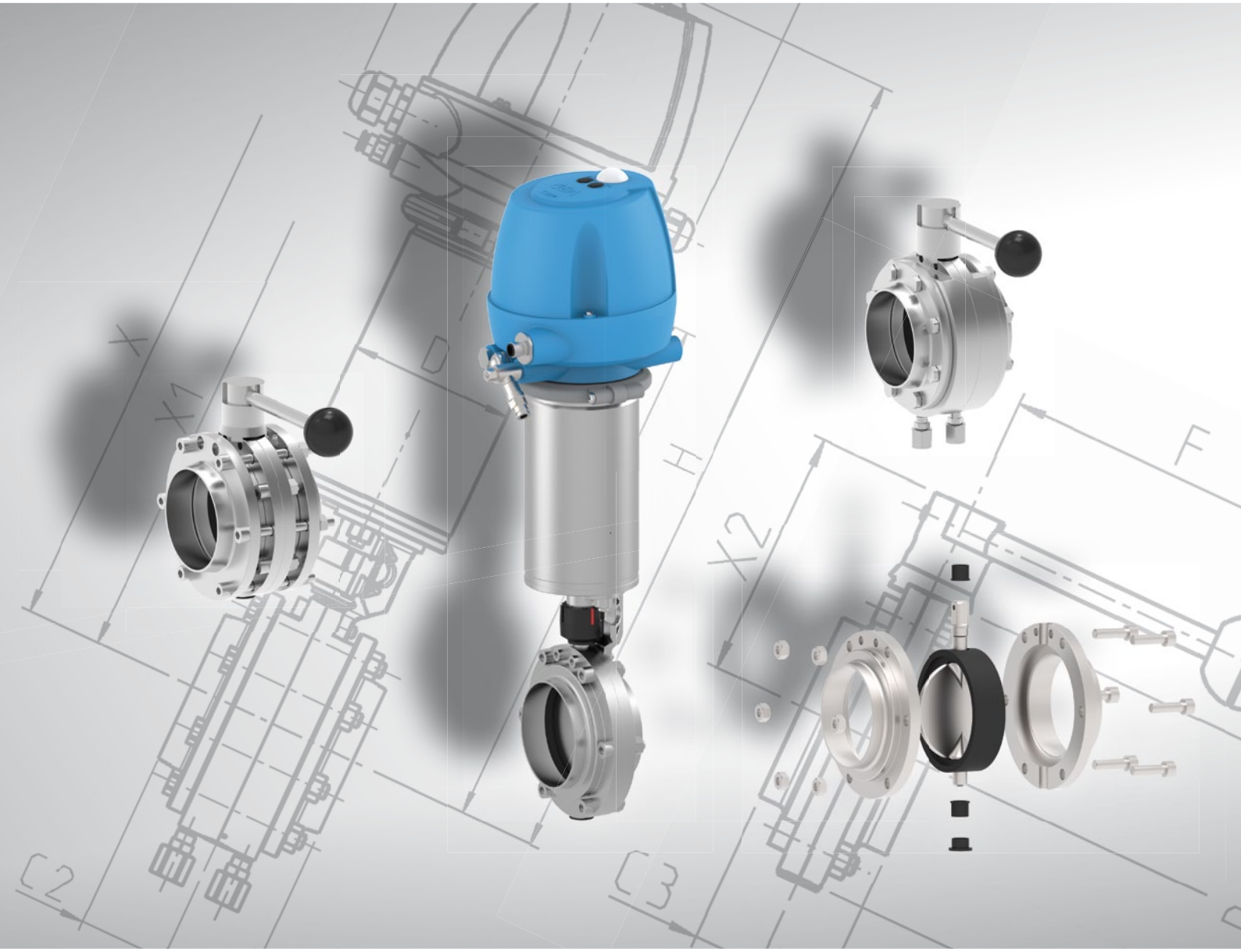

GEA Tuchenhagen Butterfly Valves T-smart

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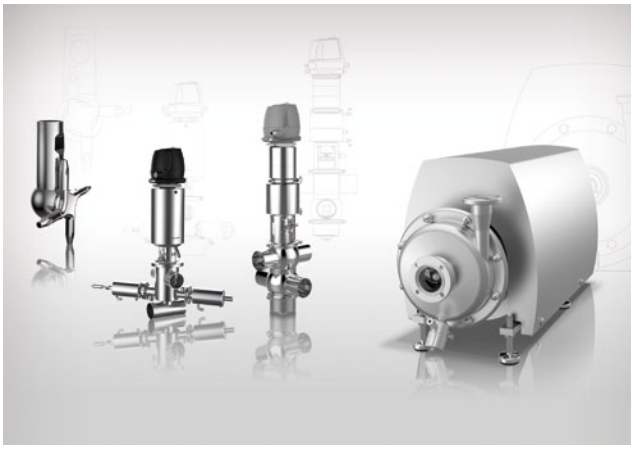
Every second litre of beer brewed in the world may well have flown through a component supplied by GEA Group. About every fourth litre of milk is extracted or further processed with equipment produced by GEA Group. One third of the worldwide instant coffee is produced in GEA Group systems. With sales of more than five billion euros, the group is one of the largest suppliers of process machinery and technology in the world.

GEA Group

GEA Group comprises six segments. The business unit GEA Flow Components is part of the GEA Mechanical Equipment segment, together with the business units Mechanical Separation and Homogenizer.

The business unit GEA Flow Components comprises:

GEA Tuchenhagen in Büchen (Germany), GEA Aseptomag in Kirchberg (Switzerland) and GEA Breconcherry in the UK as well as various locations in the USA, Canada, China, India, Poland and France. Our main focus is on the growth and further strengthening of our market position as an internationally recognized technology leader in components for the food industry, mainly in the business areas of valve, pump and cleaning technology.



GEA Tuchenhagen 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 Tuchenhagen 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 Tuchenhagen 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 Tuchenhagen 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 Tuchenhagen: not only can they profit from a range of highly efficient products, they can also use the individually tailored engineering support available from GEA Tuchenhagen. 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 Tuchenhagen 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

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)

Intermediate flange variant

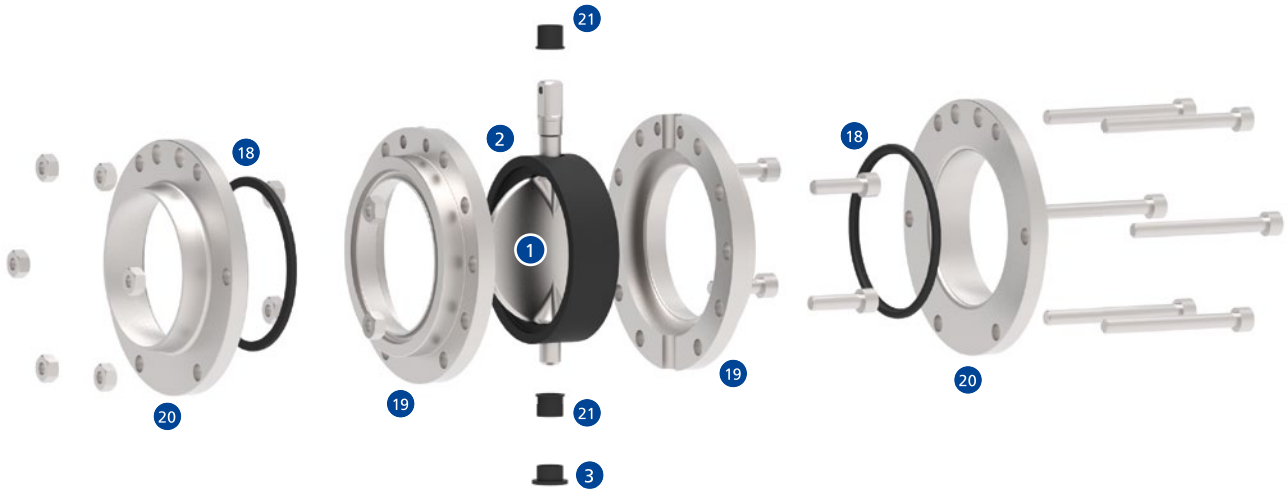
The intermediate flange variant offers simple plant extension even during operation while the butterfly valve safely shuts off the process from the atmosphere.

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.



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

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

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 1/2" 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.

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 1/2" OD and 3/4" 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

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 ASME-BPE-a-2004, **Inch SMS**: Outside diameter acc. to SMS 1146

Surfaces

Product wetted surfaces are by default finished to Ra ≤ 0.8 µm. Higher-quality surfaces finished to Ra ≤ 0.4 µm 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.

Material test certificates

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

Seal materials

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

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 defrosted 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/m³
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 m³ 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 head with all options.

Material properties

Material number	Short name	Similar materials			PREN*	Major alloying elements (% in mass) Cr (Chromium)	Ni (Nickel)	Mo (Molyb-denum)	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 + 0.5 W) + 20 N

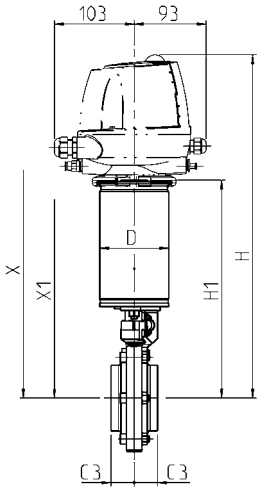
Gasket material properties

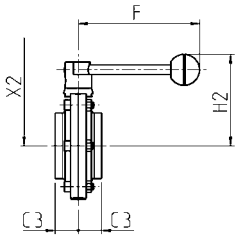
Seal material			EPDM	FKM	HNBR	VMQ
(general operation temperature)			–40 to 135 °C* –40 to 275 °F*	–10 to 200 °C* 14 to 392 °F*	–25 to 140 °C* –13 to 284 °F*	–50 to 200 °C* –58 to 392 °F*
Medium	**Concentration**	**At approved operation temperature**				
Caustics	≤ 3 %	to 80 °C	+	o	+	o
	≤ 5 %	to 40 °C	+	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	





	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 × 1.65	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	25	On request	0.8
OD ¾"	19.05 × 1.65	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	25	On request	0.8
OD 1"	25.4 × 1.65	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	25	23	0.7
OD 1 ½"	38.1 × 1.65	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	25	87	0.8
OD 2"	50.8 × 1.65	88.9	116	428.0	266.0	96.0	448.0	286.0	116.0	25	170	1.1
OD 2 ½"	63.5 × 1.65	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	25	240	1.5
OD 3"	76.2 × 1.65	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	30	400	1.8
OD 4"	101.6 × 2.11	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	30	880	2.8

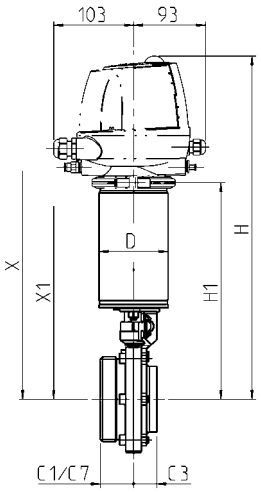
Position	Description of order code			
1	**Valve type**			
	7	Butterfly Valve		
2	**Flange connection**			
	11	Weld connection/weld connection		
3	**Pipe standard**			
	0	OD	1	DN
4	**Nominal sizes**			
	012	OD ½"	015	DN 15
	075	OD ¾"	020	DN 20
	010	OD 1"	025	DN 25
	112	OD 1 ½"	040	DN 40
	200	OD 2"	050	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	None		
	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	None		
	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	None		
	1	Factory test certificate 2.2		
	2	Certificate 3.1		
	3	Certificates 2.2 and 3.1		
13	**ATEX approval**			
	0	No		
	1	Yes		

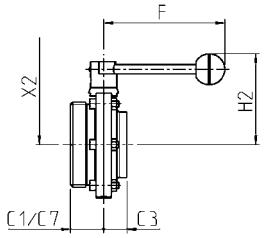
The code is composed as follows, depending on the chosen configuration:

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

+ For control and feedback systems codes see insert 3 below, starting on page 51.

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	





	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 × 1.65	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	35	25	23	0.8
OD 1 ½"	38.1 × 1.65	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	35	25	87	1.0
OD 2"	50.8 × 1.65	88.9	116	428.0	266.0	96.0	448.0	286.0	116.0	35	25	170	1.4
OD 2 ½"	63.5 × 1.65	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	38	25	240	1.9
OD 3"	76.2 × 1.65	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	43	30	400	2.2
OD 4"	101.6 × 2.11	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	43	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 × 1.65	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 × 1.65	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	41	25	87	1.0
SMS 2"	50.8 × 1.65	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 × 1.65	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	45	25	240	1.9
SMS 3"	76.2 × 1.65	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	45	30	400	2.2
SMS 4"	101.6 × 2.11	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	51	30	880	3.5

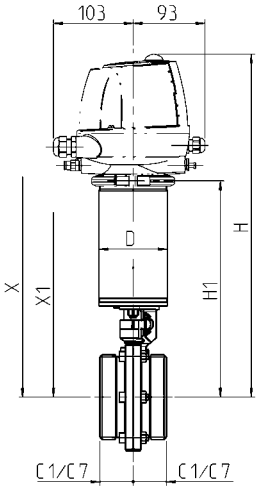
Position	Description of order code					
1	**Valve type**					
	7	Butterfly Valve				
2	**Flange connection**					
	21	Male/weld connection				
3	**Pipe standard**					
	0	OD	1	DN	7	SMS
4	**Nominal sizes**					
	010	OD 1"	025	DN 25	010	OD 1"
	112	OD 1 ½"	040	DN 40	112	OD 1 ½"
	200	OD 2"	050	DN 50	200	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	None				
	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	None				
	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	None				
	1	Factory test certificate 2.2				
	2	Certificate 3.1				
	3	Certificates 2.2 and 3.1				
13	**ATEX approval**					
	0	No				
	1	Yes				

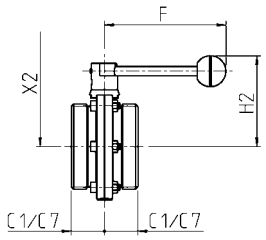
The code is composed as follows, depending on the chosen configuration:

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

+ For control and feedback systems codes see insert 3 below, starting on page 51.

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	





	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 × 1.65	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	35	23	0.9
OD 1 ½"	38.1 × 1.65	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	35	87	1.1
OD 2"	50.8 × 1.65	88.9	116	428.0	266.0	96.0	448.0	286.0	116.0	35	170	1.6
OD 2 ½"	63.5 × 1.65	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	38	240	2.2
OD 3"	76.2 × 1.65	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	43	400	2.6
OD 4"	101.6 × 2.11	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	43	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 × 1.65	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	36	23	0.9
SMS 1 ½"	38.1 × 1.65	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	41	87	1.1
SMS 2"	50.8 × 1.65	88.9	116	428.0	266.0	96.0	448.0	286.0	116.0	41	170	1.6
SMS 2 ½"	63.5 × 1.65	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	45	240	2.2
SMS 3"	76.2 × 1.65	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	45	400	2.6
SMS 4"	101.6 × 2.11	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	51	880	4.2

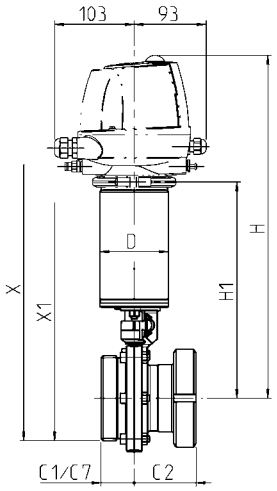
Position	Description of order code					
1	**Valve type**					
	7	Butterfly Valve				
2	**Flange connection**					
	22	Male/male				
3	**Pipe standard**					
	0	OD	1	DN	7	SMS
4	**Nominal sizes**					
	010	OD 1"	025	DN 25	010	OD 1"
	112	OD 1 ½"	040	DN 40	112	OD 1 ½"
	200	OD 2"	050	DN 50	200	OD 2"
	212	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	None				
	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	None				
	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	None				
	1	Factory test certificate 2.2				
	2	Certificate 3.1				
	3	Certificates 2.2 and 3.1				
13	**ATEX approval**					
	0	No				
	1	Yes				

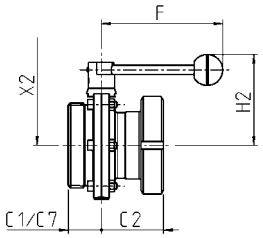
The code is composed as follows, depending on the chosen configuration:

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

+ For control and feedback systems codes see insert 3 below, starting on page 51.

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	





	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 × 1.65	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	35	47	23	1.0
OD 1 ½"	38.1 × 1.65	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	35	51	87	1.4
OD 2"	50.8 × 1.65	88.9	116	428.0	266.0	96.0	448.0	286.0	116.0	35	53	170	1.9
OD 2 ½"	63.5 × 1.65	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	38	57	240	2.8
OD 3"	76.2 × 1.65	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	43	67	400	3.3
OD 4"	101.6 × 2.11	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	43	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 × 1.65	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 × 1.65	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	41	51	87	1.4
SMS 2"	50.8 × 1.65	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 × 1.65	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	45	57	240	2.8
SMS 3"	76.2 × 1.65	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	45	67	400	3.3
SMS 4"	101.6 × 2.11	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

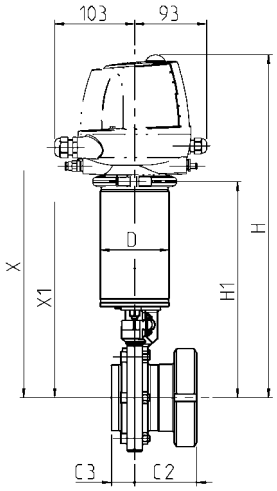
Position	Description of order code					
1	**Valve type**					
	7	Butterfly Valve				
2	**Flange connection**					
	24	Male/liner				
3	**Pipe standard**					
	0	OD	1	DN	7	SMS
4	**Nominal sizes**					
	010	OD 1"	025	DN 25	010	OD 1"
	112	OD 1 ½"	040	DN 40	112	OD 1 ½"
	200	OD 2"	050	DN 50	200	OD 2"
	212	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	None				
	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	None				
	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	None				
	1	Factory test certificate 2.2				
	2	Certificate 3.1				
	3	Certificates 2.2 and 3.1				
13	**ATEX approval**					
	0	No				
	1	Yes				

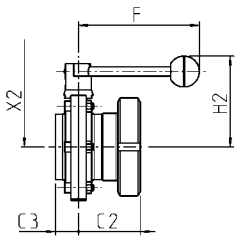
The code is composed as follows, depending on the chosen configuration:

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

+ For control and feedback systems codes see insert 3 below, starting on page 51.

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	





	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 × 1.65	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 × 1.65	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	25	51	87	1.2
OD 2"	50.8 × 1.65	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 × 1.65	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	25	57	240	2.4
OD 3"	76.2 × 1.65	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	30	67	400	2.9
OD 4"	101.6 × 2.11	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

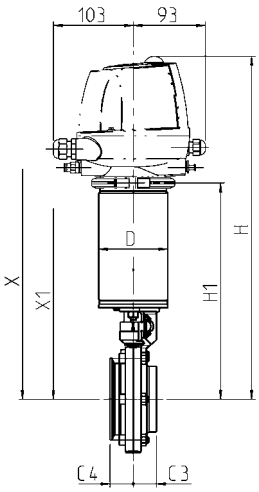
Position	Description of order code			
1	**Valve type**			
	7	Butterfly Valve		
2	**Flange connection**			
	14	Weld connection/liner		
3	**Pipe standard**			
	0	OD	1	DN
4	**Nominal sizes**			
	010	OD 1"	025	DN 25
	112	OD 1 ½"	040	DN 40
	200	OD 2"	050	DN 50
	212	OD 2 ½"	065	DN 65
	300	OD 3"	080	DN 80
	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	None		
	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	None		
	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	None		
	1	Factory test certificate 2.2		
	2	Certificate 3.1		
	3	Certificates 2.2 and 3.1		
13	**ATEX approval**			
	0	No		
	1	Yes		

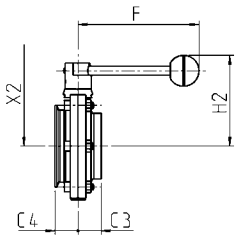
The code is composed as follows, depending on the chosen configuration:

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

+ For control and feedback systems codes see insert 3 below, starting on page 51.

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	





	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 × 1.65	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 × 1.65	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	25	30	87	0.8
OD 2"	50.8 × 1.65	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 × 1.65	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	25	30	240	1.5
OD 3"	76.2 × 1.65	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	30	30	400	1.9
OD 4"	101.6 × 2.11	88.9	160	454.0	292.0	130.5	474.0	312.0	150.5	30	30	880	3.0

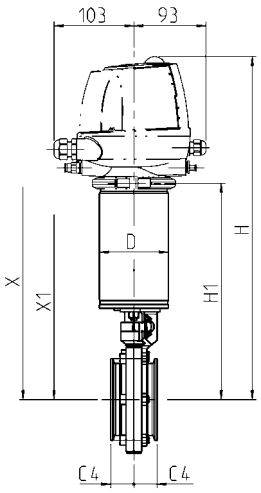
Position	Description of order code			
1	**Valve type**			
	7	Butterfly Valve		
2	**Flange connection**			
	31	Clamp flange/weld connection		
3	**Pipe standard**			
	0	OD	1	DN
4	**Nominal sizes**			
	010	OD 1"	025	DN 25
	112	OD 1 ½"	040	DN 40
	200	OD 2"	050	DN 50
	212	OD 2 ½"	065	DN 65
	300	OD 3"	080	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	None		
	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	None		
	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	None		
	1	Factory test certificate 2.2		
	2	Certificate 3.1		
	3	Certificates 2.2 and 3.1		
13	**ATEX approval**			
	0	No		
	1	Yes		

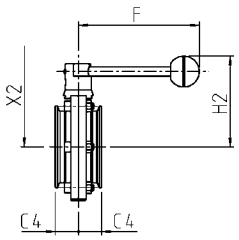
The code is composed as follows, depending on the chosen configuration:

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

+ For control and feedback systems codes see insert 3 below, starting on page 51.

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	





	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 × 1.65	88.9	116	415.0	253.0	83.0	435.0	273.0	103.0	40	23	1.1
OD 1 ½"	38.1 × 1.65	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	30	87	0.9
OD 2"	50.8 × 1.65	88.9	116	428.0	266.0	96.0	448.0	286.0	116.0	30	170	1.3
OD 2 ½"	63.5 × 1.65	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	30	240	1.6
OD 3"	76.2 × 1.65	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	30	400	2.0
OD 4"	101.6 × 2.11	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 sizes**			
	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	None		
	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	None		
	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	None		
	1	Factory test certificate 2.2		
	2	Certificate 3.1		
	3	Certificates 2.2 and 3.1		
13	**ATEX approval**			
	0	No		
	1	Yes		

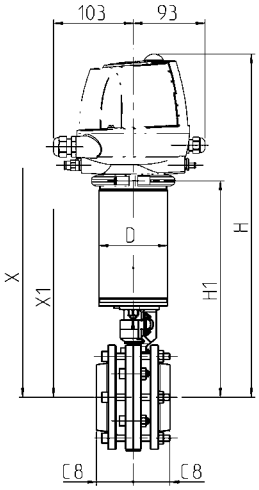
The code is composed as follows, depending on the chosen configuration:

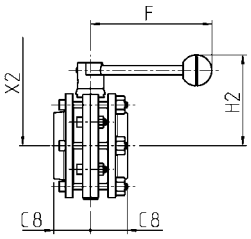
Position	1	2		3		4			5		6	7	8	9		10	11	12	13
Code	7	3	3		-					-					-				

+ For control and feedback systems codes see insert 3 below, starting on page 51.

Intermediate flange variant 788

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	





	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	52.5	1100	8.7
DN 150	154 × 2.0	114.3	220	486.0	324.0	159.0	506.0	344.0	180.0	52.5	1800	12.2
OD ½"	12.7 × 1.65	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 × 1.65	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 × 1.65	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 × 1.65	88.9	116	420.0	258.0	88.0	440.0	278.0	108.0	47.5	87	1.7
OD 2"	50.8 × 1.65	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 × 1.65	88.9	116	436.5	274.5	105.0	456.5	294.5	125.0	47.5	240	3.1
OD 3"	76.2 × 1.65	88.9	160	444.0	282.0	118.0	464.0	302.0	138.0	47.5	400	3.5
OD 4"	101.6 × 2.11	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 sizes**			
	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	None		
	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	None		
	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	None		
	1	Factory test certificate 2.2		
	2	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		-					-					-				

+ For control and feedback systems codes see insert 3 below, starting on page 51.

Manual actuator	
Material	AISI 304 and phenolic resin (ball head)

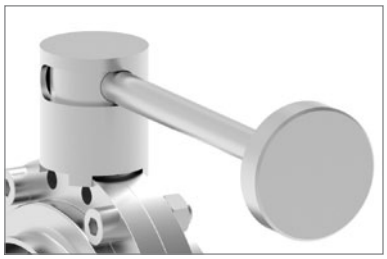
Dimensions			
Nominal size **OD / SMS DN**	½" – 2 ½" 15 – 65	3" – 4" 80 – 100	125 – 150
Length of lever	116 mm	160 mm	220 mm
Weight	0.3 kg	0.4 kg	0.4 kg

Pneumatic actuator	
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**	½" – 2 ½" 15 – 65	3" – 4" 80 – 100	125 – 150
Ø	97 mm	97 mm	114.3 mm
H	223 mm	223 mm	223 mm
Weight	4.1 kg	4.1 kg	5.5 kg

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**	½" – 2 ½" 15 – 65	3" – 4" 80 – 100	125 – 150
Ø	88.9 mm	88.9 mm	114.3 mm
H	223 mm	223 mm	223 mm
Weight	4.1 kg	4.1 kg	5.5 kg



Manual actuator stepless	
Material	AISI 304

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

Manual actuator scissors handle	
Material	AISI CF-8

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

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 sizes**					
	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	None				
	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	None				
	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	None				
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	

+ For control and feedback systems codes see insert 3 below, starting on page 51.

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" 15 – 65	3" – 4" 80 – 100	125 – 150
H	80 mm	80 mm	80 mm
Weight	0.8 kg	0.8 kg	0.8 kg

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. See page 77 for proximity switches. The depicted padlock is merely an example.

Technical data			
Material	PA12		

Dimensions			
Nominal size **OD / SMS DN**	½" – 2 ½" 15 – 65	3" – 4" 80 – 100	125 – 150
Weight	36 g	42 g	42 g

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" 15 – 65	3" – 4" 80 – 100	125 – 150
H	182 mm	182 mm	182 mm
Weight	1.5 kg	1.5 kg	1.5 kg

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" 15 – 65	3" – 4" 80 – 100	125 – 150
H (without T.VIS®)		103 mm	103 mm	103 mm
Weight		1.7 kg	1.7 kg	1.7 kg

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 module 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

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

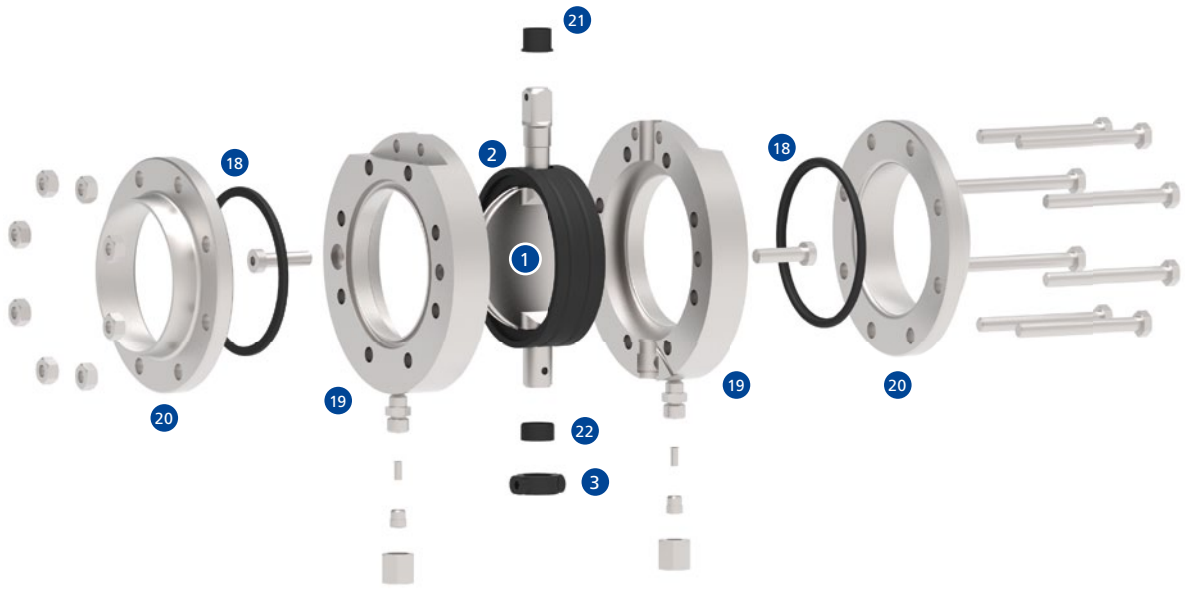
Mixproof Butterfly Valves T-smart 9

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.

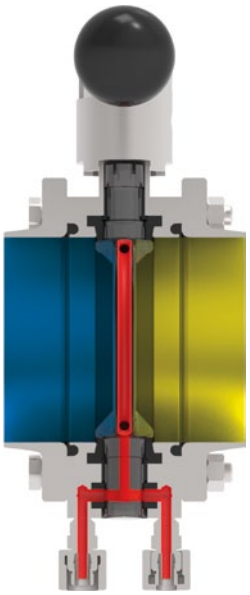


1 Butterfly valve disk
2 Butterfly valve gasket
3 Radial seal
18 VARIVENT® O-ring
19 Body flanges (intermediate flange with O-ring groove)
20 Welding flange (outside flange)
21 Upper bearing
22 Lower bearing

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

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.

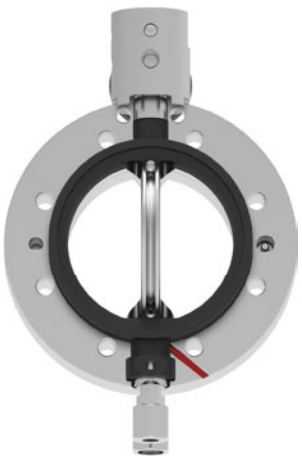


Mixproof product area separation with the leakage cavity open to the atmosphere so any leakage becomes visible immediately.

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 ASME-BPE-a-2004

Surfaces

Product wetted surfaces are by default finished to Ra ≤ 0.8 µm. Higher-quality surfaces finished to Ra ≤ 0.4 µm 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.

Material test certificates

Flanges and disks of the Mixproof Butterfly Valves T-smart 9 are available with factory test certificate 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/m³
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 m³ 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 T.VIS® control head with all options.

Material properties

						Major alloying elements (% in mass)			
Material number	Short name	Similar materials			PREN*	Cr (Chromium)	Ni (Nickel)	Mo (Molyb-denum)	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

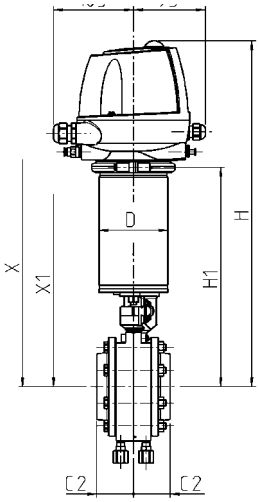
Gasket material properties

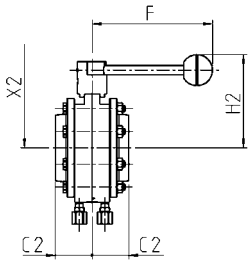
Seal material			EPDM
(general operation temperature)			–40 to 135 °C* –40 to 275 °F*
Medium	**Concentration**	**At approved operation temperature**	
Caustics	≤ 3 %	to 80 °C	+
	≤ 5 %	to 40 °C	+
	≤ 5 %	to 80 °C	+
	> 5 %		o
Inorganic acids**	≤ 3 %	to 80 °C	+
	≤ 5 %	to 80 °C	o
	> 5 %	to 100 °C	–
Water		to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

+ = good resistance
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 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	





	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	156	469	310	105	520	360	130	47.5	On request	4.0
DN 65	70 × 2.0	88.9	156	478	319	114	520	360	139	47.5	On request	5.0
DN 80	85 × 2.0	88.9	156	488	329	121	535	380	146	47.5	On request	5.9
DN 100	104 × 2.0	88.9	156	501	342	134	550	390	159	47.5	On request	8.3
OD 2"	50.8 × 1.65	88.9	156	469	310	105	520	360	130	47.5	On request	4.0
OD 2 ½"	63.5 × 1.65	88.9	156	478	319	114	520	360	139	47.5	On request	5.1
OD 3"	76.2 × 1.65	88.9	156	485	329	121	535	380	146	47.5	On request	6.1
OD 4"	101.6 × 2.11	88.9	156	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 sizes**			
	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	None		
	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	None		
	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	None		
	1	Factory test certificate 2.2		
	2	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	-				

+ For control and feedback systems codes see insert 3 below, starting on page 51.

Manual actuator	
Material	AISI 304 and phenolic resin (ball head)

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

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		97 mm	114.3 mm
H		223 mm	223 mm
Weight		4.1 kg	5.5 kg

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

Position	Description of order code			
1	**Valve type**			
	9	Mixproof Butterfly Valve		
2	**Flange connection**			
	99	Actuator only		
3	**Pipe standard**			
	0	OD	1	DN
4	**Nominal sizes**			
	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**			
	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		
8	**Air connection**			
	0	None		
	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	None		
	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**			
	9	Not applicable		
12	**Certificate**			
	0	None		
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	9	9		-				9	-	9			0	-		9	0	

+ For control and feedback systems codes see insert 3 below, starting on page 51.

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

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. See page 77 for proximity switches. 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

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

T.VIS® Control Modules

T.VIS® Control Modules are optimum performance systems for controlling and surveilling GEA Tuchenhagen valves.

They are available in different variants for specific valve types, tasks and handling comfort requirements.

All T.VIS® Control Modules share these features:

- Flexible modular system to supply the best variant for each task (e.g. specific connection type, number of solenoid valves etc.)
- Internal air-routing, provides high fail-safety of essential valve functions, since no external air hose is required
- Characteristic design
- High protection class (min. IP65, optional IP67)
- Easy cleanability without dead areas in any mounting situation
- Clear identification of the valve's switching position via a flashing color LED indicator on the top of the control module (clearly visible from all sides)
- Low energy consumption
- Easy handling
- Maintenance-free electronic modules
- Many special options, e.g.:
  - Special material
  - Throttles
  - Compatible cable sockets

For maintenance work on the valve, the control module can be dismounted from the valve actuator without the need of disconnecting electric or pneumatic connections.

The T.VIS® M-1 and the SES both feature a modular design. This makes it possible to retro-fit or exchange solenoid valves and, on the M-1, bus system connection modules.

T.VIS® concept – for valves with pneumatic actuator

T.VIS® M-1 – Control Module with manual set-up

- For end position feedback and actuator control
- Proven sensor technology
- Retro-fittable modules and solenoid valves

T.VIS® A-8 – Control Module with automatic set-up

- For end position feedback and actuator control
- Automatic set-up

T.VIS® P-20 – Positioning of the valve disk

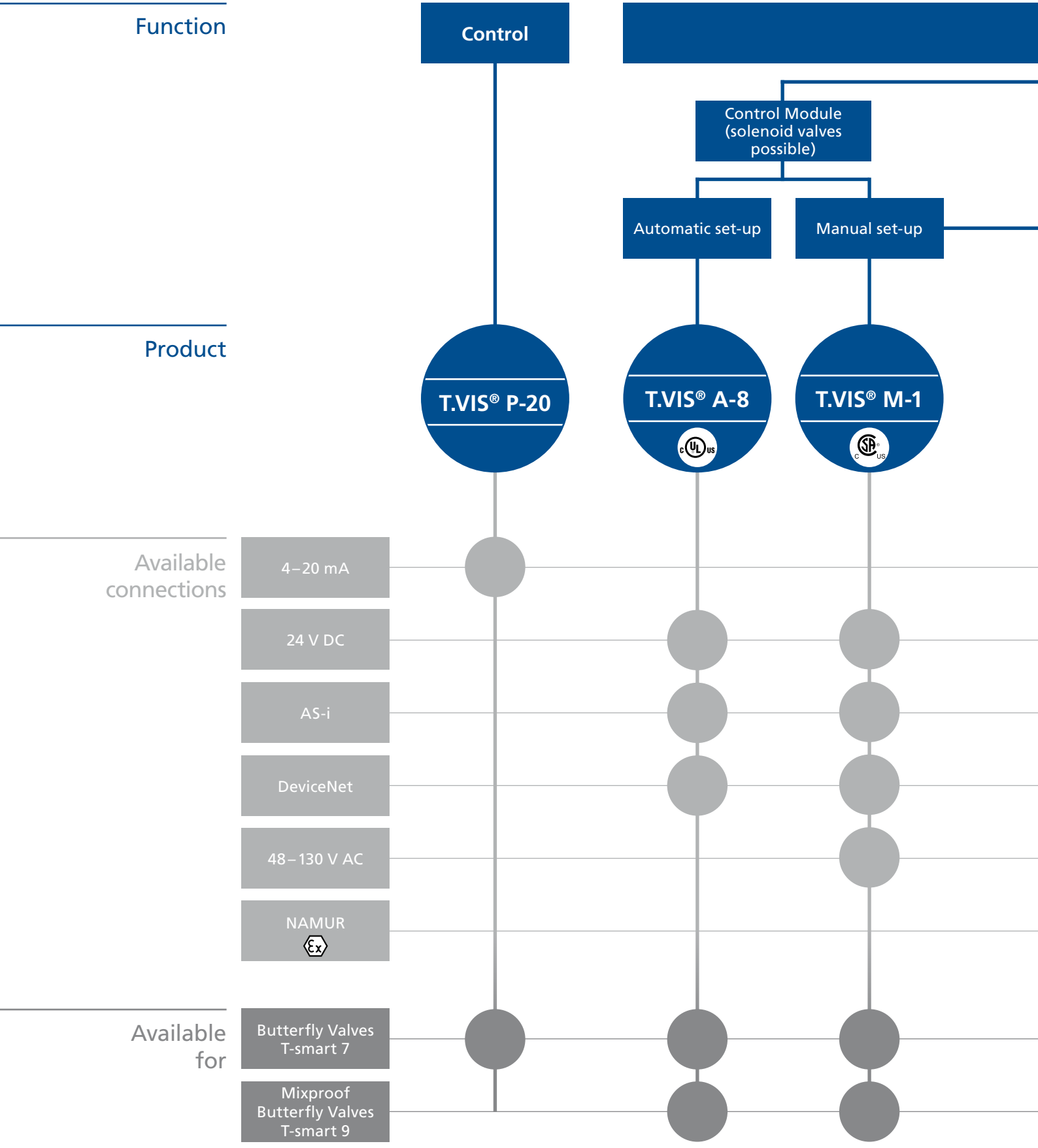
- For stepless positioning of the valve disk between end positions
- Automatic set-up

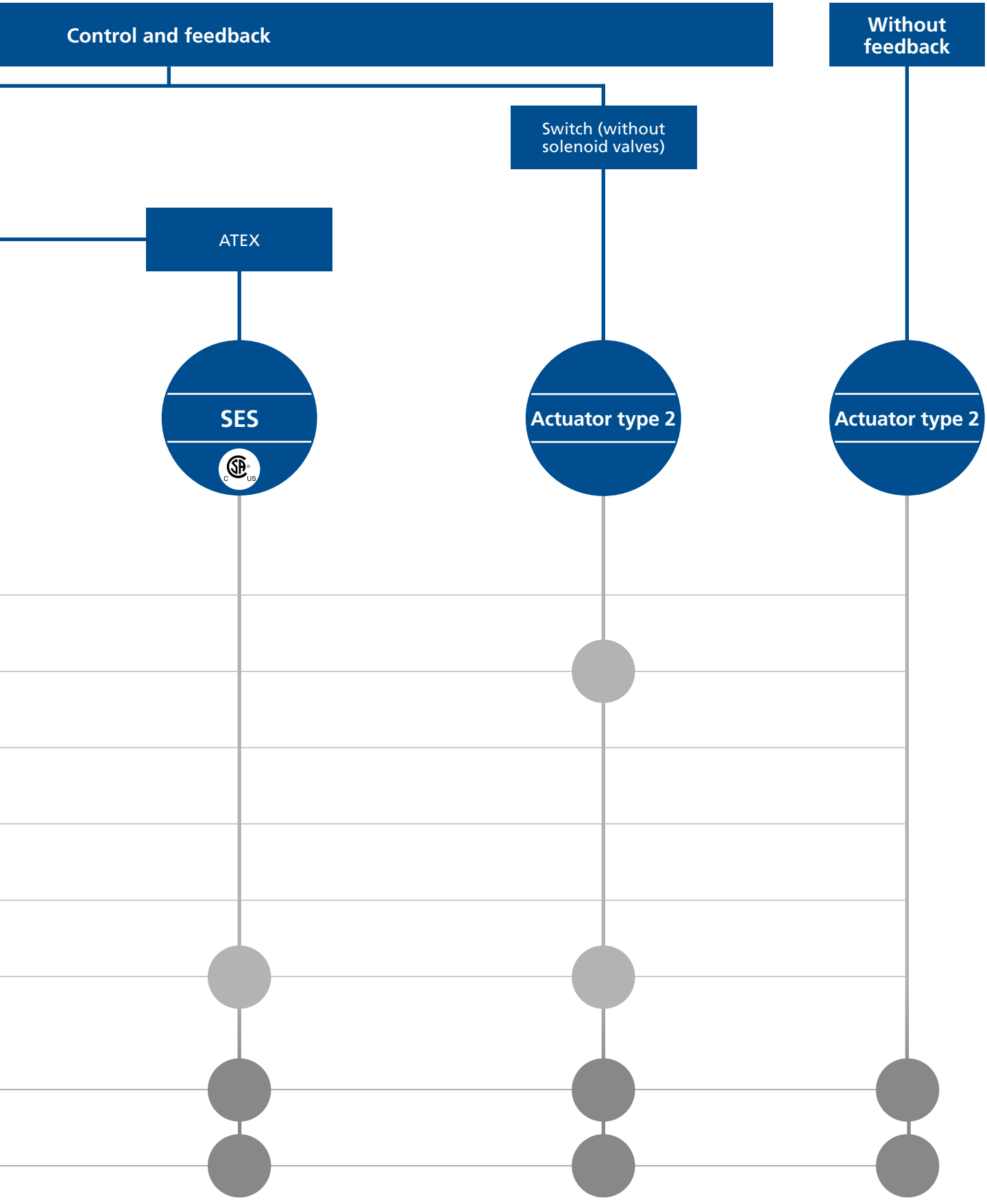
SES – Control Module for explosive atmospheres

- For end position feedback and actuator control
- Intrinsically safe sensors and solenoid valves

Proximity switch holder in bracket

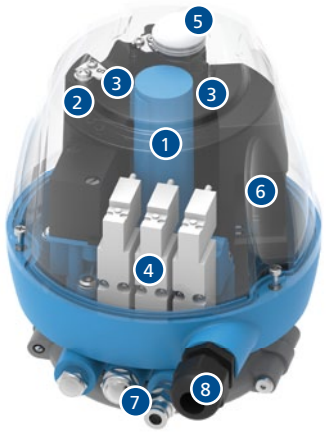
- For 2 proximity switches M12×1


Function
Control
Control Module (solenoid valves possible)
Automatic set-up
Manual set-up
Product
T.VIS® P-20
T.VIS® A-8
T.VIS® M-1
Available connections
4–20 mA
24 V DC
AS-i
DeviceNet
48–130 V AC
NAMUR
Available for
Butterfly Valves T-smart 7
Mixproof Butterfly Valves T-smart 9


Control and feedback
Without feedback
Switch (without solenoid valves)
ATEX
SES
Actuator type 2
Actuator type 2

Concept

With manually adjustable sensors and a modular set of configuration options, the T.VIS® M-1 embodies T.VIS® feedback system technology in a basic variant. It is optimally adapted to the fundamental requirements in a process system and offers the advantages of the modern T.VIS® series with proven sensor technology at a reduced cost.



1. Air-routing with internal switch bar
2. 24 V DC control unit
3. Sensors
4. Solenoid valves
5. LED visualization
6. Optional adapter module (48–130 V AC/AS-Interface/DeviceNet)
7. Central compressed-air supply with replacable filter
8. Cable connection/M12-plug

Features

- Proven sensor technology
- Quick and simple sensor adjustment
- LED visualization of valve status
- Flexible modular system
- Various communication variants available
- Simple valve maintenance
- Retro-fittable components
- Solenoid valves protected by filter
- Supply and exhaust air throttles fittable

Structure

T.VIS® M-1 stands out for its proven sensor technology. The basic equipment of the control module comprises the 24 VDC interface module, two sensors for feedback of the valve position and up to three solenoid valves that can also be retro-fitted.

To implement the connection types AC, DeviceNet and AS-Interface, a retro-fittable adapter module is installed upstream of the standard interface module.

A replacable air supply filter protects the solenoid valves.

Position detection

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

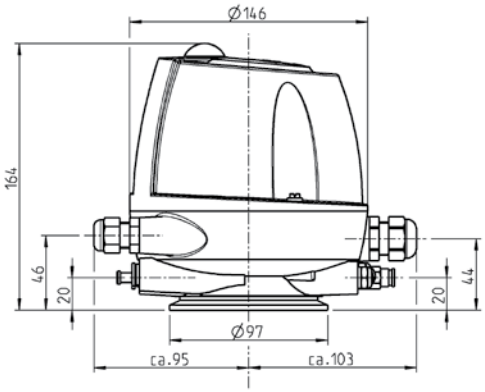
Set-up

Mechanically – The sensors are adjusted mechanically via positioning spindle, which can be safely secured against loosening.

Visualization

LED display:
- green
- yellow

Technical data of standard variant		
Position detecting	Sensors	
Casing material	PPO	
Ambient temperature	–20 to +60 °C	
Control air	Pressure range	2 to 8 bar
	Standard	acc. ISO 8573-1:2010
	Solid particle content	Quality class 6
	Water content	Quality class 4
	Oil content	Quality class 3
Size air connections	Metric 6/4 mm, inch 6.35/4.31 mm (¼")	
Protection class	IP 66	
Noise level via exhaust air throttle	max. 72 dB	
Visualization	LED (green/yellow)	
Certificates	CE	
Certificates (optional)	C SP US	• CSA C22.2 • UL 429



Interface module	24 V DC, 3-wire, PNP 24 V DC, 3-wire, NPN	48–130 V AC
Power Supply		
Nominal supply voltage	24 V DC (+20 %, –15 %)	48–130 V AC
No-load current	≤ 40 mA	≤ 51 mA
Max. power input	285 mA	185 mA
Reverse voltage protection	Yes	Yes
Certificate	cCSAus/CE	cULus/CE
Inputs		
Control 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	≤ 2 mA
Activation "PV Y1"	Direct control of solenoid valve	electronic input
Activation "PV Y2"	Direct control of solenoid valve	electronic input
Activation "PV Y3"	Direct control of solenoid valve	electronic input
Outputs		
Switching type	24 V DC (PNP/NPN switchable)	
Max. power rating per feedback output	50 mA	≤ 100 mA
Voltage drop 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

* When PLC modules with electronic outputs are used, leakage currents can be generated. If leakage currents above 1,5 mA are present, a loading resistor must be provided in parallel to the interface module. Recommendation: 15 KΩ/2 W

Position	Description of order code	
1	**Location of feedback**	
	TM1.	Control module T.VIS® M-1
2	**Control module 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	**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	None
6	**Connection**	
	M	Metric air connection, M20×1.5 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)

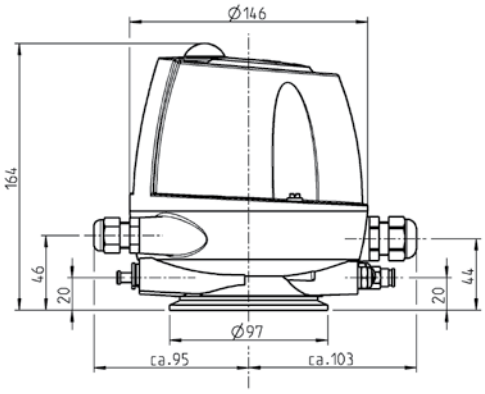
	Options (multiple selection possible)	
	-0	No further options
	/18	Air supply throttle: Controls opening speed of the valves
	/19	Exhaust air throttle: Controls closing speed of the valves
	/22	5-pin plug (M 12) for connections J, P (Material-No. 508-963) 8-pin plug (M 12) for connections H, I (Material-No. 508-061)
	/43	Material PA 12/L: UV resistant, oil and fat resistant
	/50	Metal label for plant identification number
	/52	Sticker label for plant identification number
	/67	Protection class IP 67
	/UC	Certification UL/CSA

Please note: If no further options are selected, -0 is printed after position 6 on the identification plate.
If one or more options are selected, -S is printed instead.

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

Position	1	2	3	4	5	6	Options						
Code	TM1.												

Technical data of standard variant		
Position detecting	Sensors	
Casing material	PPO	
Ambient temperature	–20 to +60 °C	
Control air	Pressure range	2 to 8 bar
	Standard	acc. ISO 8573-1:2010
	Solid particle content	Quality class 6
	Water content	Quality class 4
	Oil content	Quality class 3
Size air connections	Metric 6/4 mm, inch 6.35/4.31 mm (¼")	
Protection class	IP 66	
Noise level via exhaust air throttle	max. 72 dB	
Visualization	LED (green/yellow)	
Certificates	CE	
Certificates (optional)	cULus	• CSA C22.2 • UL 429



Interface module	AS-Interface Bus	DeviceNet
Power Supply		
Nominal supply voltage	23.5–31.6 V DC	21–26 V DC
No-load current	≤ 62 mA	≤ 58 mA (bei 24 V DC)
Max. power input	225 mA	235 mA
Reverse voltage protection	Yes	Yes
Specifications	AS-i V2.11 (max. 62 slaves with master V2.11)	ODVA conforming
Additional information	ID.ID2.IO-Code: 7.A.E	EDS-File: F1022_R4.eds
Certificate	AS-i Association/CE/cCSAus	ODVA/CE
Inputs		
Feedback "Start position"	Data bit DI 0	Data bit DI 0
Feedback "End position"	Data bit DI 1	Data bit DI 1
Feedback "Seat-lift position" (ext. NI)	Data bit DI 2	Data bit DI 2
Common fault		Data bit DI 7
Outputs		
Activation "PV Y1"	Data bit DO 0	Data bit DO 0
Activation "PV Y2"	Data bit DO 1	Data bit DO 1
Activation "PV Y3"	Data bit DO 2	Data bit DO 2

Position	Description of order code	
1	**Location of feedback**	
	TM1.	Control module T.VIS® M-1
2	**Control module 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 1 proximity switch
4	**Interface module**	
	A	AS-Interface bus
	D	DeviceNet
5	**Solenoid valve**	
	A	24 V DC, 0.85 W
	0	None
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)	
	-0	No further options
	/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, Material-No. 508-963)
	/43	Material PA 12/L: UV resistant, oil and fat resistant
	/50	Metal label for plant identification number
	/52	Sticker label for plant identification number
	/67	Protection class IP 67
	/81	AS-i connection box on cable 1 m with M12 plug (Material-No. 508-027) for connections L, U
	/82	AS-i connection box on cable 2 m with M12 plug (Material-No. 508-028) for connections L, U
	/UC	Certification UL/CSA

Please note: If no further options are selected, -0 is printed after position 6 on the identification plate.
If one or more options are selected, -S is printed instead.

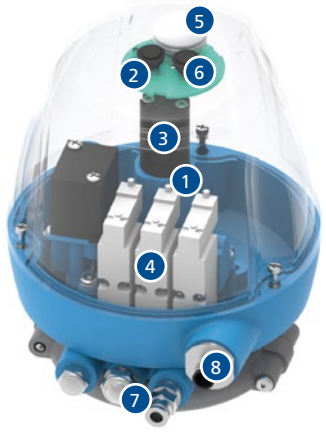
The code is composed as follows, depending on the chosen configuration:

Position	1	2	3	4	5	6	Options						
Code	TM1.												

Concept

Employing a high-precision path measuring system, the T.VIS® A-8 offers automatic end-position detecting on any GEA Tuchenhagen valve that can be fitted with a T.VIS® feedback system.

Our development work has focused on the requirements and wishes of our customers in the liquid processing industry. Apart from the safe and reliable monitoring and control of all functions of the process valves in breweries, dairies, fruit juice production plants as well as in the pharmaceutical industry, T.VIS® A-8 offers significant advantages which are instantly reflected in lower total cost of ownership (TCO).



1. Air-routing with internal switch bar
2. Control unit
3. Path measuring system
4. Solenoid valves
5. LED visualization
6. 2 push buttons
7. Central compressed-air supply with replacable filter
8. M12 plug

Features

- Quick, automatic initialization
- Secure against mal-adjustment of tolerances
- Reduced energy consumption
- Solenoid valves protected by filter
- Reduced operational costs
- LED visualization of valve status
- End position LED colors switchable
- Supply and exhaust air throttles fittable

Structure

The T.VIS® A-8 is equipped with a precise path measurement system for position detecting.

The path measurement system is part of the closed T.VIS® control module, which never needs to be opened. All the necessary wiring for activation and feedbacks is connected from outside via a standard M12 plug.

Operation and configuration of the T.VIS® A-8 is enabled by two push buttons on the cap, which are secured against unintentional activation during operation.

A replacable air supply filter protects the solenoid valves.

Position detecting

Contact-free path measuring system – The valve positions are detected by an ultramodern, contact-free path measurement system.

Set-up

Automatic – After unlocking simply pushing the two push-buttons on the cap starts the fully automatic set-up procedure. The control module does not need to be opened to do so which leads to a very easy, safe and quick commissioning of the control module (approx. 1 minute).

End position tolerances and signal damping can be adjusted immediately after setup in the parameters menu.

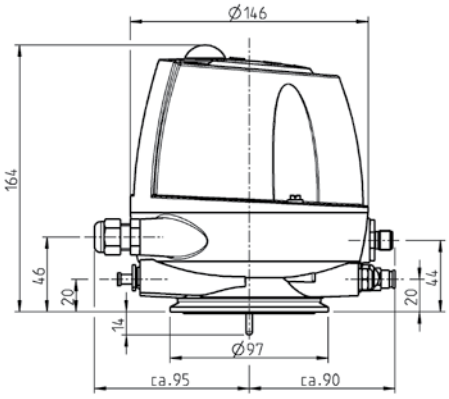
Visualization

LED display:
- green = start position
- yellow = end position
- red = setup
- red blinking = error

Via a programmable color setting the display colors green and yellow can be exchanged.

Technical data of standard variant		
Position detecting	Contact-free path measuring system	
Casing material	PPO	
Ambient temperature	–20 to +60 °C	
Control air	Pressure range	2 to 8 bar
	Standard	acc. ISO 8573-1:2010
	Solid particle content	Quality class 6*
	Water content	Quality class 4
	Oil content	Quality class 3
Size air connections	Metric 6/4 mm, inch 6.35/4.31 mm (¼")	
Protection class	IP 66	
Noise level via exhaust air throttle	max. 72 dB	
Visualization	LED (green/yellow/red)	
Certificates	CE	
Certificates (optional)	cULus	• CSA C22.2 • UL 61010-1

* recommended



Interface module	24 V DC, 3-wire, PNP	AS-Interface Bus	DeviceNet
Power Supply			
Nominal supply voltage	24 V DC (+20 %, –12.5 %)	23.5–31.0 V DC	21–26 V DC
No-load current	≤ 25 mA	≤ 25 mA	≤ 35 mA
Max. power input	265 mA	65 mA	75 mA
Reverse voltage protection	Yes	Yes	Yes
Specifications		AS-i V3.0 (max. 62 slaves)	
Additional information		IO.ID.ID2.-Code: 7.A.E.	
Certificate	CE	AS-i Association/CE	ODVA
Inputs			
Connection type	24 V DC (PNP)		
Short circuit proof	Yes		
Overcharge safe	Yes		
Max. power rating 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			
Control 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

Position	Description of order code	
1	**Location of feedback**	
	TA8.	Control module T.VIS® A-8
2	**Control module 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
	9	2 digital feedbacks with 1 proximity switch
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	None
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)

	Options (multiple selection possible)	
	-0	No further options
	/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 (Material-No. 508-963) 24 V DC: 8-pin plug for connections H, I (Material-No. 508-061)
	/43	Material PA 12/L: UV resistant, oil and fat resistant
	/50	Metal label for plant identification number
	/52	Sticker label for plant identification number
	/67	Protection class IP 67
	/81	AS-i connection box on cable 1 m with 5-pin M12 plug (Material-No. 508-027)
	/82	AS i connection box on cable 2 m with 5-pin M12 plug (Material-No. 508-028)
	/UC	Certification UL/CSA

Please note: If no further options are selected, -0 is printed after position 6 on the identification plate.
If one or more options are selected, -S is printed instead.

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

Position	1	2	3	4	5	6	Options						
Code	TA8.												

Concept

A control unit on the basis of the technology of the T.VIS® A-8, the T.VIS® P-20 with path measuring system can, in combination with an air-to-spring actuator, realize any desired valve position between the learned end positions.

The T.VIS® P-20 is characterized by its performance, easy handling and favorable price-performance ratio.

1. Air-routing with internal switch bar
2. Control unit
3. Path measuring system
4. Solenoid valves
5. LED visualization
6. 2 push buttons
7. Replacable filter
8. M12 plug
9. Air supply throttle
10. Exhaust air throttle

Features

- Automatic initialization
- LED visualization of valve status
- Selectable deadband (control hysteresis)
- Simple and secure handling
- Manual operation of the process valve
- Feedback of end positions (optional)
- High cost reduction potential

Structure

The T.VIS® P-20 is equipped with an ultra-modern position measuring system to constantly acquire the current valve position.

The path measurement system is part of the closed T.VIS® control module, which never needs to be opened. The necessary wiring for activation and feedback is always connected externally via a standard M12 plug.

Operation and configuration of T.VIS® P-20 is enabled by two push buttons on the top of the cap, which are secured against unintentional activation during operation.

Position control

The position controller T.VIS® P-20 is equipped with a microprocessor and software for operation, visualization as well as intelligent position measurement and processing. Any user-defined set-value (4 – 20mA), provided for example by the SPS control system, will be automatically realized and maintained. The set-value can also be manually programmed through the push buttons on the top of the control module. Current position can be given out via analog signal or optional via three binary outputs to be processed by SPS.

Set-up

Automatic – After unlocking simply pushing the two push-buttons on the cap starts the fully automatic set-up procedure. The control module does not have to be opened resulting in a simple, safe and exceptionally quick set-up (approx. 1 minute).

End position tolerances, control hysteresis and control features can be adjusted immediately after setup in the parameters menu.

Visualization

LED display:
- green = start position
- yellow = end position
- blue = position regulated
- blue blinking = position to be regulated
- red = setup
- red blinking = error

Via a programmable color setting the display colors green and yellow can be exchanged.

Feedback signals

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

Application

The position controller T.VIS® P-20 can be applied on a Butterfly Valve T-smart 7 to control the valve disk position. Opening the valve in specific partial positions can be used to regulate the hydraulic characteristics of a system.

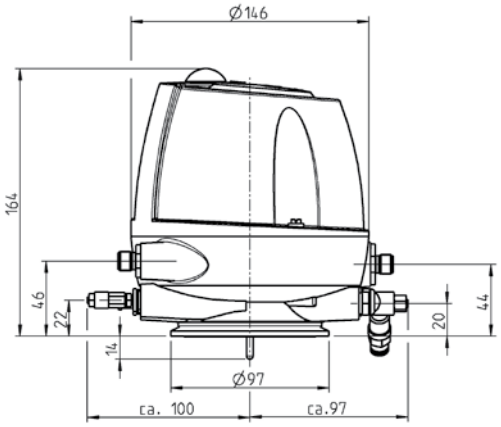
For simple control tasks the T.VIS® P-20 is a cost-favorable alternative to proven control valve types.

Flow rate control

The position controller T.VIS® P-20 offers both linear and equal-percentage transformation of position signals. This makes it possible to achieve significantly more exact partial positions of the valve disk in positions close to the non-activated position.

Technical data of standard variant		
Position detecting	Contact-free path measuring system	
Casing material	PPO	
Ambient temperature	–20 to +60 °C	
Control air	Pressure range	2 to 8 bar
	Standard	acc. ISO 8573-1:2010
	Solid particle content	Quality class 6*
	Water content	Quality class 4
	Oil content	Quality class 3
Size air connections	Metric 6/4 mm, inch 6.35/4.31 mm (¼")	
Protection class	IP 65	
Noise level via exhaust air throttle	max. 72 dB	
Visualization	LED (green/yellow/red/blue)	
Certificates	CE	

* recommended



Interface module	24 V DC programmable
Power Supply	
Supply voltage U_V	24 V DC (+20 %, –12.5 %)
No-load current	≤ 20 mA
Max. power input	$\sum_I = (I_{T.VIS} + I_{PV} + I_{RM})$ ± 10 % 260 mA
Residual ripple max.	5 %
Inputs	
Control voltage max. 28.8 V DC	High = ≥ 13 V DC Low = ≤ 6 V DC
Control current	≤ 10 mA
Outputs	
Output voltage	High = U_V – ≤ 5 % Low = ≤ 5 V
Current max.	($\sum_{IRM}$) 200 mA short circuit proof
Switching frequency	(resistive + inductive loads ≤ 25 mH) 2 Hz
Operating current	internal solenoid valve (I_{PV}) 35 … 45 mA
Analogue input	Nominal valve 4–20 mA/0–100 % stroke
Analogue input	Actual valve 4–20 mA/0–100 % stroke
Load	max. 600 Ω

Position	Description of order code	
1	**Location of feedback**	
	TP20.	Control module T.VIS® P-20
2	**Control module type**	
	I	2 solenoid valves
3	**Feedback**	
	4	T.VIS® P-20 (with analog module)
	5	T.VIS® P-20 (with analog module + 2 feedback signals and error signal)
4	**Interface module**	
	P	24 V DC programmable
5	**Solenoid valve**	
	A	24 V DC, 0.85 W
6	**Connection (with analog module)**	
	D	Metric air connection, 5-pin M12 plug, A-coded With feedback code 5: additional M12 plug B-coded included
	K	Inch air connection, 5-pin M12 plug, A-coded With feedback code 5: additional M12 plug B-coded included
	PLEASE NOTE: Add compatible plug socket to your order as needed.	

	Options (multiple selection possible)	
	-0	No further options
	/22	5-pin plug socket for A-coded plug (Material-No. 508-963) 5-pin plug socket for B-coded plug (Material-No. 508-964)
	/43	Material PA 12/L: UV resistant, oil and fat resistant
	/50	Metal label for plant identification number
	/52	Sticker label for plant identification number
	/67	Protection class IP 67

Please note: If no further options are selected, -0 is printed after position 6 on the identification plate.
If one or more options are selected, -S is printed instead.

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

Position	1	2	3	4	5	6	Options						
Code	TP20.	I		P	A								

Concept

The SES Control Module stands out for its proven sensor technology. The control module comprises an interface module, up to two sensors for carrying out feedback of the valve position and up to three solenoid valves that can be installed.

The SES is available only with PA 12/L material, since conductivity of the material is required for application 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 detected via two manually adjustable proximity switches for the non-actuated position and the actuated position.

Set-up

Mechanically – the proximity switches are adjusted mechanically via positioning on the threaded rod.

Visualization

Position of switch bar – The position of the switch bar, which protrudes from the control module, indicates the valve position.

Field of application

Approved for application in explosive atmospheres:*

- **with proximity switch** up to zone 1 and 20**
  - to be connected to approved, intrinsically safe components
  - ATEX marking:
    II 2G Ex ia IIC T6
    II 1D Ex iaD 20 T97 °C

- **with solenoid valve up to zone 0 and 20**
  - to be connected to approved, intrinsically safe components
  - ATEX marking:
    II 2G Ex ia IIC T6

- **with interface module**
  - not subject to Ex-approval, as this is merely a passive component

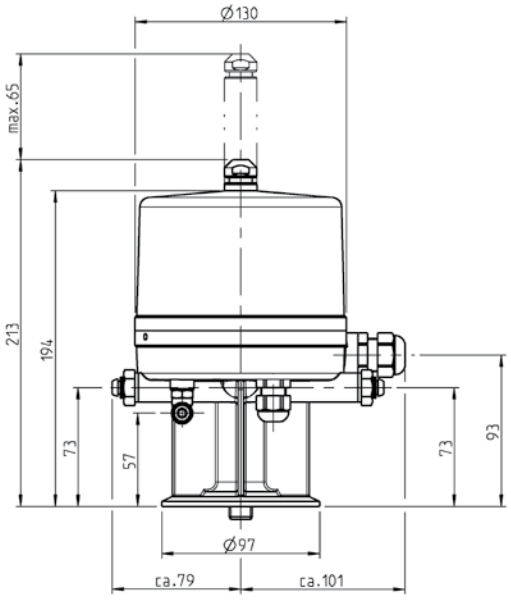
Please note

*) An ATEX certificate for the complete control module does not exist. Certificates can only be issued for the individual components of the control module. Please note that the permitted Ex zone/ATEX category of the complete control module depends on the approval of the component with the lowest protection level.

**) The intrinsically safe components may only be connected individually to an approved safety barrier. This arrangement allows the components to be used in a hazardous area.

Technical data of standard variant		
Position detecting	Inductive proximity switches	
Casing material	PA 12/L	
Ambient temperature	0 to 45 °C	
Control air	Pressure range	1.5 to 7 bar
	Standard	acc. ISO 8573-1:2010
	Solid particle content	Quality class 6
	Water content	Quality class 4
	Oil content	Quality class 3
Size air connections	Metric 6/4 mm, inch 6.35/4.31 mm (¼")	
Protection class	IP 65*	
Noise level via exhaust air throttle	max. 72 dB	
Visualization	Position of switch bar	
Certificates	CE	
	Ex	• II 2G EEx ia IIC T6**
Certificates (optional)	CSA C US	• CSA C22.2 • ANSI/ISA 82.02.01-1999 • UL 1203, 4th Ed. • UL 429, 6th Ed. • ISA/ANSI 12.12.01-2011

* not if installed upside-down ** standard for SES



Interface module	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)
Device 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
Material-No.	505-093	505-093

Solenoid valve		
Nominal voltage	12 V DC –10 % / +25 %	24 V DC –10 % / +15 %
Nominal rating	0.5 W	0.5 W
Device category	II 1GD Eex ia IIC T6	II 1GD Eex ia IIC T6
Material-No.	512-124	512-155

Position	Description of order code	
1	**Location of feedback**	
	SES.	Control module sensor technic
2	**Control module 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	None
	1	1 feedback
	2	2 feedbacks
	3	2 feedbacks with external initiator
4	**Interface module**	
	E	EEx/ATEX
5	**Solenoid valve**	
	0	None
	E	12 V DC, ATEX
	X	24 V DC, ATEX
6	**Connection**	
	M	Metric air connection, Pg 13.5 cable connection
	Z	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 Module SES)
	/50	Metal label for plant identification number
	/52	Sticker label for plant identification number
	/UC	Certification UL/CSA

Please note: -S is printed after position 6 on the identification plate.

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

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

Switch bars and adapters

For retro-fitting a T.VIS® feedback system on a Butterfly Valve T-smart the following components are required:

Butterfly Valve T-smart 7			
	T.VIS® M-1	T.VIS® A-8/T.VIS® P-20	SES
Switch bar	**224-001227**	**224-001226**	**221-405.03**
Adapter switch bar	–	–	**224-001225**

Mixproof Butterfly Valve T-smart 9			
	T.VIS® M-1	T.VIS® A-8	SES
Switch bar	**224-001227**	**224-001226**	**221-405.03**
Adapter switch bar	–	–	**224-001225**

Polyamide material (PA 12/L)

Control modules made of PA 12/L material provide, via their black color, clear differentiation from the standard blue control modules.

PA 12/L offers good UV radiation resistance and resistance against substances containing oil or fat.

All T.VIS® M-1, A-8 and P-20 units can optionally be configured with PA 12/L.

Owing to its conductivity, PA12/L also is the standard material for control units which are operated in explosive areas.

Application: UV radiation, oil, fat

	Order code for air connection		In combination with connection or plug	Application	Corresponding connection socket		
	Metric	Inch			Option	Material-No.	Designation
	M		M20×1,5 cable connection	T.VIS® M-1	–	–	–
			Pg 13,5 cable connection	SES	–	–	–
		Z	0,5" NPT cable connection	T.VIS® M-1	–	–	–
			Pg 13,5 cable connection	SES	–	–	–
	A	S	M20×1,5 cable connection with connection box on cable 1 m	T.VIS® M-1 (AS-i)	–	–	–
	L	U	2-pin M12 plug (A-coded)	T.VIS® M-1 (AS-i)	/22	508-963	5-pin M12 connection box (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-1 (DeviceNet)	/22	508-963	5-pin M12 connection socket (A-coded)
				T.VIS® P-20			
			5-pin M12 plug (B-coded)	T.VIS® P-20 (additionally with 2 feedback signals and error signal)		508-964	5-pin M12 connection socket (B-coded)
	J	P	5-pin M12 plug (A-coded)	T.VIS® M-1 (24 V DC) T.VIS® M-1 (48–130 V AC)	/22	508-963	5-pin M12 connection socket (A-coded)
				T.VIS® A-8 (24 V DC) T.VIS® A-8 (AS-i) T.VIS® A-8 (DeviceNet)			
	H	I	8-pin M12 plug (A-coded)	T.VIS® M-1 (24 V DC) T.VIS® M-1 (48–130 V AC)	/22	508-061	8-pin M12 connection socket (A-coded)
				T.VIS® A-8 (24 V DC)			
		B	Brad Harrison 0,5" NPT 5-pin plug	T.VIS® M-1 (24 V DC) T.VIS® M-1 (48–130 V AC)	–	–	–

24 V (PNP/NPN)

In case of 24 V parallel wiring, digital signals are exchanged between one terminal unit and, usually, corresponding assembly and extension groups of an SPS. For every signal, a dedicated wire is required, usually in the form of a multi-core cable.

PNP (sourcing) designates a signal transmission against reference potential L–.

NPN (sinking) designates a signal transmission against reference potential L+.

BUS AS-Interface

The AS-Interface (AS-i = Actuator Sensor Interface) is a standard for fieldbus communication. It was developed for the connection of actuators and sensors with simple wiring to replace the conventional parallel wiring. Since 1999 the AS-Interface is a standard according to EN50295 and IEC62026-2. The AS-International Association certifies AS-i products to ensure that products from different manufacturers will work together in a system. An unscreened two-wire yellow flat cable serves for data transmission as well as for voltage supply (24 – 30 V DC) for the communication electronics and for participants with a low current requirement. Up to 62 slaves can be connected per master. Each of these slaves needs an unambiguous address, entered manually via a handheld address programming device, or automatically via the AS-i master. The maximum length of AS-i cables is 100 m, which can be extended to 400 m with repeaters.

BUS DeviceNet

DeviceNet is a CAN-based fieldbus which is mainly applied in automation technology. DeviceNet was developed by Allen-Bradley (a part of Rockwell Automation) and submitted as an open standard to the ODVA (Open DeviceNet Vendor Association). DeviceNet is primarily common in the USA and in parts of Asia. It can serve max. 64 network nodes per fieldbus segment. The so-called node address can either be entered per rotary switch or DIP switch on the device, or configured via bus with corresponding software. The maximum length of a DeviceNet cable depends on cable type and baud rate, but is limited to max. 500 m.

48 – 130 V AC

This is a type of parallel wiring that works with AC signals, which are processed in the control unit via a long-range E/A module. This communication technology is primarily applied at 110 V in the USA and Canada, but also at 48 V in parts of southern Europe.

NAMUR

The two-conductor NAMUR sensors and solenoid valves presented here are, according to their ignition protection category, “intrinsically safe” for application in Ex zones. The use of external isolation amplifiers enables control units with this communication technology to operate in areas up to zone 1 and 21.

External indicators are available for fitting on the bracket of a pneumatic actuator or an optional initiator and lock holder on a standard manual actuator.

Proximity indicator	Material-No.
2-wire (terminal chamber)	505-035
3-wire PNP (M12 plug)	505-096
NAMUR (terminal chamber)	505-085

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 sizes**			
	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**	
	TM1.	Control module T.VIS® M-1
2	**Control module 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	0	0	0

+

Position	1	2	3	4	5	6	Options						
Code	TM1.	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		Confomité 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 techology
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 by ODVA
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	Confomité 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 industies, associated research institutes and public health services
EN	European Norm, a term for regulations issued by the European Comitee 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	Polyamide
Pg	For German “Panzergewinde” = armoured thread
PNP	Signal transmission against reference potential L– (sourcing)
PPO	Polyphenylene oxide, thermoplastic material
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 Tuchenhagen Control Unit for Ex areas, a Control Unit system from GEA Tuchenhagen
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 Mjölk 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 Tuchenhagen Valve Information System, a program of Control Modules from GEA Tuchenhagen
T-smart	Valve series from GEA Tuchenhagen
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 Tuchenhagen
VMQ	High-polymer vinyl methyl polisiloxane, 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 ex works 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 delive ries 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.

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