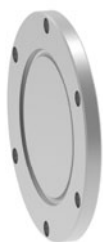
		EPDM	HNBR	FKM	VMQ
Nominal size		Article No.	Article No.	Article No.	Article No.
DN	15	224-001332	224-001334	224-001333	224-001335
DN	20	224-001332	224-001334	224-001333	224-001335
DN	25	224-001300	224-001302	224-001301	224-001303
DN	40	224-001304	224-001306	224-001305	224-001307
DN	50	224-001308	224-001310	224-001309	224-001311
DN	65	224-001312	224-001314	224-001313	224-001315
DN	80	224-001316	224-001318	224-001317	224-001319
DN	100	224-001320	224-001322	224-001321	224-001323
DN	125	224-001324	224-001326	224-001325	224-001327
DN	150	224-001328	224-001330	224-001329	224-001331
OD	½"	224-001332	224-001334	224-001333	224-001335
OD	¾"	224-001332	224-001334	224-001333	224-001335
OD	1"	224-001332	224-001334	224-001333	224-001335
OD	1 ½"	224-001336	224-001338	224-001337	224-001339
OD	2"	224-001340	224-001342	224-001341	224-001343
OD	2 ½"	224-001344	224-001346	224-001345	224-001347
OD	3"	224-001348	224-001350	224-001349	224-001351
OD	4"	224-001352	224-001354	224-001353	224-001355

Seal kits for Butterfly Valves T-smart 788



Included in the seal kit		
Position	Quantity	Designation
2	1	Butterfly valve gasket
21	2	Bearings
18	2	VARIVENT® O-ring

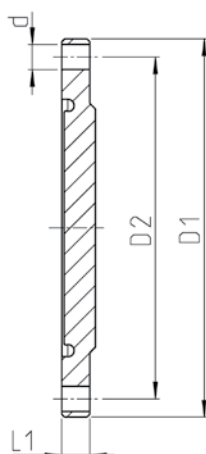
		EPDM	HNBR	FKM	VMQ
Nominal size		Article No.	Article No.	Article No.	Article No.
DN	15	224-001388	224-001390	224-001389	224-001391
DN	20	224-001388	224-001390	224-001389	224-001391
DN	25	224-001356	224-001358	224-001357	224-001359
DN	40	224-001360	224-001362	224-001361	224-001363
DN	50	224-001364	224-001366	224-001365	224-001367
DN	65	224-001368	224-001370	224-001369	224-001371
DN	80	224-001372	224-001374	224-001373	224-001375
DN	100	224-001376	224-001378	224-001377	224-001379
DN	125	224-001380	224-001382	224-001381	224-001383
DN	150	224-001384	224-001386	224-001385	224-001387
OD	½"	224-001388	224-001390	224-001389	224-001391
OD	¾"	224-001388	224-001390	224-001389	224-001391
OD	1"	224-001388	224-001390	224-001389	224-001391
OD	1 ½"	224-001392	224-001394	224-001393	224-001395
OD	2"	224-001396	224-001398	224-001397	224-001399
OD	2 ½"	224-001400	224-001402	224-001401	224-001403
OD	3"	224-001404	224-001406	224-001405	224-001407
OD	4"	224-001408	224-001410	224-001409	224-001411



Blind Grooved Flange

The range also contains blind grooved flanges for butterfly valves T-smart 7. They are used for closing off pipelines behind the intermediate flange variant of the butterfly valve, e.g. when an expansion of the system is planned for a later time.

Technical data	
Material	AISI 316 L (1.4404)
Surface in contact with the product	$Ra \leq 0.8 \mu m$
Certificates	3.1/AD2000W2
Seal materials	EPDM (FDA), FKM (FDA), HNBR (FDA)



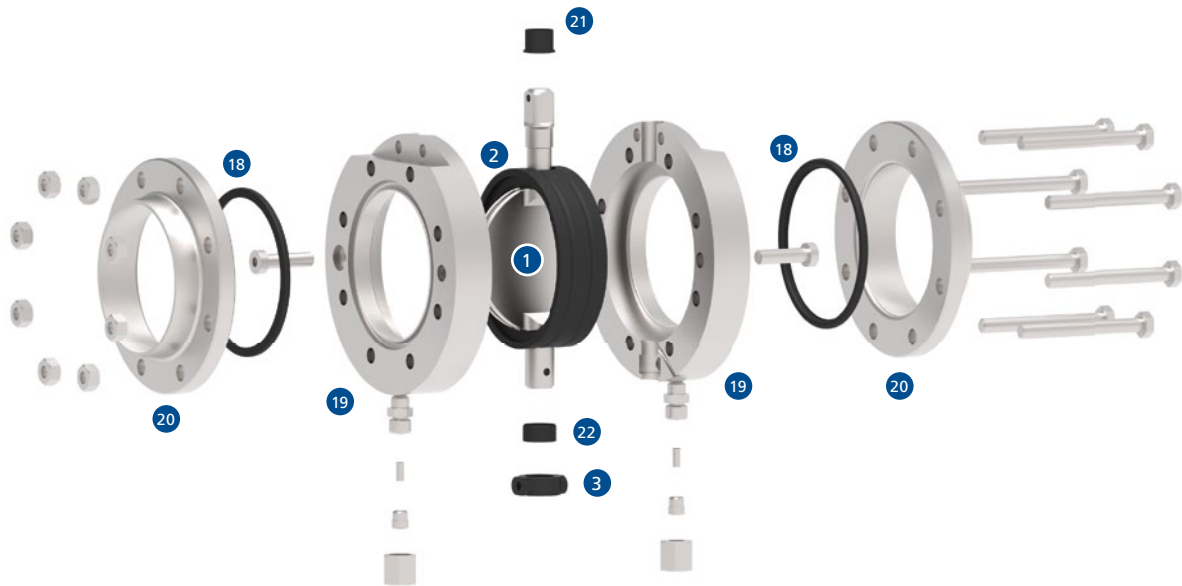
Blind grooved flange



O-ring

Blind grooved flange								O-ring			
Dimensions							Article No.	Dimensions	Article No.		
Nominal width	D1 [mm]	D2 [mm]	d [mm]	L1 [mm]	PN	Weight [kg]		D1 x L1 [mm]	Material		
									EPDM	FKM	HNBR
DN 25	78	68	4 x Ø 7	10	10	0.4	224-001673	25.0 x 5.0	930-393	930-564	930-551
DN 40	87	77	4 x Ø 7	10	10	0.4	224-001671	36.0 x 5.0	930-545	930-566	930-552
DN 50	103	90	4 x Ø 9	10	10	0.6	224-001669	47.0 x 5.0	930-546	930-567	930-553
DN 65	120	107	6 x Ø 9	10	10	0.9	224-001667	62.0 x 5.0	930-547	930-526	930-554
DN 80	135	122	6 x Ø 9	10	10	1.1	224-001665	75.0 x 5.0	930-450	930-527	930-555
DN 100	155	142	8 x Ø 9	10	10	1.5	224-001663	92.0 x 5.0	930-549	930-568	930-556
DN 125	191	175	8 x Ø 11	10	10	2.3	224-001661	115.0 x 5.0	930-550	930-569	930-557
DN 150	219	200	8 x Ø 13	15	10	4.6	224-001662	134.2 x 5.7	930-574	930-575	930-872
OD 1"	78	68	4 x Ø 7	10	10	0.4	224-001674	22.0 x 5.0	930-376	930-593	930-851
OD 1 ½"	84	74	4 x Ø 7	10	10	0.4	224-001672	33.5 x 5.0	930-497	930-570	930-852
OD 2"	101	88	4 x Ø 9	10	10	0.6	224-001670	45.0 x 5.0	930-559	930-571	930-853
OD 2 ½"	116	103	6 x Ø 9	10	10	0.8	224-001668	56.0 x 5.0	930-560	930-572	930-854
OD 3"	128	115	6 x Ø 9	10	10	1.0	224-001666	68.0 x 5.0	930-319	930-666	930-652
OD 4"	160	147	8 x Ø 9	10	10	1.6	224-001664	90.0 x 5.0	930-561	930-573	930-855

Mixproof Butterfly Valves T-smart 9



- 1 Butterfly valve disk
- 2 Butterfly valve gasket
- 3 Radial seal
- 18 VARIVENT® O-ring

- 19 Body flanges (intermediate flange with O-ring groove)
- 20 Welding flange (outside flange)
- 21 Upper bearing
- 22 Lower bearing

The Mixproof Butterfly Valve T-smart 9 offers an interesting valve variant for the mixproof separation of media. Highly functional, CIP/SIP-enabled and easy to service, this valve supplies continuous safety to production processes. In addition to the main opening, the rotating valve disk enforces the mechanical opening or closing of drain ports, depending on the valve position. This minimizes switching losses and ensures the functionality of four valve disks – without further actuation – and the need of the corresponding control system.

Application examples

CIP systems

Flush-out processes

Water management

Use as CIP return valve in a valve matrix

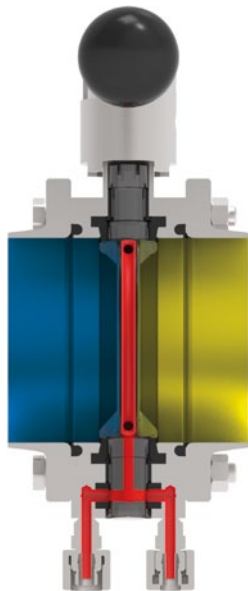


The Mixproof Butterfly Valves T-smart 9 are characterized by their hygienic design without dome and sump, offering all before mentioned advantages.

Significant product features

Valve disk made from solid material
Compact build
Minimum switching loss
Optimum cleanability
Simple and safe leakage indication
Only one product wetted seal
Hygienically placed drain paths
Product wetted parts in 316L (1.4404)
Intermediate flange seals in proven VARIVENT® seal design
Long service life, high productivity in process
Vacuum-proof

Mixproof separation of the two product areas, when the valve disk is closed, is achieved through two peripheral sealing edges with the leakage cavity between them.



Mixproof product area separation with the leakage cavity open to the atmosphere so any leakage becomes visible immediately.

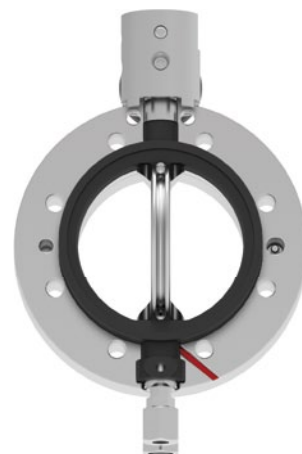
The leakage cavity itself drains automatically and is designed in such a way that it can be flushed, from one drain port to the other, without dead areas or short-cuts. With little resources applied, products are successfully and completely flushed out, for optimum cleanability.



Upon closing of the valve disk the drain ports are opened. Remaining product from the switching operation can drain, and be flushed out, immediately after switching.



Upon opening of the valve disk the drain ports are automatically closed and reliably prevent product loss.



Specially positioned leakage apertures allow immediate detection of any leakage between the two seals.

Pneumatic actuators

For narrow mounting situations and low air consumption the pneumatic actuators have been made even more compact. The gap-free design ensures optimum cleanability and fulfils highest demands to hygiene.

Torque maxima towards both end positions enable application on both normally closed and normally open valves. Metallic stops ensure exact disk positioning. There are air-to-spring and air-to-air variants.

The integrated T.VIS® interface also safely accommodates optional accessories – booster cylinder, two-position stop and limit stop. The internal pneumatic system reduces the risk of failures, being without external tubing.

All actuators are by default applicable for Ex zones. Compliance of any electric accessories with Ex regulations must be ensured.



Features

Compact, hygienic design

Metallic stops

Torque maxima towards both end positions

Air-to-spring and air-to-air variants available

Integrated T.VIS® interface

Actuator bracket

The new actuator bracket can be attached to the flanges more easily because of its one-sided design and integrated threads for the mounting screws.

Two integrated proximity switch holders are located at a 45 ° angle above one of the two flanges. Turning the bracket 180 ° places the switches above the other side. This means one side of the valve is always free from structures mounted on top, thus allowing free access to male flanges, for example.

The switches are plugged into half-open holders on the side, which allows for easy mounting since the counter nuts only need to be loosened, not removed.



Gaskets

The vacuum-proof gasket has been completely redeveloped and offers maximum stability and service life. The double-sided valve disk bearing provides a defined seal compression and lowest switch torque.

Gaskets with decisive advantages
Low torque
Double-sided valve disk bearing
Long service-life
Vacuum-proof
FDA-approved EPDM seal material

Selection of dimensions and connection fittings

Flange variant						
Code	Nominal size	DN	50	65	80	100
8	Intermediate flange V		•	•	•	•

Flange variant						
Code	Nominal size	OD	2"	2½"	3"	4"
8	Intermediate flange V		•	•	•	•



8 (T-smart 988)

Pipe classes

Dimensions of weld connections comply with the following standards:

- **Metric:** Outside diameter acc. to DIN 11850, series II, DIN 11866, series A
- **Inch OD:** Outside diameter acc. to BS 4825

Surfaces

Product wetted surfaces are by default finished to $Ra \leq 0.8 \mu m$. Higher-quality surfaces finished to $Ra \leq 0.4 \mu m$ are optionally available.

Non product wetted surfaces (flanges) are metal blank.

Materials

Product wetted parts of the Mixproof Butterfly Valves T-smart 9 are built in AISI 304 (1.4301). Other materials are available on request, e.g. for applications handling aggressive media.

For detailed information regarding properties of the materials consult the “**Material properties**” table.

Test report and inspection certificate

Flanges and disks of the Mixproof Butterfly Valves T-smart 9 are available with test report 2.2 or material inspection certificate 3.1 in compliance with EN 10204 (on request).

Seal materials

Product wetted seals are EPDM.

Mixing components of our seal materials are included in the FDA “**White List**” and comply with the “**FOOD and DRUG**” (FDA) regulations 21 CFR Part 177.2600 and 21 CFR 177.1550: “Rubber Articles intended for repeated use”.

The resistance of the sealing material depends on the type and temperature of the medium conveyed. The contact time can negatively affect the service life of the seals.

For detailed information regarding properties of the seal materials consult the “**Seal material properties**” table.

Conditions for operation

Mixproof Butterfly Valves T-smart 9 can be operated at ambient temperatures from 0 to 45 °C (32 to 113 °F). The proximity switches are approved for ambient temperatures from –20 to 80 °C (–4 to 176 °F). The Butterfly Valves T-smart 9 can be operated in outdoor areas. However, they need to be protected from frost in those areas or must be defrosted before switching.

Mixproof Butterfly Valves T-smart 9 must be mounted stress-free. Horizontal lateral forces, e.g. thermal pipe elongation, cannot be compensated for in the valve, which makes damages to the valve a possibility. In such cases, suitable measures to compensate the elongation are recommended, such as using a VARICOMP® expansion compensator.

The clearance required for mounting and demounting Butterfly Valves T-smart is listed together with the respective technical data and dimensions.

Control air

The control air pressure is min. 4.8 bar, max. 8 bar. For lower control air pressure, a booster cylinder can be applied. The quality of the control air must comply with the requirements acc. to ISO 8573-1:2010:

ISO 8573-1:2010	
Particle content	Quality class 6
	Particle size max. 5 µm
	Particle density max. 5 mg/m ³
Water content	Quality class 4
	Max. dew point 3 °C
	For operation locations in higher regions or at low ambient temperatures, the dew point must be re-calculated accordingly.
Oil content	Quality class 3
	Max. 1 mg oil for 1 m ³ air, ideally oil-free

Actuator selection

The modular concept of the Mixproof Butterfly Valves T-smart 9 allows for a variety of actuator variants to be fitted. Different manual and pneumatic actuators are available.

The pneumatic actuators are optimized for long-term operation and are maintenance-free. To prevent damages in the pipe-work, the closing speed of the pneumatic actuators can be reduced per air throttle.

Feedback signal

Proximity switches of M12×1 size indicate the positions “open” and/or “closed”. The actuator bracket for pneumatic actuators has two sensor casings, an optional and retro-fittable proximity switch holder is available for standard manual actuators.

All pneumatic actuators can be fitted with the proven TVIS® control top with all options.

Technical data

Material properties

Material number	Short name	Similar materials			PREN*	Major alloying elements (% in mass)			
						Cr (Chromium)	Ni (Nickel)	Mo (Molybdenum)	C max (Carbon)
AISI 316L	X2 CrNiMo 17-12-2	1.4404	BS 316S11	SS2348	25	16.5–18.5	10.0–13.0	2.0–2.5	0.03

* Pitting Resistance Equivalent Number = % Cr + 3.3 × (% Mo + 0.5 W) + 20 N

Gasket material properties

Seal material			EPDM
(general operation temperature)			–40 to 135 °C* –40 to 275 °F*
Medium	Concentration	At approved operation temperature	
Caustics	≤ 3 %	to 80 °C	+
	≤ 5 %	to 40 °C	+
	≤ 5 %	to 80 °C	+
	> 5 %		○
Inorganic acids**	≤ 3 %	to 80 °C	+
	≤ 5 %	to 80 °C	○
	> 5 %	to 100 °C	–
Water		to 80 °C	+
Steam		to 135 °C	+
Steam, app. 30 min		to 150 °C	+
Fuels / hydrocarbons			–
Product with fat content	≤ 35 %		+
	> 35 %		–
Oils			–

+ = good resistance
○ = reduced service life
– = not resistant

Other applications on request
* Depending on installation circumstances
** Inorganic acids such as carbonic, nitric or sulphide acid



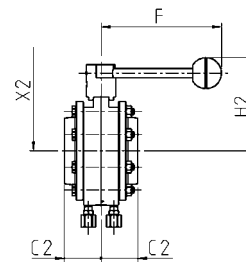
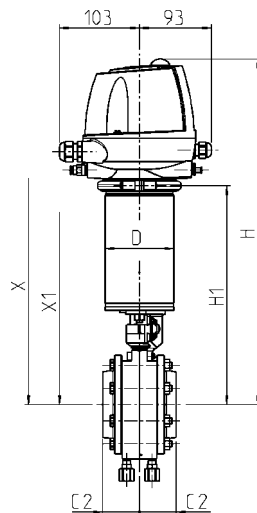
Technical data standard variant

Product wetted materials	AISI 316L
Non product wetted materials	AISI 304
Product wetted gasket material	EPDM
Ambient temperature	0 to 45 °C
Control air pressure	4.8 to 8 bar
Max. product pressure	10 bar
Product wetted surface	Ra 0.8 µm
Non product wetted surface	Metal blank
Pneumatic Actuator	Air-to-spring

Certificates



*The CE-marking is valid for a T-smart Butterfly Valve with pneumatic actuator.

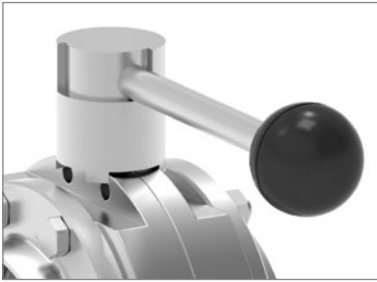


	Pipe	Actuator		Dimensions			Removal space			Flange width	Valve	
Nominal size	Ø [mm]	Ø D [mm]	F [mm]	H [mm]	H1 [mm]	H2 [mm]	X [mm]	X1 [mm]	X2 [mm]	C2 [mm]	KVS [m³/h]	Weight (without actuator) [kg]
DN 50	53 × 1.5	88.9	160	469	310	105	520	360	130	47.5	On request	4.0
DN 65	70 × 2.0	88.9	160	478	319	114	520	360	139	47.5	On request	5.0
DN 80	85 × 2.0	114.3	220	488	329	121	535	380	146	47.5	On request	5.9
DN 100	104 × 2.0	114.3	220	501	342	134	550	390	159	47.5	On request	8.3
OD 2"	50.8 × 1.6	88.9	160	469	310	105	520	360	130	47.5	On request	4.0
OD 2 ½"	63.5 × 1.6	88.9	160	478	319	114	520	360	139	47.5	On request	5.1
OD 3"	76.2 × 1.6	114.3	220	485	329	121	535	380	146	47.5	On request	6.1
OD 4"	101.6 × 2.0	114.3	220	501	342	134	550	390	159	47.5	On request	8.3

Position	Description of order code			
1	Valve type			
	9	Mixproof Butterfly Valve		
2	Flange connection			
	88	Intermediate flange variant		
3	Pipe standard			
	0	OD	1	DN
4	Nominal size			
	200	OD 2"	050	DN 50
	212	OD 2 ½"	065	DN 65
	300	OD 3"	080	DN 80
	400	OD 4"	100	DN 100
5	Product wetted material			
	2	AISI 316L (1.4404)		
6	Product wetted gasket material			
	0	EPDM		
7	Actuator type			
	0	Manual actuator		
	1	Pneumatic for T.VIS®		
	2	Pneumatic incl. 2 proximity switch holders		
8	Air connection			
	0	Without		
	1	Metric (only for actuator type 2)		
	2	Inch (only for actuator type 2)		
	3	Metric with air throttle (only for actuator type 2)		
	4	Inch with air throttle (only for actuator type 2)		
9	Fail position of valve			
	0	Closed		
10	Accessories			
	0	Without		
	1	Extension piece +80 mm		
	2	Lockable bracket incl. 4 proximity switch holders (actuator type 0 only)		
	7	Booster cylinder (actuator types 1 and 2 only)		
11	Product wetted surface			
	0	0.8 µm		
	1	0.4 µm		
12	Certificate			
	0	Without		
	1	Test report 2.2		
	2	Inspection certificate 3.1		
	3	Certificates 2.2 and 3.1		
13	ATEX approval			
	0	No		
	1	Yes		

The code is composed as follows, depending on the chosen configuration:

Position	1	2	3		4	5		6	7	8	9		10	11	12	13	
Code	9	8	8	-		2	-	0			0	-					+ Code for control and feedback systems, see section 3

**Manual actuator**

Material	AISI 304 and phenolic resin (ball head)
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Dimensions

Nominal size	OD / SMS DN	2" – 2 ½" 50–65	3" – 4" 80–100
Length of lever		160 mm	220 mm
Weight		0.4 kg	0.4 kg
Article No.		224-001055	224-001056

**Pneumatic actuator for T.VIS®**

Material	AISI 304
Ambient temperature	0 to 45 °C
Control air pressure	4.8 to 8 bar
Surface	Metal blank
Actuator type	Air-to-spring

Dimensions

Nominal size	OD / SMS DN	2" – 2 ½" 50–65	3" – 4" 80–100
Ø		88.9 mm	114.3 mm
H		223 mm	223 mm
Weight		4.1 kg	5.5 kg
Article No.		224-001586	224-001509

**Pneumatic actuator**

Material	AISI 304
Ambient temperature	0 to 45 °C
Control air pressure	4.8 bis 8 bar
Surface	Metal blank
Actuator type	Air-to-spring

Dimensions

Nominal size	OD / SMS DN	2" – 2 ½" 50–65	3" – 4" 80–100
Ø Cylinder pipe		88.9 mm	114.3 mm
Ø Connecting plate		97 mm	114.3 mm
H		223 mm	223 mm
Weight		4.1 kg	5.5 kg
Article No.		224-001586	224-001509



Extension piece

To encapsulate the valve together with the pipe the actuator interface needs to be relocated to the outside. The extension piece for all actuator types shifts the actuator 80 mm to the outside.

Technical data			
Material		AISI 304	
Surface		Metal blank	
Dimensions			
Nominal size	OD / SMS DN	2" – 2 ½" 50–65	3" – 4" 80–100
H		80 mm	80 mm
Weight		0.8 kg	0.8 kg
Article No.		224-001608	224-001243



Lockable bracket incl. 4 proximity switch holders

The fit-on bracket offers two horizontal and two vertical mounting options, which means up to eight different configurations for mounting proximity in M12×1 size. The bracket also features an eyelet to fit a padlock in order to secure the mechanical standard manual actuator in closed valve position. The depicted padlock is merely an example.

Technical data			
Material		PA12	
Dimensions			
Nominal size	OD / SMS DN	2" – 2 ½" 50–65	3" – 4" 80–100
Weight		42 g	42 g
Article No.		224-001057	224-001058



Booster cylinder

The booster cylinder is used for enlarging the piston surface area that allows to open the valve with a lower air pressure.

Technical data			
Material		AISI 304	
Surface		Metal blank	
Dimensions			
Nominal size	OD / SMS DN	2" – 2 ½" 50–65	3" – 4" 80–100
H		95 mm	95 mm
Weight		2.3 kg	2.3 kg
Requested control air pressure (min.)		3 bar/44 psi	3 bar/44 psi
Article No.		224-001249	224-001249

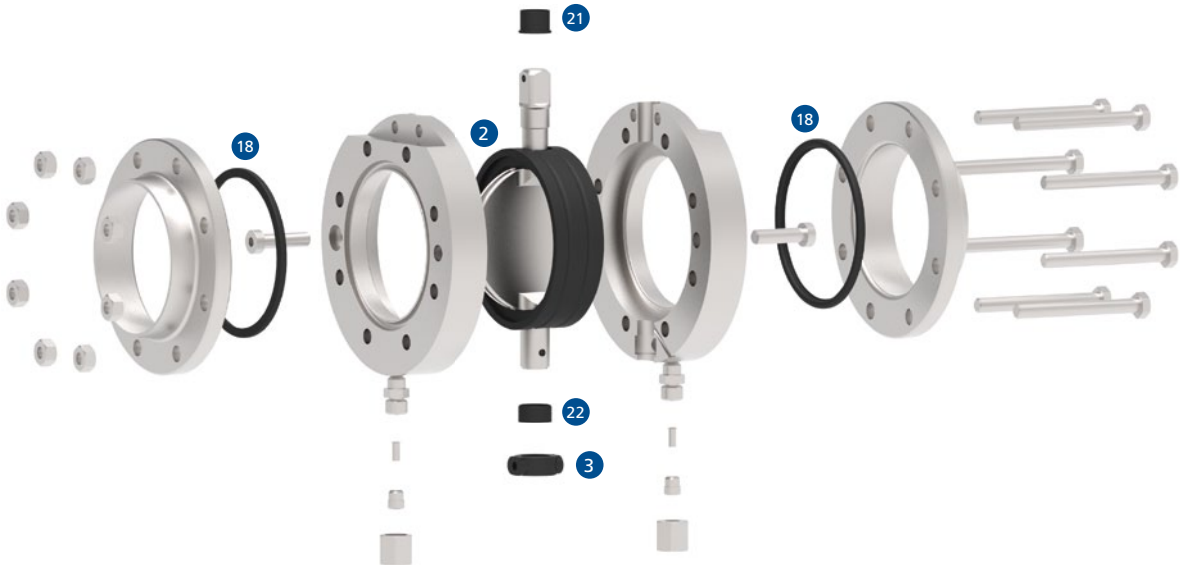


Service adapter

For the manual commissioning of Mixproof Butterfly Valves T-smart 9 that are to be equipped with a pneumatic actuator at a later point in time. The manual actuator that is additionally necessary for this is not included in the scope of delivery and must be ordered separately.

Technical data			
Material		AISI 304	
Surface		Metal blank	
Dimensions			
Nominal size	OD / SMS DN	2" – 2 ½" 50–65	3" – 4" 80–100
Article No.		224-000660	224-000661

Seal kits



Included in the seal kit		
Position	Quantity	Designation
2	1	Butterfly valve gasket
3	1	Radial seal
18	2	VARIVENT® O-Ring
21	1	Upper bearing
22	1	Lower bearing

		EPDM
Nominal size		Article No.
DN	50	224-000696
DN	65	224-000697
DN	80	224-000698
DN	100	224-000699
OD	2"	224-000700
OD	2 ½"	224-000701
OD	3"	224-000702
OD	4"	224-000703

T.VIS® control top

The T.VIS® control top is an optimal system for controlling and monitoring GEA Tuchenhausen valves.

This is available in several variants depending on the valve type, tasks and user convenience.

Common features of all T.VIS® variants are:

- Flexible modular system for optimum variant configuration for the particular task (e.g. type of interface module, number of solenoid valves, etc.)
- Internal air supply for high security against failure of the main valve functions because no external air hose is required
- Characteristic design
- High Protection class (min. IP66, optional IP67 or IP69k)
- Ease of cleaning without dead zones, whatever the installation orientation
- Clear visualization of the valve status via a light dome visible 360°, which is illuminated by colored LEDs
- Low energy consumption
- Ease of handling
- Maintenance-free electronic modules
- Many special options, e.g.:
 - Air throttles
 - Cable connections, etc.

For maintenance work on the valve, the control tops can be removed from the valve actuator by loosening two bolts on the clamp, without electrical or pneumatic connections having to be disconnected.

T.VIS® concept – for valves with pneumatic actuator



T.VIS® M-15 – control top with manual sensor setting

- For open/close position feedback and actuator control
- Proven sensor technology
- Modules and solenoid valves can be retrofitted



T.VIS® A-15 – control top with automatic set-up

- For open/close position feedback and actuator control
- Automatic set-up
- Semi-automatic setup



T.VIS® P-15 – positioning of the valve disc

- For infinitely definable positioning of the valve disc between the open/close positions
- Automatic set-up



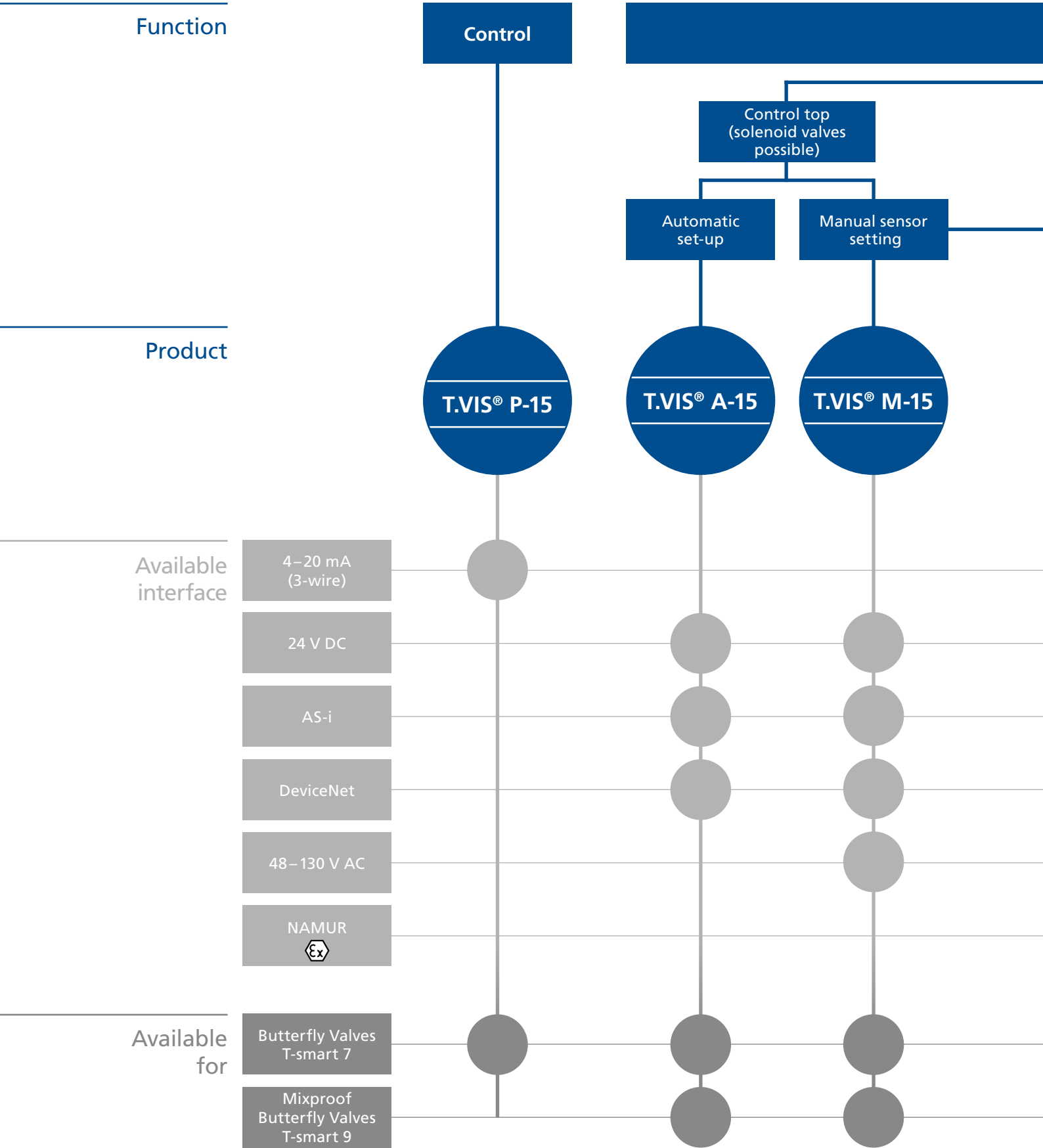
SES – control top for potentially explosive areas

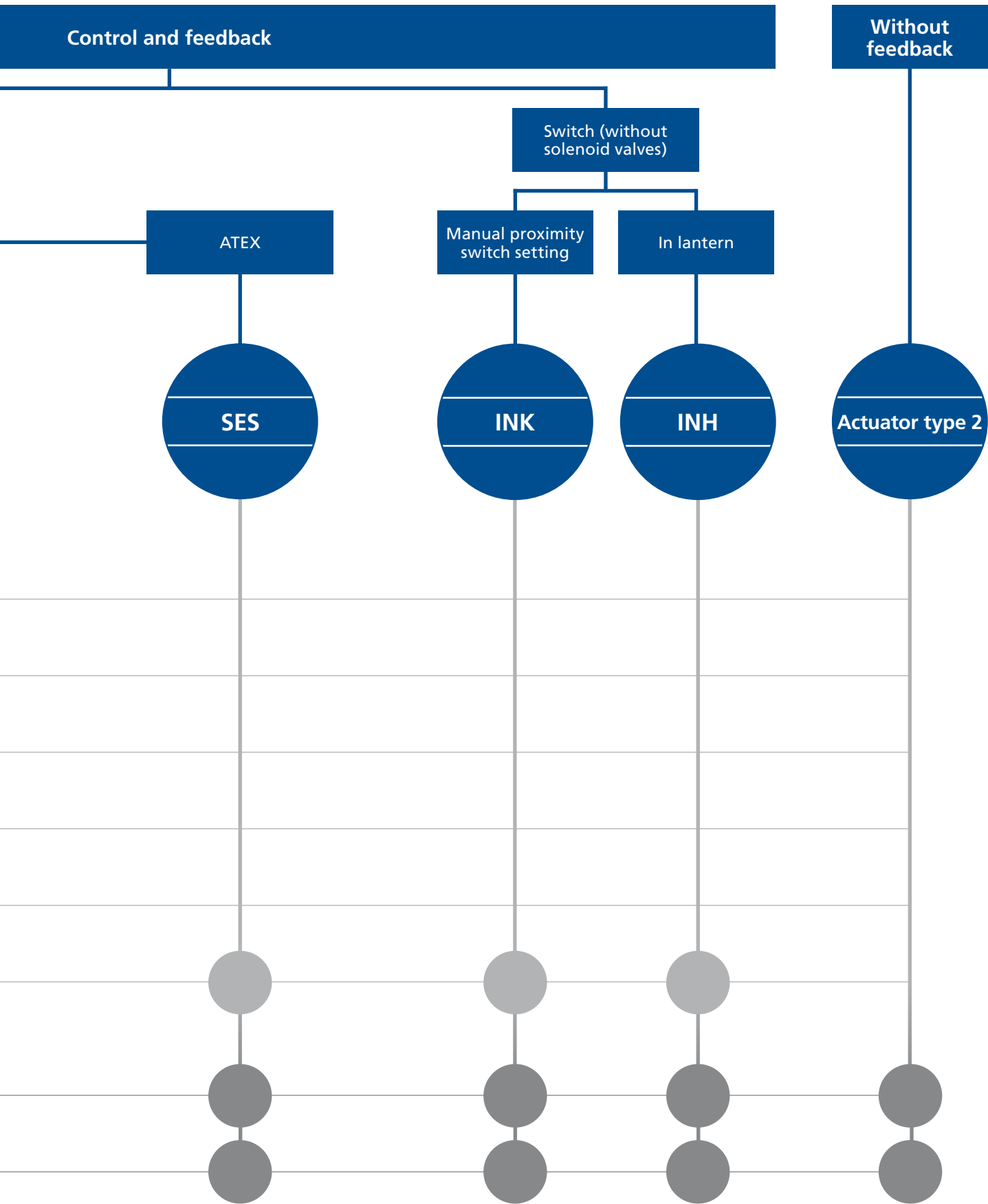
- For open/close position feedback and actuator control
- Intrinsically safe sensors and solenoid valves



Proximity switch holder in bracket

- For 2 proximity switches M12x1





Concept

The T.VIS® M-15 is equipped with manually adjustable sensors and a modular system of options, all of which form the basics of the T.VIS® feedback technology. This means it is optimally adapted to the basic requirements of the process system.

With proven sensor technology, it offers the advantages of the modern T.VIS® series in an inexpensive manner.

Standard variant



- 1 Pneumatic block
- 2 24 V DC interface module
- 3 Sensors
- 4 Solenoid valves
- 5 LED lighting
- 6 Central compressed air connection with replaceable filter
- 7 Cable gland

Features

- Flexible modular system
- Use of proven sensor technology
- Quick and easy adjustment of the sensors
- Valve status indication by LED
- Various communication standards available
- Components can be upgraded/converted subsequently
- Filter protects solenoid valves
- High-quality pneumatic fittings
- Exchangeable compressed air connection
- Supply and exhaust air throttles can be fitted
- Standard protection class IP66

Structure

The T.VIS® M-15 is characterized by proven sensor technology. The basic equipment of the control top comprises of the 24 V DC interface module with two sensors for feedback of the valve position and three solenoid valves which can be installed subsequently, if necessary.

In the interface types with AC (alternating current), DeviceNet and AS-Interface, an adapter module is connected ahead of the standard interface module, and can also be retrofitted or converted.

A replaceable filter in the supply air connection protects the solenoid valves.

Position detection

Inductive sensor system – The valve positions are detected via two manually adjustable sensors.

Setting

Mechanical – the sensors are calibrated mechanically using the positioning spindles, which are subsequently secured to prevent self-adjustment.

Visualization

LED display:

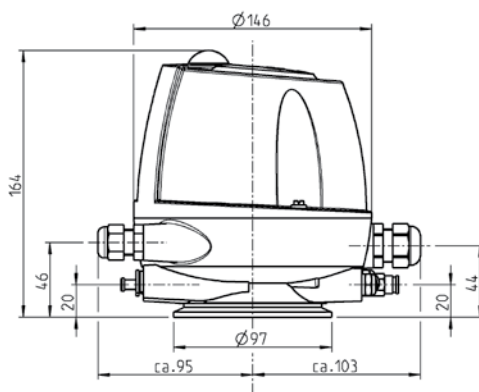
- green
- yellow





Technical data of the standard version

Position detection	Sensors	
Housing material	PA 12/L	
Ambient temperature	−20 to +60 °C	
Air supply	Pressure range	2 to 8 bar
	Standard	acc. to ISO 8573-1:2010
	Solid content	Quality class 6
	Water content	Quality class 4
	Oil content	Quality class 3
Dimensions of air connections	Metric 6/4 mm, inch 6.35/4.31 mm (¼")	
Protection class	IP66 (powerful water jet)	
Sound pressure level via exhaust air throttle	Max. 72 dB	
Visualization	LED (green, yellow)	
Certificates (optional)	 C US	• CSA C22.2 • UL 429



Type of interface	24 V DC, 3-wire, PNP 24 V DC, 3-wire, NPN	48–130 V AC
Supply		
Operating voltage	24 V DC (+20 %, –12.5 %)	48–130 V AC
No-load current	≤ 40 mA	≤ 51 mA
Maximum current consumption	285 mA	185 mA
Polarity reversal protection	Yes	Yes
Certificate	cCSAus	cULus
Inputs		
Activation voltage	21–28.8 V = High; < 16 V = Low	48–130 V = High*; < 30 V = Low > 1.5 mA = High*; < 0.4 mA = Low
Current consumption per input	≤ 35 mA	≤ 3 mA
Activation "PV Y1"	Direct PV activation	Electronic input
Activation "PV Y2"	Direct PV activation	Electronic input
Activation "PV Y3"	Direct PV activation	Electronic input
Outputs		
Connection type	24 V DC (PNP/NPN switchable)	
Maximum current capacity per feedback output	50 mA	≤ 100 mA
Voltage drop on the outputs	≤ 3 V	≤ 5 V
Feedback "start position"	Electronic outputs	Electronic outputs
Feedback "end position"	Electronic outputs	Electronic outputs
Feedback "seat-lift position"	Electronic outputs	Electronic outputs

* Leakage currents can arise if PLC modules with electronic outputs are used. If the leakage currents are more than 1.5 mA, it is essential to use a load resistor in parallel with the interface module. Recommendation: 15 kΩ / 2 W

Position	Description of order code
1	Location of feedback
	TM15 Control top T.VIS® M-15
2	Control top type
	N Without solenoid valve
	P 1 solenoid valve Y1
	R 1 solenoid valve Y1 (retro-fittable: Y2, Y3)
	I 2 solenoid valves Y1, Y2 (retro-fittable: Y3)
	J 2 solenoid valves Y1, Y3 (retro-fittable: Y2)
	L 3 solenoid valves Y1, Y2, Y3
3	Feedback
	2 2 feedbacks
4	Interface module
	B 24 V DC, 3-wire, PNP
	N 24 V DC, 3-wire, NPN
	C 48–130 V AC
5	Solenoid valve
	A 24 V DC, 0.85 W
	0 Without
6	Connection
	M Metric air connection, M20x1.5 cable connection
	Z Inch air connection, 0.5" NPT cable connection
	J Metric air connection, 5-pin connector (M12) (1 solenoid valve, 2 feedbacks)
	P Inch air connection, 5-pin connector (M12) (1 solenoid valve, 2 feedbacks)
	H Metric air connection, 8-pin connector (M12) (> 1 solenoid valve, > 2 feedbacks)
	I Inch air connection, 8-pin connector (M12) (> 1 solenoid valve, > 2 feedbacks)
	B Inch air connection, Brad Harrison 0.5" NPT 5-pin connector (US)
	Options (multiple selection possible)
	/18 Air supply throttle: Controls opening speed of the valves
	/19 Exhaust air throttle: Controls closing speed of the valves
	/22 5-pin plug (M 12) for connections J, P (Article No. 508-963) 8-pin plug (M 12) for connections H, I (Article No. 508-061)
	/67 Protection class IP67 (temporary immersion)
	/69k Protection class IP69k (high pressure spray down)
	/UC Certification UL/CSA

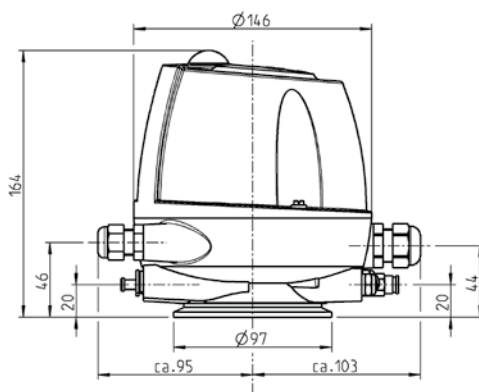
The code is composed as follows, depending on the chosen configuration:

Position	1	2	3	4	5	6	Options					
Code	TM15		2									



Technical data of the standard version

Position detection	Sensors	
Housing material	PA 12/L	
Ambient temperature	-20 to +60 °C	
Air supply	Pressure range	2 to 8 bar
	Standard	acc. to ISO 8573-1:2010
	Solid content	Quality class 6
	Water content	Quality class 4
	Oil content	Quality class 3
Dimensions of air connections	Metric 6/4 mm, inch 6.35/4.31 mm (¼")	
Protection class	IP66 (powerful water jet)	
Sound pressure level via exhaust air throttle	Max. 72 dB	
Visualization	LED (green, yellow)	
Certificates (optional)	 • CSA C22.2 • UL 429	



Type of interface	AS-Interface Bus	DeviceNet
Supply		
Operating voltage	25.0–31.6 V DC	21–26 V DC
No-load current	≤ 62 mA	≤ 58 mA (at 24 V DC)
Maximum current consumption	225 mA	235 mA
Polarity reversal protection	Yes	Yes
Specification	AS-i V2.11 (max. 62 slaves with master V2.11)	ODVA conforming
Additional information	IO.ID.ID2-Code: 7.A.E	EDS-File: F1022_R4.eds
Certificate	AS-i Association/ cCSAus	ODVA
Inputs		
Feedback "start position"	Data bit DI 0	Data bit I-0
Feedback "end position"	Data bit DI 1	Data bit I-1
Feedback "seat-lift position" (ext. NI)	Data bit DI 2	Data bit I-2
Collective fault		Data bit I-7
Outputs		
Activation "PV Y1"	Data bit DO 0	Data bit O-0
Activation "PV Y2"	Data bit DO 1	Data bit O-1
Activation "PV Y3"	Data bit DO 2	Data bit O-2

Position	Description of order code
1	Location of feedback
	TM15 Control top T.VIS® M-15
2	Control top type
	N Without solenoid valve
	P 1 solenoid valve Y1
	R 1 solenoid valve Y1 (retro-fittable: Y2, Y3)
	I 2 solenoid valves Y1, Y2 (retro-fittable: Y3)
	J 2 solenoid valves Y1, Y3 (retro-fittable: Y2)
	L 3 solenoid valves Y1, Y2, Y3
3	Feedback
	2 2 feedbacks
4	Interface module
	A AS-Interface bus
	D DeviceNet
5	Solenoid valve
	A 24 V DC, 0.85 W
	0 Without
6	Connection
	A Metric air connection, M20×1.5 cable connection with connection box on cable 1 m (AS-i)
	S Inch air connection, M20×1.5 cable connection with connection box on cable 1 m (AS-i)
	L Metric air connection, 2-pin connector (M12) (AS-i)
	U Inch air connection, 2-pin connector (M12) (AS-i)
	D Metric air connection, 5-pin connector (M12) (DeviceNet)
	K Inch air connection, 5-pin connector (M12) (DeviceNet)
	Options (multiple selection possible)
	/18 Air supply throttle: Controls opening speed of the valves
	/19 Exhaust air throttle: Controls closing speed of the valves
	/22 5-pin plug (M 12) for connections L, U, D, K (A-coded, Article No. 508-963)
	/67 Protection class IP67 (temporary immersion)
	/69k Protection class IP69k (high pressure spray down)
	/81 AS-i connection box on cable 1 m with M12 plug (Article No. 508-027) for connections L, U
	/82 AS-i connection box on cable 2 m with M12 plug (Article No. 508-028) for connections L, U
	/UC Certification UL/CSA

The code is composed as follows, depending on the chosen configuration:

Position	1	2	3	4	5	6	Options					
Code	TM15		2									

Concept

The T.VIS® A-15 is equipped with a high-precision path measuring system. This automatic open/close position recognition is available on any valve from GEA Tuchenhausen, along with a T.VIS® feedback system.

Development has focussed on the requirements and necessities of our customers from the fluid-processing industry. In addition to safe control and monitoring of all functions of the process valves in breweries, dairies, plants for manufacturing fruit juices as well as pharmaceuticals, the T.VIS® A-15 offers significant advantages that are directly reflected in lower total cost of ownership.

Standard variant



- 1 Pneumatic block
- 2 Control unit
- 3 Path measuring system
- 4 Solenoid valves
- 5 LED lighting
- 6 2 push buttons
- 7 Central compressed air connection with replaceable filter
- 8 M12 plug connection

Features

Quick, automatic initialization
Tamper-proof setting of tolerances
Reduced energy consumption
Reduction in operating costs
Valve status display by LED
Basic LED colors can be selected specifically for the customer
Filter protects solenoid valves
High-quality pneumatic fittings
Exchangeable compressed air connection
Supply and exhaust air throttles can be fitted
Semi-automatic setup
Standard protection class IP66

Structure

The T.VIS® A-15 is equipped with a precise path measuring system for detecting its position.

The necessary wiring for control and feedback is performed, depending on the requirements, via the M12 plug connections accessible from the outside or through direct wiring and cable glands.

The control top can be opened for this.

Operation and configuration of the T.VIS® A-15 takes place either by the two push buttons mounted on the cap or, with the cap removed, via the buttons below. The push buttons are secured electronically against inadvertent or incorrect operation, while in operating mode.

A replaceable filter, in the supply air connection protects the solenoid valves.

Position detection

Path measuring system – The valve positions is registered by means of a highly modern path measurement system.

Setting

Automatic – following unlocking, simply pressing the two buttons on the cap of the T.VIS® A-15 starts the initialization process which runs fully automatically. There is no need to open the control top for this purpose, resulting in particularly quick, easy and safe commissioning of the control top (on average < 1 minute).

Immediately following the set-up, it is possible to set the open/close position tolerances and signal attenuation in the parameter menu.

Semi-automatic setup

As a new feature, our control top T.VIS® A-15 has the option of semi-automatic set-up that permits uncomplicated exchange in the current process.

For more information about the semi-automatic setup, refer to the end of this section.

Visualization

LED display:

- Green
- Yellow
- Red



Protection class IP66

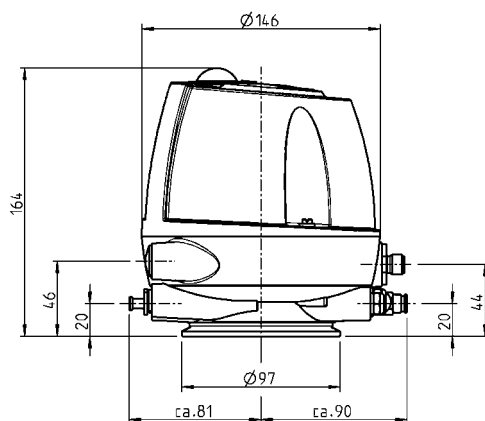
The programmable color change allows the display of colors yellow and green to be swapped over.



Technical data of the standard version

Position detection	Path measuring system	
Housing material	PA 12/L	
Ambient temperature	-20 to +60 °C	
Air supply	Pressure range	2 to 8 bar
	Standard	acc. to ISO 8573-1:2010
	Solid content	Quality class 6*
	Water content	Quality class 4
	Oil content	Quality class 3
Dimensions of air connections	Metric 6/4 mm, inch 6.35/4.31 mm (¼")	
Protection class	IP66 (powerful water jet)	
Sound pressure level via exhaust air throttle	Max. 72 dB	
Visualization	LED (green, yellow, red)	
Certificates (optional)	 • CSA C22.2 • UL 61010-1	

* Recommended



Type of interface	24 V DC, 3-wire, PNP	AS-Interface Bus	DeviceNet
Supply			
Operating voltage	24 V DC (+20 %, -12.5 %)	26.5–31.0 V DC	11**–26 V DC
No-load current	≤ 25 mA	≤ 25 mA	≤ 35 mA
Maximum current consumption	265 mA	65 mA*	75 mA
Polarity reversal protection	Yes	Yes	Yes
Specification		AS-i V3.0 (max. 62 slaves)	
Additional information		IO.ID.ID2-Code: 7.A.E	
Certificate		AS-i association	ODVA
Inputs			
Connection type	24 V DC (PNP)		
Short circuit proof	Yes		
Overload-proof	Yes		
Maximum current carrying per feedback output	100 mA		
Voltage drop at the outputs	≤ 1 V		
Feedback "start position"	Electronic output	Data bit DI 0	Data bit I-0
Feedback "end position"	Electronic output	Data bit DI 1	Data bit I-1
Feedback "seat-lift position"	Electronic output	Data bit DI 2	Data bit I-2
Outputs			
Activation voltage	> 13V = High; < 6V = Low		
Current consumption per input	< 10 mA		
Activation "PV Y1"	Electronic input	Data bit DO 0	Data bit O-0
Activation "PV Y2"	Electronic input	Data bit DO 1	Data bit O-1
Activation "PV Y3"	Electronic input	Data bit DO 2	Data bit O-2

* This value is valid only with an activated solenoid valve. ** This value is valid for a control top without solenoid valve.

Position	Description of order code
1	Location of feedback TA15 Control top T.VIS® A-15
2	Control top type N Without solenoid valve P 1 solenoid valve Y1 I 2 solenoid valves Y1, Y2 J 2 solenoid valves Y1, Y3 L 3 solenoid valves Y1, Y2, Y3
3	Feedback 8 2 digital feedbacks
4	Interface module A AS-Interface bus B 24 V DC PNP D DeviceNet
5	Solenoid valve A 24 V DC, 0.85 W 0 Without
6	Connection J Metric air connection, 5-pin connector (M12) for 24 V DC (1 solenoid valve, 2 feedbacks), AS-i, DeviceNet P Inch air connection, 5-pin connector (M12) for 24 V DC (1 solenoid valve, 2 feedbacks), AS-i, DeviceNet H Metric air connection, 8-pin connector (M12) for 24 V DC (> 1 solenoid valve, > 2 feedbacks) I Inch air connection, 8-pin connector (M12) for 24 V DC (> 1 solenoid valve, > 2 feedbacks) M Metric air connection, M20×1,5 cable gland with integrated terminal strip Z Inch air connection, 0.5" NPT cable gland with integrated terminal strip
	Options (multiple selection possible) /18 Air supply throttle: Controls opening speed of the valves /19 Exhaust air throttle: Controls closing speed of the valves /22 24 V DC/AS-i/DeviceNet: 5-pin plug for connections J, P (Article No. 508-963) 24 V DC: 8-pin plug for connections H, I (Article No. 508-061) /67 Protection class IP67 (temporary immersion) /69k Protection class IP69k (high pressure spray down) /81 AS-i connection box on cable 1 m with 5-pin M12 plug (Article No. 508-027) /82 AS i connection box on cable 2 m with 5-pin M12 plug (Article No. 508-028) /UC Certification UL/CSA

The code is composed as follows, depending on the chosen configuration:

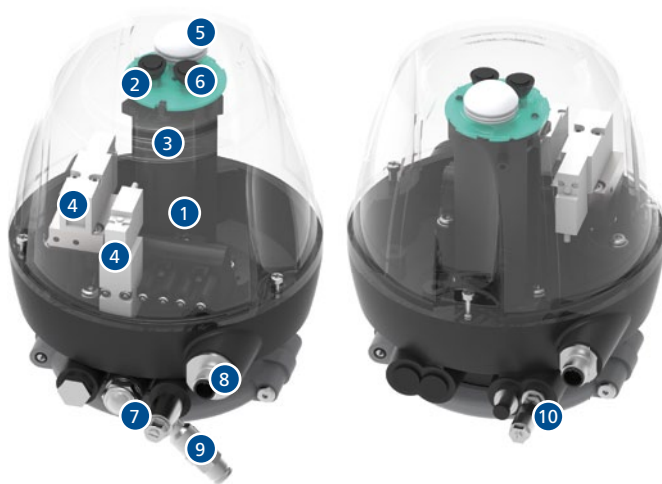
Position	1	2	3	4	5	6	Options					
Code	TA15		8									

Concept

As a controller based on the technology of the T.VIS® A-15 with path measuring system, the T.VIS® P-15 in combination with an air-spring actuator can move to any required valve position between the open/close positions.

The T.VIS® P-15 is characterized not only by its performance but also by its ease of operation and outstanding price/performance ratio.

Standard variant



- 1 Pneumatic block
- 2 Control unit
- 3 Path measuring system
- 4 Solenoid valves
- 5 LED lighting
- 6 2 push buttons
- 7 Exchangeable filter
- 8 M12 plug connection
- 9 Supply air throttle
- 10 Exhaust air throttle

Features

- Automatic initialization
- Simple and safe operation
- Manual operation of the process valve
- Valve status display by LED
- Open/close position feedback (optional)
- Selectable dead band (control hysteresis)
- High-quality pneumatic fittings
- High potential for cost reduction
- Standard protection class IP66

Structure

The T.VIS® P-15 is equipped with a precise path measuring system for detecting its position.

The necessary wiring for control and feedback is configured using M12 plug connections that can be accessed externally.

The control top can be opened for this.

Operation and configuration of the T.VIS® P-15 takes place either by the two push buttons mounted on the cap or, with the cap removed, via the buttons below. The push buttons are secured electronically against inadvertent or incorrect operation, while in operating mode.

The T.VIS® P-15 is equipped as standard with adjustable supply and exhaust air throttles.

Position control

The T.VIS® P-15 position controller works with an integrated microprocessor which contains the software for operation, visualization as well as intelligent position detection and evaluation. When a nominal value is specified (4 – 20 mA), e.g. by the PLC, the process valve can be set to any required position. The push buttons on the cap also make it possible to specify a nominal value manually, in order to set the process valve to the required position. The position is detected using a position transducer and is automatically controlled using two integrated solenoid valves. The valve disc position can also be permanently evaluated using the analog actual value output, as well as, three binary outputs in the PLC.

Setting

Automatic – following unlocking, simply pressing the two buttons on the cap of the T.VIS® P-15 starts the initialization process which runs fully automatically. There is no need to open the position controller for this purpose, resulting in particularly quick, easy and safe commissioning of the position controller (on average < 1 minute).

Directly following the set-up, the open/close position tolerances, the control hysteresis and control characteristics can be set in the parameter menu.



Visualization

LED display:

- Green
- Yellow
- Red
- Blue
- Blue flashing

Feedback signals

- Standard: valve position 0 – 100 %, travel (4 – 20 mA)
- Optional: 24 V DC binary signals for closed and opened position

Field of application

The T.VIS® P-15 can be used on VARIVENT® and ECOVENT® valves for controlling the valve disc position. Opening the valves to specific intermediate positions makes it possible to influence the hydraulic characteristics of the system. In N-valves, a control cone is available as an option which permits precise hydraulic setting.

Flow control

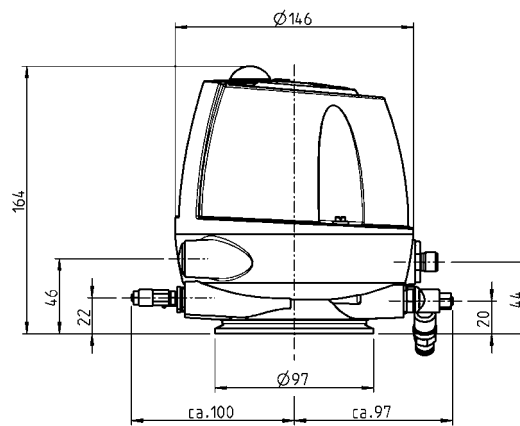
The T.VIS® P-15 position controller offers not only linear position signal transformation, but also the possibility of equal percentage position signal transformation. This permits significantly more precise position control of the valve disc in positions close to the non-actuated position.



Technical data of the standard version

Position detection	Path measuring system	
Housing material	PA 12/L	
Ambient temperature	–20 to +60 °C	
Air supply	Pressure range	2 to 8 bar
	Standard	acc. to ISO 8573-1:2010
	Solid content	Quality class 6*
	Water content	Quality class 4
	Oil content	Quality class 3
Dimensions of air connections	Metric 6/4 mm, inch 6.35/4.31 mm (¼")	
Protection class	IP66 (powerful water jet)	
Sound pressure level via exhaust air throttle	Max. 72 dB	
Visualization	LED (green, yellow, red, blue)	

* Recommended



Type of interface	24 V DC programmable
Supply	
Supply voltage U_v	24 V DC (+20 %, –12.5 %)
No-load current	≤ 20 mA
Maximum power consumption	$\Sigma I = (I_{T.VIS} + I_{PV} + I_{RM}) \pm 10 \% 260$ mA
Maximum residual ripple	5 %
Inputs	
Control voltage max. 28.8 V DC	High = ≥ 13 V DC Low = ≤ 6 V DC
Pilot current	≤ 10 mA
Outputs	
Output voltage	High = $U_v - \leq 5 \%$ Low = ≤ 5 V
Max. current	(ΣI_{RM}) 200 mA short circuit proof
Switching frequency	(resistive + inductive loads ≤ 25 mH) 2 Hz
Operating current	internal solenoid valve (I_{PV}) 35 ... 45 mA
Analog input	Nominal valve 4–20 mA/0–100 % stroke
Analog input	Actual valve 4–20 mA/0–100 % stroke
Load	max. 600 Ω

Position	Description of order code
1	Location of feedback TP15 Control top T.VIS® P-15
2	Control top type I 2 solenoid valves
3	Feedback 4 T.VIS® P-15 (with analog module) 5 T.VIS® P-15 (with analog module + 2 feedbacks/error output)
4	Interface module P 24 V DC programmable
5	Solenoid valve A 24 V DC, 0.85 W
6	Connection (with analog module) J Metric air connection, 5-pin M12 plug, A-coded With feedback code 5: additional M12 plug B-coded inclusive P Inch air connection, 5-pin M12 plug, A-coded With feedback code 5: additional M12 plug B-coded inclusive IMPORTANT: Please also order the appropriate connection sockets as well.
	Options (multiple selection possible) /22 5-pin plug socket for A-coded plug (Article No. 508-963) 5-pin plug socket for B-coded plug (Article No. 508-964) /67 Protection class IP67 (temporary immersion) /69k Protection class IP69k (high pressure spray down)

The code is composed as follows, depending on the chosen configuration:

Position	1	2	3	4	5	6	Options					
Code	TP15	I		P	A							

Concept

The SES is characterized by proven sensor technology. The control top consists of an interface module, up to 2 sensors for valve position feedback and up to 3 solenoid valves which can also be installed subsequently.

The SES is only available in PA 12/L material, because conductivity of the material is required for use in ATEX/Ex areas.



- 2 Interface module
- 3 Proximity switches
- 4 Solenoid valves
- 8 Cable connection

Features

Proven NAMUR sensors

Simple and quick adjustment of sensors

Flexible modular system

Selection of various solenoid valves

Retro-fittable

Position detection

Proximity switches – the valve positions are recorded using two manually adjustable proximity switches for the non-actuated and actuated position.

Setting

Mechanical – the sensors are calibrated mechanically using the positioning spindles, which are subsequently secured to prevent adjustment.

Field of application

Use in potentially explosive atmospheres is permitted:*

- **With proximity switch** up to zone 1 and 20**
 - For connection to approved intrinsically safe equipment
 - ATEX identification:
 - II 2G Ex ia IIC T6
 - II 1D Ex iaD 20 T97 °C
- **With solenoid valve up to zone 0 and 20**
 - For connection to approved intrinsically safe equipment
 - ATEX identification:
 - II 2G Ex ia IIC T6
- **With interface module**
 - Not subject to Ex approval because it is a purely passive component

Please note

- *) There is no ATEX certification for the complete control top. Certifications can only be issued for the individual components of the control top. Please note that the permitted Ex-zone/ATEX category of the complete control top depends on the approval of the component with the lowest protection level. The entire control top with all components is optionally certified according to:
- CSA C22.2
 - ANSI/ISA 82.02.01-1999
 - UL 1203, 4th Ed.
 - UL 429, 6th Ed.
 - ISA/ANSI 12.12.01-2011

- **) The intrinsically safe components are only allowed to be individually connected to an approved safety barrier. This arrangement permits use in a risk area.

Visualization

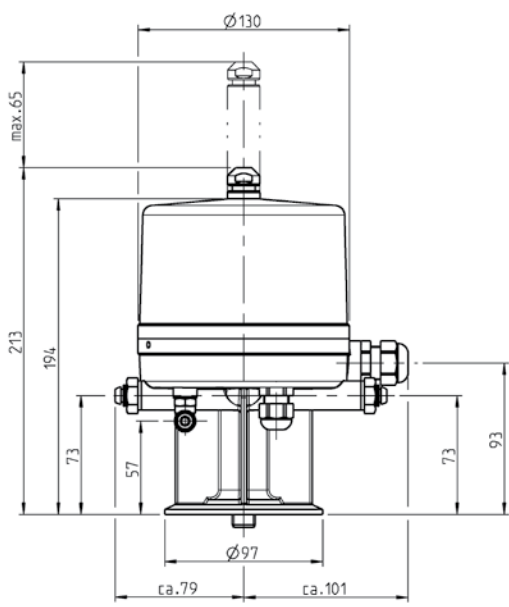
The position of the switch bar projecting from the control top makes it possible to detect what the position of the valve is.





Technical data of the standard version		
Position detection	Inductive proximity switches	
Housing material	PA 12/L	
Ambient temperature	0 to 45 °C	
Air supply	Pressure range	1.5 bis 7 bar
	Standard	acc. to ISO 8573-1:2010
	Solid content	Quality class 6
	Water content	Quality class 4
	Oil content	Quality class 3
Dimensions of air connections	Metric 6/4 mm, inch 6.35/4.31 mm (¼")	
Protection class	IP65*	
Sound pressure level via exhaust air throttle	Max. 72 dB	
Visualization	Position of switch rod	
Certificates	 • II 2G EEx ia IIC T6**	

* Not for overhead installation ** Standard for SES



Type of interface	EEx / ATEX (12 V DC)	EEx / ATEX (24 V DC)
Sensor		
Communication	NAMUR 8.2 VDC (operating voltage 6–30 V DC)	NAMUR 8.2 VDC (operating voltage 6–30 V DC)
Equipment category	II 2G Eex ia IIC T6 and Ex iaD 20 T97 °C	II 2G Eex ia IIC T6 and Ex iaD 20 T97 °C
Article no.	505-093	505-093
Solenoid valve		
Rated voltage	12 V DC –10 % / +25 %	24 V DC –10 % / +15 %
Rated power	0.5 W	0.5 W
Equipment category	II 1GD Eex ia IIC T6	II 1GD Eex ia IIC T6
Article no.	512-124	512-155
Certificates (optional)		
  • CSA C22.2 • ANSI/ISA 82.02.01-1999 • UL 1203, 4th Ed. • UL 429, 6th Ed. • ISA/ANSI 12.12.01-2011		

Position	Description of order code
1	Location of feedback SES. Control top sensor technology
2	Control top type N Without solenoid valve P 1 solenoid valve Y1 I 2 solenoid valves Y1, Y2 L 3 solenoid valves Y1, Y2, Y3
3	Feedback 0 Without 1 1 feedback 2 2 feedbacks
4	Interface module E EEx/ATEX
5	Solenoid valve 0 Without E 12 V DC, ATEX X 24 V DC, ATEX
6	Connection E Metric air connection, Pg 13.5 cable connection N Inch air connection, Pg 13.5 cable connection
	Options (multiple selection possible) /43 Material PA 12/L: UV resistant, oil and fat resistant (standard for control top SES) /UC Certification UL/CSA

The code is composed as follows, depending on the chosen configuration:

Position	1	2	3	4	5	6	Options					
Code	SES.			E			/43					



INK – Proximity switch holder with bracket for 2 proximity switches M12x1

The proximity switch holder with bracket can be used as an alternative to feedback systems if a control top is not desired above the actuator. The holders are integral parts of the bracket for the pneumatic actuator. The order code INK allows for a choice of proximity switches to be ordered for the valve.

Technical data

Material	AISI 304
Surface	Metal blank



INH – Proximity switch holder for manual actuator for 2 proximity switches M12x1

This clip-on bracket can be installed in two horizontal positions and two vertical positions, thereby offering up to 8 different configurations for proximity switches of size M12x1 as well as an eyelet for a padlock to secure the mechanical, standard manual actuator in the closed valve position. The depicted lock is only an example. The holders are integral parts of the optional bracket for the manual actuator. The order code INH allows for a choice of proximity switches to be ordered for the valve.

Technical data

Material	PA12
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Position	Description of order code
1	Location of feedback
	INK. Proximity switch holder with bracket for 2 proximity switches M12×1 (only actuator type 2)
	INH. Proximity switch holder for manual actuator for 2 proximity switches M12×1 (only actuator type 0)
2	Number of feedback switches
	0 Without
	1 1 feedback
	2 2 feedbacks
3	Type of feedback
	0 Without
	B NI 24 V DC 3-wire PNP M12×1 with terminal chamber (Article No. 505-088)
	F NI 24 V DC 2-wire M12×1 with terminal chamber (Article No. 505-104)
	E NI NAMUR M12×1 with terminal chamber (Article No. 505-085)
	X NI 24 V DC 3-wire opened with terminal chamber (Article No. 505-089)
	S NI 24 V DC 3-wire PNP M12×1 with connector (Article No. 505-096)

The code is composed as follows, depending on the chosen configuration:

Position	1	2	3
Code			

Proximity Switches

External proximity switches M12×1 for mounting on the actuator or in the lantern.



Technical data	
Nominal switching distance	2 to 4 mm
Protection class	IP 67
Operating voltage	10–30 V DC/NAMUR
Material	PA 12/L GF 30/VA
Permitted ambient temperature	–30 to 85 °C

Proximity switch M12×1 for INA, LAT	Article no.
2-wire (terminal chamber)	505-104
3-wire PNP (M12 plug)	505-088

Technical data	
Nominal switching distance	4 mm
Operating voltage	10–30 V DC
Permitted ambient temperature	–30 to 85 °C

Proximity switch M12×1 for T.VIS®	Article no.
3-wire PNP (plug connector)	505-096

Technical data	
Nominal switching distance	3 mm
Operating voltage	10–65 V DC
Permitted ambient temperature	–30 to 85 °C

Proximity switch M12×1 for T.VIS® – normally open	Article no.
4-wire PNP (terminal chamber)	505-089

Technical data	
Nominal switching distance	2 mm
Operating voltage	8.2 V DC norm.
Permitted ambient temperature	–25 to 70 °C

Proximity switch M12×1 for SES	Article no.
NAMUR (terminal chamber)	505-085

Switch bars and adapters

The following components are required for subsequent installation of a control and feedback system on a Butterfly Valve T-smart.

Butterfly Valve T-smart 7			
	T.VIS® M-15	T.VIS® A-15/T.VIS® P-15	SES
Switch bar	224-001697	224-001696	224-001548
Adapter switch bar	–	–	224-001549

Mixproof Butterfly Valve T-smart 9			
	T.VIS® M-15	T.VIS® A-15	SES
Switch bar	224-001697	224-001696	224-001548
Adapter switch bar	–	–	224-001549



Switch bar 224-001697
for T.VIS® M-15



Switch bar 224-001696
for T.VIS® A-15/T.VIS® P-15

IP protection classes

The IP protection classes inform about the scope at which the housing of an electrical device is protected against ingress of solids (first number) and moisture (second number).

So called IP-codes are assigned to the protected systems. Their index figures represent common error options against which the system is protected. The code starts with the letters IP for "International Protection".

Meaning of the index numbers

1. Index*	Protection from solids
6	Dust-tight
2. Index*	Protection from moisture
6	Protection from powerful water jet
7	Protection from temporary immersion
9k	Protection from water at high pressure/ steam jet cleaning

* Further indices and more precise explanations can be found in the corresponding standard.

If an index number is not to be stated, it is replaced by the letter x (e.g. IPx6).

For the 2nd index figure (protection from moisture), the following applies:

- The protection class IPx6 includes all protection classes below.

- **This does not apply to the higher protection class IPx7.**

If this protection class is to include a lower protection class, this is to be indicated by a combination of index figures (e.g. IP67/69k).

The TVIS® control top designs of the M-15 and A-15 comply with the requirements of protection class IP66 (DIN EN 60529) as standard. Designs in the stronger protection classes IP67 or IP69k (both DIN EN 60529) are also available.

Semi-automatic setup

By means of the semi-automatic setup, a control top can be replaced without interrupting the current process.

For this, an employee only needs to perform the simple configuration once on site: in the version in protection class IP66 with two push buttons on the T.VIS® cap, and for the optional protection classes IP67 and IP69k with the cap removed right with the two buttons below.

For the semi-automatic set-up, the control top initially only learns the position of the valve disc on the non-actuated position and then remains until the valve is actuated in the scope of a running process. Only then will the end position of the valve be stored. The process thus does not need to be stopped!

The semi-automatic set-up is integrated into the T.VIS® A-15 as standard and does not require any additional hardware.

Connection types

	Order code for air connection		In conjunction with screw fitting or plug	Use	Matching connection socket		
	Metric	Inch			Option	Article no.	Designation
	M		M20×1.5 cable gland	T.VIS® M-15 T.VIS® A-15	–	–	–
	E		Pg 13.5 cable gland	SES	–	–	–
		Z	0.5" NPT cable gland	T.VIS® M-15 T.VIS® A-15	–	–	–
		N	Pg 13.5 cable gland	SES	–	–	–
	A	S	M20×1.5 cable gland with connection box on cable 1 m	T.VIS® M-15 (AS-i)	–	–	–
	L	U	2-pin M12-plug (A-coded)	T.VIS® M-15 (AS-i)	/22	508-963	5-pin M12 connection socket (A-coded)
					/81	508-027	AS-i connection box on cable 1 m with 5-pin M12 connection socket (A-coded)
					/82	508-028	AS-i connection box on cable 2 m with 5-pin M12 connection socket (A-coded)
	D	K	5-pin M12 plug (A-coded)	T.VIS® M-15 (DeviceNet)	/22	508-963	5-pin M12 connection socket (A-coded)
			5-pin M12 plug (B-coded)	T.VIS® M-15 (DeviceNet)		508-964	5-pin M12 connection socket (B-coded)
	J	P	5-pin M12-plug (A-coded)	T.VIS® M-15 (24 V DC) T.VIS® M-15 (48–130 V AC)	/22	508-963	5-pin M12 connection socket (A-coded)
				T.VIS® A-15 (24 V DC) T.VIS® A-15 (AS-i) T.VIS® A-15 (DeviceNet)			
				T.VIS® P-15			
			5-pin M12 plug (B-coded)	T.VIS® P-15	/22	508-964	5-pin M12 connection socket (B-coded)
	H	I	8-pin M12-plug (A-coded)	T.VIS® M-15 (24 V DC) T.VIS® M-15 (48–130 V AC)	/22	508-061	8-pin M12 connection socket (A-coded)
				T.VIS® A-15 (24 V DC)			
		B	Brad Harrison 0.5" NPT 5-pin plug	T.VIS® M-15 (24 V DC) T.VIS® M-15 (48–130 V AC)	–	–	–

24 V (PNP/NPN)

In 24 V parallel wiring digital signals are exchanged between a terminal unit and generally the corresponding input and output modules of a PLC. In this case, it is necessary to have a separate wire for each signal, usually in the form of a multi-core cable.

PNP (current-supplying) indicates signal transfer against reference potential L₋.

NPN (current-drawing) indicates signal transfer against reference potential L₊.

BUS AS-Interface



AS-Interface (Actuator-Sensor Interface) is a standard in fieldbus communication that was developed for connecting actuators and sensors. This is to replace parallel cabling used in the past. The AS-Interface has been an international standard acc. to EN 50295 and IEC 62026-2 since 1999. AS-i products are certified by the AS International Association, thereby, ensuring that equipment from different manufacturers will work together in the same system. The transmission medium is an unshielded, two-core yellow cable which also carries the electrical power supply (24 – 30 V direct current voltage) for the communication electronics and the slaves. A maximum of 62 slaves can be used per AS-i master. The slaves are addressed manually using a manual addressing unit or automatically by the master. The maximum length of the AS-i cable is 100 m, although by using repeaters it is possible to extend the entire length up to 400 m.

DeviceNet bus

DeviceNet is a CAN-based fieldbus that is chiefly used in automation engineering. DeviceNet was developed by Allen-Bradley (part of Rockwell Automation) and later transferred to the ODVA (Open DeviceNet Vendor Association) as an open standard. DeviceNet is chiefly used in the USA and, to a certain extent, Asia. A maximum of 64 network nodes can be used per fieldbus segment. The nodes address is set either using dial or DIP switches on the device, or can be configured using the bus on the basis of software. The maximum length of the DeviceNet cable depends on the selected cable type and baud rate, although it cannot exceed 500 m.

48–130 V AC

This is also parallel wiring but with alternating current voltage signals that are processed in the control top using a wide-band I/O module. This communication technology is chiefly used in the United States and Canada with 110 V, although it can also be encountered in southern Europe with 48 V.

NAMUR

The 2-wire NAMUR sensors and solenoid valves used here can be operated in the Ex area because of their “intrinsically safe” ignition protection type. Using external isolating switching amplifiers, it is possible to operate control tops with this communication technology up to zone 1 or 21.

4–20 mA (3-wire)

In industrial automation engineering, the 4 – 20 mA current signal is the one most frequently used for analog measured value transmission. The enormously widespread use of this type of signal is explained by its ease of handling and, above all, its resistance to interference.

Using 4 mA as the initial value instead of 0 mA makes it very easy to detect and evaluate a wire break. As a rule, 4 – 20 mA corresponds to 0 – 100 % of the physical measuring range of an analog sensor or the working range of an actuator set in the parameters; the nominal value is supplied or the actual value is returned via an interface of this kind.

Valve selection

Position	Description of order code			
1	Valve type			
	7	Butterfly Valve		
2	Flange connection			
	11	Weld connection/weld connection		
3	Pipe standard			
	0	OD	1	DN
4	Nominal size			
	012	OD ½"	015	DN 15
	075	OD ¾"	020	DN 20
	010	OD 1"	025	DN 25
	112	OD 1 ½"	040	DN 40
	200	OD 2"	050	DN 50
	212	OD 2 ½"	065	DN 65
	300	OD 3"	080	DN 80
	400	OD 4"	100	DN 100
			125	DN 125
			150	DN 150
5	Product wetted material			
	1	AISI 304 (1.4301)		
	2	AISI 316L (1.4404)		
6	Product wetted gasket material			
	0	EPDM		
	1	HNBR		
	2	FKM		
	6	VMQ		
7	...			

Feedback system selection

Position	Description of order code	
1	Location of feedback	
	TM15	Control top T.VIS® M-15
2	Control top type	
	N	Without solenoid valve
	P	1 solenoid valve Y1
	R	1 solenoid valve Y1 (retro-fittable: Y2, Y3)
	I	2 solenoid valves Y1, Y2 (retro-fittable: Y3)
	J	2 solenoid valves Y1, Y3 (retro-fittable: Y2)
	L	3 solenoid valves Y1, Y2, Y3
3	Feedback	
	2	2 feedbacks
	3	2 feedbacks with external initiator
4	...	

Example of complete order code, including valve and feedback system:

Position	1	2	3	4	5	6	7	8	9	10	11	12	13
Code	7	1	1	0	1	1	2	1	0	1	0	0	0

Position	1	2	3	4	5	6	Options						
Code	TM15	P	2	B	A	M	-0						

AS-i		Actuator Sensor Interface. Bus system for the lowest field level.
ATEX		Atmosphères Explosibles. ATEX comprises the safety regulations in the European Union concerning explosions. There is the ATEX Product Directive 94/9/EG as well as the ATEX Operational Directive 1999/92/EG.
cCSAus		Product tests carried out by CSA according to safety standards in Canada and the USA.
CE		Conformité Européenne. By applying the CE marking, the manufacturer confirms that a product complies with product-specific European directives.
CSA		Canadian Standards Association. A non-governmental organization in Canada that develops norms and standards and carries out safety tests on products for certification. The association is active worldwide.
cULus		Product tests carried out by UL according to safety standards in Canada and the USA.
DeviceNet		Bus system from the ODVA organization for complex communication on various field levels.
EG 1935/2004		For product wetted materials of valves from GEA Tuchenhagen GmbH the EG 1935/2004 directive is observed. That directive sets a general framework for those materials and objects that are applied in operations where they will be in contact with food.
EHEDG		European Hygienic Engineering & Design Group. European-based agency dedicated to controlling food and pharmaceutical engineering. The organization approves products and materials that are applied in the food and pharmaceutical industries.
FDA		Food and Drug Administration. US agency dedicated to controlling food and pharmaceutical engineering. The organization approves products and materials that are applied in the food and pharmaceutical industries.
ODVA		ODVA is an international organization of leading companies in the automation industry. In the interests of its members the organization develops network protocols and standards to advance the worldwide inter-operability of production systems.
TÜV		Technischer Überwachungs-Verein. A German agency operating as a private service to carry out safety tests prescribed by law or state regulations.
UL		Underwriters Laboratories. A US organization that tests and certifies products and product safety.

Abbreviation	Meaning
°C	Degree Celsius, unit of measurement for temperature
°F	Degree Fahrenheit, unit of measurement for temperature
A	Ampere, unit for measurement of electric current or output, a term used in automation technology
AC	Alternating Current
AISI	American Iron and Steel Institute, an association of the American steel industry
ANSI	American National Standards Institute, a US agency for the standardization of industrial processes
AS-i	Actuator-Sensor-Interface, a fieldbus communication standard developed
ASME	American Society of Mechanical Engineers, professional association of industrial engineers in the USA
ASME-BPE	A standard developed by the ASME section BioProcessings Equipment
ATEX	Atmosphères Explosibles, a term for European Union safety directives regarding explosive areas
bar	From Greek βαρύς = heavy. A unit for the measurement of pressure in the European Union and Switzerland. Data with the unit [bar] in this catalog are understood to mean positive pressure [bar g], unless otherwise noted.
CAN	Controller Area Network, an asynchronous serial bus system
CE	Conformité Européenne, a mandatory mark of conformity for products circulating in the European Economic Area
CIP	Cleaning in Place, a method for cleaning process technology systems
CSA	Canadian Standards Association, a non-governmental standards developing organization in Canada
dB	Dezibel, a tenth of a Bel, a unit for the measuring of levels, named after Alexander Graham Bell
DC	Direct Current
DIN	Deutsches Institut für Normung e. V., a standards developing institute in Germany. Also the designation of the standards issued by that organization.
DIP	Dual in-line package, a type of switch design
DN	Diameter Nominal, DIN nominal size
E	For German "Eingabe" = input, a term in the automation industry
EHEDG	European Hygienic Engineering and Design Group. Association of suppliers to the food processing industries, associated research institutes and public health services
EN	European Norm, a term for regulations issued by the European Committee for Standardization
EPDM	Short name for ethylene propylene diene monomer rubber according to DIN/ISO 1629

Abbreviation	Meaning
Ex	Synonymous with ATEX
FDA	Food and Drug Administration. US agency dedicated to controlling food and pharmaceutical engineering
FKM	Short name for fluoroelastomer rubber according to DIN/ISO 1629
H	Henry, unit for the measuring of inductivity
HNBR	Short name for hydrated acrylonitrile butadiene rubber according to DIN/ISO 1629
Hz	Hertz, unit for the measuring of frequency, named after Heinrich Hertz
I	Formula symbol for electric current
IEC	International Electrotechnical Commission, international standards organization for electric and electronic technologies
IP	Ingress Protection/International Protection, protection class according to IEC 60529
ISA	International Society of Automation, international US organization of the automation industry
ISO	International Organization for Standardization, an organization that develops international standards and norms. Also the designation of the standards issued by that organization
kg	Kilogram, unit for the measurement of weight
KVS	The KV value of a valve at a nominal stroke of 100 % opening degree is defined as the KVS value
L	For German "leitfähig" = conductive
LED	Light-emitting diode
mm	Millimeter, measuring unit for length
M	Metric, a unit system based on the meter unit. Also for the term mega, multiplying a unit by a million
m ³ /h	Cubic meters per hour, a unit for the measuring of flow rates
max.	Maximal
NAMUR	Normenarbeitsgemeinschaft für Mess- und Regeltechnik, a standards developing association in the chemical industry. Also the name used for the standard connection type of that organization, especially for explosive areas
NPN	Signal transmission against reference potential L+ (sinking)
NPT	National Pipe Thread, US standard for self-sealing pipe threads
OD	Outside Diameter
ODVA	Open DeviceNet Vendor Association, an international organization for developing network protocols and standards

Abbreviation	Meaning
PA 12/L	Polyamide
Pg	For German "Panzergewinde" = armoured thread
PNP	Signal transmission against reference potential L- (sourcing)
PV	For German "Pilotventil" = solenoid valve
Ra in µm	Average roughness value, describes the roughness of a technical surface
RM	For German "Rückmeldung" = feedback
SES	GEA Tuchenhausen Control Top for Ex areas, a Control Top system from GEA Tuchenhausen
SET-UP	Self-learning installation. The SET-UP process carries out all necessary settings and generates all necessary signals during system start-up and servicing.
SIP	Sterilization in Place, a method for cleaning process technology systems
SMS	Svensk Mjolk Standard, a pipe size system employed in Scandinavia
SPS	For German "Speicherprogrammierbare Steuerung" = programmable logic controller, a device for digitally controlling and handling a machine or system
T.VIS®	GEA Tuchenhausen Valve Information System, a program of Control Tops from GEA Tuchenhausen
T-smart	Valve series from GEA Tuchenhausen
UL	Underwriters Laboratories, a US organization that tests and certifies products and product safety
UV	Ultraviolet, ultraviolet radiation, a wavelength of light
V	Volt, unit for the measurement of electric tension
VARICOMP®	Pipe expansion compensator from GEA Tuchenhausen
VMQ	High-polymer vinyl methyl polysiloxane, silicon rubber, also referred to as MVQ
W	Watt, measuring unit for electrical power
Y	Control air connection to a pneumatic cylinder
µ	Mikro, a millionth of a unit
Ω	Ohm, unit for the measurement of electric impedance, named after Georg Simon Ohm

Any contract placed with us (hereinafter referred to as “the Seller”) by any private-law corporation, company or other business or any public-law legal person or other entity (hereinafter referred to as “the Buyer”) shall exclusively be subject to these Standard Sales Terms and these Standard Sales Terms shall be applicable to any transaction agreed between the Seller and the Buyer thereafter even if no express reference to these Standard Sales Terms is made in connection with any such further transaction. The Seller hereby expressly refuses to accept any standard terms of the Buyer referred to in any correspondence or other document placing any such order. Notwithstanding any reference of the Buyer to any standard terms of the Buyer, the Buyer shall, upon the acceptance of any delivery by the Seller to the Buyer, be deemed to have accepted these Standard Sales Terms. No standard terms of the Buyer shall be applicable to any contract or order placed by the Buyer with the Seller unless such terms have been accepted expressly by the Seller in writing and the performance of any such contract or order by the Seller shall not be deemed to be an acceptance of any terms of the Buyer by the Seller.

Unless otherwise provided for in these Standard Sales Terms, the relationship between the Seller and the Buyer shall be governed by the provisions of applicable law.

If these Standard Sales Terms are otherwise inapplicable or ineffective for any reason whatsoever, the sale of any goods delivered by the Seller to the Buyer (“the Goods”) shall be subject to the reservations of Clause 6 in Article V hereinbelow.

I. General Terms

1. Any bid or offer submitted by the Seller to the Buyer shall not be binding upon the Seller and unless otherwise expressly agreed upon by the Seller and the Buyer, no contract placed by the Buyer shall be effective unless expressly accepted by the Seller in writing.
2. The title to any sample, drawing or other document or information, whether reduced to writing or in electronic form, including but not limited to any copyrights or other rights associated therewith, which may be provided by the Seller to the Buyer shall remain vested in the Seller and no such sample, drawing or other document or information may be made accessible by the Buyer to any third party.
3. Any performance or other data or description of any Goods by the Seller in any brochure, price list, bid, proposal, offer or any other document which may form part of any such bid, proposal or offer shall be deemed to be approximate in accordance with standard industry practices and shall not be binding upon the Seller unless expressly accepted as binding by the Seller and the Seller does not make any warranties whatsoever with respect to any properties of any of the Goods.
4. Commercial terms agreed between the Seller and the Buyer shall be interpreted in accordance with Incoterms 2000.

II. Price and Payment

1. Unless expressly otherwise agreed upon, any price agreed between the Seller and the Buyer shall be exclusive of any packaging. Each such price shall be exclusive of any sales tax which shall be billed by the Seller in addition to said price at the rate which may be applicable at any time and from time to time.
2. Unless otherwise agreed upon, the price of any of the Goods shall be paid without any deduction for any reason whatsoever as follows:
 - One third upon the receipt of the Seller’s acceptance of the contract placed by the Buyer
 - One third upon the receipt by the Buyer of the Seller’s notice that all main components of the Goods are ready for shipment
 - The remaining sum upon the transfer of the risks of the Goods to the Buyer and upon the issuance of the Seller’s final invoice for the Goods
3. The Buyer shall not have the right to retain any payment due to the Seller for any reason whatsoever and shall not deduct from any moneys due to the Seller any money owed or allegedly owed by the Seller to the Buyer unless any such counterclaim is undisputed by the Seller or has been awarded to the Buyer by a judgment from which no appeal can be taken.
4. If, during the period between the date on which any contract was awarded by the Buyer to or any order was placed by the Buyer with the Seller and the date on which production for the performance of said contract or order commences, any labor, material and/or production costs associated with said contract or order increase for any reason for which the Seller is not liable and the cost of any of the Goods (as defined in Section 255 of the German Commercial Code) as determined in accordance with generally accepted German accounting principles is shown by the Seller to have risen by more than twenty percent (20 %) since the date of contract award or order placement, then the Seller shall have the right to redetermine the price of any such Goods payable by the Buyer under said contract or order provided however that the Seller shall not be entitled to increase said price by more than the increase in said cost.
5. The Buyer shall pay any amount owing to the Seller within seven (7) calendar days from the due date for the payment of said amount.

III. Delivery Time and Late Delivery

1. The time available to the Seller for the delivery of the Goods (“Delivery Time”) shall be as agreed between the Parties in the contract placed. The Seller shall not be obligated to deliver within said Delivery Time unless all technical and commercial details have been agreed upon order placement and the Buyer performs all of its obligations under said contract or order such as, without limitation, any obligation to obtain necessary certificates, approvals or permits from agencies or authorities and the obligation to make any advance payment provided that

any non-satisfaction of any of the preceding conditions shall operate to increase the Delivery Time reasonably and further provided that no delay for which the Seller may be liable shall operate to increase the Delivery Time.

2. The Seller shall not be obligated to deliver any Goods within the Delivery Time unless the Seller receives deliveries from its suppliers as and when ordered by the Seller provided that the Seller shall notify the Buyer as soon as reasonably possible of any delay in delivery it may become aware of.
3. The Seller shall be deemed to have delivered within the Delivery Time if the Goods have left the Seller's works prior to the expiry of the Delivery Time or the Seller has notified the Buyer prior to the expiry of the Delivery Time that the Goods are ready for Delivery.
4. If the Buyer fails to make any payment to the Seller under any contract or order whatsoever when said payment is due, the Seller shall, upon notice to the Buyer, have the right to discontinue performance under the contract awarded or the order placed for the Goods until the payment the Buyer has failed to make when due has been received provided however that the Seller shall not have said right if the payment so due but not made is immaterial.
5. If the Seller is unable to deliver any Goods within the Delivery Time for reasons of force majeure, due to any labor dispute or due to any circumstances beyond the reasonable control of the Seller then the Delivery Time shall be extended reasonably. The Seller shall notify the Buyer of the commencement and the end of any such circumstances as soon as may be reasonably possible.

IV. Transfer of Risk and Acceptance

1. Unless expressly otherwise agreed upon between the Seller and the Buyer, the Goods shall be delivered ex works.
2. If the Goods to be delivered by Seller to the Buyer are divisible, then the Seller shall have the right to deliver and to invoice to the Buyer said Goods in reasonable parts and the Buyer shall not have the right to retain payment for any such reasonable part on the grounds of the non-delivery of any other parts of the Goods.
3. If any delivery by the Seller to the Buyer requires acceptance by the Buyer under any express provision of the order placed by the Buyer or at law, then any delivery by the Seller to the Buyer shall be deemed to have been accepted by the Buyer if and in as far as
 - any Goods manufactured or processed by the Seller are, after delivery, sold to or allowed to be used by any third party or
 - any Goods manufactured or processed by the Seller are, after delivery, processed or mixed or combined with any other things with the agreement of the Buyer or

- any Goods manufactured or processed by the Seller are, beyond trials or tests, used by the Buyer or by any third party with the agreement of the Buyer or
- the Goods are accepted by any purchaser from the Buyer.

Whatever may be earlier provided that any prior acceptance under the contract awarded or the order placed by the Buyer or at law shall take precedence over any acceptance under this Clause.

V. Retention of Title

1. The title to all Goods delivered by the Seller to the Buyer shall remain vested in the Seller until the full payment of all accounts receivable by the Seller from the Buyer for any reason whatsoever provided that under current account arrangements the title so retained shall be deemed to be security for any balance owed to the Seller.

The Buyer shall not dispose of any of the Goods the title to which is so vested in the Seller ("Title Reservation Goods") other than in the Buyer's ordinary course of business provided that the Buyer shall no longer have the right so to dispose of any Title Reservation Goods if and as soon as the Buyer fails to make payments when payments are due. The Buyer shall not have the right to pledge or to transfer by way of security the title to any Title Reservation Goods. The Buyer shall be obligated to maintain the rights of the Seller if the Title Reservation Goods are sold by the Buyer to any third party under credit arrangements. The Buyer shall promptly notify the Seller of any lien of attachment, execution or garnishment or any seizure or the like relating to any Title Reservation Goods.

The Buyer hereby assigns to the Seller and the Seller hereby accepts the Buyer's assignment of any title to payment for any of the Goods resold by the Buyer to any purchaser and any security received by the Buyer from any such purchaser for any such payment provided however that the Buyer shall, subject to any notice to the contrary given by the Seller, have the right to collect any such payment and to enforce any such security at its cost. Upon the request of the Seller, the Buyer shall notify the Seller of the debtors against which titles to payment so assigned are held, the securities provided therefor, the type and the amount of the debt of each such debtor and the type and the amount of each such security and deliver to the Seller all documents which may be necessary to collect any amount so owed by any such debtor. Upon notice to the Buyer, the Seller shall have the right to notify any such debtor of the assignment of the title to payment by the Buyer to the Seller hereunder.

2. If the Goods are sold by the Buyer to any purchaser together with any other goods the title to which is not vested in the Seller, then a share of the full title to payment of the Buyer under said sale to said purchaser equal to the price of said Goods agreed between the Buyer and the Seller shall be deemed to have been assigned by the Buyer to the Seller.

3. Upon the request of the Buyer, the Seller shall waive any title to Goods delivered by the Seller to the Buyer in as far as the value of all Goods the title to which has been retained by the Seller hereunder exceeds one hundred ten percent (110 %) of the value of all titles to payment the Seller holds against the Buyer.
4. The Buyer shall, as of the transfer of risks associated with Title Reservation Goods, insure all Title Reservation Goods against any damage or loss or destruction as a result of any fire, inundation, flooding or theft or any destruction or loss or damage in transit provided that the Buyer shall notify the Seller promptly of any such destruction or loss or damage and shall, upon the request of the Seller, provide to the Seller any documentation of any such loss or damage such as, without limitation, any expert report on said destruction or loss or damage, the names of the insurers of said Goods and, as requested by the Seller, the insurance policy or policies relating to the Title Reservation Goods or insurance certificates issued by the insurer or the insurers for the Title Reservation Goods. The Buyer hereby assigns to the Seller, conditionally as of the time of any such destruction or loss of or damage to any Goods, any title against any insurer or any party liable for any such destruction or loss or damage to a maximum amount equal to the price agreed for any such Goods affected by any such destruction or loss or damage by way of security for all moneys owed by the Buyer to the Seller.
5. Any processing of any Title Reservation Goods by the Buyer shall be for the Seller and the Seller shall be deemed to be the processor for the purposes of Section 950 of the German Civil Code. If Title Reservation Goods are processed, combined or mixed with other goods the title to which is not vested in the Seller, then a fraction of the title to the new product equal to the ratio between the price invoiced to the Buyer for the Goods so processed, combined or mixed and the sum of the price invoiced to the Buyer for the Goods so processed, combined or mixed and the price or prices invoiced to the Buyer for the other goods so processed, combined or mixed shall be vested in the Seller. The Buyer shall be the custodian of any such new product the title to which is vested in the Seller in total or in part for the Seller. If any such Title Reservation Goods are processed, combined or mixed with goods of the Buyer and the goods of the Buyer are the main constituents of the new product thereby created, then the Buyer shall be deemed to have transferred to the Seller a fraction of the title to any such new product computed in accordance with the principles of the preceding sentence and shall be the custodian of said new product for the Seller.

The provisions of Clauses 1 through 4 hereinabove applicable to Title Reservation Goods shall apply mutatis mutandis to any new product obtained by processing, combination or mixing in which the Seller acquires in total or in part a title through the operation of this Clause.
6. If these Standard Sales Terms have not been agreed effectively, any transfer of title to any of the Goods shall be subject to the Seller receiving the full price agreed between the Seller and the Buyer therefor.

VI. Defects

1. General
 - 1.1 If Section 377 or Sections 377 and 381 of the German Commercial Code (sales and contract manufacture agreements between business organizations as defined in Section 1 et seq. of the German Commercial Code) are applicable to the order placed, the Buyer shall notify the Seller promptly of any patent defect in any of the Goods provided that said notice shall be given no later than on the fourth (4th) working day following the delivery of said Goods. Any latent defect in any of said Goods shall be notified promptly by the Buyer to the Seller provided that said notice shall be given no later than on the fourth (4th) working day following the discovery of said defect. Each such notice of any defect in any of the Goods shall be in writing. The conditions applicable to any such notice and the effects of a late notice of any defect in any of the Goods shall furthermore be governed by the conditions of law (Sections 377, respectively 377 and 381 of the German Commercial Code).
 - 1.2 If the Buyer is not a business organization, notice of any patent defect in any of the Goods delivered by the Seller to the Buyer shall be given by the Buyer to the Seller within two (2) weeks following the delivery of said Goods in the case of sales and contract manufacture agreements and within two (2) weeks following acceptance in the case of service agreements. The term provided for hereinbefore shall be deemed to have been complied with if said notice is forwarded by the Buyer within said term and received by the Seller within four (4) weeks from such delivery or acceptance as the case may be. The Buyer shall not be entitled to any remedy for any patent defect in any of the Goods if the Buyer fails to give notice as aforesaid unless and in as far as
 - the Seller is liable for said defect due to willful act, neglect or omission, any act of bad faith or any gross negligence,
 - said defect is covered by a warranty of the Seller in accordance with Section 443 of the German Civil Code or
 - said defect is claimed in connection with loss of human life, injury, impairment of health or loss of freedom.
 Provided that any liability of the Seller for any such defect shall be excluded in accordance with the provisions of law such as but not limited to the provisions of Section 640, paragraph 2, or Section 442 of the German Civil Code if the Buyer had known said defect or did not know said defect due to its own gross negligence.
2. Product Defects
 - 2.1 If any of the Goods delivered by the Seller to the Buyer is defective, the Seller shall remedy said defect by repair or replacement. If said remedial action fails, then, subject to the provisions on damages in Article VII hereinbelow, the Buyer shall be entitled to any of the remedies provided for by law.

- 2.2 If any remedial action is taken by the Seller, then the Seller shall bear all costs and expenses occasioned by the removal of said defect such as, without limitation, any transportation or traveling expenses or any labor or material costs provided however that any extra costs occasioned by the Buyer moving the Goods after delivery to a place other than the registered premises of the Buyer shall be carried by the Buyer unless the removal of said Goods is a use for which the Goods are intended.
- 2.3 The Buyer shall give the Seller the time and the opportunity which may be needed to remove any defect in any of the Goods provided that the Seller shall not be held liable for any consequences of not being given such time and opportunity.
- 2.4 Any repair or replacement by the Seller with respect to any Goods shall irrespective of the scope of any such repair or replacement not be deemed to be an acceptance of any liability for any defect in any of the Goods claimed by the Buyer provided that no persons other than legal representatives or procurators under Sect. 49 German Commercial Code ("Prokuristen") of the Seller shall have the right to accept any liability for any defect on behalf of the Seller.
- 2.5 If any defect in any of the Goods claimed by the Buyer shows not to be a defect for which the Seller is liable, then the Buyer shall reimburse to the Seller all costs reasonably incurred by the Seller to remove said alleged defect in good faith provided that material and labor costs so incurred by the Seller shall be reimbursed at the Seller's standard rates applicable at the time when the alleged defect was so removed.
- 2.6 The Buyer shall not be entitled to the removal by the Seller of any defect due to any of the following:
- Improper use of any Goods or use of any Goods for a purpose for which the Goods are not fit or defective installation or commissioning of the Goods by the Buyer or any third party
 - Natural wear and tear, improper or negligent handling, improper maintenance or use of any unfit consumables or utilities
 - Defective construction work, unsuitable foundations or chemical, electrochemical or electrical interference unless caused by the Seller
- 2.7 The Seller shall not be held liable for the consequences of any improper or inappropriate removal of any defect in any of the Goods by the Buyer or any third party or any modification to any of the Goods made without the Seller's prior consent.
3. Legal Defects
- 3.1 The liability of the Seller for the Goods not to be in breach of any third-party industrial property rights or copyrights shall be limited to the Federal Republic of Germany and the country in which the Buyer is registered. The Seller shall have no such liability for any other country, such as any country to which the Goods may be moved by the Buyer, unless such other country has been notified by the Buyer to the Seller prior to awarding the contract or placing the order for the Goods.
- 3.2 If the use of the Goods delivered by the Seller to the Buyer is in breach of any third-party industrial property rights or copyrights and the Seller is liable for said breach according to Clause 3.1 hereinabove, the Seller shall, at its cost, obtain for the Buyer the right to continue the use of said Goods or modify said Goods in a manner reasonably acceptable to the Buyer so that said Goods will no longer be in breach of any such industrial property rights or copyrights. If such rights cannot be obtained at reasonable commercial terms or within a reasonable period of time and if the Goods cannot be so modified, then the Buyer shall have the right, at its discretion, to rescind the contract awarded by the Buyer to the Seller or the order placed by the Buyer with the Seller or to obtain from the Seller a reasonable reduction in the price of said Goods.
- The Seller shall in any such event further indemnify the Buyer against any undisputed claims or any claims determined by non-appealable court decision of the owners of such industrial property rights or copyrights.
- 3.3 Subject to Clause 3.4 hereinbelow, the Buyer shall not have the rights under Clause 3.2 hereinabove, unless
- the Buyer notifies the Seller promptly of any breach of industrial property rights or copyrights claimed by any third party,
 - the Buyer reasonably supports the defense of any such claims by the Seller and allows the Seller to make modifications as referred to in Clause 3.2 hereinabove,
 - the Buyer allows the Seller to defend at its own cost any such claim or to make any out-of-court settlement with respect to any such claim as the Seller may think fit,
 - the legal defect is not due to any instructions given by the Buyer to the Seller and
 - the legal defect is not due to any modification of the Goods by the Buyer or any use of the Goods not in conformity with the intended use.
- 3.4 Notwithstanding the limitations in Clauses 3.2 and 3.3 hereinabove, the provisions laid down by law shall apply, if and in as far as
- the title of the Buyer against the Seller is held under Section 478 or under Sections 651 and 478 of the German Civil Code,
 - the Seller is liable for the breach of the industrial property rights or the copyrights due to any willful act, neglect or omission or any gross negligence on the part of the Seller,
 - the Seller warranted (as provided for in Section 443 of the German Civil Code) that the Goods will not violate any industrial property rights or copyrights or
 - any damages claimed as a result of any breach of any industrial property rights or copyrights are on the grounds of any loss of life, injury, loss of health or loss of freedom.
4. Warranties Under Section 443 of the German Civil Code
- No person other than a legal representative or a procurator under Sect. 49 German Commercial Code ("Prokuristen") of the Seller will have the right to agree any warranties according to Section 443 of the German Civil Code.

VII. Liability and Damages

1. The Seller shall be liable for any willful acts, neglects and omissions and any gross negligence of its legal representatives and/or any other persons authorized by the Seller to perform any of the obligations of the Seller under any contract awarded to the Seller or order placed with the Seller ("Agent or Employee").
2. In the event of any ordinary negligence of any legal representative, Agent or Employee of the Seller, the liability of the Seller shall be limited to liability for any loss or damage the Seller foresaw when the contract was awarded or the order was placed by the Buyer or should have foreseen when the contract was awarded or the order was placed by the Buyer considering the circumstances the Seller knew or should have known when the contract was awarded or the order was placed by the Buyer.

If and in as far as any loss or damage suffered by the Buyer due to the ordinary negligence of any legal representative, Agent or Employee of the Seller is compensated by any final payment by any insurer under any insurance contract against loss or indemnity concluded by the Buyer or for the Buyer such as, but not limited to any liability, all-risks, transportation, fire or business interruption insurance, the liability of the Seller shall be limited to any losses incurred by the Buyer as a result of any such insurance claim such as, without limitation, any increase in insurance premium. Any liability of the Seller for any loss or damage caused by the ordinary negligence of any of the legal representatives, Agents or Employees of the Seller and covered by a final insurance payment to the Buyer shall be excluded.

Subject to the limitations provided for hereinbefore, any liability of the Seller for any loss or damage caused by the ordinary negligence of any legal representative, Agent or Employee of the Seller shall for each incident be limited to an amount of two hundred fifty thousand Euros (250,000 €).

3. The exclusions and limitations of liability provided for hereinabove shall not apply,
 - if and in as far as the Seller is held liable for any human loss of life, injury or loss of health,
 - if and in as far as the Seller is held liable under the German Product Liability Act or
 - if and in as far as the Seller is held liable under any warranty in accordance with Section 443 of the German Civil Code agreed by the Seller to provide security to the Buyer with respect to the loss or damage incurred by the Buyer.
4. The provisions of Clauses 1 through 3 hereinabove shall not operate to alter any of the provisions of law regarding the onus probandi.

VIII. Limitation

1. The period of limitation with respect to any defect shall be a period of one (1) year provided that said period shall be five (5) years for any defect in any Goods serving as civil engineering structure or structures or any defect in any civil engineering structure caused by any Goods ordinarily used in civil engineering structures.
2. The period of limitation with respect to any other cause under the contract awarded or the order placed by the Buyer or any other cause outside said contract or order shall be a period of eighteen (18) months.
3. Notwithstanding the provisions of Clauses 1 and 2 herein-above, the periods of limitation allowed by law shall apply, if and in as far as
 - the title held by the Buyer against the Seller is under Section 478 or Sections 651 and 478 of the German Civil Code,
 - the title of the Buyer is held on the grounds of any willful act, neglect or omission, any act of bad faith or any gross negligence on the part of any of the legal representatives, Agents or Employees of the Seller,
 - the title held by the Buyer against the Seller is on the grounds of any loss of life, injury, loss of health or loss of freedom of any person,
 - the title held by the Buyer against the Seller is under the German Product Liability Act,
 - the title held is on the grounds of a third party title in rem which grants any such third party a title to the surrender of the Goods (Sect. 438 para.1 subsubpara. a German Civil Code) or
 - the title held is on the grounds of any title recorded in any register of deeds (Sect. 438 para.1 subpara. b German Civil Code).

The provisions in Clauses 1 and 2 shall further not apply if the title is held by the Buyer under a warranty of the Seller in accordance with Section 443 of the German Civil Code provided that any such title shall exclusively be subject to the provisions of Clause 4 hereinbelow.

4. The period of limitation applicable to any warranty of the Seller in accordance with Section 443 of the German Civil Code shall commence upon the delivery of the Goods to the Buyer or, if acceptance by the Buyer is required by law, upon the acceptance of the Goods by the Buyer provided that, in the event of bad faith, said period shall commence as provided for in Section 438, paragraph 3, of the German Civil Code. Said period shall terminate as provided for in Section 438 of the German Civil Code unless a shorter period has been agreed according to the terms of the warranty under Section 443 of the German Civil Code.
5. Clauses 1 through 4 hereinabove shall not operate to alter any of the provisions of Sections 196, 197 and 479 of the German Civil Code or any of the provisions of law applicable to the onus probandi.

IX. Software Use

If the contract awarded by the Buyer to the Seller or the order placed by the Buyer with the Seller provides for the supply of software, the Buyer will be granted a non-exclusive right to use said software and any documentation of said software. Said software will be supplied by the Seller to the Buyer for use with the Goods delivered by the Seller to the Buyer provided that the Buyer shall not have the right to use said software on more than one system.

Any copying, modification or translation of said software or any conversion of the object code of said software into source code shall be limited as provided for in Section 69 et seq. of the German Copyright Act. The Buyer agrees not to remove from said software any reference to the developer of said software such as, without limitation, any copyright reference and not to modify any such reference unless the prior express content of the Seller has been obtained.

Any other rights associated with such software and any documentation of said software and any copies thereof shall remain vested in the Seller or the supplier of said software as the case may be. The Buyer shall not grant any sub-license.

X. Applicable Law and Jurisdiction

1. The relationship between the Seller and the Buyer shall exclusively be governed by the law of the Federal Republic of Germany as the same may be applicable to the relationship between two German parties provided however that the application of the United Nations Convention on Contracts for the International Sale of Goods of 11 April 1980 shall be excluded.
2. If the Buyer is a business or any public-law legal person or other entity, any dispute between the Seller and the Buyer shall be settled by the courts having jurisdiction at the registered offices of the Seller provided however that the Seller shall have the right to bring action against the Buyer in the courts having jurisdiction at the registered offices of the Buyer.
3. If any of the terms and conditions of the Contract or these Standard Sales Terms is or become ineffective, the remaining provisions of the Contract and these Standard Sales Terms shall remain in full force and effect. Any such ineffective provision shall be deemed to have been replaced by the Seller and the Buyer by an effective provision which shall have commercial, financial and economic implications which shall be as close to those of said ineffective provision as may be reasonably.

GEA Tuchenhagen

Headquarters of the Business Unit GEA Flow Components

Am Industriepark 2 – 10, 21514 Büchen, Germany
Phone +49 4155 49 0, Fax +49 4155 49 2423
geatuchenhagen@gea.com

GEA Aseptomag

Industrie Neuhof 28, 3422 Kirchberg, Switzerland
Phone +41 34 426 29 22, Fax +41 34 426 29 28
info.aseptomag@gea.com

GEA Breconcherry

Unit 4 Porthouse Business Centre, Tenbury Road
Bromyard, Herefordshire, HR7 4FL, UK
Phone +44 1531 632476, Fax +44 1531 633839
cip@gea.com, cip.enquiries@gea.com

GEA Tuchenhagen France

29, route de la Wantzenau, 67800 Hoenheim, France
Phone +33 3 88 19 70 90, Fax +33 3 88 19 70 99
tuchenhagen.france@gea.com

GEA Tuchenhagen North America

33 McAllister Farm Road, Portland, ME 04103, USA
Phone +1 207 797 9500, Fax +1 207 878 7914
gea-fc.us@gea.com

GEA Tuchenhagen Canada

20 King Street West, Unit B
Stoney Creek, ON L8G 1G8, Canada
Phone +1 905 930 8738, Fax +1 905 930 8848
gea-fc.us@gea.com



GEA Tuchenhagen Polska

Ul. BoWiD 9R, 75-209 Koszalin, Poland
Phone +48 94 346 75 40 do 43, Fax +48 94 340 58 35
service.pl@gea.com

GEA Tuchenhagen China

248 Guanghua Road, Shanghai 201108, P.R. China
Phone +86 21 3126 6008, Fax +86 21 3126 0680
tuchenhagen.cn@gea.com

GEA Flow Components India

#3A1, Bommasandra Industrial Area
Hebbagodi Hosur Road
Bengaluru, 560099, India (Karnataka)
Phone +91 -80 4968 2300
tuchenhagen.india@gea.com



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GEA Tuchenhausen GmbH

Am Industriepark 2–10, 21514 Büchen, Germany

Phone +49 4155 49-0

sales.geatuchenhausen@gea.com, www.gea.com