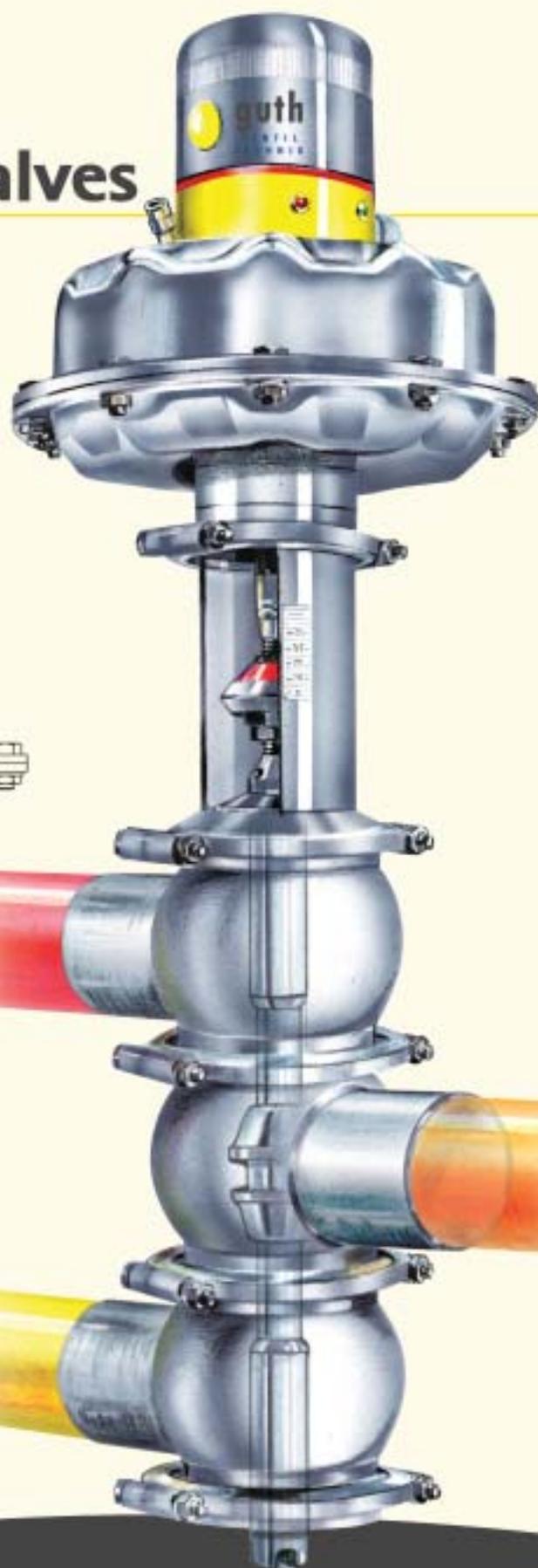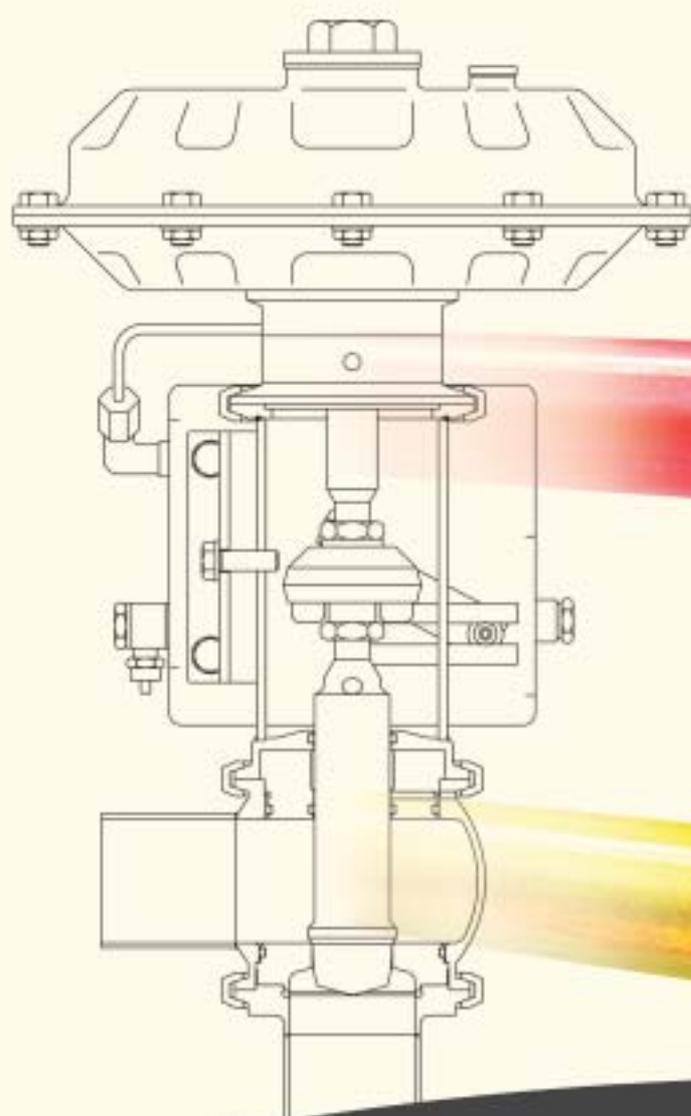# Guth modulating valves

The perfect solution

VSR modulating valves
with membrane actuator

Modulating valves are used in process tech-
nology to control process parameters such as
temperature, pressure or flow when handling
liquid and gaseous media.
Guth's team of design and process engineers
have developed the VSR series of modulating
valves, which meets the product-specific
hygienic requirements of the food and phar-
maceutical industry.
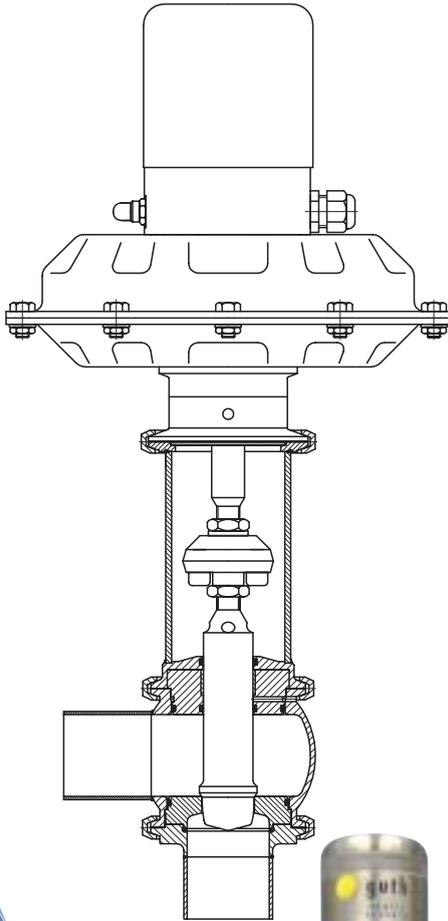
● **Custom solution**
Modular concept offering diverse combinations of
actuators, control cones and housings for optimal
process and cost results

● **Complete construction in stainless steel**
Solid valve housing, membrane actuator in electro-
polished stainless steel, robust lantern construction,
valve positioner with stainless steel cover

● **Precise valve positioning**
Digital I/P-valve positioner DigiPos as standard,
lantern with NAMUR-interface (DIN/IEC 534-6)
for installation of alternative positioners

● **Hygienic design**
  • spherical housings with minimal dead space
    for streamlined product flow
  • valve seat and housing insert which are flush
    with the inner wall guarantee complete draining
    of the valve body
  • no contamination of product, entrainment loss
   or cleaning agent residue

● **Easy assembly and maintenance**
Free selection for direction of connections, valve
insert can be completely lifted out for maintenance
and inspection, turnable actuators to change the
safety position

● **Variety of modulation characteristics**
Replaceable fittings (cone/seat) for the integration/
modification of different kvs/cv values with linear or
equal percentage modulation characteristics, cone
design with metallic or elastomeric sealing

● **Special solutions**
  • small housings from DN 10-25 (1/2"-1") for
    control of smallest quantities from kvs 0.1
  • high pressure resistance of up to 40 bar for
    valves up to DN 40
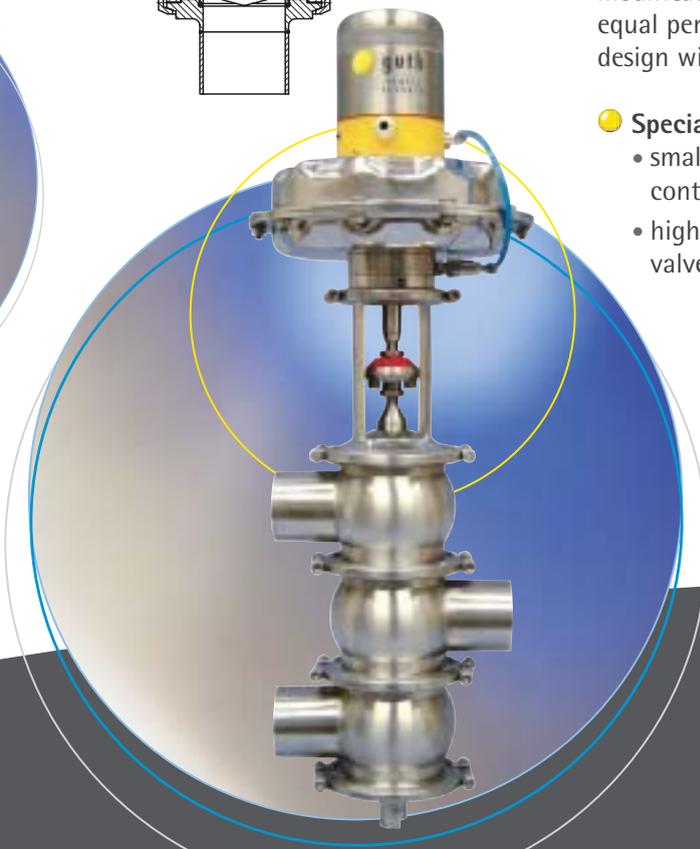
VSR modulating valves
with piston actuator

- Cleanable hygienic fitting with waterproof protection of stainless steel actuator

- Slimly dimensioned

- No external movable parts, therefore improved accident prevention

- The spindle is sealed with elastic sealing elements, leakage borehole indicates when to change the sealing ring
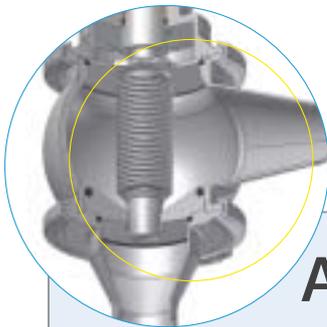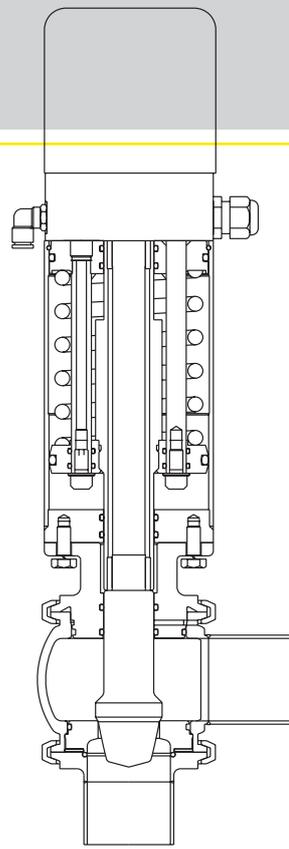
Valve seat and spindle of VSR aseptic valve with metal bellow. The valve seat is sealed tightly to the valve housing with o-rings
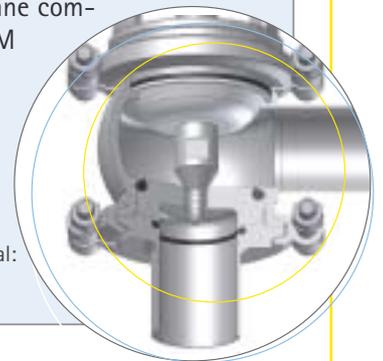
Aseptic modulating valves

With the growing requirement for modulating valves in aseptic processes, Guth offers two solutions that meet sterile production standards: the metal bellow and membrane-type valve models in the VSR series.

Any contamination caused by the spindle stroke movement is unable to penetrate the hermetically sealed product chamber.
The decision to extend the VSR series by these aseptic models is based on experience with **metal bellows** in bottom seat valves and change-over valves.

A further option is a **membrane type** that pools the positive characteristics of conventional valve membranes. The result is a membrane combination of elastomers and TFM 1700, whose durability was impressively confirmed in continuous switching tests.

VSR aseptic valve with membrane seal: hermetically sealed product chamber

Modulating valves
with rotary actuator

- **Butterfly control valves**
  - the economical solution for simple control tasks such as filling level control of vessels

- **Arc modulating valve**
  - valve housing with unrestricted cross-section, therefore minimal pressure loss when valve is fully opened
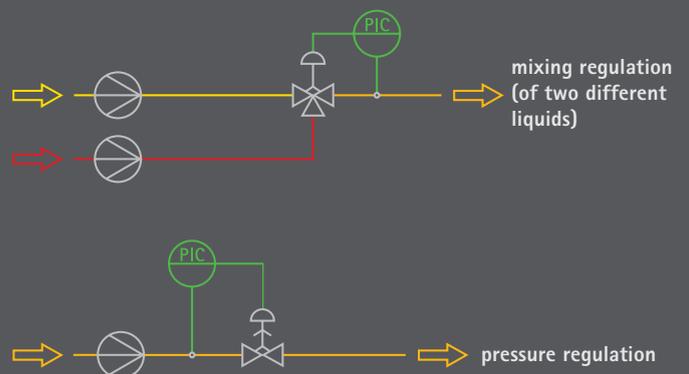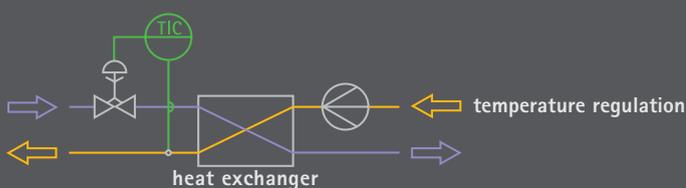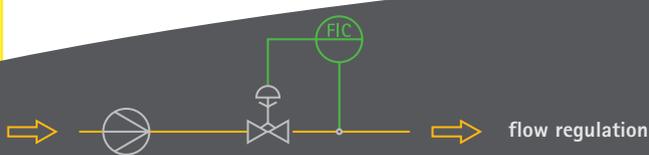
guth
VENTIL TECHNIK

Main dimensions & Housing types

VSR – L

VSR – LS

VSR – LD
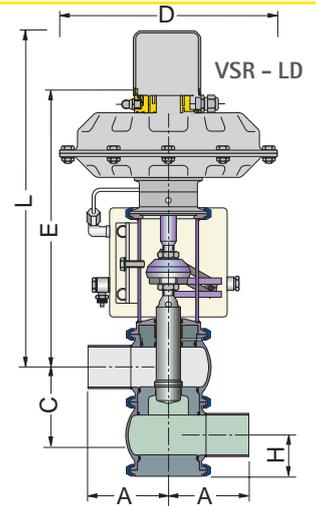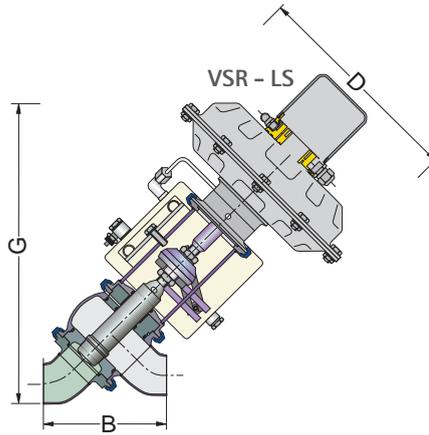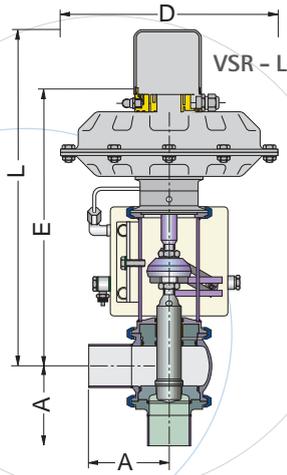
	DN	A	B	C	D[1]	E[2]	F	G	H	I	J	K[1]	L[2]	M
small housings	10	36	88	40	165	264	322	262	–	–	–	102	393	–
	15	36	100	40	165	264	322	267	–	–	–	102	393	–
	20	50	128	50	165	264	322	286	–	–	–	102	393	–
	25	50	142	50	165	274	332	290	–	–	–	102	403	–
standard housings	25	90	153	74	165	342	400	361	48	73	100	102	471	84
	32	90	161	74	165	342	400	365	48	73	100	102	471	84
	40	90	168	74	165	342	400	370	48	73	100	102	456	84
	50	100	187	85	270	347	406	381	56	88	127	102	461	83
	65	115	209	106	270	379	416	419	65	104	163	102	493	105
	80	130	239	116	270	387	423	444	78	116	186	133	501	116
	100	140	270	136	270	395	433	470	86	160	264	133	509	128
	125	140	–	160	400	499	–	–	100	–	–	–	611	–
	150	180	–	190	400	538	–	–	108	–	–	–	650	–

[1] actuator sizes can vary according to valve design [2] measurement L: valve positioner DigiPos; measurement E: valve positioner installed at NAMUR interface

VSR – LLD K3
mixing

VSR – LLD K4
distribution

VSR – LID
pressure
reduction

VSR – L
piston actuator

flow regulation

mixing regulation
(of two different
liquids)

temperature regulation

heat exchanger

pressure regulation
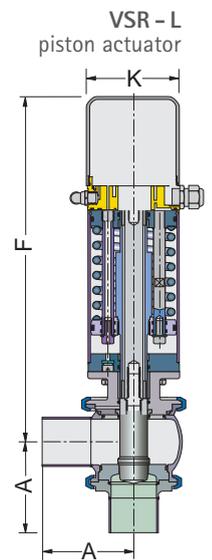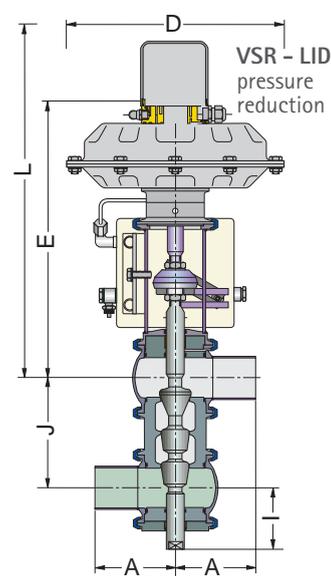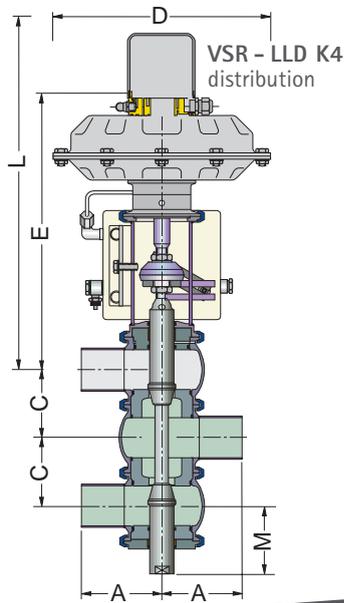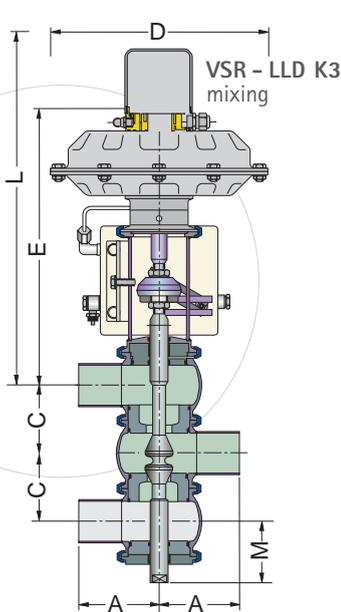
Valve positioners

The standard modulating valves are equipped with DigiPos digital I/P positioners from Guth, other types of controllers can be fitted at the NAMUR interface if requested.

● **DigiPos**

Design / Characteristics
- digital I/P positioner for membrane, piston and rotary actuators
- simple assembly and operation
- contact-free positioning, therefore easy to install, non-wearing and insensitive to vibration
- no internal air consumption in adjusted position
- compact construction, no movable parts on the outside, therefore improved accident prevention
- protection of electronic parts by stainless steel hood (protection class IP65)

Calibration
- calibration of the characteristic curve via interface (RS 232) and visualization software
- choice of linear, equal percentage or curves with special characteristics
- auto-calibration for simple start-up
- signal range 4-20 mA
- partial or split range operation as well as signal inversion possible

Valve testing

● Modulating valves undergo **extensive functional testing** before shipment to customers

● A **modern, computer-assisted test stand** simulates plant conditions

● **Documentation**, as required, on
- kvs measurements according to DIN,
- kvs individual value measurements,
- regulation behaviour

● Each valve is supplied with an **individually prepared test certificate**

pre-heater   heater   cooler   filler   cooling tunnel

hot water circuit

temperature regulation with
heat recovery via distribution valve

guth
VENTIL
TECHNIK
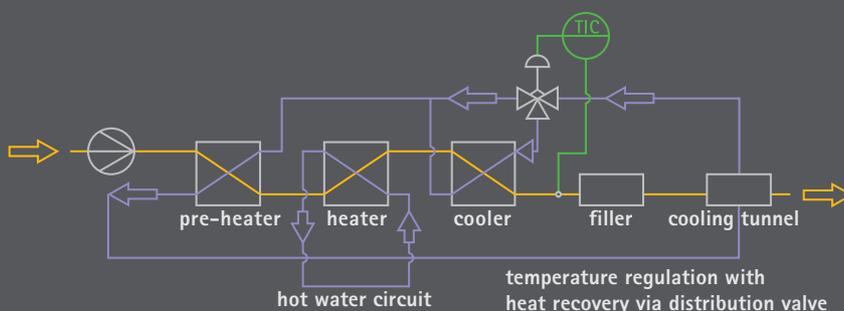
Actuators: Technical data

● **Special features:**
- solid stainless steel construction
- e-polished housing
- high performance membrane max. load 6 bar
- easily turnable (to change safety position)
- locking pressure selectable via number of springs
- reliable sealing and spindle guide
- easy maintenance
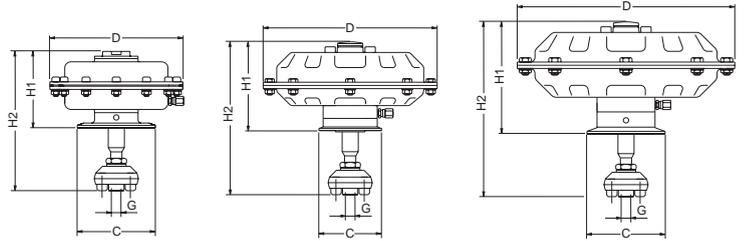
membrane actuators							
type	M02	M1	M2	M3	M4	M9	M10
D	165	270	270	270	270	400	400
H1	96	139	139	165	165	237	237
H2	187	227	227	260	260	384	384
C	97	97	97	97	97	155	155
G (internal thread)	M14	M14	M14	M14	M14	M14	M14
stroke [mm]	bis 20	20	20	30	30	60	60
effective area [cm²]	128	320	320	320	320	720	720
number of springs	6	3	6	3	6	6	12
operating pressure [bar] (from–to)	0.8-4	0.5-1.5	1.0-3.0	0.65-2.2	1.3-4.4	3.1-4.6	3.3-4.3
spring load [kN]	0.72	1.5	3.1	2.1	4.2	1.9	3.4
air load [kN], air-closing 4.5 bar	3.5	9.5	4.7	7.5	3.5	20.5	30.8
at air pressure [bar] 6.0 bar	5.4	14.3	9.5	12.2	5.3	10.3	20.6

● **Special features:**
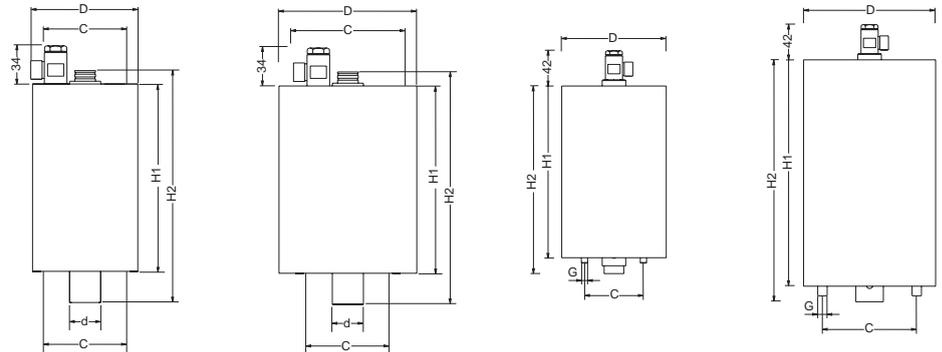- easily removable pre-set actuating unit
- changeable safety position

	piston actuators				rotary actuators			
type	PV1		PV2		PS2		PS3	
	air/spring	air/air	air/spring	air/air	air/spring	air/air	air/spring	air/air
D	102	102	133	133	102	102	133	133
H1	182	182	182	182	182	182	220	220
H2	215	215	215	215	202	202	240	240
C	Ø76; 4xM8	Ø76; 4xM8	Ø76; 4xM8	Ø76; 4xM8	Ø75; 4xM8	Ø75; 4xM8	Ø75; 4xM8	Ø75; 4xM8
d	30	30	30	30	-	-	-	-
stroke [mm]	25	25	25	25	-	-	-	-
piston area [cm²]	63	63	115	115	70	70/62	124	124/113
air consumption [l/double stroke] at 6 bar	0.8	1.6	1.6	3.2	2.6	4.8	5	9.6
spring load [kN]	1.9	–	3.4	–	1.6	-	2.3	-
air load [kN] at 6.0 bar	–	3.2	–	6.2	-	-	-	-
4.5 bar	–	2.4	–	4.6	-	-	-	-
switching time [s] air against spring	1.4	–	1.6	–	-	-	-	-
air pressure = 6 bar spring	0.8	–	1.2	–	-	-	-	-
actuator air/air	–	0.8	–	1.0	-	-	-	-
required min. air pressure [bar]	5	5	5	5	5	5	5	5

Rough calculation of kv value:
Use the following equation:

$$kv = Q * \sqrt{\frac{\rho}{1000 * \Delta p}}$$

Q = flow rate [m³/h]

ρ = density [kg/m³]
Δp = pressure difference

Kvs dimensioning & Materials

actuator type			membrane actuators							piston actuators	
			M02	M1	M2	M3	M4	M9	M10	H1	H2
effective area [cm²]			128	320				720		74	129
air pressure range [bar]			0.8–4.0	0.75–1.5	1.5–3.0	0.7–1.5	1.5–3.0	0.7–1.5	1.4–3.0	2.5–5.0	2.5–5.0
stroke [mm]			20			30		60		25	
number of springs			6	3	6	3	6	6	12	1	
DN	kvs [m³/h]	seat Ø [mm]									
10	0.1	6	16							16	
15	1	7	16							16	
20	1.6	8.5	16							16	
25	2.5	11	16	16	16					16	16
	4	16	16	16	16					16	16
	7	19	16	16	16					16	16
	9	24	11	16	16					16	16
32	7	19	16	16	16					16	16
	11	24	11	16	16					16	16
	15	32	6.0	16	16					16	16
40	11	24	11	16	16					16	16
	18	32		16	16					16	16
50	18	32		12	16	12	16			16	16
	26	37		8.4	16	8.4	16			16	16
	28	48		7.7	16	7.7	16			9.1	16
65	26	37				8.4	16			16	16
	43	48				7.7	16			9.1	16
	50	62				4.4	11			5.1	8.9
80	43	48				7.7	16			9.1	16
	68	62				4.3	11			5.1	8.9
	85	73				2.0	7.9			3.4	6.4
100	68	62				4.3	11	16	16		8.9
	100	73				2.9	7.9	16	16		6.4
	120	90				1.7	5.0	14	16		3.8
125	150	90						10	10		
	260	115						7.8	10		
150	380	135						5.5	8.2		

Remark: Maximum permissible product pressure for air closing-spring opening: DN 25-100: 16 bar, DN 125-150: 10 bar

from 1 to 6 bar
up to 10 bar
above 10 bar

⬤ **Temperatures for standard valves (EPDM)**
- continuous operation: 120°C
- cleaning: approx. 85°C
- sterilization: 145°C (short-time)

⬤ **Connections**
- standard: tube weld ends according to DIN 11850, series 2, inch-tube weld ends (O.D. tube)
- optional: other tube connections, e.g. tri-clamp, thread ends (DIN 11851), flanges, as specified by the customer

⬤ **Stainless steel material**
- product-wetted parts: AISI 316L (DIN 1.4404)
- parts not in contact with product: AISI 304 (DIN 1.4301)

⬤ **Sealing elements**
- standard: EPDM
- optional: PTFE-coated viton o-rings
- steam version: v-ring-packings

⬤ **Surfaces**
- wetted surfaces: Ra $\leq 0,8\ \mu m$
- optional: e-polished

The parameters required for design calculation:

Kv value: corresponds to the flow rate Q [m³/h] of water at approx. 20 °C, with a pressure difference of $\Delta p = p1-p2 = 1$ bar, that passes through the control valve at a particular stroke.

Kvs value: characteristic value of the valve type that represents the rated kv value at the nominal stroke H_{100} of the valve.

Kv_{100} value: kv value of the valve at nominal stroke H_{100}. It must not deviate more than $\pm10\%$ from the given kvs value.

Nominal stroke: a nominal stroke H_{100} is given for each valve type, taking the valve as fully opened.