

GEA Tuchenhagen Seat Valves T-smart
Business Line Hygienic Valve Technology

Catalog 2015

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

The GEA Group

GEA Group Aktiengesellschaft is one of the largest system providers for the food-processing industry. As an internally active technology group, GEA focuses on process technology and components for demanding production processes in different end markets.

The Business Unit GEA Flow Components

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

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



Four business lines – for everything that flows

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

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

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

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



Hygienic Valve Technology

GEA Tuchenhagen



Hygienic Pump Technology

GEA Tuchenhagen



Cleaning Technology

GEA Breconcherry



Aseptic Valve Technology

GEA Aseptomag



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

GEA Tuchenhagen seat valves of the T-smart series can save you considerable costs. The compact actuators and efficient control technology ensure low energy consumption.

The design of the valves without dead space satisfies the most exacting hygienic requirements and prevents unnecessary product losses. Long-lived seals help reduce operating costs. These design features reduce the consumption of valuable energy, water and cleaning media, as well as the time and staff expenditure for cleaning and maintenance.

The ROI on your investment in innovative process technology from GEA Tuchenhagen will be quickly noticeable.

Economical

Higher product quality

Reduced consumption of energy, water and cleaning media

Reduced time and personnel costs for maintenance and cleaning



You score points with environmental protection

Lower consumption of energy, water and chemicals means less pollution for the climate and environment. GEA Tuchenhagen meets these requirements by complying with binding international standards.

As a user of GEA Tuchenhagen products, you benefit from proven environmentally-friendly production processes, as well as the high standards for hygienic processing and care of your products. This makes a significant contribution to protecting the global environment and climate.

With our products, you show how important sustainable working processes are to you and that you take responsibility for future generations!

Our support is your gain

In addition to our product range, you can also make use of the individualized engineering support from GEA Tuchenhagen. Even before you have started using our products, this support provides you with extensive digital tools – from technical drawings to 3-D models.

The individualized service concepts from GEA Tuchenhagen ensure that maintenance work is conducted with the lowest amount of production downtime possible. We look forward to creating and customizing a maintenance plan for you.

Sustainable
Lower climate and environmental impact
Sustainable, environmentally friendly production processes
High standards for hygienic processing and care of products

Service-oriented
Individual engineering support
Shortest possible interruptions of production
Individual service concept

Seat valves T-smart

The compact seat valves of the T-smart series set new standards for high power with low space demands. Due to their small build, the valves have a low weight, which considerably simplifies operation. Low operation, maintenance and servicing costs contribute to high system productivity.

The T-smart valve series offers valves in standard forms that are often used with optional equipment parts and comprehensive accessories. All necessary versions in housing spaces and control top types are available.

Like all GEA components, the T-smart series corresponds to the highest quality demands and seamlessly merges with the outstanding product range “Made by GEA Tuchenhagen”.

Seat valves T-smart are subject to production certified acc. to DIN EN ISO 9001:2000 without exception and correspond to the requirements of the European Hygienic Engineering and Design Group (EHEDG).

The T-smart valves have not only been tested for precise compliance with the guidelines named, but also have passed an independent and a standardized cleaning test for their suitability with easy and efficient cleaning.



Small and compact
Low weight
Maintenance-friendly
Low servicing costs

Hygienic design
Low risk of contaminating the end product
Maximum efficiency in cleaning
Lower CIP costs

The bayonet lock

The innovative bayonet lock is the perfect interface between the valve lantern and the housings. In connection with pre-tension-free radial seals, the benefit of this lock is that the user does not need any special tools to (dis)assemble the valve insert. Clamping connections were not used at all. The bayonet lock meets all necessary safety requirements: A securing clip prevents inadvertent twisting/opening of the valve; the two interlocking metal surfaces of the bayonet lock additionally secure against opening of the valve under product pressure.

Seat Valves T-smart
Reliable and simple maintenance
Hygienic and space-saving design
Suitable material selection for metal components and seals
High surface quality of components in contact and not in contact with the product
Self draining system of the housings without domes and sumps
GEA Tuchenhagen valve technology

Actuator

The actuators of the T-smart seat valve series are available spring-to-open and spring-to-close. This must be indicated clearly by the article number when ordering, since the actuator cannot be turned subsequently to change the effect.

The design of T-smart seat valves has been standardized as well. The lift functions for both valve discs are integrated into the actuator as standard.

GEA Tuchenhagen utilizes its known high quality demands and always maintenance-free designs with its actuators of the T-smart seat valve series. This ensures maximum safety for the user, since the actuators do not have to be opened with the present spring forces for maintenance purposes.

Valve housing

The housings of the T-smart seat valve series are delivered standardized with an inner surface quality of $Ra \leq 0.8\mu m$ and a ground outer surface. This corresponds to the required surface qualities of the essential standards in the valve design (e.g. EHEDG).

For single-seat valves (shut-off, divert and tank bottom valves), in-line and angle housings (L- and T-housings) are available as standard versions. Different housing combinations can be chosen for double-seat valves.

For all T-smart seat valves, the housing combinations are designed as firmly connected housings; therefore, the correct angle between the housings must be ensured when you place the order. The different angles are determined by the article numbers and must be indicated clearly in the order code.

Seals

The sealing of the valve discs takes place by maintenance-friendly O-rings, available in material EPDM. Particularly narrow production tolerances for these O-rings ensure hygienically proper sealing under the different process conditions.

To reduce necessary spare parts inventories at the customer's site, seals of the same kind are reused according to valve type and rated widths, so that the number of required sealings is minimal.

Valve informations system T.VIS®

Control tops of the T.VIS® generation are available in different versions for the T-smart seat valves, under which the proper selection is made depending on customer needs. The T.VIS® control tops are individually optimized for each customer, independently of whether the proven sensor technology of the T.VIS® M-15 or the state-of-the-art path measuring technology of the T.VIS® A-15 are used.

T-smart benefits
Made by GEA Tuchenhagen
EHEDG-certified
Innovative bayonet lock

Pipe classes

The dimensions of the welding ends comply with the following standards:

- **Metric:** Outside diameter acc. to DIN 11850
- **Inch OD:** Outside diameter acc. to BS 4825

Surfaces

Surfaces in contact with the product are designed in $Ra \leq 0.8 \mu m$ as standard.

Materials

Components in contact with the product are produced from AISI 316 L, while those not in contact with the product are made from AISI 304.

For detailed information about the properties of the materials, refer to the **material properties table**.

Material test certificates

Optionally, the valve housings and product wetted parts can be supplied with a test report 2.2 or an inspection certificate 3.1 acc. to EN 10204.

Seal materials

Seals in contact with the product are EPDM. NBR material is used for seals not in contact with the product.

The mixing constituents of our seal materials are contained in the FDA "**White List**" and are in accordance with "**FOOD and DRUG**" (FDA) guidelines 21 CFR Part 177.2600 or 21 CFR 177.1550: "Rubber articles intended for repeated use".

The resistance of the seal material depends on the nature and temperature of the product being transported. The contact time can negatively affect the service life of seals.

For detailed information about the properties of the seal materials, refer to the seal material properties table.

Operating pressure

The valves can be used up to a vacuum of -0.95 bar and are designed up to a product pressure of 5 bar (NC: DN 80–DN 100, OD 4") or 6 bar (NC: DN 25–DN 65, OD 1"–OD 3" / NO: DN 25–DN 100, OD 1"–OD 4").

Ambient conditions

T-smart seat valves may be used at ambient temperatures of $0 \text{ to } 45 \text{ }^\circ\text{C}$ ($32 \text{ to } 113 \text{ }^\circ\text{F}$). If the valves are equipped with a control top and have solenoid valves contained in them, the ambient temperature must be between $0 \text{ and } 45 \text{ }^\circ\text{C}$ ($32 \text{ and } 113 \text{ }^\circ\text{F}$). The permitted ambient temperature for the proximity switches is $-20 \text{ to } 80 \text{ }^\circ\text{C}$ ($-4 \text{ to } 176 \text{ }^\circ\text{F}$).

The valves can also be used outdoors. However, in these application areas they must be protected against icing, or else de-iced before switching or lifting.

The product or operating temperature depends on the seal material and can be seen in the **seal material properties table**.

T-smart seat valves must be installed without stresses. Lateral forces such as expansion of the pipelines due to heat cannot be compensated in the valve; as a result valve damage is possible. In such cases, we recommend taking measures to compensate for the expansion, such as by using the VARICOMP® expansion compensator.

The required clearance for installing and removing a T-smart seat valve is specified in the particular technical data and dimensional sheet.

Air supply

The air supply pressure is min. 6 bar , max. 8 bar . The actuator sizes are designed for an air supply pressure of min. 6 bar . The quality of the air supply must meet the requirements of ISO 8573-1:2010.

ISO 8573-1:2010	
Solid content	Quality class 6
	Particle size max. $5 \mu m$
	Particle density max. 5 mg/m^3
Water content	Quality class 4
	Max. dew point $3 \text{ }^\circ\text{C}$
	A correspondingly different dew point is required for applications at high altitude or with low ambient temperatures.
Oil content	Quality class 3
	Max. $1 \text{ mg oil per } 1 \text{ m}^3 \text{ air}$, preferably oil-free

Actuator types

Seat valves T-smart are delivered with a pneumatic actuator. They are configured for long-term operation, and are maintenance-free.

Technical Data

Feedback

In the control top

See section 7: Control and feedback systems

Proximity switch holder on the actuator

The proximity switch holder M12x1 (INA) makes it possible to use feedback sensors above the actuator. The proximity switch holder has prepared M12x1 holes which allow the sensors to

be set optimally. A direct connection to the controller provides the feedback on the valve position (see section 7: Control and Feedback Systems).

Recommended flow direction

If possible, the valves should close against the flow direction in order to avoid water hammer.

Material properties

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

* Effective sum of stainless steels = % Cr + 3.3 × (% Mo + 0.5 W) + 20 N


Seal material properties


Seal material			EPDM
General application temperature*			–40 to 135 °C –40 to 275 °F
Medium	Concentration	At permitted operating temperature	
Alkali	≤ 3 %	up to 80 °C	+
	≤ 5 %	up to 40 °C	+
	≤ 5 %	up to 80 °C	+
	> 5 %		○
Inorganic acid**	≤ 3 %	up to 80 °C	+
	≤ 5 %	up to 80 °C	○
	> 5 %	up to 100 °C	–
Water		up to 80 °C	+
Steam		up to 135 °C	+
Steam, approx. 30 min		up to 150 °C	+
Hydrocarbons/ fuels			–
Products containing grease	≤ 35 %		+
	> 35 %		–
Oils			–


+ = Good resistance
○ = Reduced service life
– = Not resistant


Other applications on request
* Depending on the installation situation
** Inorganic acids include hydrochloric acid, nitric acid, sulphuric acid

Catalogs
Hygienic Valve Technology


 Hygienic Valves
VARIVENT® and ECOVENT®

 Butterfly Valves T-smart

 Seat Valves T-smart

 Hygienic Valves
and Components

Catalogs
Hygienic Pump Technology

 Hygienic Centrifugal Pumps

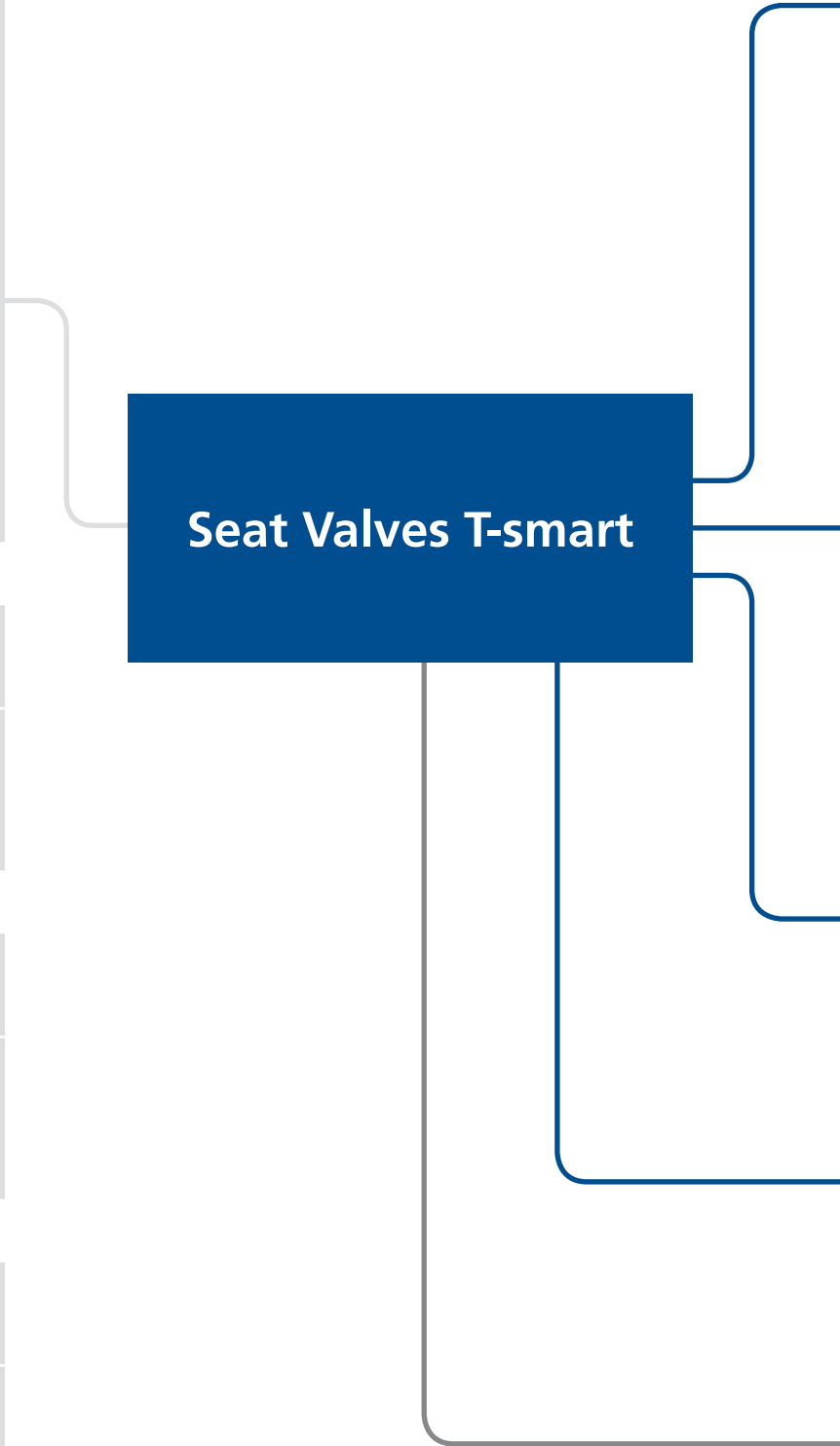
Catalogs
Aseptic Valve Technology

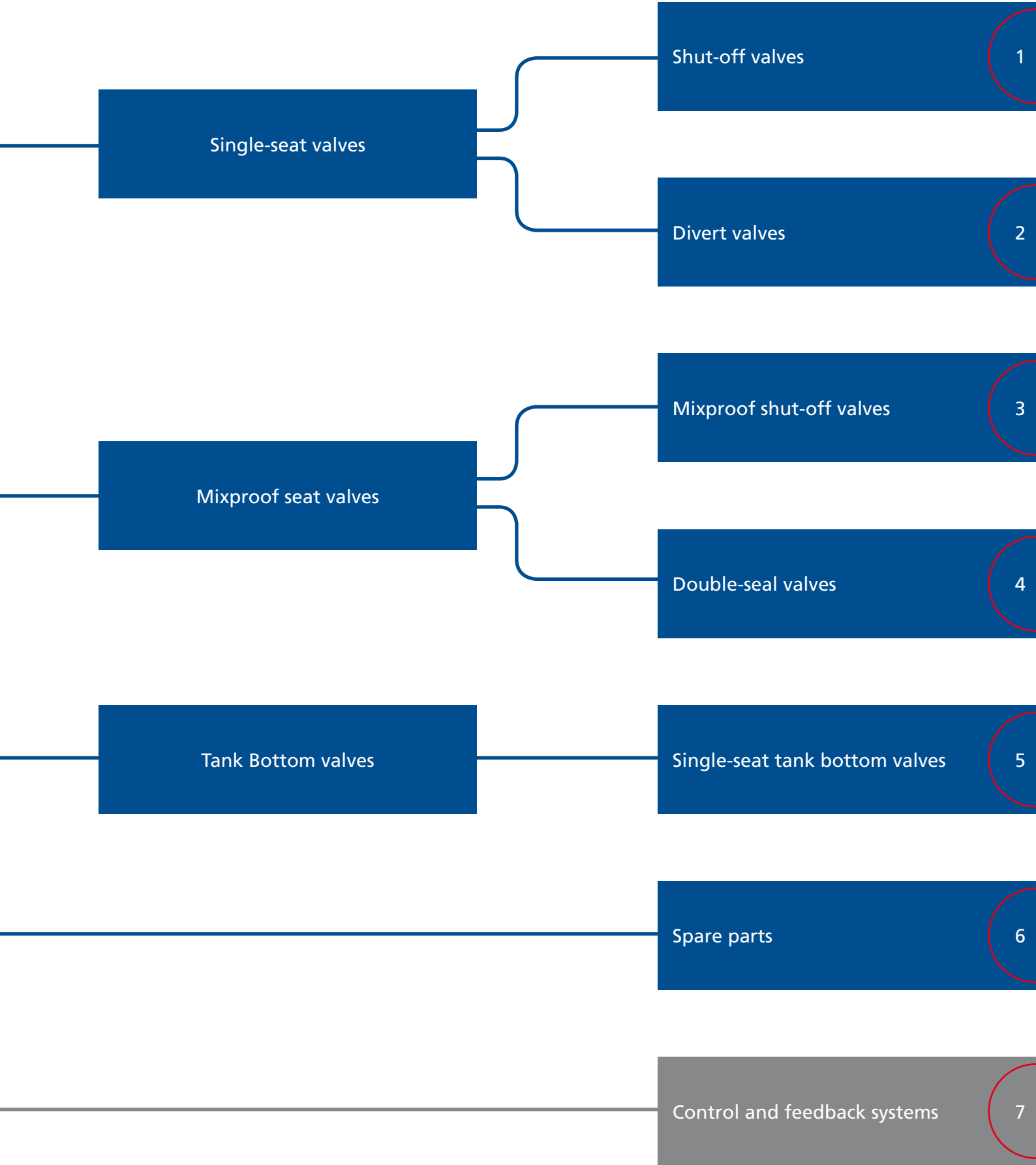
 Aseptic Valve Technology

Catalogs
Cleaning Technology

 Cleaning Technology

Seat Valves T-smart







T-smart shut-off valves – Series 1000

T-smart single-seat valves of the 1000 series are used for simple shut-off in hygienic applications. The valves are characterized by their ease of operation and flexibility.

Function of the valve

In the simple shut-off, there is only one seal in the one-piece valve disc separating the pipelines from one another. This means liquid can pass from one pipeline to the other in the event of a seal defect. For this reason, shut-off valves of the 1000 series are not suitable for separating incompatible fluids.

Application examples

In practical use, these valves are used, for example, as emptying/drainage valves or for shutting off a bypass line. Frequently, these types of valve are also used as dosing valves.

Special features
EHEDG-certified hygienic configuration
Small and compact
Maintenance-friendly
Innovative bayonet lock

T-smart benefits

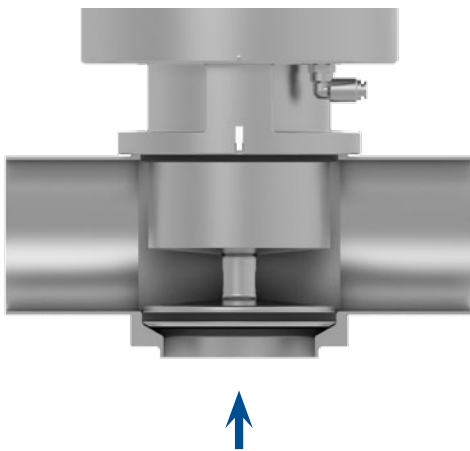
The valve series T-smart offers valves in standard forms that are used often and dispenses with optional equipment parts and comprehensive accessories.

The compact design and the philosophy of the hygienic valves leads to an economical solutions for standard requirements. All necessary versions in terms of housing shapes and control top types are available.

Sizes T-smart 1000
DN 25 – DN 100
OD 1" – OD 4"

Recommended flow direction

To avoid water hammers when closing one path while the product is flowing, T-smart shut-off valves 1000 should be switched against the flow direction of the product, if possible.



Housing combinations

Two housing designs are available as standard in the T-smart shut-off valve 1000 series.





Single-seat valve type 1007

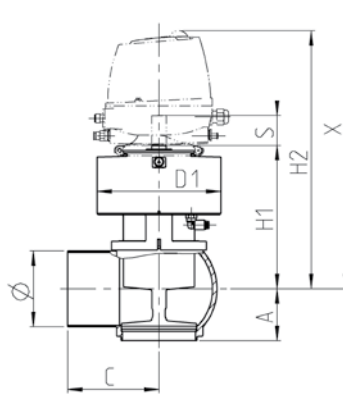


Single-seat valve type 1003






Technical data of the standard version	
Recommended flow direction	Contrary to the flow direction of the product
Material in contact with the product	AISI 316L
Material not in contact with the product	AISI 304
Seal material in contact with the product	EPDM
Ambient temperature	0 to 45 °C
Air supply pressure	Min. 6 bar, max. 8 bar
Max. product pressure	DN 25 – DN 65 OD 1" – OD 3" Max. 6 bar
	DN 80 – DN 100 OD 4" Max. 5 bar/max. 6 bar*
Surface in contact with the product	Ra ≤ 0.8 µm
Surface not in contact with the product	Metal blank
Control and feedback system	Connection 0 (without control top)
Actuator type	Pneumatic actuator air/spring
Connection fittings	Welding end
Certificates	 



	Pipe	Housing		Actuator	Dimensions			Valve		
Nominal width	Ø [mm]	A [mm]	C [mm]	Ø D [mm]	H1 [mm]	H2 [mm]	X [mm]	Stroke S [mm]	Particle size [mm]	Weight [kg]
DN 25	29,0 × 1,50	34.0	90	109	117.5	281.5	165	18	9	4.5
DN 40	41,0 × 1,50	37.0	90	109	130.5	294.5	190	25	16	4.5
DN 50	53,0 × 1,50	41.0	90	109	136.5	300.5	210	25	16	4.5
DN 65	70,0 × 2,00	50.0	125	135/170*	154.5	318.5	245	33	24	8.5
DN 80	85,0 × 2,00	65.5	125	170	180.0	344.0	285	41	32	12.5
DN 100	104,0 × 2,00	71.0	125	170	189.5	353.5	315	41	32	13.0
OD 1"	25,4 × 1,65	33.0	90	109	115.5	279.5	160	18	9	4.5
OD 1 ½"	38,1 × 1,65	36.5	90	109	129.0	293.0	185	25	16	4.5
OD 2"	50,8 × 1,65	42.0	90	109	135.5	299.5	205	25	16	4.5
OD 2 ½"	63,5 × 1,65	49.0	125	135/170*	151.5	315.5	235	33	24	8.5
OD 3"	76,2 × 1,65	52.5	125	135/170*	158.0	322.0	255	33	24	8.5
OD 4"	101,6 × 2,11	72.0	125	170	188.5	352.5	310	41	32	13.0

* The left value refers to the closed fail-safe position of the valve, the right one to the open non-actuated position (see position 5 in the order code).

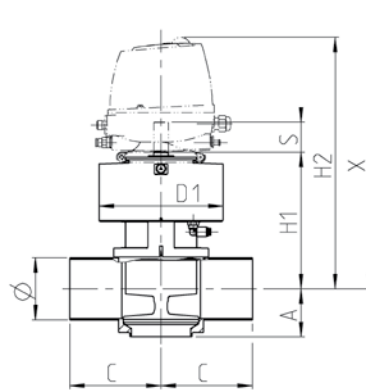
Position	Description of the order code for the standard version			
1	Valve type			
	1	Shut-off valve		
2	Housing combinations			
	007	 L		
3	Nominal width standard			
	0	OD	1	DN
4	Nominal width			
	100	OD 1"	025	DN 25
	150	OD 1 1/2"	040	DN 40
	200	OD 2"	050	DN 50
	250	OD 2 1/2"	065	DN 65
	300	OD 3"	080	DN 80
	400	OD 4"	100	DN 100
5	Non-actuated position			
	0	Closed		
6	Air connection			
	0	Without		
	1	Metric		
7	Port orientation top			
	0	0°		
8	Air support			
	0	Without		
9	Seal material			
	0	EPDM		
10	Port orientation bottom			
	0	No connection		
11	Connection fittings			
	0	Welding end		
12	Certificates			
	0	Without		
	1	Test report 2.2		
	2	Inspection certificate 3.1		
	3	Certificates 2.2 and 3.1		

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

Position	1	2		3	4		5	6	7	8		9	10	11	12	
Code	1	007	-			-			0	0	-	0	0			+ Code for control and feedback systems, see section 7




Technical data of the standard version	
Recommended flow direction	Contrary to the flow direction of the product
Material in contact with the product	AISI 316L
Material not in contact with the product	AISI 304
Seal material in contact with the product	EPDM
Ambient temperature	0 to 45 °C
Air supply pressure	Min. 6 bar, max. 8 bar
Max. product pressure	DN 25 – DN 65 OD 1" – OD 3" Max. 6 bar
	DN 80 – DN 100 OD 4" Max. 5 bar/max. 6 bar*
Surface in contact with the product	Ra ≤ 0.8 µm
Surface not in contact with the product	Metal blank
Control and feedback system	Connection 0 (without control top)
Actuator type	Pneumatic actuator air/spring
Connection fittings	Welding end
Certificates	



Nominal width	Pipe	Housing		Actuator	Dimensions			Valve		
	Ø [mm]	A [mm]	C [mm]	Ø D [mm]	H1 [mm]	H2 [mm]	X [mm]	Stroke S [mm]	Particle size [mm]	Weight [kg]
DN 25	29,0 × 1,50	34.0	90	109	117.5	281.5	165	18	9	4.5
DN 40	41,0 × 1,50	37.0	90	109	130.5	294.5	190	25	16	4.5
DN 50	53,0 × 1,50	41.0	90	109	136.5	300.5	210	25	16	4.5
DN 65	70,0 × 2,00	50.0	125	135/170*	154.5	318.5	245	33	24	8.5
DN 80	85,0 × 2,00	65.5	125	170	180.0	344.0	285	41	32	12.5
DN 100	104,0 × 2,00	71.0	125	170	189.5	353.5	315	41	32	13.0
OD 1"	25,4 × 1,65	33.0	90	109	115.5	279.5	160	18	9	4.5
OD 1 ½"	38,1 × 1,65	36.5	90	109	129.0	293.0	185	25	16	4.5
OD 2"	50,8 × 1,65	42.0	90	109	135.5	299.5	205	25	16	4.5
OD 2 ½"	63,5 × 1,65	49.0	125	135/170*	151.5	315.5	235	33	24	8.5
OD 3"	76,2 × 1,65	52.5	125	135/170*	158.0	322.0	255	33	24	8.5
OD 4"	101,6 × 2,11	72.0	125	170	188.5	352.5	310	41	32	13.0

* The left value refers to the closed fail-safe position of the valve, the right one to the open non-actuated position (see position 5 in the order code).

Position	Description of the order code for the standard version			
1	Valve type			
	1	Shut-off valve		
2	Housing combinations			
	003			
3	Nominal width standard			
	0	OD	1	DN
4	Nominal width			
	100	OD 1"	025	DN 25
	150	OD 1 1/2"	040	DN 40
	200	OD 2"	050	DN 50
	250	OD 2 1/2"	065	DN 65
	300	OD 3"	080	DN 80
	400	OD 4"	100	DN 100
5	Non-actuated position			
	0	Closed		
6	Air connection			
	0	Without		
	1	Metric		
7	Port orientation top			
	0	0°		
8	Air support			
	0	Without		
9	Seal material			
	0	EPDM		
10	Port orientation bottom			
	0	No connection		
11	Connection fittings			
	0	Welding end		
12	Certificates			
	0	Without		
	1	Test report 2.2		
	2	Inspection certificate 3.1		
	3	Certificates 2.2 and 3.1		

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

Position	1	2	-	3	4	-	5	6	7	8	-	9	10	11	12	+ Code for control and feedback systems, see section 7
Code	1	003							0	0		0	0			



T-smart divert valve – Series 2000

T-smart divert valves are used for simple divert functions in hygienic applications. The valves are characterized by their ease of operation. The individual variants are designed for different flow directions.

Function of the valve

In divert valves, there is only one seal for each switching position in the valve disc separating the particular pipelines from one another. This means liquid can pass from one pipeline to the other in the event of a seal defect. For this reason, divert valves of the T-smart series are not suitable for separating incompatible fluids.

Application examples

In practice, these valves are frequently used in CIP supply and return lines. A typical use case is found at the end of a valve block as divert valve between the process line and drain, e.g. during pushing out.

Special features

- EHEDG-certified hygienic configuration
- Small and compact
- Maintenance-friendly
- Innovative bayonet lock

T-smart benefits

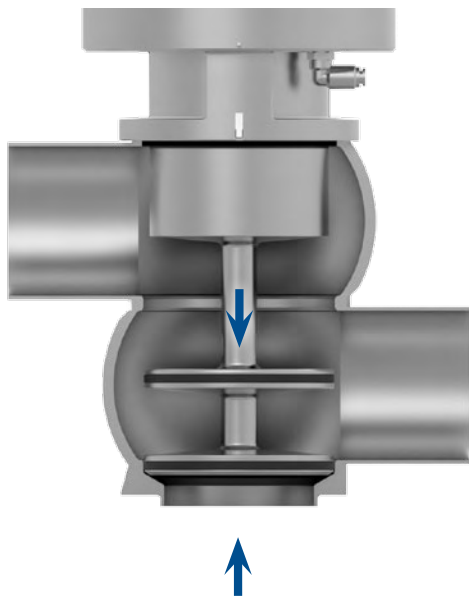
The valve series T-smart offers valves in standard forms that are used often and dispenses with optional equipment parts and comprehensive accessories.

The compact design and the philosophy of the hygienic valves leads to an economical solution for standard requirements. All necessary versions in terms of housing shapes and control top types are available.

Sizes T-smart 2000
DN 25 – DN 100
OD 1" – OD 4"

Recommended flow direction

To avoid water hammers when closing one path while the product is flowing, T-smart divert valves 2000 should be switched against the flow direction of the product, if possible.



Housing combinations

T-smart divert valves are available as the standard in two housing versions.





Single-seat valve type 2017

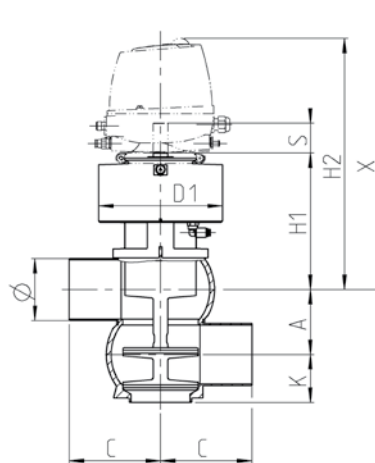


Single-seat valve type 2027






Technical data of the standard version	
Recommended flow direction	Contrary to the flow direction of the product
Material in contact with the product	AISI 316L
Material not in contact with the product	AISI 304
Seal material in contact with the product	EPDM
Ambient temperature	0 to 45 °C
Air supply pressure	Min. 6 bar, max. 8 bar
Max. product pressure	DN 25 – DN 65 OD 1" – OD 3" Max. 6 bar
	DN 80 – DN 100 OD 4" Max. 5 bar/max. 6 bar*
Surface in contact with the product	Ra ≤ 0.8 µm
Surface not in contact with the product	Metal blank
Control and feedback system	Connection 0 (without control top)
Actuator type	Pneumatic actuator air/spring
Connection fittings	Welding end
Certificates	 



Nominal width	Pipe	Housing			Actuator	Dimensions				Valve	
	Ø [mm]	A [mm]	C [mm]	K [mm]	Ø D1 [mm]	H1 [mm]	H2 [mm]	X [mm]	Stroke S [mm]	Particle size [mm]	Weight [kg]
DN 25	29,0 × 1,50	34.0	90	34.0	109	117.5	281.5	199	18	6	5.5
DN 40	41,0 × 1,50	46.0	90	37.0	109	130.5	294.5	236	25	16	5.5
DN 50	53,0 × 1,50	58.0	90	41.0	109	136.5	300.5	268	25	16	6.0
DN 65	70,0 × 2,00	74.0	125	53.0	135/170*	154.5	318.5	319	33	24	12.0
DN 80	85,0 × 2,00	89.0	125	65.5	170	180.0	344.0	374	41	32	16.5
DN 100	104,0 × 2,00	108.0	125	71.0	170	189.5	353.5	423	41	32	17.0
OD 1"	25,4 × 1,65	30.0	90	33.0	109	115.5	279.5	190	18	4	5.5
OD 1 ½"	38,1 × 1,65	43.0	90	36.5	109	129.0	293.0	228	25	16	5.5
OD 2"	50,8 × 1,65	55.5	90	42.0	109	135.5	299.5	261	25	16	6.0
OD 2 ½"	63,5 × 1,65	68.0	125	50.0	135/170*	151.5	315.5	303	33	24	11.5
OD 3"	76,2 × 1,65	81.0	125	52.5	135/170*	158.0	322.0	336	33	24	12.0
OD 4"	101,6 × 2,11	105.5	125	72.0	170	188.5	352.5	416	41	32	16.5

* The left value refers to the closed fail-safe position of the valve, the right one to the open non-actuated position (see position 5 in the order code).



Position	Description of the order code for the standard version			
1	Valve type			
	2 Divert valve			
2	Housing combinations			
	K 017 			
3	Nominal width standard			
	0	OD	1	DN
4	Nominal width			
	100	OD 1"	025	DN 25
	150	OD 1 1/2"	040	DN 40
	200	OD 2"	050	DN 50
	250	OD 2 1/2"	065	DN 65
	300	OD 3"	080	DN 80
	400	OD 4"	100	DN 100
5	Non-actuated position			
	0 Closed 1 Opened			
6	Air connection			
	0 Without 1 Metric 2 Inch			
	Port orientation top			
7	1 90° 2 180° 3 270°			
	Air support			
	0 Without			
9	Seal material			
	0 EPDM			
10	Port orientation bottom			
	0 No connection			
11	Connection fittings			
	0 Welding end 1 Tri-clamp			
	Certificates			
12	0 Without 1 Test report 2.2 2 Inspection certificate 3.1 3 Certificates 2.2 and 3.1			

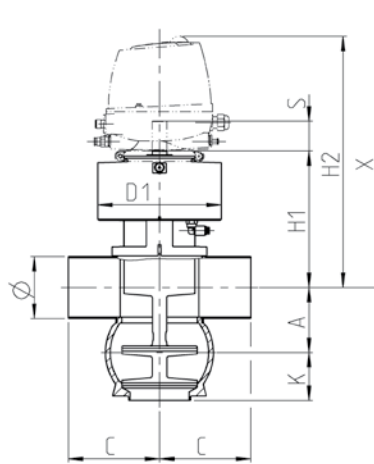


The code is composed as follows, depending on the chosen configuration:

Position	1	2	3	4	5	6	7	8	9	10	11	12	
Code	2	017	-		-			0	-	0	0		+ Code for control and feedback systems, see section 7




Technical data of the standard version	
Recommended flow direction	Contrary to the flow direction of the product
Material in contact with the product	AISI 316L
Material not in contact with the product	AISI 304
Seal material in contact with the product	EPDM
Ambient temperature	0 to 45 °C
Air supply pressure	Min. 6 bar, max. 8 bar
Max. product pressure	DN 25 – DN 65 OD 1" – OD 3" Max. 6 bar
	DN 80 – DN 100 OD 4" Max. 5 bar/max. 6 bar*
Surface in contact with the product	Ra ≤ 0.8 µm
Surface not in contact with the product	Metal blank
Control and feedback system	Connection 0 (without control top)
Actuator type	Pneumatic actuator air/spring
Connection fittings	Welding end
Certificates	 



Nominal width	Pipe	Housing			Actuator	Dimensions				Valve	
	Ø [mm]	A [mm]	C [mm]	K [mm]	Ø D1 [mm]	H1 [mm]	H2 [mm]	X [mm]	Stroke S [mm]	Particle size [mm]	Weight [kg]
DN 25	29,0 × 1,50	34.0	90	34.0	109	117.5	281.5	199	18	6	5.5
DN 40	41,0 × 1,50	46.0	90	37.0	109	130.5	294.5	236	25	16	5.5
DN 50	53,0 × 1,50	58.0	90	41.0	109	136.5	300.5	268	25	16	6.0
DN 65	70,0 × 2,00	74.0	125	53.0	135/170*	154.5	318.5	319	33	24	12.0
DN 80	85,0 × 2,00	89.0	125	65.5	170	180.0	344.0	374	41	32	16.5
DN 100	104,0 × 2,00	108.0	125	71.0	170	189.5	353.5	423	41	32	17.0
OD 1"	25,4 × 1,65	30.0	90	33.0	109	115.5	279.5	190	18	4	5.5
OD 1 ½"	38,1 × 1,65	43.0	90	36.5	109	129.0	293.0	228	25	16	5.5
OD 2"	50,8 × 1,65	55.5	90	42.0	109	135.5	299.5	261	25	16	6.0
OD 2 ½"	63,5 × 1,65	68.0	125	50.0	135/170*	151.5	315.5	303	33	24	11.5
OD 3"	76,2 × 1,65	81.0	125	52.5	135/170*	158.0	322.0	336	33	24	12.0
OD 4"	101,6 × 2,11	105.5	125	72.0	170	188.5	352.5	416	41	32	16.5

* The left value refers to the closed fail-safe position of the valve, the right one to the open non-actuated position (see position 5 in the order code).

Position	Description of the order code for the standard version			
1	Valve type			
	2 Divert valve			
2	Housing combinations			
	027  P			
3	Nominal width standard			
	0	OD	1	DN
4	Nominal width			
	100	OD 1"	025	DN 25
	150	OD 1 1/2"	040	DN 40
	200	OD 2"	050	DN 50
	250	OD 2 1/2"	065	DN 65
	300	OD 3"	080	DN 80
	400	OD 4"	100	DN 100
5	Non-actuated position			
	0 Closed 1 Opened			
6	Air connection			
	0 Without 1 Metric 2 Inch			
	Port orientation top			
7	1 90°			
	Air support			
8	0 Without			
	Seal material			
9	0 EPDM			
	Port orientation bottom			
10	0 No connection			
	Connection fittings			
11	0 Welding end 1 Tri-clamp			
	Certificates			
12	0 Without 1 Test report 2.2 2 Inspection certificate 3.1 3 Certificates 2.2 and 3.1			

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

Position	1	2	3	4	5	6	7	8	9	10	11	12		
Code	2	027	-		-		1	0	-	0	0			+ Code for control and feedback systems, see section 7



T-smart double-seat valves – Series 3000

To meet special requirements in different industries, applications and processes, the T-smart valve range also includes mixproof shut-off valves.

T-smart double-seat valves are used for mixproof shut-off of incompatible products at the pipe junctions.

Function of the valve

When the valve is closed (non-actuated position), there are always two seals between the separated pipelines. If one seal is defective, the resulting leakage will be directed through the leakage outlet into the periphery, without mixing with the product in the second pipeline. This method enables that there is no mixing between the products from two pipelines.

Application examples

T-smart double-seat valves are often used in non-critical areas:

- Breweries: Cold process area, e.g. fermenting cellar
- Dairies: Before heat treatment, e.g. milk reception, raw milk storage...

Special features

EHEDG-certified hygienic configuration

Leakage-free connection

Maintenance-friendly

Mixproof separation

T-smart benefits

T-smart double-seat valves are characterized by a radial sealing which reduces the switching leakage to a minimum (possibility of product residue adhering to the metallic surfaces). The T-smart design has the lower and upper valve discs both designed balanced.

The balanced valve discs give the valve the required water hammer safety (up to 25 bar) and reduce the necessary actuator diameter to open the valves to a minimum.

Since the valve is equipped with an integrated lifting actuator, as standard, that makes the valve appear compact.

Sizes T-smart 3000

DN 25 – DN 100

OD 1" – OD 4"

Housing combinations

T-smart double-seat valves are available in four housing designs.



Double-seat valve type 3022



Double-seat valve type 3011





Double-seat valve type 3012

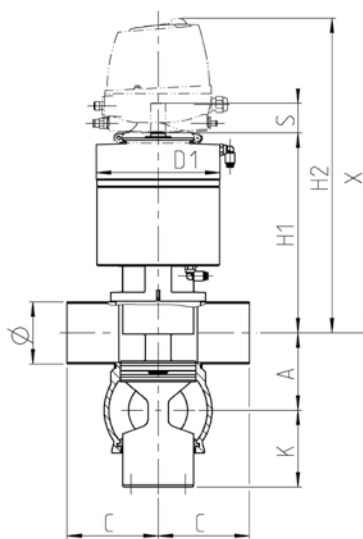


Double-seat valve type 3021






Technical data of the standard version	
Material in contact with the product	AISI 316L
Material not in contact with the product	AISI 304
Seal material in contact with the product	EPDM
Ambient temperature	0 to 45 °C
Air supply pressure	Min. 6 bar, max. 8 bar
Max. product pressure	Max. 6 bar
Surface in contact with the product	Ra ≤ 0.8 µm
Surface not in contact with the product	Metal blank
Control and feedback system	Connection 0 (without control top)
Actuator type	Pneumatic actuator air/spring
Connection fittings	Welding end
Certificates	 



Nominal width	Pipe	Housing			Actuator	Dimensions			Valve		
	Ø [mm]	A [mm]	C [mm]	K [mm]	Ø D [mm]	H1 [mm]	H2 [mm]	X [mm]	Stroke S [mm]	Particle size [mm]	Weight [kg]
DN 25	29,0 × 1,50	51.0	90	61.0	109	217.5	381.5	370	28	–	8.5
DN 40	41,0 × 1,50	63.0	90	69.0	109	223.5	387.5	410	30	–	9.0
DN 50	53,0 × 1,50	75.0	90	80.0	109	229.5	393.5	455	35	8	9.0
DN 65	70,0 × 2,00	91.0	125	88.0	135	237.5	401.5	500	35	8	17.0
DN 80	85,0 × 2,00	106.0	125	105.5	170	267.0	431.0	580	45	18	29.0
DN 100	104,0 × 2,00	125.0	125	115.0	170	276.5	440.5	635	45	18	30.0
OD 1"	25,4 × 1,65	47.0	90	55.0	109	215.5	379.5	360	24	–	8.5
OD 1 ½"	38,1 × 1,65	60.0	90	66.5	109	222.0	386.0	395	29	–	9.0
OD 2"	50,8 × 1,65	72.5	90	79.0	109	228.5	392.5	445	35	8	9.0
OD 2 ½"	63,5 × 1,65	85.0	125	85.0	135	234.5	398.5	485	35	8	17.0
OD 3"	76,2 × 1,65	98.0	125	91.5	135	241.0	405.0	525	35	8	18.0
OD 4"	101,6 × 2,11	122.5	125	114.0	170	275.5	439.5	630	45	18	30.0



Position	Description of the order code for the standard version			
1	Valve type			
	3	Mixproof shut-off valves		
2	Housing combinations			
	022	 E		
3	Nominal width standard			
	0	OD	1	DN
4	Nominal width			
	100	OD 1"	025	DN 25
	150	OD 1 1/2"	040	DN 40
	200	OD 2"	050	DN 50
	250	OD 2 1/2"	065	DN 65
	300	OD 3"	080	DN 80
	400	OD 4"	100	DN 100
5	Non-actuated position			
	0	Closed		
6	Air connection			
	0	Without		
	1	Metric		
	2	Inch		
7	Port orientation top			
	0	0°		
	1	90°		
8	Air support			
	0	Without		
9	Seal material			
	0	EPDM		
10	Port orientation bottom			
	0	No connection		
11	Connection fittings			
	0	Welding end		
	1	Tri-clamp		
12	Certificates			
	0	Without		
	1	Test report 2.2		
	2	Inspection certificate 3.1		
	3	Certificates 2.2 and 3.1		

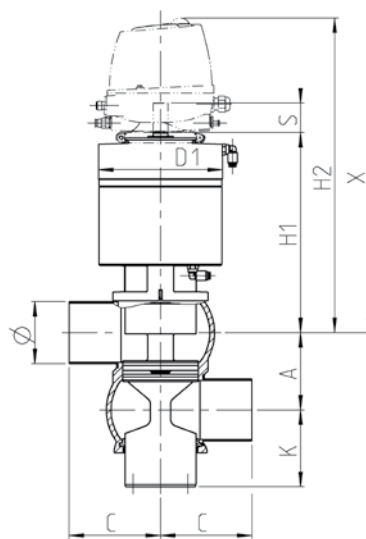


The code is composed as follows, depending on the chosen configuration:


Position	1	2		3	4		5	6	7	8		9	10	11	12	
Code	3	022	-			-	0			0	-	0				+ Code for control and feedback systems, see section 7



Technical data of the standard version	
Material in contact with the product	AISI 316L
Material not in contact with the product	AISI 304
Seal material in contact with the product	EPDM
Ambient temperature	0 to 45 °C
Air supply pressure	Min. 6 bar, max. 8 bar
Max. product pressure	Max. 6 bar
Surface in contact with the product	Ra ≤ 0.8 µm
Surface not in contact with the product	Metal blank
Control and feedback system	Connection 0 (without control top)
Actuator type	Pneumatic actuator air/spring
Connection fittings	Welding end
Certificates	 



Nominal width	Pipe	Housing			Actuator	Dimensions			Valve		
	Ø [mm]	A [mm]	C [mm]	K [mm]	Ø D [mm]	H1 [mm]	H2 [mm]	X [mm]	Stroke S [mm]	Particle size [mm]	Weight [kg]
DN 25	29,0 × 1,50	51.0	90	61.0	109	217.5	381.5	370	28	–	8.5
DN 40	41,0 × 1,50	63.0	90	69.0	109	223.5	387.5	410	30	–	9.0
DN 50	53,0 × 1,50	75.0	90	80.0	109	229.5	393.5	455	35	8	9.0
DN 65	70,0 × 2,00	91.0	125	88.0	135	237.5	401.5	500	35	8	17.0
DN 80	85,0 × 2,00	106.0	125	105.5	170	267.0	431.0	580	45	18	29.0
DN 100	104,0 × 2,00	125.0	125	115.0	170	276.5	440.5	635	45	18	30.0
OD 1"	25,4 × 1,65	47.0	90	55.0	109	215.5	379.5	360	24	–	8.5
OD 1 ½"	38,1 × 1,65	60.0	90	66.5	109	222.0	386.0	395	29	–	9.0
OD 2"	50,8 × 1,65	72.5	90	79.0	109	228.5	392.5	445	35	8	9.0
OD 2 ½"	63,5 × 1,65	85.0	125	85.0	135	234.5	398.5	485	35	8	17.0
OD 3"	76,2 × 1,65	98.0	125	91.5	135	241.0	405.0	525	35	8	18.0
OD 4"	101,6 × 2,11	122.5	125	114.0	170	275.5	439.5	630	45	18	30.0



Position	Description of the order code for the standard version			
1	Valve type			
	3	Mixproof shut-off valves		
2	Housing combinations			
	011			
3	Nominal width standard			
	0	OD	1	DN
4	Nominal width			
	100	OD 1"	025	DN 25
	150	OD 1 1/2"	040	DN 40
	200	OD 2"	050	DN 50
	250	OD 2 1/2"	065	DN 65
	300	OD 3"	080	DN 80
	400	OD 4"	100	DN 100
5	Non-actuated position			
	0	Closed		
6	Air connection			
	0	Without		
	1	Metric		
	2	Inch		
7	Port orientation top			
	0	0°		
	1	90°		
	2	180°		
	3	270°		
8	Air support			
	0	Without		
9	Seal material			
	0	EPDM		
10	Port orientation bottom			
	0	No connection		
11	Connection fittings			
	0	Welding end		
	1	Tri-clamp		
12	Certificates			
	0	Without		
	1	Test report 2.2		
	2	Inspection certificate 3.1		
	3	Certificates 2.2 and 3.1		

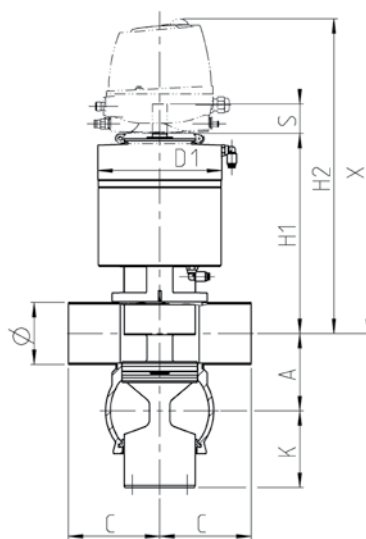


The code is composed as follows, depending on the chosen configuration:


Position	1	2	3	4	5	6	7	8	9	10	11	12	
Code	3	011	-		-	0		0	-	0			+ Code for control and feedback systems, see section 7



Technical data of the standard version	
Material in contact with the product	AISI 316L
Material not in contact with the product	AISI 304
Seal material in contact with the product	EPDM
Ambient temperature	0 to 45 °C
Air supply pressure	Min. 6 bar, max. 8 bar
Max. product pressure	Max. 6 bar
Surface in contact with the product	Ra ≤ 0.8 µm
Surface not in contact with the product	Metal blank
Control and feedback system	Connection 0 (without control top)
Actuator type	Pneumatic actuator air/spring
Connection fittings	Welding end
Certificates	 



Nominal width	Pipe	Housing			Actuator	Dimensions			Valve		
	Ø [mm]	A [mm]	C [mm]	K [mm]	Ø D [mm]	H1 [mm]	H2 [mm]	X [mm]	Stroke S [mm]	Particle size [mm]	Weight [kg]
DN 25	29,0 × 1,50	51.0	90	61.0	109	217.5	381.5	370	28	–	8.5
DN 40	41,0 × 1,50	63.0	90	69.0	109	223.5	387.5	410	30	–	9.0
DN 50	53,0 × 1,50	75.0	90	80.0	109	229.5	393.5	455	35	8	9.0
DN 65	70,0 × 2,00	91.0	125	88.0	135	237.5	401.5	500	35	8	17.0
DN 80	85,0 × 2,00	106.0	125	105.5	170	267.0	431.0	580	45	18	29.0
DN 100	104,0 × 2,00	125.0	125	115.0	170	276.5	440.5	635	45	18	30.0
OD 1"	25,4 × 1,65	47.0	90	55.0	109	215.5	379.5	360	24	–	8.5
OD 1 ½"	38,1 × 1,65	60.0	90	66.5	109	222.0	386.0	395	29	–	9.0
OD 2"	50,8 × 1,65	72.5	90	79.0	109	228.5	392.5	445	35	8	9.0
OD 2 ½"	63,5 × 1,65	85.0	125	85.0	135	234.5	398.5	485	35	8	17.0
OD 3"	76,2 × 1,65	98.0	125	91.5	135	241.0	405.0	525	35	8	18.0
OD 4"	101,6 × 2,11	122.5	125	114.0	170	275.5	439.5	630	45	18	30.0



Position	Description of the order code for the standard version			
1	Valve type			
	3 Mixproof shut-off valves			
2	Housing combinations			
	012			
3	Nominal width standard			
	0	OD	1	DN
4	Nominal width			
	100	OD 1"	025	DN 25
	150	OD 1 1/2"	040	DN 40
	200	OD 2"	050	DN 50
	250	OD 2 1/2"	065	DN 65
	300	OD 3"	080	DN 80
	400	OD 4"	100	DN 100
5	Non-actuated position			
	0 Closed			
6	Air connection			
	0 Without			
	1 Metric			
7	Port orientation top			
	0 0°			
	1 90°			
8	Air support			
	0 Without			
9	Seal material			
	0 EPDM			
10	Port orientation bottom			
	0 No connection			
11	Connection fittings			
	0 Welding end			
	1 Tri-clamp			
12	Certificates			
	0 Without			
	1 Test report 2.2			
	2 Inspection certificate 3.1			
3 Certificates 2.2 and 3.1				

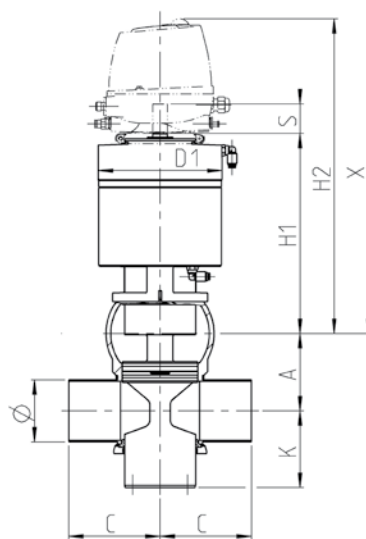


The code is composed as follows, depending on the chosen configuration:


Position	1	2	-	3	4	-	5	6	7	8	-	9	10	11	12	+ Code for control and feedback systems, see section 7
Code	3	012					0					0				



Technical data of the standard version	
Material in contact with the product	AISI 316L
Material not in contact with the product	AISI 304
Seal material in contact with the product	EPDM
Ambient temperature	0 to 45 °C
Air supply pressure	Min. 6 bar, max. 8 bar
Max. product pressure	Max. 6 bar
Surface in contact with the product	Ra ≤ 0.8 µm
Surface not in contact with the product	Metal blank
Control and feedback system	Connection 0 (without control top)
Actuator type	Pneumatic actuator air/spring
Connection fittings	Welding end
Certificates	 



Nominal width	Pipe	Housing			Actuator	Dimensions			Valve		
	Ø [mm]	A [mm]	C [mm]	K [mm]	Ø D [mm]	H1 [mm]	H2 [mm]	X [mm]	Stroke S [mm]	Particle size [mm]	Weight [kg]
DN 25	29,0 × 1,50	51.0	90	61.0	109	217.5	381.5	370	28	–	8.5
DN 40	41,0 × 1,50	63.0	90	69.0	109	223.5	387.5	410	30	–	9.0
DN 50	53,0 × 1,50	75.0	90	80.0	109	229.5	393.5	455	35	8	9.0
DN 65	70,0 × 2,00	91.0	125	88.0	135	237.5	401.5	500	35	8	17.0
DN 80	85,0 × 2,00	106.0	125	105.5	170	267.0	431.0	580	45	18	29.0
DN 100	104,0 × 2,00	125.0	125	115.0	170	276.5	440.5	635	45	18	30.0
OD 1"	25,4 × 1,65	47.0	90	55.0	109	215.5	379.5	360	24	–	8.5
OD 1 ½"	38,1 × 1,65	60.0	90	66.5	109	222.0	386.0	395	29	–	9.0
OD 2"	50,8 × 1,65	72.5	90	79.0	109	228.5	392.5	445	35	8	9.0
OD 2 ½"	63,5 × 1,65	85.0	125	85.0	135	234.5	398.5	485	35	8	17.0
OD 3"	76,2 × 1,65	98.0	125	91.5	135	241.0	405.0	525	35	8	18.0
OD 4"	101,6 × 2,11	122.5	125	114.0	170	275.5	439.5	630	45	18	30.0

Position	Description of the order code for the standard version			
1	Valve type			
	3 Mixproof shut-off valves			
2	Housing combinations			
	021	 A		
3	Nominal width standard			
	0	OD	1	DN
4	Nominal width			
	100	OD 1"	025	DN 25
	150	OD 1 1/2"	040	DN 40
	200	OD 2"	050	DN 50
	250	OD 2 1/2"	065	DN 65
	300	OD 3"	080	DN 80
	400	OD 4"	100	DN 100
5	Non-actuated position			
	0 Closed			
6	Air connection			
	0 Without			
	1 Metric			
7	Port orientation top			
	0 0°			
	1 90°			
8	Air support			
	0 Without			
9	Seal material			
	0 EPDM			
10	Port orientation bottom			
	0 No connection			
11	Connection fittings			
	0 Welding end			
	1 Tri-clamp			
12	Certificates			
	0 Without			
	1 Test report 2.2			
	2 Inspection certificate 3.1			
3 Certificates 2.2 and 3.1				



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

Position	1	2	3	4	5	6	7	8	9	10	11	12	
Code	3	021	-		-	0		0	-	0			+ Code for control and feedback systems, see section 7



T-smart double-seal valve – Series 5000

T-smart double-seal valves are used as a shut-off in hygienic applications. When the valve is closed (non-actuated position), there are always two seals between the separated pipelines. This leakage chamber can also be cleaned via flushing valves or can serve as leakage detection.

Function of the valve

In the double shut-off, there are two seals in the one-piece valve disc separating the pipelines from one another. This means liquid can pass from one pipeline to the other in the event of a leak in the chamber.

To avoid contamination, this leakage space can be pressurized with steam with two flushing valves and prevent contamination of the product.

Application examples

- T-smart double-seal valves are often used in non-critical areas:
- Breweries: Cold process area, e.g. fermenting cellar
 - Dairies: Before heat treatment, e.g. milk reception, raw milk storage...

Special features

EHDG-certified hygienic configuration

Maintenance-friendly

Small and compact

Integrated flushing valves

Leakage chamber

In the standard version, two flushing valves are connected to the leakage chamber. To avoid contamination of the product, they can be pressurized with steam.

Alternatively, the flushing valves can also serve as leakage detection. Subsequent cleaning of the leakage chamber is recommended.



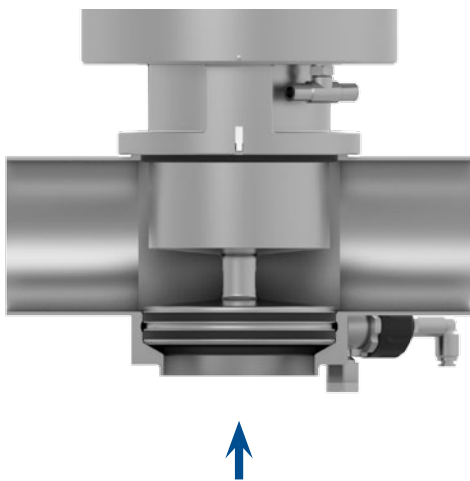
T-smart benefits

T-smart double-seal valves are characterized by leakage-free sealing that is permitted by the doubly radial seal. The compact design of the hygienic valves is an economical solution for basic requirements. All necessary versions in terms of housing shapes and control top types are available.

Sizes T-smart 5000
DN 25 – DN 100
OD 1" – OD 4"

Recommended flow direction

To avoid water hammers when closing one path while the product is flowing, T-smart double-seal valves should be switched against the flow direction of the product, if possible.



Housing combinations

Standard T-smart double-seal valves are available in two housing designs.





Double-seal valve type 5007

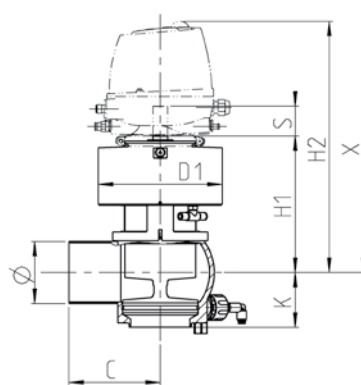


Double-seal valve type 5003






Technical data of the standard version	
Recommended flow direction	Contrary to the flow direction of the product
Material in contact with the product	AISI 316L
Material not in contact with the product	AISI 304
Seal material in contact with the product	EPDM
Ambient temperature	0 to 45 °C
Air supply pressure	Min. 6 bar, max. 8 bar
Max. product pressure	DN 25 – DN 65 OD 1" – OD 3" Max. 6 bar
	DN 80 – DN 100 OD 4" Max. 5 bar/max. 6 bar*
Surface in contact with the product	Ra ≤ 0.8 µm
Surface not in contact with the product	Metal blank
Control and feedback system	Connection 0 (without control top)
Actuator type	Pneumatic actuator air/spring
Connection fittings	Welding end
Certificates	 



Nominal width	Pipe	Housing		Actuator	Dimensions				Valve		
	Ø [mm]	C [mm]	K [mm]	Ø D1 [mm]	H1 [mm]	H2 [mm]	X [mm]	Stroke S [mm]	Particle size [mm]	Weight [kg]	
DN 25	29,0 × 1,50	90	43.5	109	117.5	281.5	206	18	4	5.5	
DN 40	41,0 × 1,50	90	46.5	109	130.5	294.5	212	25	9	5.5	
DN 50	53,0 × 1,50	90	50.5	109	136.5	300.5	222	25	9	5.5	
DN 65	70,0 × 2,00	125	59.5	170	154.5	318.5	256	33	15	9.5	
DN 80	85,0 × 2,00	125	75.0	210	182.5	346.5	299	41	23	17.5	
DN 100	104,0 × 2,00	125	80.5	210	192.0	356.0	327	41	23	18.0	
OD 1"	25,4 × 1,65	90	42.5	109	115.5	279.5	195	18	4	5.5	
OD 1 ½"	38,1 × 1,65	90	46.0	109	129.0	293.0	208	25	9	5.5	
OD 2"	50,8 × 1,65	90	51.5	109	135.5	299.5	218	25	9	5.5	
OD 2 ½"	63,5 × 1,65	125	58.5	170	151.5	315.5	247	33	15	9.5	
OD 3"	76,2 × 1,65	125	62.0	170	158.0	322.0	266	33	15	9.5	
OD 4"	101,6 × 2,11	125	81.5	210	191.0	355.0	323	41	23	18.0	

* The left value refers to the closed fail-safe position of the valve, the right one to the open non-actuated position (see position 5 in the order code).



Position	Description of the order code for the standard version			
1	Valve type			
	5 Double-seal valve			
2	Housing combinations			
	007			
3	Nominal width standard			
	0	OD	1	DN
4	Nominal width			
	100	OD 1"	025	DN 25
	150	OD 1 1/2"	040	DN 40
	200	OD 2"	050	DN 50
	250	OD 2 1/2"	065	DN 65
	300	OD 3"	080	DN 80
	400	OD 4"	100	DN 100
5	Non-actuated position			
	0 Closed			
6	Air connection			
	0 Without			
	1 Metric			
	2 Inch			
7	Port orientation top			
	0 0°			
8	Air support			
	0 Without			
9	Seal material			
	0 EPDM			
10	Port orientation bottom			
	0 No connection			
11	Connection fittings			
	0 Welding end			
	1 Tri-clamp			
12	Certificates			
	0 Without			
	1 Test report 2.2			
	2 Inspection certificate 3.1			
	3 Certificates 2.2 and 3.1			

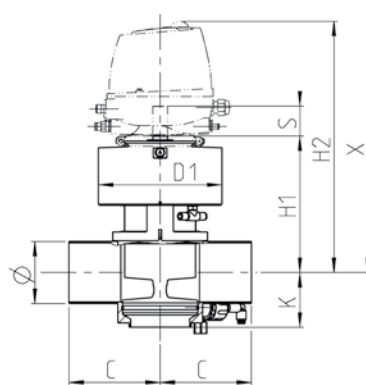


The code is composed as follows, depending on the chosen configuration:

Position	1	2	3	4	5	6	7	8	9	10	11	12		
Code	5	007	-		-	0		0	0	-	0	0		+ Code for control and feedback systems, see section 7




Technical data of the standard version	
Recommended flow direction	Contrary to the flow direction of the product
Material in contact with the product	AISI 316L
Material not in contact with the product	AISI 304
Seal material in contact with the product	EPDM
Ambient temperature	0 to 45 °C
Air supply pressure	Min. 6 bar, max. 8 bar
Max. product pressure	DN 25 – DN 65 OD 1" – OD 3" Max. 6 bar
	DN 80 – DN 100 OD 4" Max. 5 bar/max. 6 bar*
Surface in contact with the product	Ra ≤ 0.8 µm
Surface not in contact with the product	Metal blank
Control and feedback system	Connection 0 (without control top)
Actuator type	Pneumatic actuator air/spring
Connection fittings	Welding end
Certificates	 



Nominal width	Pipe	Housing		Actuator	Dimensions				Valve		
	Ø [mm]	C [mm]	K [mm]	Ø D1 [mm]	H1 [mm]	H2 [mm]	X [mm]	Stroke S [mm]	Particle size [mm]	Weight [kg]	
DN 25	29,0 × 1,50	90	43.5	109	117.5	281.5	206	18	4	5.5	
DN 40	41,0 × 1,50	90	46.5	109	130.5	294.5	212	25	9	5.5	
DN 50	53,0 × 1,50	90	50.5	109	136.5	300.5	222	25	9	5.5	
DN 65	70,0 × 2,00	125	59.5	170	154.5	318.5	256	33	15	9.5	
DN 80	85,0 × 2,00	125	75.0	210	182.5	346.5	299	41	23	17.5	
DN 100	104,0 × 2,00	125	80.5	210	192.0	356.0	327	41	23	18.0	
OD 1"	25,4 × 1,65	90	42.5	109	115.5	279.5	195	18	4	5.5	
OD 1 ½"	38,1 × 1,65	90	46.0	109	129.0	293.0	208	25	9	5.5	
OD 2"	50,8 × 1,65	90	51.5	109	135.5	299.5	218	25	9	5.5	
OD 2 ½"	63,5 × 1,65	125	58.5	170	151.5	315.5	247	33	15	9.5	
OD 3"	76,2 × 1,65	125	62.0	170	158.0	322.0	266	33	15	9.5	
OD 4"	101,6 × 2,11	125	81.5	210	191.0	355.0	323	41	23	18.0	

* The left value refers to the closed fail-safe position of the valve, the right one to the open non-actuated position (see position 5 in the order code).

Position	Description of the order code for the standard version			
1	Valve type			
	5 Double-seal valve			
2	Housing combinations			
	003			
3	Nominal width standard			
	0	OD	1	DN
4	Nominal width			
	100	OD 1"	025	DN 25
	150	OD 1 1/2"	040	DN 40
	200	OD 2"	050	DN 50
	250	OD 2 1/2"	065	DN 65
	300	OD 3"	080	DN 80
	400	OD 4"	100	DN 100
5	Non-actuated position			
	0 Closed			
6	Air connection			
	0 Without			
	1 Metric			
	2 Inch			
7	Port orientation top			
	0 0°			
8	Air support			
	0 Without			
9	Seal material			
	0 EPDM			
10	Port orientation bottom			
	0 No connection			
11	Connection fittings			
	0 Welding end			
	1 Tri-clamp			
12	Certificates			
	0 Without			
	1 Test report 2.2			
	2 Inspection certificate 3.1			
	3 Certificates 2.2 and 3.1			



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

Position	1	2	3	4	5	6	7	8	9	10	11	12		
Code	5	003	-		-	0		0	0	-	0	0		+ Code for control and feedback systems, see section 7



T-smart tank bottom valves – Series 4000

T-smart tank bottom valves are used as tank protection in hygienic applications. These valves are characterized by their ease of operation and flexibility.

Function of the valve

In the simple shut-off, there is only one seal in the one-piece valve disc separating the pipelines from one another. This means liquid can pass from one pipeline to the other in the event of a seal defect. For this reason, single-seat shut-off valves are not suitable for separating incompatible products.

Application examples

T-smart tank bottom valves are used for shutting off pipelines at tanks or containers. The housing can be welded directly into the tank bottom wall, for flush mounted connection to the tank bottom.

Tank bottom valves of the T-smart 4000 series are inserted directly, thereby saving space below the tank.

T-smart benefits

The T-smart valve series offers valves in standard forms that are often used with optional equipment parts and comprehensive accessories.

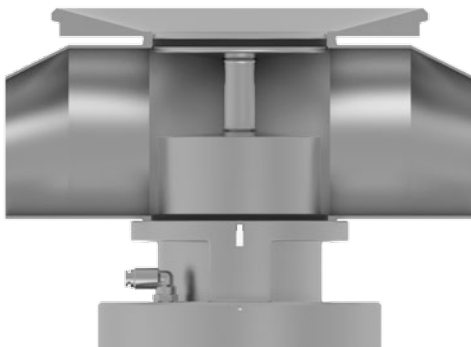
The compact design of the hygienic valves is an economical solution for basic requirements. All necessary versions in terms of housing shapes and control top types are available.

Sizes T-smart 4000
DN 25 – DN 100
OD 1" – OD 4"

Radial sealings flush at the front

The weld-in flange of the tank bottom housing permits shut-off flush at the front of the tank and thus ideal for the best tank cleaning.

Thanks to the compact design of the housing, the pipeline is well accessible for the cleaning media.



Housing combinations

T-smart tank bottom shut-off valves are available, as standard, in two housing versions.





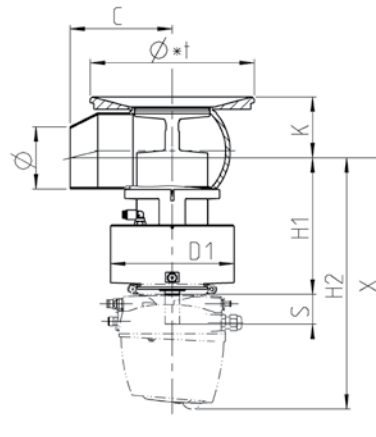
Tank bottom valve type 4001



Tank bottom valve type 4002




Technical data of the standard version	
Recommended flow direction	Filling, emptying
Material in contact with the product	AISI 316L
Material not in contact with the product	AISI 304
Seal material in contact with the product	EPDM
Ambient temperature	0 to 45 °C
Air supply pressure	Min. 6 bar, max. 8 bar
Max. product pressure	DN 25 – DN 65 OD 1" – OD 3" Max. 6 bar
	DN 80 – DN 100 OD 4" Max. 5 bar/max. 6 bar*
Surface in contact with the product	Ra ≤ 0.8 µm
Surface not in contact with the product	Metal blank
Control and feedback system	Connection 0 (without control top)
Actuator type	Pneumatic actuator air/spring
Connection fittings	Welding end
Certificates	 



	Pipe	Housing	Actuator	Dimensions			Valve			Housing connection	
Nominal width	Ø [mm]	C [mm]	Ø D1 [mm]	H1 [mm]	H2 [mm]	X [mm]	Stroke S [mm]	Particle size [mm]	Weight [kg]	K [mm]	Øt* [mm]
DN 25	29,0 × 1,50	90	109	123.5	287.5	197	25	16	8.5	59.5	165
DN 40	41,0 × 1,50	125	170	140.5	304.5	231	33	24	9.0	71.0	200
DN 50	53,0 × 1,50	125	170	146.5	310.5	237	33	24	9.0	65.0	200
DN 65	70,0 × 2,00	140	170	172.5	336.5	298	41	32	17.0	91.0	225
DN 80	85,0 × 2,00	140	170	180.0	344.0	306	41	32	29.0	83.5	225
DN 100	104,0 × 2,00	140	170	189.5	353.5	340	41	32	30.0	99.0	225
OD 1"	25,4 × 1,65	90	109	124.5	288.5	194	25	16	8.5	59.0	165
OD 1 ½"	38,1 × 1,65	125	170	139.0	303.0	236	33	24	9.0	66.5	200
OD 2"	50,8 × 1,65	125	170	145.0	309.0	242	33	24	9.0	60.5	200
OD 2 ½"	63,5 × 1,65	140	170	170.0	334.0	296	41	32	17.0	91.5	225
OD 3"	76,2 × 1,65	140	170	176.5	340.5	303	41	32	18.0	85.0	225
OD 4"	101,6 × 2,11	140	170	188.5	352.0	339	41	32	30.0	100.5	225

* The left value refers to the closed fail-safe position of the valve, the right one to the open non-actuated position (see position 5 in the order code).



Position	Description of the order code for the standard version			
1	Valve type			
	4 Tank bottom valve			
2	Housing combinations			
	001			
3	Nominal width standard			
	0	OD	1	DN
4	Nominal width			
	100	OD 1"	025	DN 25
	150	OD 1 1/2"	040	DN 40
	200	OD 2"	050	DN 50
	250	OD 2 1/2"	065	DN 65
	300	OD 3"	080	DN 80
	400	OD 4"	100	DN 100
5	Non-actuated position			
	0 Closed			
6	Air connection			
	0 Without			
	1 Metric			
	2 Inch			
7	Port orientation top			
	0 0°			
8	Air support			
	0 Without			
9	Seal material			
	0 EPDM			
10	Port orientation bottom			
	0 No connection			
11	Connection fittings			
	0 Welding end			
	1 Tri-clamp			
12	Certificates			
	0 Without			
	1 Test report 2.2			
	2 Inspection certificate 3.1			
	3 Certificates 2.2 and 3.1			

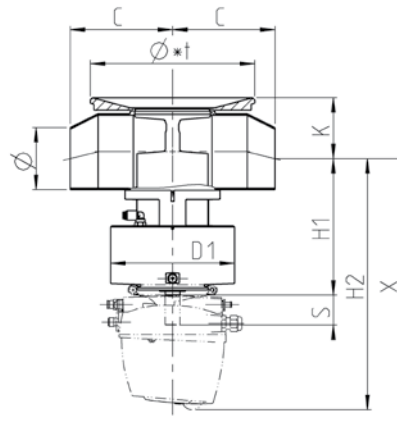


The code is composed as follows, depending on the chosen configuration:

Position	1	2	3	4	5	6	7	8	9	10	11	12		
Code	4	001	-		0		0	0	-	0	0			+ Code for control and feedback systems, see section 7




Technical data of the standard version	
Recommended flow direction	Filling, emptying
Material in contact with the product	AISI 316L
Material not in contact with the product	AISI 304
Seal material in contact with the product	EPDM
Ambient temperature	0 to 45 °C
Air supply pressure	Min. 6 bar, max. 8 bar
Max. product pressure	DN 25 – DN 65 OD 1" –OD 3" Max. 6 bar
	DN 80 – DN 100 OD 4" Max. 5 bar/max. 6 bar*
Surface in contact with the product	Ra ≤ 0.8 µm
Surface not in contact with the product	Metal blank
Control and feedback system	Connection 0 (without control top)
Actuator type	Pneumatic actuator air/spring
Connection fittings	Welding end
Certificates	 



	Pipe	Housing	Actuator	Dimensions			Valve			Housing connection	
Nominal width	Ø [mm]	C [mm]	Ø D1 [mm]	H1 [mm]	H2 [mm]	X [mm]	Stroke S [mm]	Particle size [mm]	Weight [kg]	K [mm]	Øt* [mm]
DN 25	29,0 × 1,50	90	109	123.5	287.5	197	25	16	8.5	59.5	165
DN 40	41,0 × 1,50	125	170	140.5	304.5	231	33	24	9.0	71.0	200
DN 50	53,0 × 1,50	125	170	146.5	310.5	237	33	24	9.0	65.0	200
DN 65	70,0 × 2,00	140	170	172.5	336.5	298	41	32	17.0	91.0	225
DN 80	85,0 × 2,00	140	170	180.0	344.0	306	41	32	29.0	83.5	225
DN 100	104,0 × 2,00	140	170	189.5	353.5	340	41	32	30.0	99.0	225
OD 1"	25,4 × 1,65	90	109	124.5	288.5	194	25	16	8.5	59.0	165
OD 1 ½"	38,1 × 1,65	125	170	139.0	303.0	236	33	24	9.0	66.5	200
OD 2"	50,8 × 1,65	125	170	145.0	309.0	242	33	24	9.0	60.5	200
OD 2 ½"	63,5 × 1,65	140	170	170.0	334.0	296	41	32	17.0	91.5	225
OD 3"	76,2 × 1,65	140	170	176.5	340.5	303	41	32	18.0	85.0	225
OD 4"	101,6 × 2,11	140	170	188.5	352.0	339	41	32	30.0	100.5	225

* The left value refers to the closed fail-safe position of the valve, the right one to the open non-actuated position (see position 5 in the order code).

Position	Description of the order code for the standard version			
1	Valve type			
	4 Tank bottom valve			
2	Housing combinations			
	002			
3	Nominal width standard			
	0	OD	1	DN
4	Nominal width			
	100	OD 1"	025	DN 25
	150	OD 1 1/2"	040	DN 40
	200	OD 2"	050	DN 50
	250	OD 2 1/2"	065	DN 65
	300	OD 3"	080	DN 80
	400	OD 4"	100	DN 100
5	Non-actuated position			
	0 Closed			
6	Air connection			
	0 Without			
	1 Metric			
	2 Inch			
7	Port orientation top			
	0 0°			
8	Air support			
	0 Without			
9	Seal material			
	0 EPDM			
10	Port orientation bottom			
	0 No connection			
11	Connection fittings			
	0 Welding end			
	1 Tri-clamp			
12	Certificates			
	0 Without			
	1 Test report 2.2			
	2 Inspection certificate 3.1			
	3 Certificates 2.2 and 3.1			

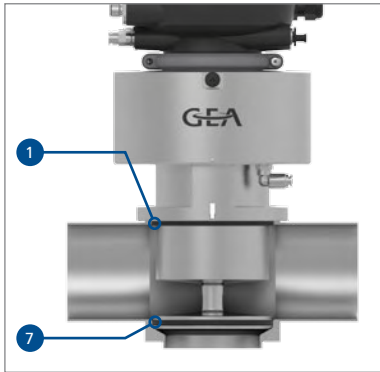


The code is composed as follows, depending on the chosen configuration:

Position	1	2	3	4	5	6	7	8	9	10	11	12		
Code	4	002	-		-	0		0	0	-	0	0		+ Code for control and feedback systems, see section 7

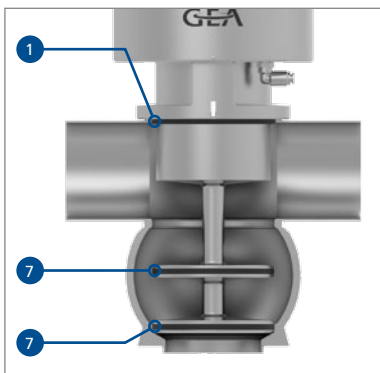
The adjacent illustrations of the T-smart seat valves show an example for the composition of a sealing set. The content differs between the individual valve types.

A seal kit contains the seals, for the specific valve, that come in contact with the product. The precise components of all seal kits and information about maintenance can be found in the associated operating instructions.



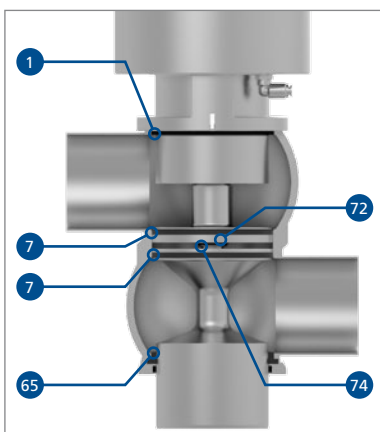
Components of the sealing set for a T-smart shut-off valve 1000	
Position	Designation
1	Sealing ring
7	O-ring

Nominal width		EPDM
DN	OD	Article number
25	1"	231-000227
40/50	1 ½"/2"	231-000228
65/80	2 ½"/3"	231-000229
100	4"	231-000230



Components of the sealing set for a T-smart divert valve 2000	
Position	Designation
1	Sealing ring
7	O-ring

Nominal width		EPDM
DN	OD	Article number
25	1"	231-000235
40/50	1 ½"/2"	231-000236
65/80	2 ½"/3"	231-000237
100	4"	231-000238



Components of the sealing set for a T-smart double-seat valve 3000	
Position	Designation
1	Sealing ring
7	O-ring
65	Sealing ring
72	Snap seal
74	O-ring

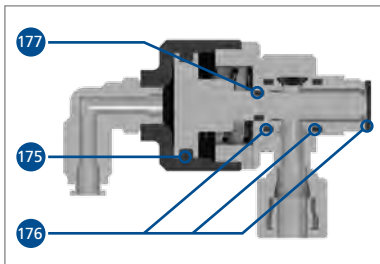
Nominal width		EPDM
DN	OD	Article number
25/40/50	1"/1 ½"/2"	231-000243
65	2 ½"	231-000244
80/100	3"/4"	231-000245

The adjacent illustrations of the T-smart seat valves show an example for the composition of a sealing set. The content differs between the individual valve types.

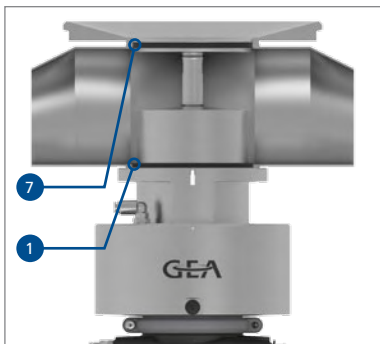
A seal kit contains the seals, for the specific valve, that come in contact with the product. The precise components of all seal kits and information about maintenance can be found in the associated operating instructions.



Components of the sealing set for a T-smart double-seal valve 5000	
Position	Designation
1	Sealing ring
7	O-ring
8	O-ring
175	O-ring
176	O-ring
177	O-ring























Nominal width		EPDM
DN	OD	Article number
25/40/50	1" / 1 1/2" / 2"	231-000488
65	2 1/2"	231-000489
80/100	3" / 4"	231-000490



Components of the sealing set for a T-smart single-seat bottom valve 4000	
Position	Designation
1	Sealing ring
7	O-ring

Nominal width		EPDM
DN	OD	Article number
25	1"	231-000228
40/50	1 1/2" / 2"	231-000229
65/80/100	2 1/2" / 3" / 4"	231-000230

Lubricant		
	Tool	Article number
	Rivolta F.L.G. MD-2	413-071
Tools T-smart 1000/T-smart 2000/T-smart 4000		
	Tool	Article number
	Hose cutter	407-065
	Strap wrench	408-142
	Allen key 3 mm	408-121
	Open-end spanner 13x17 mm	408-036
	Adjustable face wrench 125/6 3 mm	408-198
Tools T-smart 3000		
	Tool	Article number
	<p>Ring screw M14</p> <p>The ring screw can be used for installation and maintenance of a double-seat valve T-smart 3000. For this, the ring screw must be screwed into the piston stem of the actuator after disassembly of the control top, which permits secure transport with the present lifting equipment.</p>	221-104.98
	Hose cutter	407-065
	Strap wrench	408-142
	Allen key 3 mm	408-121
	Open-end spanner 13x17 mm	408-036
	Adjustable face wrench 125/6 3 mm	408-198
	Snap ring pliers for shafts A31, 40-100	9065839
	Mounting tool DSV	231-000275

Tools T-smart 5000		
	Tool	Article number
	<p>Ring screw M14</p> <p>The ring screw can be used for installation and maintenance of a double-seat valve T-smart 5000. For this, the ring screw must be screwed into the piston stem of the actuator after disassembly of the control top, which permits secure transport with the present lifting equipment.</p>	221-104.98
	Hose cutter	407-065
	Strap wrench	408-142
	Allen key 3 mm	408-121
	Open-end spanner 30x32 mm	408-041
	Adjustable face wrench 125/6 3 mm	408-198

T.VIS® Control Top

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

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

Common features of all T.VIS® variants are:

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

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

T.VIS® concept – for valves with pneumatic actuator



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

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



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

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



INA – proximity switch holder on the actuator

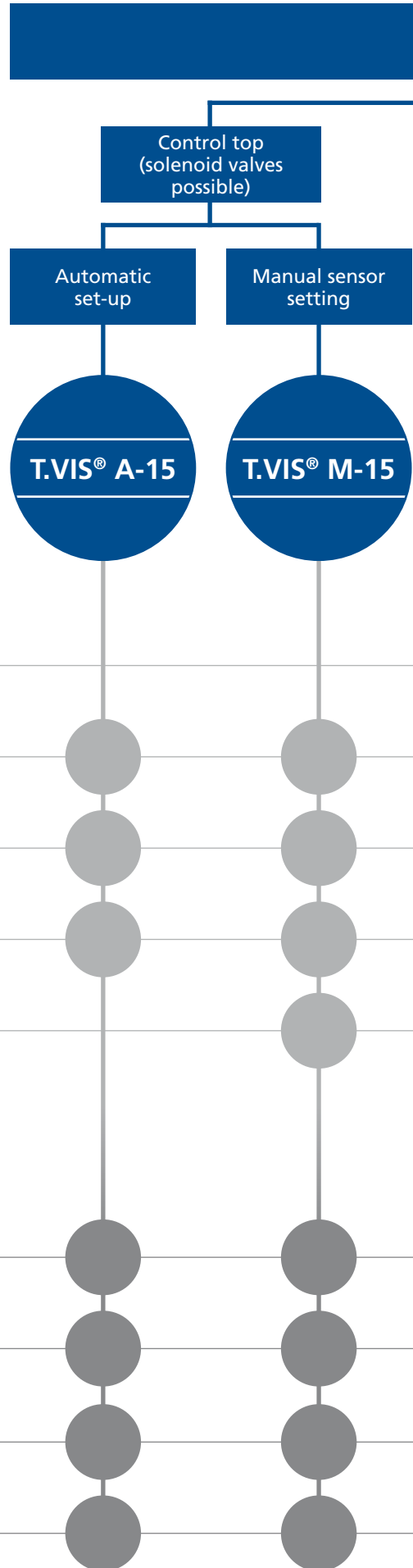
- For 2 proximity switches M12x1

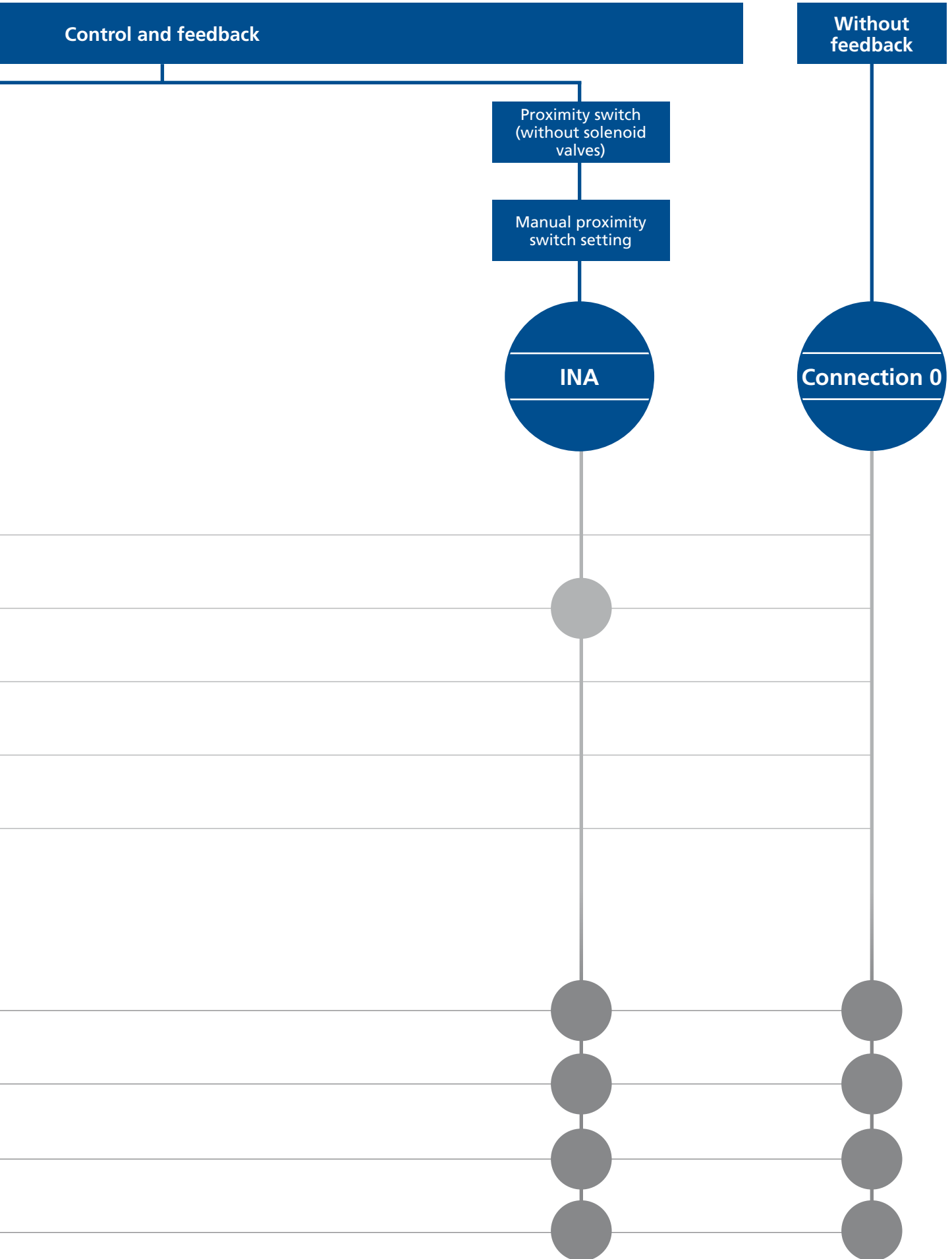
Function

Product

Available interface

Available for





Concept

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

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

Standard version



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

Features

- Flexible modular system
- Use of proven sensor technology
- Quick and easy adjustment of the sensors
- Valve status display by LED
- Various communication standards available
- Components can be upgraded/converted subsequently
- Filter protects solenoid valves
- High-quality pneumatic screw connections
- Exchangeable compressed air connection
- Supply and exhaust air throttles can be fitted
- Logic NOT-element
- Standard protection class IP66

Structure

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

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

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

Position detection

Inductive sensor system – the valve positions (open/close) are detected using two manually adjustable sensors.

Setting

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

Logic NOT-element (not available for T-smart 3000)

A logic NOT-element is available as an option. It simplifies wiring with automatic air support of the spring in the actuator, in order to increase the holding force of the valve.

For more information about the logic NOT-element, refer to the end of this section.


Visualization

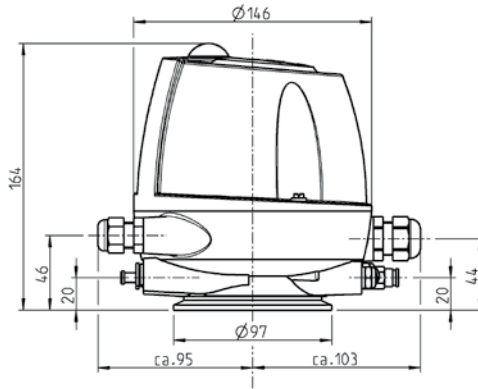
LED display:

- green
- yellow





Technical data of the standard version		
Position detection	Sensors	
Housing material	PA12/L	
Ambient temperature	-20 to +60 °C	
Air supply	Pressure range	2 bis 8 bar
	Standard	acc. to ISO 8573-1:2010
	Solid content	Quality class 6
	Water content	Quality class 4
	Oil content	Quality class 3
Dimensions of air connections	Metric 6/4 mm, inch 6.35/4.31 mm (1/4")	
Protection class	IP66 (powerful water jet)	
Sound pressure level via exhaust air throttle	Max. 72 dB	
Visualization	LED (green, yellow)	
Certificates (optional)		• CSA C22.2
		• UL 429



Type of interface	24 V DC, 3-wire, PNP 24 V DC, 3-wire, NPN	48 – 130 V AC
Supply		
Operating voltage	24 V DC (+20 %, -12.5 %)	48 – 130 V AC
No-load current	≤ 40 mA	≤ 51 mA
Maximum current consumption	285 mA	185 mA
Polarity reversal protection	Yes	Yes
Certificate	cCSAus	cULus
Inputs		
Activation voltage	21–28,8 V = High; < 16 V = Low	48–130 V = High*; < 30 V = Low > 1.5 mA = High*; < 0.4 mA = Low
Current consumption per input	≤ 35 mA	≤ 3 mA
Control "PV Y1"	Direct PV activation	Electronic input
Control "PV Y2"	Direct PV activation	Electronic input
Control "PV Y3"	Direct PV activation	Electronic input
Outputs		
Connection type	24 V DC (PNP/NPN changeover function)	
Maximum current carrying capacity per feedback output	50 mA	≤ 100 mA
Voltage drop on the outputs	≤ 3 V	≤ 5 V
Feedback "Start position"	Electronic outputs	Electronic outputs
Feedback "End position"	Electronic outputs	Electronic outputs
Feedback "Seat lift position"	Electronic outputs	Electronic outputs


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

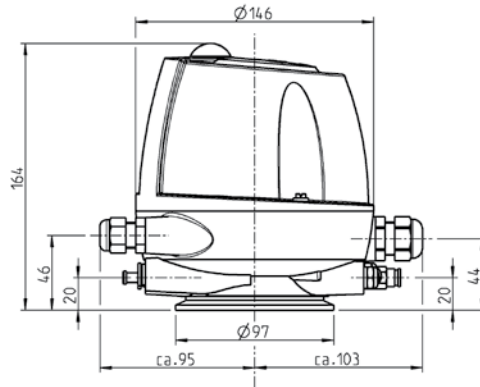
Position	Description of the order code
13	Feedback location TM15 Control top T.VIS® M-15
14	Control top type N Without solenoid valve P 1 solenoid valve Y1 R 1 solenoid valve Y1 (retrofittable: Y2, Y3) I 2 solenoid valves Y1, Y2 (retrofittable: Y3) J 2 solenoid valves Y1, Y3 (retrofittable: Y2) L 3 solenoid valves Y1, Y2, Y3 V 1 solenoid valve Y1, logic NOT-element
15	Feedback 2 2 feedbacks
16	Type of interface B 24 V DC, 3-wire, PNP N 24 V DC, 3-wire, NPN C 48–130 V AC
17	Solenoid valve A 24 V DC, 0,85 W 0 Without
18	Screw fitting M Metr. Air connection, M20x1.5 cable gland Z Inch air connection, 0.5" NPT cable gland J Metr. air connection, 5-pin M12 plug (1 solenoid valve, 2 feedbacks) P Inch air connection, 5-pin M12 plug (1 solenoid valve, 2 feedbacks) H Metr. air connection, 8-pin M12 plug (> 1 solenoid valve, > 2 feedbacks) I Inch air connection, 8-pin M12 plug (> 1 solenoid valve, > 2 feedbacks) B Inch air connection, Brad Harrison 0.5" NPT 5-pin plug (US)
	Options (multiple selection possible) /18 Supply air throttle: regulates the opening speed of the valve /19 Exhaust air throttle: regulates the closing speed of the valve /22 5-pin M12 connection socket for screw fitting J, P (article no. 508-963) 8-pin M12 connection socket for screw fitting H, I (article no. 508-061) /67 Protection class IP67 (temporary immersion) /69k Protection class IP69k (high pressure spray down) /UC Certification UL/CSA

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

Position	13	14	15	16	17	18	Options								
Code	TM15		2												



Technical data of the standard version		
Position detection	Sensors	
Housing material	PA12/L	
Ambient temperature	-20 to +60 °C	
Air supply	Pressure range	2 bis 8 bar
	Standard	acc. to ISO 8573-1:2010
	Solid content	Quality class 6
	Water content	Quality class 4
	Oil content	Quality class 3
Dimensions of air connections	Metric 6/4 mm, inch 6.35/4.31 mm (¼")	
Protection class	IP66 (powerful water jet)	
Sound pressure level via exhaust air throttle	Max. 72 dB	
Visualization	LED (green, yellow)	
Certificates (optional)		<ul style="list-style-type: none"> • CSA C22.2 • UL 429



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

Position	Description of the order code
13	Feedback location TM15 Control top T.VIS® M-15
14	Control top type N Without solenoid valve P 1 solenoid valve Y1 R 1 solenoid valve Y1 (retrofittable: Y2, Y3) I 2 solenoid valves Y1, Y2 (retrofittable: Y3) J 2 solenoid valves Y1, Y3 (retrofittable: Y2) L 3 solenoid valves Y1, Y2, Y3 V 1 solenoid valve Y1, logic NOT-element
15	Feedback 2 2 feedbacks
16	Type of interface A AS-interface bus D DeviceNet
17	Solenoid valve A 24 V DC, 0,85 W 0 Without
18	Screw fitting A Metr. air connection M20x1.5 cable gland with connection box on cable 1 m (AS-i) S Inch air connection M20x1.5 cable gland with connection box on cable 1 m (AS-i) L Metr. air connection, 2-pin M12 plug (AS-i) U Inch air connection, 2-pin M12 plug (AS-i) D Metr. air connection, 5-pin M12 plug (DeviceNet) K Inch air connection, 5-pin M12 plug (DeviceNet)
	Options (multiple selection possible) /18 Supply air throttle: regulates the opening speed of the valve /19 Exhaust air throttle: regulates the closing speed of the valve /22 5-pin M12 connection socket for screw fitting L, U, D, K (A-coded, article no. 508-963) /67 Protection class IP67 (temporary immersion) /69k Protection class IP69k (high pressure spray down) /81 AS-i connection box on cable 1 m with M12 connection socket (article no. 508-027) for screw fitting L, U /82 AS-i connection box on cable 2 m with M12 connection socket (article no. 508-028) for screw fitting L, U /UC Certification UL/CSA

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

Position	13	14	15	16	17	18	Options								
Code	TM15		2												

Concept

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

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

Standard version



- 1 Pneumatic block
- 2 Control unit
- 3 Path measuring system
- 4 Solenoid valves
- 5 LED lighting
- 6 2 push buttons
- 7 Central compressed air connection with replaceable filter
- 8 M12 plug connection
- 9 Logic NOT-element

Features

- Quick, automatic initialization
- Tamper-proof setting of tolerances
- Reduced energy consumption
- Reduction in operating costs
- Valve status display by LED
- Basic LED colors can be selected specifically for the customer
- Filter protects solenoid valves
- High-quality pneumatic screw connections
- Exchangeable compressed air connection
- Supply and exhaust air throttles can be fitted
- Logic NOT-element
- Semi-automatic set-up
- Standard protection class IP66

Structure

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

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

The control top can be opened for this.

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

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

Position detection

Path measuring system – the valve position is registered by means of a highly modern path measuring system.

Setting

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

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

Logic NOT-element (not available for T-smart 3000)

A logic NOT-element is an available option. It simplifies wiring with automatic air support of the spring in the actuator, in order to increase the holding force of the valve.

For more information about the logic NOT-element, refer to the end of this section.

Semi-automatic set-up

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

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

Visualization

LED display:


- green
- yellow
- red



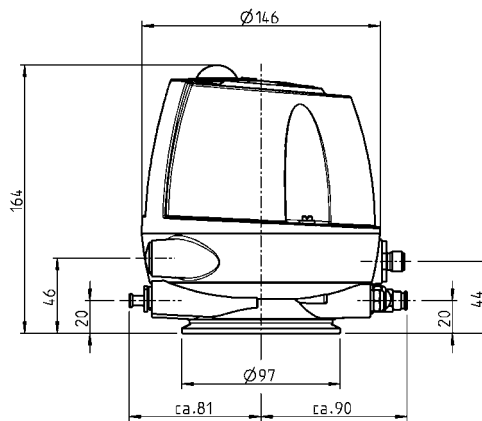
Protection class IP66

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



Technical data of the standard version		
Position detection	Path measuring system	
Housing material	PA12/L	
Ambient temperature	-20 to +60 °C	
Air supply	Pressure range	2 bis 8 bar
	Standard	acc. to ISO 8573-1:2010
	Solid content	Quality class 6*
	Water content	Quality class 4
	Oil content	Quality class 3
Dimensions of air connections	Metric 6/4 mm, inch 6.35/4.31 mm (¼")	
Protection class	IP66 (powerful water jet)	
Sound pressure level via exhaust air throttle	Max. 72 dB	
Visualization	LED (green, yellow, red)	
Certificates (optional)		• CSA C22.2
		• UL 61010-1

* Recommended



Type of interface	24 V DC, 3-wire, PNP	AS-interface bus	DeviceNet
Supply			
Operating voltage	24 V DC (+20 %, -12.5 %)	26.5–31.0 V DC V DC	11** – 26 V DC
No-load current	≤ 25 mA	≤ 25 mA	≤ 35 mA
Maximum current consumption	265 mA	65 mA*	75 mA
Polarity reversal protection	Yes	Yes	Yes
Specification		AS-i V3.0 (max. 62 slaves)	
Additional information		IO.ID.ID2-code: 7.A.E.	
Certificate		AS-i Association	ODVA

Inputs			
Connection type	24 V DC (PNP)		
Short circuit-proof	Yes		
Overload-proof	Yes		
Maximum current carrying capacity per feedback output	100 mA		
Voltage drop on the outputs	≤ 1 V		
Feedback "Start position"	Electronic output	Data bit DI 0	Data bit I-0
Feedback "End position"	Electronic output	Data bit DI 1	Data bit I-1
Feedback "Seat lift position"	Electronic output	Data bit DI 2	Data bit I-2

Outputs			
Activation voltage	> 13 V = high; < 6 V = low		
Current consumption per input	< 10 mA		
Control "PV Y1"	Electronic input	Data bit DO 0	Data bit O-0
Control "PV Y2"	Electronic input	Data bit DO 1	Data bit O-1
Control "PV Y3"	Electronic input	Data bit DO 2	Data bit O-2

* This value only applies with the solenoid valve activated. ** This value applies with a control top without solenoid valve.

Position	Description of the order code
13	Feedback location TA15 Control top T.VIS® A-15
14	Control top type N Without solenoid valve P 1 solenoid valve Y1 I 2 solenoid valves Y1, Y2 (Y2 for lower seat lift) J 2 solenoid valves Y1, Y3 (Y3 for upper seat lift, air/air actuator or external process valve) L 3 solenoid valves Y1, Y2, Y3 V 1 solenoid valve Y1, logic NOT-element
15	Feedback 8 2 digital feedbacks
16	Type of interface A AS-interface BUS B 24 V DC PNP D DeviceNet
17	Solenoid valve A 24 V DC, 0,85 W 0 Without
18	Screw fitting J Metr. air connection, 5-pin M12 plug for 24 V DC (1 solenoid valve, 2 feedbacks), AS-i, DeviceNet P Inch air connection, 5-pin M12 plug for 24 V DC (1 solenoid valve, 2 feedbacks), AS-i, DeviceNet H Metr. air connection, 8-pin M12 plug for 24 V DC (> 1 solenoid valve, > 2 feedbacks) I Inch air connection, 8-pin M12 plug for 24 V DC (> 1 solenoid valve, > 2 feedbacks) M Metr. air connection M20x1.5 cable gland with integrated terminal strip Z Inch air connection 0.5" NPT cable gland with integrated terminal strip
	Options (multiple selection possible) /18 Supply air throttle: regulates the opening speed of the valve /19 Exhaust air throttle: regulates the closing speed of the valve /22 24 V DC/AS-i/DeviceNet: 5-pin connection socket for screw fitting J, P (article no. 508-963) 24 V DC: 8-pin connection socket for screw fitting H, I (article no. 508-061) /67 Protection class IP67 (temporary immersion) /69k Protection class IP69k (high pressure spray down) /81 AS-i connection box on cable 1 m with 5-pin M12 connection socket (article no. 508-027) /82 AS-i connection box on cable 2 m with 5-pin M12 connection socket (article no. 508-028) /UC Certification UL/CSA

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

Position	13	14	15	16	17	18	Options								
Code	TA15		8												



Connection 0

Connection 0 can be used as an alternative to feedback systems if no feedback sensors are wanted above the actuator. Connection 0 is available in a metric and inch variant.

Technical data	
Material	AISI 304
Surface	Metal blank



INA – proximity switch holder on the actuator

The proximity switch holder M12x1 (INA) makes it possible to use feedback sensors above the actuator. The proximity switch holder has prepared M12x1 holes which allow the sensors to be set optimally. A direct connection to the controller provides the feedback on the valve position.

Technical data	
Material	AISI 304
Surface	Metal blank

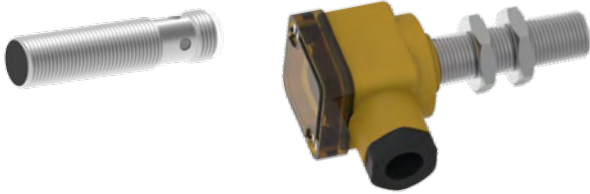
Position	Description of the order code
13	Feedback location
	000 Connection 0 (without feedback) INA. Proximity switch holder for connection 0 for max. 2 proximity switches M12x1
14	Control top type
	0 Connection 0
15	Feedback
	0 Without (INA, 000)
	1 1 feedback (INA)
16	Type of switch
	0 Without (INA, 000)
	B NI 24 V DC 3-wire PNP M12x1 with terminal chamber (INA)
	F NI 24 V DC 2-wire M12x1 with terminal chamber (INA)
	E NI NAMUR M12x1 with terminal chamber (INA)
	X NI 24 V DC 3-wire NPN M12x1 with terminal chamber (INA)
S NI 24 V DC 3-wire PNP M12x1 with plug connector (INA)	
17	Cable connection
	0 Without
18	air connection
	0 Without
	M Metric (article no. 221-140.02) Z Inch (article no. 2214-140.04)

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

Position	13	14	15	16	17	18	Options								
Code		0			0										

Proximity Switches

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



Technical data	
Nominal switching distance	2 to 4 mm
Protection class	IP67
Operating voltage	10–30 V DC/NAMUR
Material	PA 12/L GF 30/VA
Permitted ambient temperature	-30 to +85 °C

Proximity switch M12×1 for INA, LAT	Article number
2-wire (terminal chamber)	505-104
3-wire PNP (M12-plug)	505-088
4-wire NPN (change with terminal chamber)	505-105

Technical data	
Nominal switching distance	4 mm
Operating voltage	7.5-30 V DC
Permitted ambient temperature	-20 to 70 °C

Proximity switch M12×1 for T.VIS®	Article number
NAMUR (M12-plug)	505-098

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

Proximity switch M12×1 for SES	Article number
NAMUR (terminal chamber)	505-085

Switch bars

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

T-smart seat valves		
	T.VIS® M-15	T.VIS® A-15
Switch bar	221-589.80	221-589.75



Switch bar 221-589.80
for T.VIS® M-15



Switch bar 221-589.75
for T.VIS® A-15

Logic NOT-element

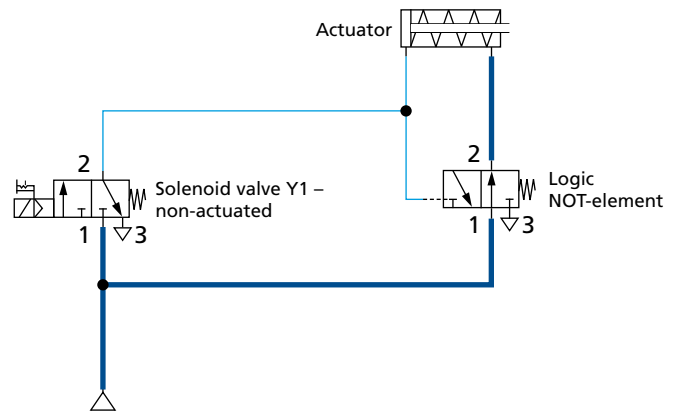
The control tops TVIS® A-15 and TVIS® M-15 can optionally be ordered equipped with a logic NOT-element. It simplifies wiring with optionally available automatic air support of the spring chamber in the actuator in order to increase the locking force of the valve, thus ensuring that it remains closed even at high product pressures, for example.

The logic NOT-element is linked to the solenoid valve Y1 (main stroke) of the particular control top, and automatically channels the air supply to the spring side of the actuator as soon as solenoid valve Y1 for the main stroke is deactivated.

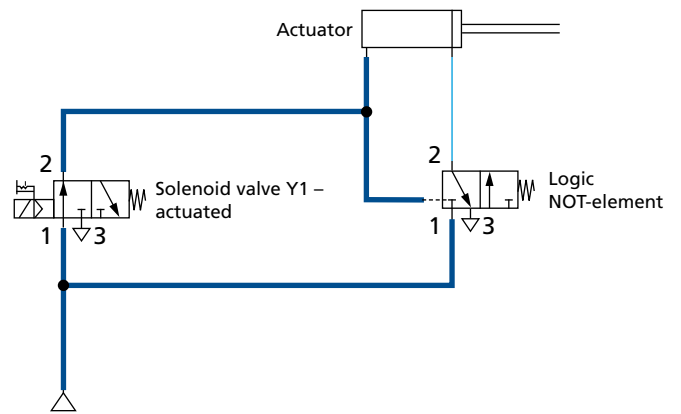
The pneumatic operating method of the logic NOT-element means there is no additional control complexity. In order for the logic NOT-element to be used, it is necessary for the installed actuator to be equipped with an air connection on the spring side.

To order a control top with logic NOT-element, select one of the following options in the order code under “control top type”:

- V – 1 solenoid valve and a NOT-element
- X – 2 solenoid valves and a NOT-element



When the solenoid valve is closed, the logic NOT-element automatically directs the supporting air supply to the spring side of the actuator.



Activating the solenoid valve also activates the logic NOT-element pneumatically. The spring chamber is opened to the atmosphere and depressurized, causing the main stroke to take place.

IP protection classes

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

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

Meaning of the index numbers

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

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

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

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

- The protection class IPx6 includes all protection classes below.
- **This does not apply to the higher protection class IPx7.** If this protection class is to include a lower protection class, this is to be indicated by a combination of index figures (e.g. IP67/69k).

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



Semi-automatic Setup




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

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

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

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

Connection Screw Fitting

	Order code for air connection		In conjunction with screw fitting or plug	Use	Matching connection socket		
	Metric	Inch			Option	Item no.	Designation
	M		M20x1,5 cable gland	T.VIS® M-15 T.VIS® A-15	-	-	-
		Z	0.5" NPT cable gland	T.VIS® M-15 T.VIS® A-15	-	-	-
	A	S	M20x1.5 cable gland with connection box on cable 1 m	T.VIS® M-15 (AS-i)	-	-	-
	L	U	2-pin M12 plug (A-coded)	T.VIS® M-15 (AS-i)	/22	508-963	5-pin M12-connection socket (A-coded)
					/81	508-027	AS-i connection box on cable 1 m with 5-pin M12 connection socket (A-coded)
					/82	508-028	AS-i connection box on cable 2 m with 5-pin M12 connection socket (A-coded)
	D	K	5-pin M12 plug (A-coded)	T.VIS® M-15 (DeviceNet)	/22	508-963	5-pin M12-connection socket (A-coded)
			5-pin M12 plug (B-coded)	T.VIS® M-15 (DeviceNet)		508-964	5-pin M12-connection socket (B-coded)
	J	P	5-pin M12 plug (A-coded)	T.VIS® M-15 (24 V DC) T.VIS® M-15 (48–130 V AC)	/22	508-963	5-pin M12-connection socket (A-coded)
				T.VIS® A-15 (24 V DC) T.VIS® A-15 (AS-i) T.VIS® A-15 (DeviceNet)			
	H	I	8-pin M12 plug (A-coded)	T.VIS® M-15 (24 V DC) T.VIS® M-15 (48–130 V AC)	/22	508-061	8-pin M12-connection socket (A-coded)
				T.VIS® A-15 (24 V DC)			
		B	Brad Harrison 0.5" NPT 5-pin plug	T.VIS® M-15 (24 V DC) T.VIS® M-15 (48–130 V AC)	-	-	-

24 V (PNP/NPN)

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

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

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

BUS AS-Interface



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

DeviceNet bus

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

48–130 V AC


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

4–20 mA (3-wire)

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

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

Procedure for valve selection

Position	Description of the order code for the standard version
1	Valve type 3 Mixproof Shut-off Valves
2	Housing combinations E 022 
3	Nominal width standard 0 OD 1 DN
4	Nominal width 100 OD 1" 025 DN 25 150 OD 1 1/2" 040 DN 40 200 OD 2" 050 DN 50 250 OD 2 1/2" 065 DN 65 300 OD 3" 080 DN 80 400 OD 4" 100 DN 100
5	Non-actuated position 0 Closed
6	Air connection 0 Without 1 Metric 2 Inch
7	...

Procedure for feedback system selection

Position	Description of the order code
13	Feedback location TM15 Control top T.VIS® M-15
14	Control top type N Without solenoid valve P 1 solenoid valve Y1 R 1 solenoid valve Y1 (retrofittable: Y2, Y3) I 2 solenoid valves Y1, Y2 (retrofittable: Y3) J 2 solenoid valves Y1, Y3 (retrofittable: Y2) L 3 solenoid valves Y1, Y2, Y3 V 1 solenoid valve Y1, logic NOT-element
15	Feedback 2 2 feedbacks
16	...











Example for a complete order code, comprising valve and feedback system:

Position	1	2	3	4	5	6	7	8	9	10	11	12
Code	3	022	0	200	0	1	1	0	0	0	0	0

+

Position	13	14	15	16	17	18	Options					
Code	TM15	P	2	B	A	M						

The complete order code shows all the possible configurations for seat valves of the series T-smart at a glance. All available variants for the particular series are contained.

Position	Description of the order code	Available for T-smart				
		1000	2000	3000	5000	4000
1	Valve type					
	1 Shut-off valve	•				
	2 Divert valve		•			
	3 Double-seat valve			•		
	5 Double-seat valve				•	
4 Tank bottom valve					•	
2	Housing combinations					
	007 	•			•	
	003 	•			•	
	017 		•			
	027 		•			
	022 			•		
	011 			•		
	012 			•		
	021 			•		
	001 					•
	002 					•

Position	Description of the order code	Available for T-smart				
		1000	2000	3000	5000	4000
3	Nominal width standard					
	0 OD 1 DN	•	•	•	•	•
4	Nominal width					
	100 OD 1" 025 DN 25	•	•	•	•	•
	150 OD 1 ½" 040 DN 40	•	•	•	•	•
	200 OD 2" 050 DN 50	•	•	•	•	•
	250 OD 2 ½" 065 DN 65	•	•	•	•	•
	300 OD 3" 080 DN 80	•	•	•	•	•
	400 OD 4" 100 DN 100	•	•	•	•	•
5	Non-actuated position					
	0 Closed 1 Opened	•	•	•	•	•
6	Air connection					
	0 Without 1 Metric 2 Inch	•	•	•	•	•
		•	•	•	•	•
7	Port orientation top					
	0 0° 1 90° 2 180° 3 270°	•		•	•	•
			•	•		
			•*	•**		
8	Air support					
	0 Without	•	•	•	•	•
9	Seal material					
	0 EPDM	•	•	•	•	•
10	Port orientation bottom					
	0 No connection	•	•	•	•	•
11	Connection fittings					
	0 Welding end 1 Tri-clamp	•	•	•	•	•
12	Certificates					
	0 Without 1 Test report 2.2 2 Inspection certificate 3.1 3 Certificates 2.2 and 3.1	•	•	•	•	•
		•	•	•	•	•
		•	•	•	•	•

* Only for divert valve type 2017

** Only for double-seat valve type 3011










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

The complete order code makes it possible to assemble an order code for a control and feedback system. All options possible for the particular control or feedback system are included.

Position	Description of the order code	Available for control and feedback system			
		TM15	TA15	000	INA
13	Feedback location				
	TM15 Control top T.VIS® M-15	•			
	TA15 Control top T.VIS® A-15		•		
	000 Connection 0			•	
	INA. Proximity switch mount for connection 0 for 2x proximity switches M12x1				•
14	Control top type				
	0 Connection 0			•	
	N Without solenoid valve	•	•		
	P 1 solenoid valve Y1	•	•		
	R 1 solenoid valve Y1 (for T.VIS® M-15 retrofittable: Y2, Y3)	•			
	I 2 solenoid valves Y1, Y2 (for T.VIS® M-15 retrofittable: Y3)	•	•		
	J 2 solenoid valves Y1, Y3 (for T.VIS® M-15 retrofittable: Y2)	•	•		
	L 3 solenoid valves Y1, Y2, Y3	•	•		
V 1 solenoid valve Y1 (for T.VIS® M-15 retrofittable: Y2, Y3), logic NOT-element	•	•			
15	Feedback				
	0 Without feedback			•	•
	1 1 feedback				•
	2 2 feedbacks	•			•
	8 2 digital feedbacks		•		
16	Type of interface/type of switch				
	0 Without			•	•
	A AS-interface bus	•	•		
	B 24 V DC, 3-wire, PNP	•	•		
	B NI 24 V DC 3-wire PNP M12x1 with terminal chamber				•
	C 48–130 V AC	•			
	D DeviceNet	•	•		
	E NI NAMUR M12x1 with terminal chamber				•
	F NI 24 V DC 2-wire M12x1 with terminal chamber				•
	N 24 V DC, 3-wire, NPN	•			
	S NI 24 V DC 3-wire PNP M12x1 with plug connector				•
X NI 24 V DC 3-wire NPN M12x1 with terminal chamber				•	
17	Solenoid valve				
	0 Without	•	•	•	•
	A 24 V DC, 0,85 W	•	•		

Position	Description of the order code	Available for control and feedback system			
		TM15	TA15	000	INA
18	Connection screw fitting/air connection				
	0 Without			•	•
	A Metr. air connection M20×1.5 cable gland with connection box on cable 1 m (AS-i)	•			
	B Inch air connection, Brad Harrison 0.5" NPT 5-pin plug (US)	•			
	D Metr. air connection, 5-pin M12 plug (DeviceNet)	•			
	H Metr. air connection, 8-pin M12 plug (> 1 solenoid valve, > 2 feedbacks)	•			
	H Metr. air connection, 8-pin M12 plug for 24 V DC (> 1 solenoid valve, > 2 feedbacks)		•		
	I Inch air connection, 8-pin M12 plug (> 1 solenoid valve, > 2 feedbacks)	•			
	I Inch air connection, 8-pin M12 plug for 24 V DC (> 1 solenoid valve, > 2 feedbacks)		•		
	J Metr. air connection, 5-pin M12 plug (1 solenoid valve, 2 feedbacks)	•			
	J Metr. air connection, 5-pin M12 plug for 24 V DC (1 solenoid valve, 2 feedbacks), AS-i, DeviceNet		•		
	K Inch air connection, 5-pin M12 plug (DeviceNet)	•			
	L Metr. air connection, 2-pin M12 plug (AS-i)	•			
	M Metr. air connection, M20×1.5 cable gland	•	•	•	•
	P Inch air connection, 5-pin M12 plug (1 solenoid valve, 2 feedbacks)	•			
	P Inch air connection, 5-pin M12 plug for 24 V DC (1 solenoid valve, 2 feedbacks), AS-i, DeviceNet		•		
	S Inch air connection M20×1.5 cable gland with connection box on cable 1 m (AS-i)	•			
	U Inch air connection, 2-pin M12 plug (AS-i)	•			
	Z Inch air connection, 0.5" NPT cable gland	•	•	•	•
		Options			
	/18 Supply air throttle: regulates the opening speed of the valve	•	•		
	/19 Exhaust air throttle: regulates the closing speed of the valve	•	•		
	/22 5-pin M12 connection socket for connection screw fitting J, P	•			
	8-pin M12 connection socket for connection screw fitting H, I				
	/22 5-pin M12 connection socket for screw fitting L, U, D, K (A-coded)	•			
	/22 24 V DC/AS-i/DeviceNet: 5-pin connection socket for screw connection J, P		•		
	24 V DC: 8-pin connection socket for screw connection H, I:				
	/67 Protection class IP67 (temporary immersion)	•	•		
	/69k Protection class IP69k (high pressure spray down)	•	•		
	/81 AS-i connection box on cable 1 m with 5-pin M12 connection socket		•		
	/81 AS-i connection box on cable 1 m with M12 connection socket for screw fitting L, U	•			
	/82 AS-i connection box on cable 2 m with 5-pin M12 connection socket		•		
	/82 AS-i connection box on cable 2 m with M12 connection socket for screw fitting L, U	•			
	/UC Certification UL/CSA	•	•		

Position	13	14	15	16	17	18	Options									
Code																

AS-i		Actuator Sensor interface. BUS system for the lowest field level.
cCSAus		Test of a product by CSA according to applicable safety standards in Canada and the USA.
CE		Conformité Européenne. By affixing the CE mark, the manufacturer confirms that the product complies with the European directives applicable to the specific product.
CSA		Canadian Standards Association. A non-governmental Canadian organization which issues standards as well as checking and certifying the safety of products. It is now globally active.
cULus		Test of a product by UL according to applicable safety standards in Canada and the USA.
DeviceNet		BUS system of the ODVA organization for complex communication on various field levels.
EG 1935/2004		Materials in contact with the product used in valves from GEA Tuchenhagen GmbH are in accordance with EC regulation 1935/2004. This defines a general framework for materials and objects intended to come into contact with foodstuffs.
EHEDG		European Hygienic Engineering & Design Group. European supervisory authority for foodstuffs and pharmaceuticals. This authority issues approvals and certificates for products and materials that are used in the foodstuffs and pharmaceuticals industries.
FDA		Food and Drug Administration. US supervisory authority for foodstuffs and pharmaceuticals. This authority issues approvals and certificates for products and materials that are used in the foodstuffs and pharmaceuticals industries.
ODVA		ODVA is a worldwide association comprising leading automation companies. It develops network protocols and standards in the joint interests of its members, which are used for the international interoperability of production systems.
TÜV		Technischer Überwachungs-Verein. The German TÜV is a private company which carries out technical safety checks as prescribed in national legislation or regulations.
UL		Underwriters Laboratories. An organization founded in the USA for checking and certifying products and their safety.

Abbreviation	Explanation
°C	Degrees Celsius, unit of measurement for temperature
°F	Degrees Fahrenheit, unit of measurement for temperature
3D	Three-dimensional
A	Ampere, unit of measurement of current intensity or Output, term used in automation
AC	Alternating Current
AISI	American Iron and Steel Institute, association of the American steel industry
AS-i	Actuator Sensor interface, standard for fieldbus communication
bar	Unit of measurement for pressure. All pressure values [bar/psi] refer to positive pressure [bar _g /psi _g], unless specifically stated otherwise.
bar _g	Unit of measurement for pressure relative to atmospheric pressure
ca.	circa
CAN	Controller Area Network; asynchronous serial bus system
CE	Conformité Européenne, administrative symbol for the free movement of industrial products
CIP	Cleaning In Place, designates a process for cleaning technical process systems.
CSA	Canadian Standards Association, a non-governmental Canadian Standardization organization
dB	Decibel, one tenth of a bel, named after Alexander Graham Bell and used for identifying levels and dimensions
DC	Direct Current
DIN	Deutsches Institut für Normung e. V. Standardization organization in the Federal Republic of Germany, DIN = synonym for standards issued by the organization
DIP	Dual Inline Package, design of a switch
DN	Diameter Nominal, DIN nominal width
E	Input, term used in automation
EHEDG	European Hygienic Engineering and Design Group. Consortium of equipment manufacturers, food industries, research institutes as well as public health authorities
EN	European standard, rules of the European Committee for Standardization
EPDM	Ethylene propylene diene rubber, acronym acc. to DIN/ISO 1629

Abbreviation	Explanation
FDA	Food and Drug Administration, official foodstuffs monitoring in the United States
H	Henry, unit of measurement for inductance
Hz	Hertz, unit of frequency named after Heinrich Hertz
I	Formula symbol for electrical current
IEC	International Electrotechnical Commission, international standardization organization for electrical and electronic engineering
IP	Ingress Protection/International Protection, index of protection class acc. to IEC 60529
ISO	International Organization for Standardization, international organization that produced international standards, ISO = synonym for standards from the organization
kg	Kilogram, unit of measurement for weight
LED	Light-Emitting Diode
mm	Millimeter, unit of measurement for length
M	Metric, system of units based on the meter or Mega, one million times a unit
m ³ /h	Cubic meters per hour, unit of measurement for volumetric flow
max.	Maximum
NC	Normally Closed; valve or solenoid valve control which is closed in idle status
NO	Normally Open; valve or solenoid valve control which is open in idle status
NOT-Element	Logic element, NOT gate
NPN	Signal transmission against reference potential, current-consuming
NPT	National Pipe Thread, US thread standard for self-sealing pipe fittings
OD	Outside Diameter, pipe dimension
ODVA	Open DeviceNet Vendor Association, global association for network standards
PA/L	Polyamide
PNP	Signal transmission against reference potential, current-supplying
psi	Unit of measurement for pressure, pound-force per square inch, 1 psi = 6894.75 Pa. All pressure values [bar/psi] refer to positive pressure [bar _g /psi _g], unless specifically stated otherwise.

Abbreviation	Explanation
psi _g	Unit of measurement for pressure relative to atmospheric pressure
PV	Solenoid valve
Ra in µm	Average roughness value, describes the roughness of a technical surface
SET-UP	Self-learning installation, the SET-UP procedure carries out all necessary settings for generating messages during commissioning and maintenance.
SPS	Device for control of a machine or system on digital basis
SW	Indicates the size of a tool spanner, "Schlüsselweite"
T.VIS®	GEA Tuchenhagen Ventil-Information-System, Control top by GEA Tuchenhagen
T-smart	Valve series from GEA Tuchenhagen
UL	Underwriters Laboratories, a certification organization established in the USA
UV	Ultraviolet, ultraviolet radiation is a wavelength of light
V	Volt, unit of measurement for voltage
VARICOMP®	Pipe expansion compensator from GEA Tuchenhagen
W	Watt, unit of measurement for power
Y	Control air connection for the working cylinder, designation from pneumatic systems
µ	Micro, one millionth of a unit
Ω	Ohm, the unit of electrical resistance named after Georg Simon Ohm

Typical application and description

You can receive two-dimensional and/or three-dimensional drawing files of our components for making your piping planning. For this purpose, please send us your specific request, stating the particular order code and the required drawing format. The required files will then be individually prepared for you.

Available drawing formats:

	Format	Name
2D formats	drw	Native Pro/E
	igs (2D)	IGS file
	dxg	AutoCAD drawing exchange
	pdf (2D)	Adobe Acrobat document
	tif	TIFF (plot)
3D formats	asm	Native Pro/E
	igs (3D)	IGS file
	pdf (3D)	Adobe Acrobat document
	stp	STP file
	bmp (3D)	Bitmap image
	jpg (3D)	JPEG image
	tif (3D)	TIFF image
	sat	Standard ACIS

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

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

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

I. General Terms

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

II. Price and Payment

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

III. Delivery Time and Late Delivery

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

shall operate to increase the Delivery Time reasonably and further provided that no delay for which the Seller may be liable shall operate to increase the Delivery Time.

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

IV. Transfer of Risk and Acceptance

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

beyond trials or tests, used by the Buyer or by any third party with the agreement of the Buyer or

- the Goods are accepted by any purchaser from the Buyer.

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

V. Retention of Title

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

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

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

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

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

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

VI. Defects

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

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

VII. Liability and Damages

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

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

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

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

VIII. Limitation

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

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

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

IX. Software Use

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

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

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

X. Applicable Law and Jurisdiction

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

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