Diaphragm Valve

SISTO-C

Sterile Process Engineering
PN 16
DN 6-100

Type Series Booklet

SISTO

Legal information/Copyright

Type Series Booklet SISTO-C

Contents

Diaphragm Valves

Diaphragm Valves – No Dead Volume, Soft-seated, Glandless

SISTO-C

Main applications

- Chemical industry
- Homogenisation
- Food industry and beverages industry
- Pharmaceutical industry
- Process engineering
- Water treatment
- Sugar industry

Fluids handled

- Aggressive fluids
- Inorganic fluids
- Steam
- Distillate
- Gas
- Fluids posing a health hazard
- Toxic fluids
- High-temperature hot water
- Corrosive fluids
- Valuable fluids
- Volatile fluids
- Solvents
- Oil
- Organic fluids
- Polymerising/crystallising fluids
- Radioactive fluids
- Cleaning agents

Operating data

SISTO-C manually operated valve

Operating properties

Characteristic	Value
Nominal pressure	PN 16
Nominal size[1)]	DN 6 - 100
Max. permissible pressure [bar]	16
Min. permissible temperature [°C][2)]	≥ -20
Max. permissible temperature [°C][2)]	≤ +160

SISTO-C LAP actuated valve

Operating properties

Characteristic	Value
Nominal pressure	PN 16
Nominal size[1)]	DN 6 - 100
Max. permissible pressure [bar]	16
Min. permissible temperature [°C][2)]	≥ -20
Max. permissible temperature [°C][2)]	≤ +160
Control medium	Compressed air (min. 5.5 bar) (max. 7.0 bar)

Body materials

Overview of available materials

Material	Material number	Temperature limit
X2CrNiMo18-14-3[3)]	1.4435/316L	-20 °C to +160 °C
X1NiCrMoCu25-20-5	1.4539	-20 °C to +160 °C
NiCr21Mo14W	2.4602	-20 °C to +160 °C
NiCr23Mo16Al	2.4605	-20 °C to +160 °C
NiMo16Cr15W	2.4819	-20 °C to +160 °C
NiMo16Cr16Ti	2.4610	-20 °C to +160 °C

Design details

Design

- Soft-seated straightway shut-off valve in Y-pattern or T-pattern; manually or pneumatically actuated
- Shut-off and sealing to atmosphere by completely enclosed diaphragm; no dead volumes; suitable for sterilisation
- Suitable for CIP/SIP
- Self-drain angle marked on weld ends
- Marked in accordance with DIN EN 19 (ISO 5209)

1) Smaller and larger nominal sizes available on request
2) The temperatures indicated are for orientation only; they are not valid for all operating conditions.
3) Forged material to ASME BPE: sulphur content 0.005 to 0.015 %; chrome content 17 to 18 %; BN2: Δ Fe <0.5 %

- Marked in accordance with ASME BPE
- The valves satisfy the safety requirements of Annex I of the European Pressure Equipment Directive 2014/68/EU (PED) for fluids in Groups 1 and 2.
- The valves do not have a potential internal source of ignition and can be used in potentially explosive atmospheres, Group II, category 1 (zones 0+20), category 2 (zones 1+21) and category 3 (zones 2+22) to ATEX 2014/34/EU.

Variants

- Handwheel made of stainless steel 1.4404/1.4409
- Tank valves or multi-port valves[4)]
- Pneumatic actuators
- Limit switches
- Positioners
- Adjustable travel stop
- High-temperature design for temperatures ≥ 80°C at actuator cylinder

Diaphragm materials

Overview of diaphragm qualities

Diaphragm	Temperature limit [°C]
EPDM	+140
TFM/EPDM, bonded	
TFM/EPDM, 2-piece	+160

Surface finish

Suface finish of wetted internal body surfaces

Internal body surfaces				
Ra [µm][5)]	Ra [µin]	ASME BPE Code	Hygiene class DIN 11866	Surface treatment
6,3	250	SF0		Ground
3,2	125			
1,6	60	SF3		
0,8	30	SF2	H3	
0,6	25			
0,5	20	SF1		
0,4	15		H4	
0,8	30		HE3	Electropolished
0,6	25	SF6		
0,5	20	SF5		
0,4	15	SF4	HE4	
0,25	10		HE5	

Actuators

Overview of actuator materials

MD[6)]	Bonnet	Actuator
30 - 202	Stainless steel 1.4409	Stainless steel 1.4301 / 1.4409
168 - 202	Stainless steel 1.4409	Aluminium, hard anodised

SISTO-LAP piston actuator

- Actuator type LAP-AZ
  - Air-to-open
  - Air-to-close
- Actuator type LAP-OF
  - Spring-to-open
  - Air-to-close
- Actuator type LAP-SF
  - Air-to-open
  - Spring-to-close

Product benefits

- Reliable sealing ensured by one single sealing element (the diaphragm) which provides hermetic sealing to atmosphere and absolutely tight shut-off. The specially enclosed diaphragm ensures long service life and high operating reliability.
- Special design: All moving parts are separated from the fluid by the diaphragm.
- Compact valve design with integrated actuator requires minimal space.
- Actuator interface allows straightforward retrofitting of limit switches.
- Higher sterile requirements can be met with standard design by controlled discharge of exhaust air
- Pneumatic stainless steel actuators meet stringent requirements in sterile applications.
- High operating comfort thanks to visual position indicator, also with the limit switch enclosure mounted
- Low-friction piston seal minimises friction losses and ensures smooth movement of the pneumatic actuators.
- The valve hydraulics without dead volume offers optimum conditions for high-purity fluids.
- Optimised functional reliability of the diaphragm thanks to balanced diaphragm suspension
- Reliable processes ensured by limit switches in IP64 stainless steel enclosure for actuators
- Readily identifiable position: integral red position indicator on manually operated valves and pneumatic actuators
- The valves are self-draining and CIP/SIP-compatible, making them ideally suited for pharmaceutical applications
- Laser marking simplifies valve installation and identification of drain angle.

Related documents

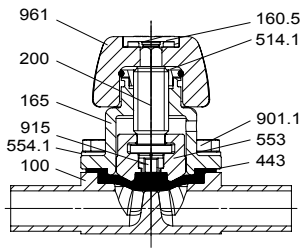
Information/documents

Document	Reference number
"Sterile Processes" catalogue	8652.10
Operating manual	0570.821
Type series booklet SK-i	8676.5

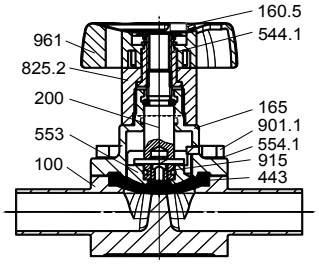
4) For further designs refer to the "Sterile Processes" catalogue, reference No. 8652.10. Further variants on request.
5) Exact values in accordance with ASME BPE: 0.76 / 0.64 / 0.51 / 0.38 µm
6) MD = diaphragm diameter

Materials

Materials of SISTO-C manually operated valve



MD 30[7)]



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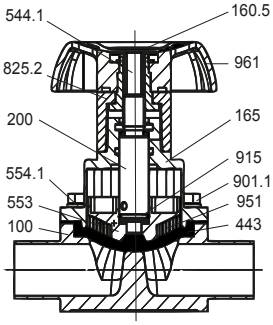

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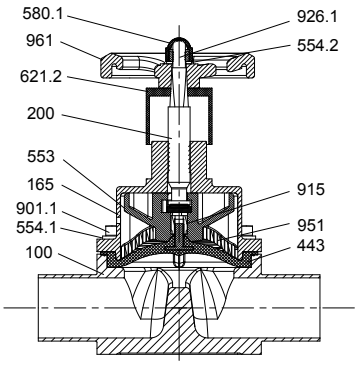
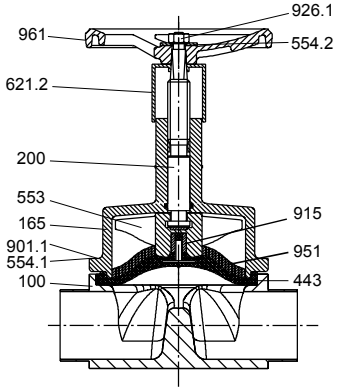


MD 92[7)]



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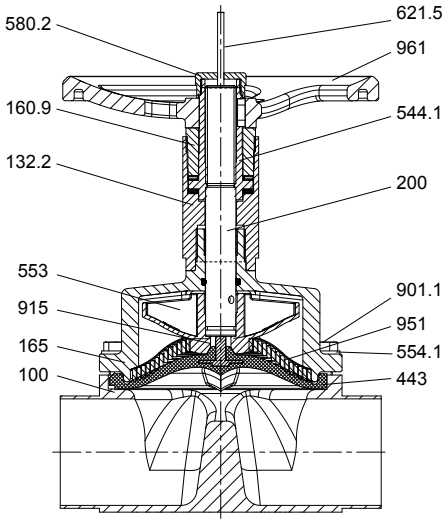

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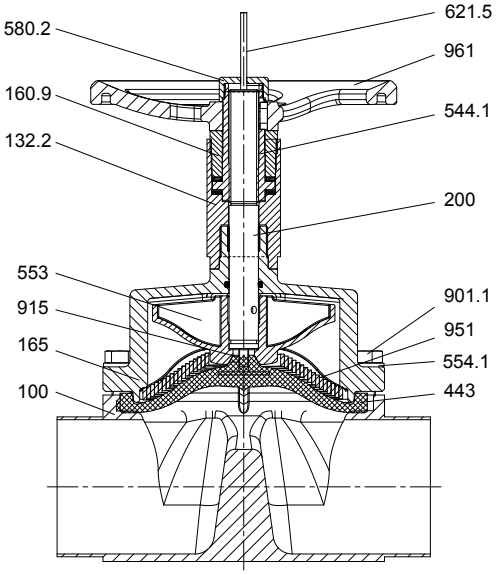


MD 202[7)]

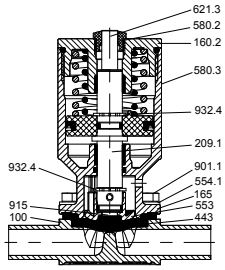
Parts list

Part No.	Description	Material	Material number	Note
100	Body	X2CrNiMo18-14-3	1.4435/316L	Forged
132.2	Intermediate piece	X2CrNiMo17-12-2	1.4404	-
160.5	Handwheel cover	PA6GF30	-	30 % glass fibre, black
160.9	Bearing cover	X2CrNiMo17-12-2	1.4404	-
165	Bonnet	GX2CrNiMo19-11-2	1.4409	-
200	Stem	X2CrNiMo17-12-2 X8CrNiS18-9	1.4404/1.4305	MD 30 = 1.4404 Kolsterised; MD 92-202 = 1.4104 (X14CrMoS17) nitrided
443[8)]	Diaphragm	EPDM	-	FDA, CFR 21, Section 177.2600 EC 1935/2004
514.1	Threaded disc	X8CrNiS18-9	1.4305	For MD 30
544.1	Threaded bush	SoMs59	-	-
553	Compressor	GX2CrNiMo19-11-2	1.4409	-
554.1	Washer	A2	-	-
554.2	Washer	A2	-	-
580.1	Cap	PE	-	-
580.2	Cap	X2CrNiMo17-12-2	1.4404	-

7) MD = diaphragm diameter
8) Recommended spare parts

Part No.	Description	Material	Material number	Note
621.2	Position indicator, upper part	Polycarbonate	-	-
621.5	Position indicator	Plastic	-	-
825.2	Adapter	PA6GF30	-	-
901.1	Hexagon head bolt	A2-70	-	DIN 933
915	Floating nut	A2	-	-
926.1	Prevailing torque nut	A2	-	-
951	Support spiral	X5CrNi18-10	1.4301	-
961	Handwheel	PA6GF30	-	MD 30 - 65; 30 % glass fibre, black
		EN-GJL-200	5.1300	MD 92 - 115; black, Rilsan-coated
		GX2CrNiMo19-11-2	1.4409	MD 168 - 202

Materials of SISTO-C with actuator



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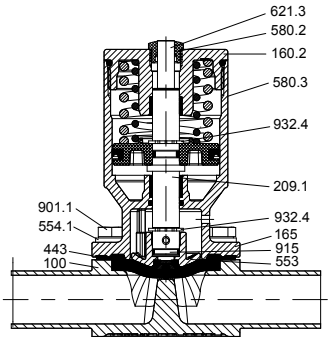

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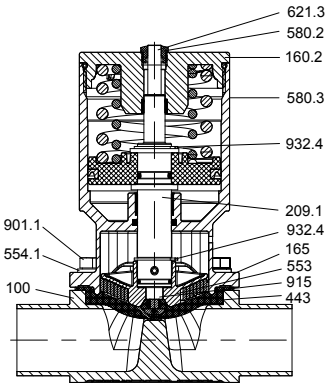
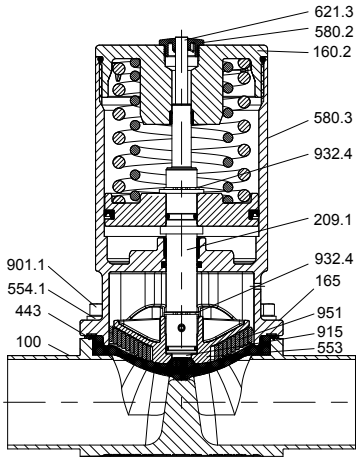


MD 65[9)]



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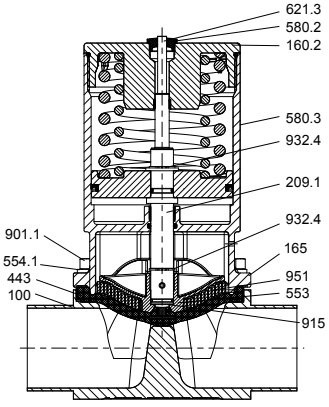

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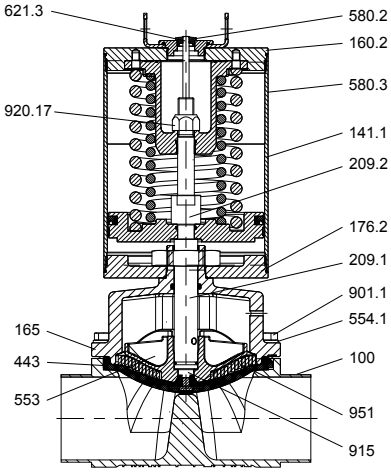

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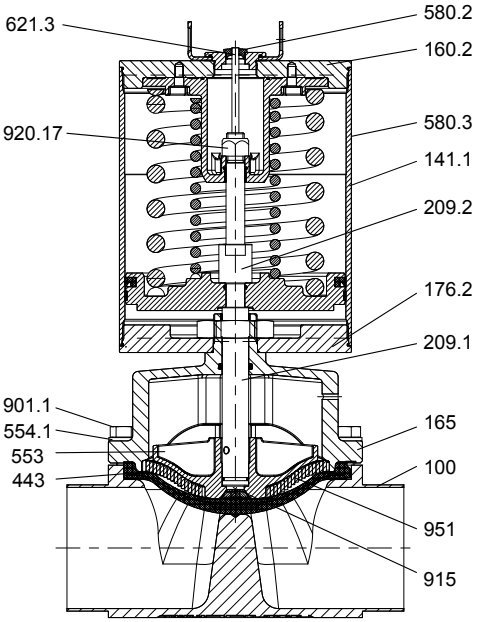


MD 202[9)]

Parts list

Part No.	Description	Material	Material number	Note
100	Body	X2CrNiMo18-14-3	1.4435/316L	Forged
141.1	Cylinder	X5CrNi18-10 / X6CrNiTi18-10	1.4301/1.4541	Variant MD168-202 Aluminium, hard anodised
160.2	Top end cap	X2CrNiMo17-12-2	1.4404	Variant MD168-202 Aluminium, hard anodised
165	Bonnet	GX2CrNiMo19-11-2	1.4409	-
176.2	Bottom end cap	X2CrNiMo17-12-2	1.4404	-
209.1	Lower piston rod	X8CrNiS18-9	1.4305	-
209.2	Upper piston rod	X8CrNiS18-9	1.4305	-
443[10)]	Diaphragm	EPDM	-	FDA, CFR 21, Section 177.2600 EC 1935/2004
553	Compressor	GX2CrNiMo19-11-2	1.4409	-
554.1	Washer	A2	-	-

9) MD = diaphragm diameter
10) Recommended spare parts

Part No.	Description	Material	Material number	Note
580.2	Cap	Plastic	-	-
580.3	Cap	Plastic	-	-
621.3	Position indicator	PA	-	-
901.1	Hexagon head bolt	A2-70	-	DIN 933
915	Floating nut	A2	-	-
920.17	Nut	A2	-	-
932.4	Circlip	A2	-	-
951	Support spiral	X5CrNi18-10	1.4301	From MD 65

Dimensions

Dimensions to DIN

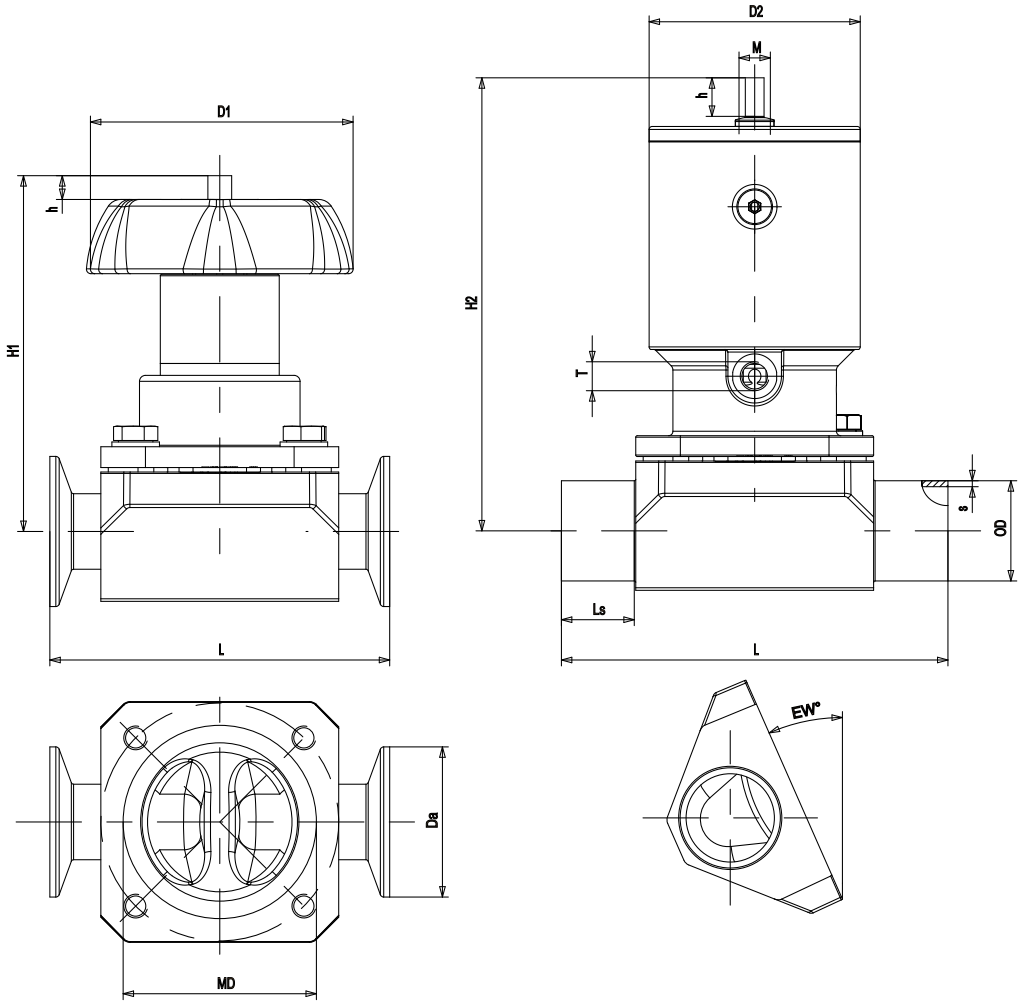


Fig. 1: Dimensions to DIN

Dimensions to DIN [mm]

DN	Inch	MD[11]	h	EW °[12]	Manually operated valve[13]		Actuator[13]				Butt weld ends[13] to DIN 11866 Series A			Clamps[13] to DIN 32676-A (DIN 11866 Series A)		K_{vs} value
					H1	D1	H2	D2	T	M	L	Ls	ODxs	L	Da	m^3/h
6	1/4	30	5	40,8	51	35	87	41	M 5	M 12x1	80	20	8x1,00	63,5	25,0	1,1
8	5/16			34,1	51		87						10x1,00	63,5	25,0	1,8
10	3/8			23,5	52		88						13x1,50	63,5	34,0	2,1
15	1/2	40	7	21,1	82	63	103	46			115	30	19x1,50	88,9	34,0	5,0
20	3/4	65	13	34,4	119	90	149	71	G 1/8		130	25	23x1,50	101,6	34,0	11,8
25	1			23,8	121		151						29x1,50	114,3	50,5	16,5
32	1 1/4	92	22	31,0	170	100	207	89		M 18x1	180	37,5	35x1,50	139,7	50,5	34,0
40	1 1/2			24,4	171		208						41x1,50	139,7	50,5	42,5
50	2	115	26	21,2	234	125	242	110			190	32,5	53x1,50	158,8	64,0	65,0
65	2 1/2	168	45	30,7	343	250	421	167			254	30	70x2,00	-	-	137,0
80	3			20,6	352		430						85x2,00	-	-	156,0
100	4	202	60	19,4	381	250	501	210			305	37,5	104x2,00	-	-	245,0

11) MD = diaphragm diameter
12) EW° = drain angle
13) Smaller and larger nominal sizes available on request

Dimensions to ISO

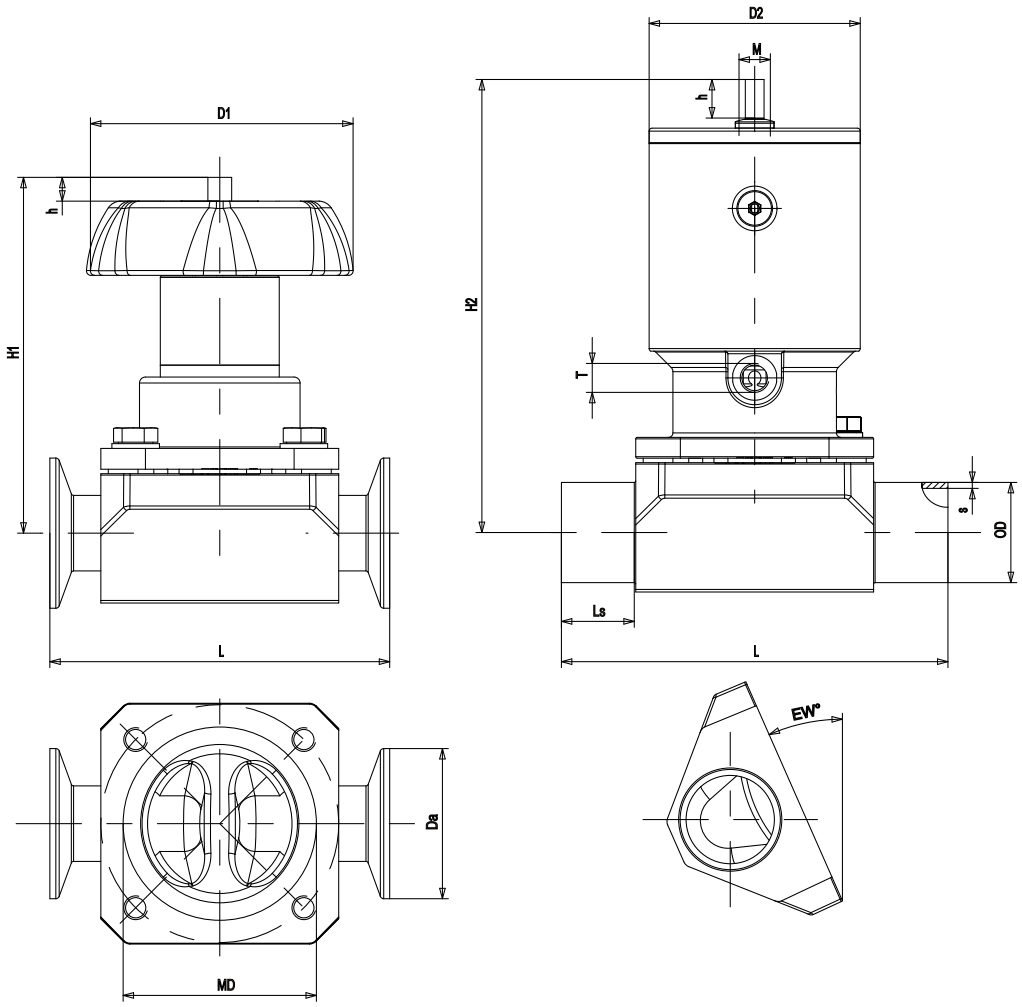


Fig. 2: Dimensions to ISO

Dimensions to ISO [mm]

DN	Inch	MD[14]	h	EW °[15]	Manually operated valve[16]		Actuator[16]				Butt weld ends[16] to DIN 11866-B (ISO 4200)			Clamps[16] to DIN 32676-B (ISO 4200)		K_{vs} value
					H1	D1	H2	D2	T	M	L	Ls	ODxs	L	Da	m^3/h
6	1/4	30	5	37,5	51	35	87	41	M 5	M 12x1	80	20	10,2x1,60	63,5	25,0	1,5
8	5/16			22,5	52		88						13,5x1,60	63,5	25,0	2,2
10	3/8	40	7	27,2	81	63	102	46			115	30	17,2x1,60	88,9	25,0	4,5
15	1/2			15,1	83		104						21,3x1,60	88,9	50,5	5,2
20	3/4	65	13	26,8	121	90	151	71	G 1/8		130	25	26,9x1,60	101,6	50,5	14,7
25	1			17,3	123		153						33,7x2,00	114,3	50,5	17,5
32	1 1/4	92	22	24,0	171	100	208	89		M 18x1	180	37,5	42,4x2,00	139,7	64,0	43,0
40	1 1/2			16,7	174		211						48,3x2,00	139,7	64,0	45,5
50	2	115	26	15,1	237	125	245	110			190	32,5	60,3x2,00	158,8	77,5	69,0
65	2 1/2	168	45	26,7	346	250	424	167			254	30	76,1x2,00	-	-	149,0
80	3			19,1	352		430						88,9x2,30	-	-	161,0
100	4	202	60	14,7	286	250	506	210			305	37,5	114,3x2,30	-	-	255,0

14) MD = diaphragm diameter
15) EW° = drain angle
16) Smaller and larger nominal sizes available on request

Dimensions to OD

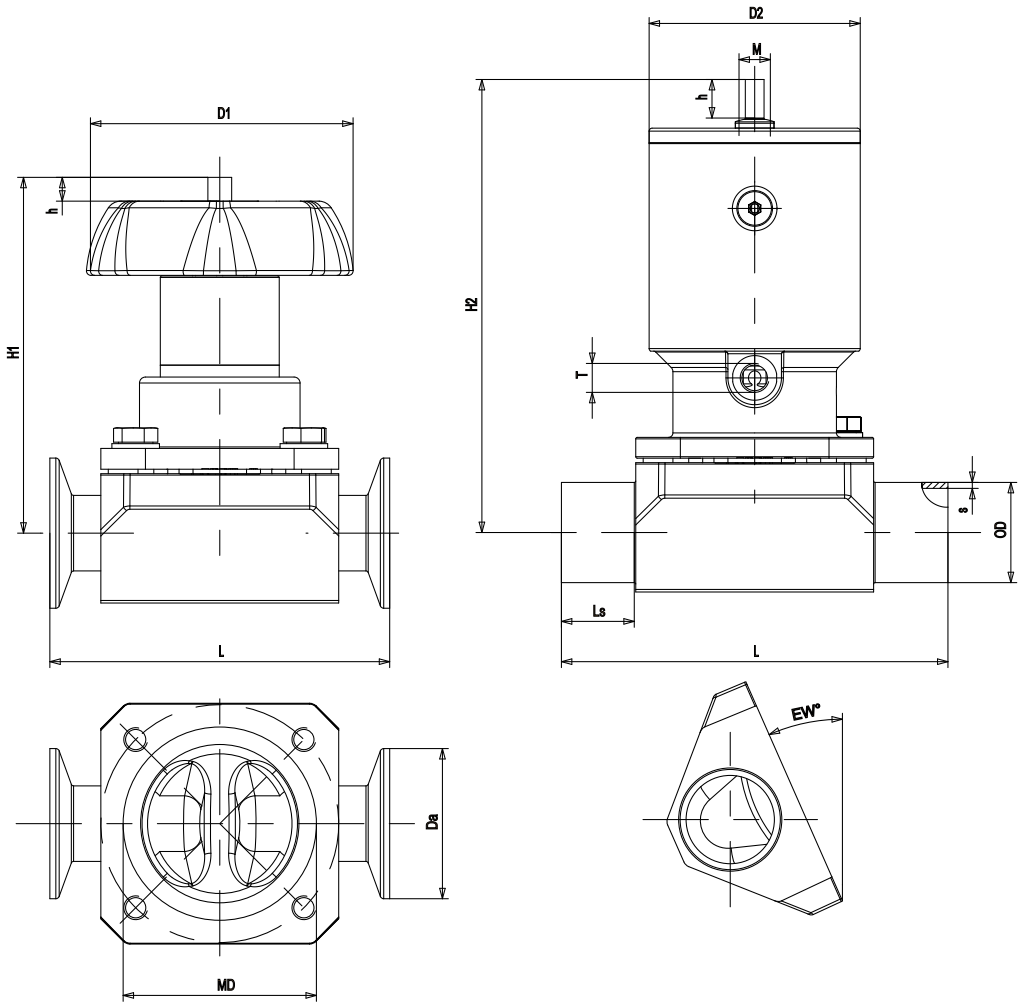


Fig. 3: Dimensions to OD

Dimensions to OD [mm]

DN	Inch	MD[17]	h	EW °[18]	Manually operated valve[19]		Actuator[19]				Butt weld ends[19] to OD ASME BPE			Clamps[19] to DIN 32676-C (OD ASME BPE)		K_{vs} value
					H1	D1	H2	D2	T	M	L	Ls	ODxs	L	Da	m^3/h
6	1/4	30	5	45,4	51	35	87	41	M 5	M 12x1	80	20,0	6,35x0,89	63,5	25,0	0,6
10	3/8			35,0	51		87						9,53x0,89	63,5	25,0	1,7
15	1/2			25,5	52		88						12,70x1,65	63,5	25,0	2,1
15	1/2	40	7	36,9	77	63	102	46			115	30,0	12,70x1,65	88,9	25,0	2,6
20	3/4			21,6	77		103						19,05x1,65	101,6	25,0	4,9
25	1	65	13	31,6	119	90	149	71	G 1/8		130	25,0	25,40x1,65	114,3	50,5	13,8
40	1 1/2	92	22	28,5	170	100	207	89		M 18x1	180	37,5	38,10x1,65	139,7	50,5	39,0
50	2	115	26	23,1	234	125	242	110			190	32,5	50,80x1,65	158,8	64,0	62,0
65	2 1/2			11,7	239		247						63,50x1,65	193,8	77,5	71,0
80	3	168	45	26,3	315	250	424	167			254	30,0	76,20x1,65	222,3	91,0	151,0
100	4	202	60	20,4	254	250	501	210			305	37,5	101,60x2,11	292,1	119,0	237,0

17) MD = diaphragm diameter
18) EW° = drain angle
19) Smaller and larger nominal sizes available on request

Specifications

Butt weld ends:	DIN 11866 Series A (DIN 11850)
	DIN 11866 Series B (DIN EN ISO 1127/ISO 4200)
	DIN 11866 Series C (OD ASME BPE)
	SMS 3008
	JIS-G 3447
Clamps:	DIN 32676
	ASME BPE
	SMS 3017
	JIS-G 3447
Marking:	DIN EN 19 (ISO 5209)
	ASME BPE

Actuator selection by operating pressure

Operating pressure[20] in bar in acc. with DIN EN 12266-2 and actuator dimensions

Operating pressure [bar] for actuator function: (LAP.520/530-SF) air-to-open/spring-to-close

Diaphragm size [mm]			EPDM [bar]		TFM, bonded [bar]		TFM, 2-piece [bar]		Dimensions [mm]	
MD[21]	Function	Piston [mm]	One side	Both sides	One side	Both sides	One side	Both sides	H2 max.	D2
30	SF	35	9	4,5	7	3,5	-	-	88	41
		40	14	7	12	6	12	6	95	46
		50	16	8	16	8	16	8	119	60
40	SF	40	9	4,5	7	3,5	-	-	104	46
		50	14	7	12	6	12	6	136	58
		63	16	8	16	8	16	8	168	77
65	SF	63	9	4,5	7	3,5	8	4	153	71
		80	14	7	12	6	12	6	197	89
		100	16	8	16	8	16	8	244	116
92	SF	80	9	4,5	7	3,5	8	4	211	89
		100	14	7	12	6	12	6	243	110
		160	16	8	16	8	16	8	371	167
115	SF	100	9	4,5	7	3,5	8	4	247	110
		160	14	7	12	6	12	6	379	167
168	SF	160	9	4,5	-	-	8	4	430	167
		200	14	7	-	-	12	6	460	210
202	SF	200	9	4,5	-	-	8	4	506	210
		D200	14	7	-	-	12	6	677	210

Operating pressure [bar] for actuator function: (LAP.520/530-OF) spring-to-open/air-to-close

Diaphragm size [mm]			EPDM [bar]		TFM, bonded [bar]		TFM, 2-piece [bar]		Dimensions [mm]	
MD[21]	Function	Piston [mm]	One side	Both sides	One side	Both sides	One side	Both sides	H2 max.	D2
30	OF	35	9	4,5	7	3,5	8	4	88	41
40	OF	40	9	4,5	7	3,5	8	4	104	46
65	OF	63	9	4,5	7	3,5	8	4	153	71
92	OF	80	9	4,5	7	3,5	8	4	211	89
115	OF	100	9	4,5	7	3,5	8	4	247	110
168	OF	160	9	4,5	-	-	8	4	430	167
202	OF	200	9	4,5	-	-	8	4	506	210

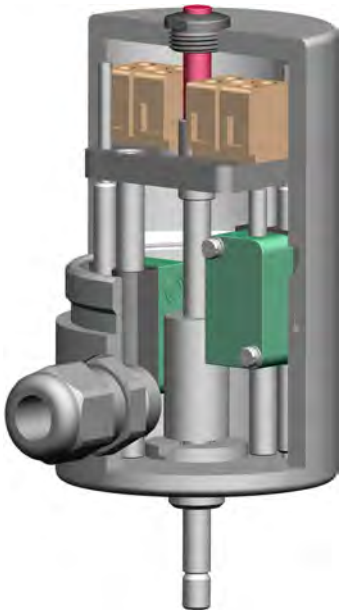
20) Higher operating pressures are possible with specific combinations.
21) MD = diaphragm diameter

Operating pressure [bar] for actuator function: (LAP.520/530-AZ) air-to-open/air-to-close

Diaphragm size [mm]			EPDM [bar]		TFM, bonded [bar]		TFM, 2-piece [bar]		Dimensions [mm]	
MD[21)]	Function	Piston [mm]	One side	Both sides	One side	Both sides	One side	Both sides	H2 max.	D2
30	AZ	35	12	6	8	4	12	6	88	41
40	AZ	40	12	6	8	4	12	6	104	46
65	AZ	63	12	6	8	4	12	6	153	71
92	AZ	80	12	6	8	4	12	6	211	89
115	AZ	100	12	6	8	4	12	6	247	110
168	AZ	160	12	6	-	-	12	6	430	167
202	AZ	200	12	6	-	-	12	6	506	210

Accessories

Electrical actual-position feedback unit SK.500/SK.510 for linear actuators, stroke: 5-60 mm



Example: SK.500

- Straightforward adjustment of limit switches by means of threaded stem
- No special tools required for retrofitting on SISTO-C
- ATEX-compliant model (sensor, block terminals and cable entry with ATEX certification)
- Block terminals easily accessible for connection
- Visual position indicator as standard
- Stainless steel housing as standard
- Reliable adjustment of limit switches even under vibration conditions

Technical data of SK.500/SK.510

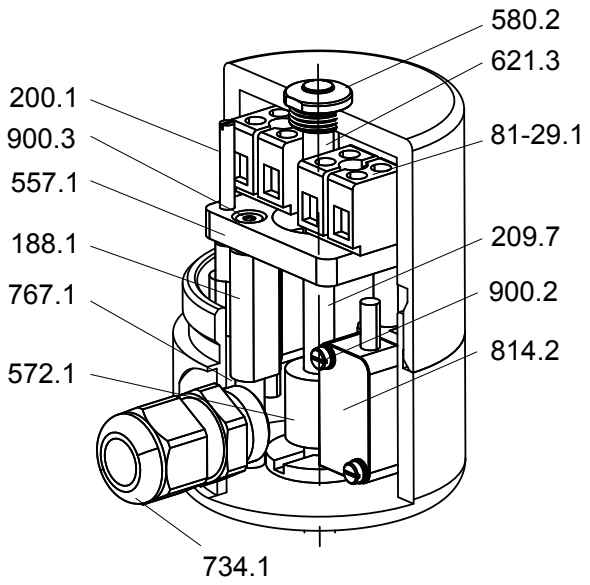
Characteristic	Type	
	SK.500	SK.510
Stroke [mm]	5-26	5-60
Housing material	1.4404	1.4404
Electrical connection	Terminal strip and cable entry (optional: connector)	
Setting the proximity sensors	Threaded stem (optional: from outside the housing)	
Travel stop	Optional	
Enclosure	IP64	

Technical data of limit switches

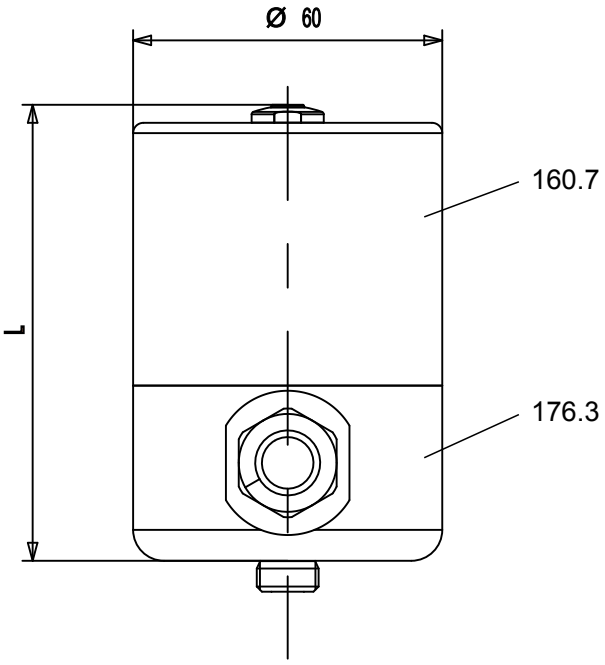
Characteristic	NCB2-V3-N0 (inductive) 2-wire system	NBB2-V3-E2 (inductive) 3-wire system	ABV161651 (mechanical)[22)]
Manufacturer	Pepperl & Fuchs	Pepperl & Fuchs	Matsushita (with modified switching flag)
Type	NAMUR normally closed contact	PNP normally open contact	Changeover contact
Voltage	8 V	10.....30V	24 VDC / 250 VAC
Temperature range	-25 °C to +100 °C	-25 °C to +70 °C	-40 °C to +85 °C
Housing material	PBT	PBT	-
ATEX	SK.500/SK.510	-	-

22) Can be used from diaphragm diameter 40 only

List of components of SK.500/SK.510



General assembly drawing of SK.500/SK.510



SK.500/SK.510 (MD 30-202)

Parts list

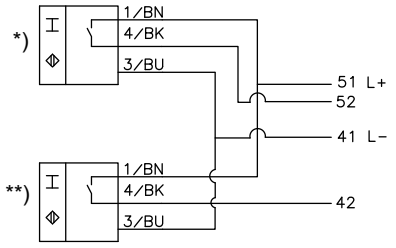
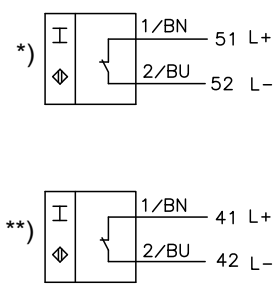
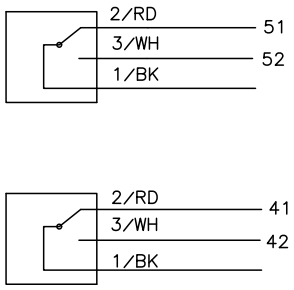
Part No.	Description	Material	Material number	Note
81-29.1	Terminal	Plastic	-	-
160.7	Cover	X2CrNiMo17-12-2	1.4404	-
176.3	Bottom	X2CrNiMo17-12-2	1.4404	-
188.1	Holder	PA6	-	-
200.1	Stem	A2	-	-
209.7	Switching rod	X2CrNiMo17-12-2	1.4404	-
557.1	Guide disc	PA6	-	-
572.1	Contact piece	X14CrMoS17	1.4104	-
580.2	Cap	PA6	-	-
621.3	Position indicator	PA	-	-
734.1	Cable gland	Plastic	-	M16x1.5
767.1	Rod guide	A2	-	-
814.2	Limit switch	Plastic	-	-
900.2	Screw	A2	-	-
900.3	Screw	A2	-	-

Dimensions table of SK.500/SK.510

Model	Diaphragm diameter [MD]	Length (L) [mm]	Stroke [mm]
SK.500	MD 30-115	101	5-26
SK.510	MD 168-202	152	5-60

Terminal diagram for SK.500/SK.510

Terminal diagram for SK.500/SK.510

		
Inductive	Inductive	Mechanical
3-wire system	2-wire system	Changeover contact

Symbols key

Symbol	Description
*)	Open
**)	Closed

09/07/2018

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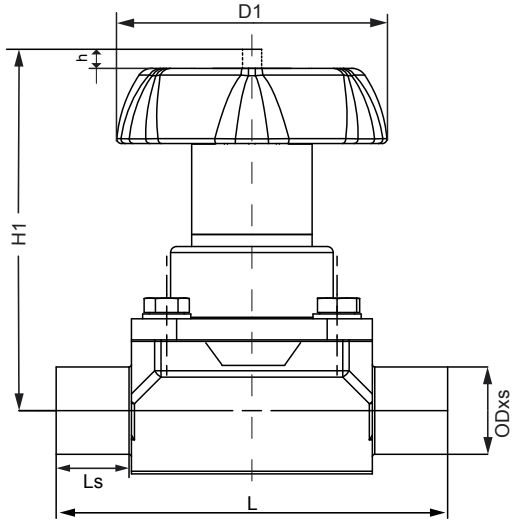
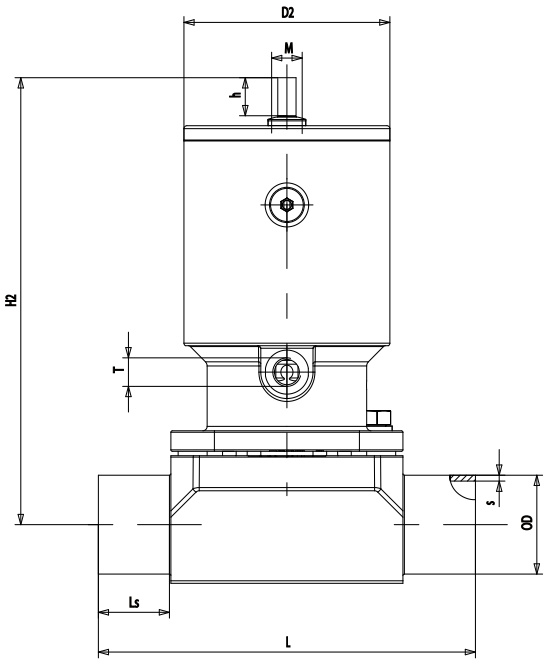
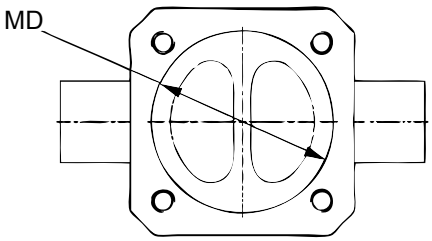
8644.1/24-EN

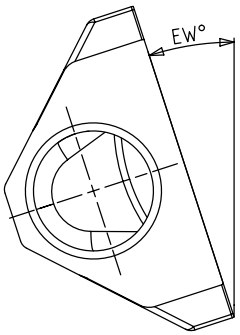
SISTO-C - old program

Dimensions and Kvs-Values









Dimensions to DIN

					Manually operated		Actuator			DIN 11866 Series A Butt weld ends			K_{vs}-Value
DN	NPS	MD	h	EW°	H1	D1	H2	D2	T	L	Ls	ODxs	m^3/h
20	¾"	40	7	9,6	86	65	106	46	M5	115	30	23 x 1,5	4,4
32	1 ¼"	65	13	12,2	127	90	155	71	G⅛	140	30	35 x 1,5	15,4
50	2"	92	22	10	180	100	216	89	G⅛	190	42,5	53 x 1,5	42,4
65	2 ½"	115	26	11	245	125	251	110	G⅛	200	37,5	70 x 2	65
100	4"	168	45	10,2	361	200	443	167	G⅛	305	56,5	104 x 2	143

Dimensions to ISO

					Manually operated		Actuator			DIN 11866 Series B (ISO 4200) Butt weld ends			K_{vs}-Value
DN	NPS	MD	h	EW°	H1	D1	H2	D2	T	L	Ls	ODxs	m^3/h
10	⅜"	30	5	7,7	57	35	91	41	M5	80	20	17,2 x 1,6	2,2
20	¾"	40	7	2,8	86	65	106	46	M5	115	30	26,9 x 1,6	4,7
32	1 ¼"	65	13	4,2	127	90	155	71	G⅛	140	30	42,4 x 2	17,5
50	2"	92	22	4,9	180	100	216	89	G⅛	190	42,5	60,3 x 2	45,7
65	2 ½"	115	26	7,1	245	125	251	110	G⅛	200	37,5	76,1 x 2	67
100	4"	168	45	6,25	361	200	443	167	G⅛	305	56,5	114,3 x 2,3	157

Dimensions to OD

					Manually operated		Actuator			OD ASME BPE Butt weld ends			K_{vs}-Value
DN	NPS	MD	h	EW°	H1	D1	H2	D2	T	L	Ls	ODxs	m^3/h
50	2"	92	22	12	180	100	216	89	G⅛	190	42,5	50,8 x 1,65	42,4
80	3"	115	26	6,4	245	125	252	110	G⅛	200	37,5	76,2 x 1,65	67
100	4"	168	45	11,2	361	200	443	167	G⅛	305	56,5	101,6 x 2,11	143