

Type test approved safety valves angle-type
for industrial applications

3.1

→ **Series 451**

451

Safety valves made of
stainless steel, angle-type
with threaded connections



■ SUITABLE FOR

Liquids	neutral and non-neutral	
Air, gases and vapours	neutral and non-neutral	
Steam		

■ EXAMPLES OF USE

For the protection of:

- pressure tanks and -systems for neutral / non-neutral vapours, gases and liquids
 - steam boilers and steam plants
 - bulk transport vehicles for liquid, granular and dusty goods.¹
- Please observe plant-specific regulations and use of appropriate valve version and sealing material.

- chemical plants, biogas plants
- process equipment construction and medical technology (sterilizers, autoclaves)
- secondary areas in the food-, beverage-, pharmaceutical- and cosmetics-industries

Safety valves are set and sealed at the factory.

■ APPROVALS

TÜV-Type test approval 666, 684	D/G, F, F/K/S ¹
EC type examination	S/G, L, F/K/S ¹
ASME CRN	S, G, L G
TSG ZF001-2006	D/G (S/G), F (L), F/K/S ¹
KGS	G
TR ZU 032/2013 - TR ZU 010/2011	D/G (S/G), F (L), F/K/S ¹
Requirements	
AD 2000 Data sheet A2 TRD 421 TRB 801 No. 22 and No. 23 ¹ DIN EN ISO 4126-1	PED 2014/68/EU ASME-Code Sec. VIII Div. 1 KGS AA 319

Classification society

DNVGL	DNVGL
Lloyd's Register EMEA	LR EMEA
American Bureau of Shipping	ABS
Bureau Veritas	BV
Russian Maritime Register of Shipping	RS



■ MATERIAL



■ SPECIFICATION

		
1/2" – 2"	– 60°C bis + 400°C depending on version	0,5 – 70 bar

■ MATERIALS

Component	Material	DIN EN	ASME
Inlet body	Stainless steel	1.4404	316 L
Outlet body	Stainless steel	1.4408	CF8M
Internal parts	Stainless steel	1.4404	316 L
Spring	Stainless steel	1.4310	302
Bellows (optional)	Stainless steel	1.4571	316 Ti

¹only for versions with bellows

Series 451 ■ VALVE VERSION

s	Standard, non-gastight version of the spring housing	for neutral media without counter pressure.
b	with bellows	for neutral and non-neutral media and/or counter pressure up to 4 bar. Spring, moving parts and the environment are protected from being affected by the medium.
t	gastight version of spring housing	for neutral and non-neutral media without counter pressure. The environment is protected from being affected by the medium. Only available without lifting device. This version is not available for inlet / outlet 15/15 and 20/20!
tb	gastight version with bellows	for neutral and non-neutral an particularly for flammable, toxic and environmentally hazardous media and/or counter pressure up to 4 bar. Spring, moving parts and the environment are protected from being affected by the medium. Double gastight.

■ MEDIUM

G	gaseous	Air, vapours, gases and - depending on safety valve version and seal - also for steam
F	liquid	The temperature of the medium under atmospheric pressure must not reach boiling point
GF	gaseous and liquid	Air, vapours, gases, liquids and - depending on safety valve version and seal - also for steam -Not in combination with ASME Approval-

■ TYPE OF LIFTING MECHANISM

K	Standard with twist-type lifting mechanism
L	Lifting lever
O	without lifting device, standard for gastight versions

■ AVAILABLE NOMINAL DIAMETERS AND CONNECTION SIZES

Nominal diameter DN		15	20	25	32		
Inlet		1/2" (15)	3/4" (20)	1" (25)	1 1/4" (32)	1 1/2" (40)	2" (50)
Outlet	1/2" (15)	■					
	3/4" (20)		■				
	1" (25)	■					
	1 1/4" (32)		■				
	1 1/2" (40)			■			
	2" (50)				■	■	■

■ TYPE OF CONNECTION INLET / OUTLET THREADED CONNECTIONS

f / f	Standard	Female thread BSP-P / Female thread BSP-P	DIN EN ISO 228-1 / DIN EN ISO 228-1
m / f		Male thread BSP-P / Female thread BSP-P	DIN EN ISO 228-1 / DIN EN ISO 228-1
BSP-Tm / f		Male thread BSP-T / Female thread BSP-P	DIN EN 10226, ISO 7-1 / DIN EN ISO 228-1

■ SEALS

NBR	Nitrile rubber	Elastomere moulded seal with metallic support up to 25 bar	-30°C to +130°C
EPDM	Ethylene propylene diene	Elastomere moulded seal with metallic support up to 25 bar	-40°C to +170°C
FKM	Fluorcarbon	Elastomere moulded seal with metallic support up to 25 bar	-20°C to +200°C
PTFE	Polytetrafluoroethylene	Flat seal up to 25 bar	-60°C to +225°C
PTFE+Kohle	Polytetrafluoroethylene + carbon	Flat seal from 25 bar	-60°C to +225°C
FFKM	Perfluorinated rubber	Elastomere moulded seal with metallic support up to 25 bar	-10°C to +260°C
MD	Metal-to-metal sealing	Flat seal	-60°C to +400°C

■ **NOMINAL DIAMETERS, CONNECTIONS, INSTALLATION DIMENSIONS**

Series 451: Connection, installation dimensions, ranges of adjustment

Nominal diameter	DN	15	20	25	32
Connection DIN EN ISO 228	G	1/2" (15)	3/4" (20)	1" (25)	1 1/4" (32)
Outlet DIN EN ISO 228	G1	1/2" (15)	1" (25)	1 1/2" (40)	2" (50)
Installation dimensions in mm	L	34	40	42	43
	Lmax	65	65	91	91
	H / H ¹	79 / 79	77 / 77	131 / 131	137 / 137
	H1 / H1 ¹	93 / 93	91 / 91	149 / 149	154 / 154
	H2 / H2 ¹	79 / 79	77 / 77	131 / 131	138 / 138
	Hmax / Hmax ¹	105 / 105	103 / 103	164 / 164	169 / 169
	h	28	30	31	39
	h1	15	15	16	16
	SW1	30	30	36	36
	SW2	-	40	40	50
	do	15,8	15,8	15,8	18
Coefficients of flow ISO 4126-1	$\alpha_w / K_{dv}(F)$	0,24	0,3 ²	0,3 ²	0,38
	$\alpha_w / K_{dv}(D/G)^3$	0,33	0,33	0,33	0,52
Coefficients of flow ASME-Code Sec. VIII Div. 1	$\alpha_w / K_{dv}(F)$	-/-	2,47 ⁴	2,47 ⁴	-/-
	$\alpha_w / K_{dv}(D/G)$	-/-	3,046 ⁴	3,046 ⁴	-/-
Weight	kg	0,4	0,4	0,8	1
Range of adjustment	bar	0,5 ² -25	0,5 ² -25	25,1-70	0,5 ² -70
Range of adjustment ASME	psi	-/-	15-363	15-1015	15-1015

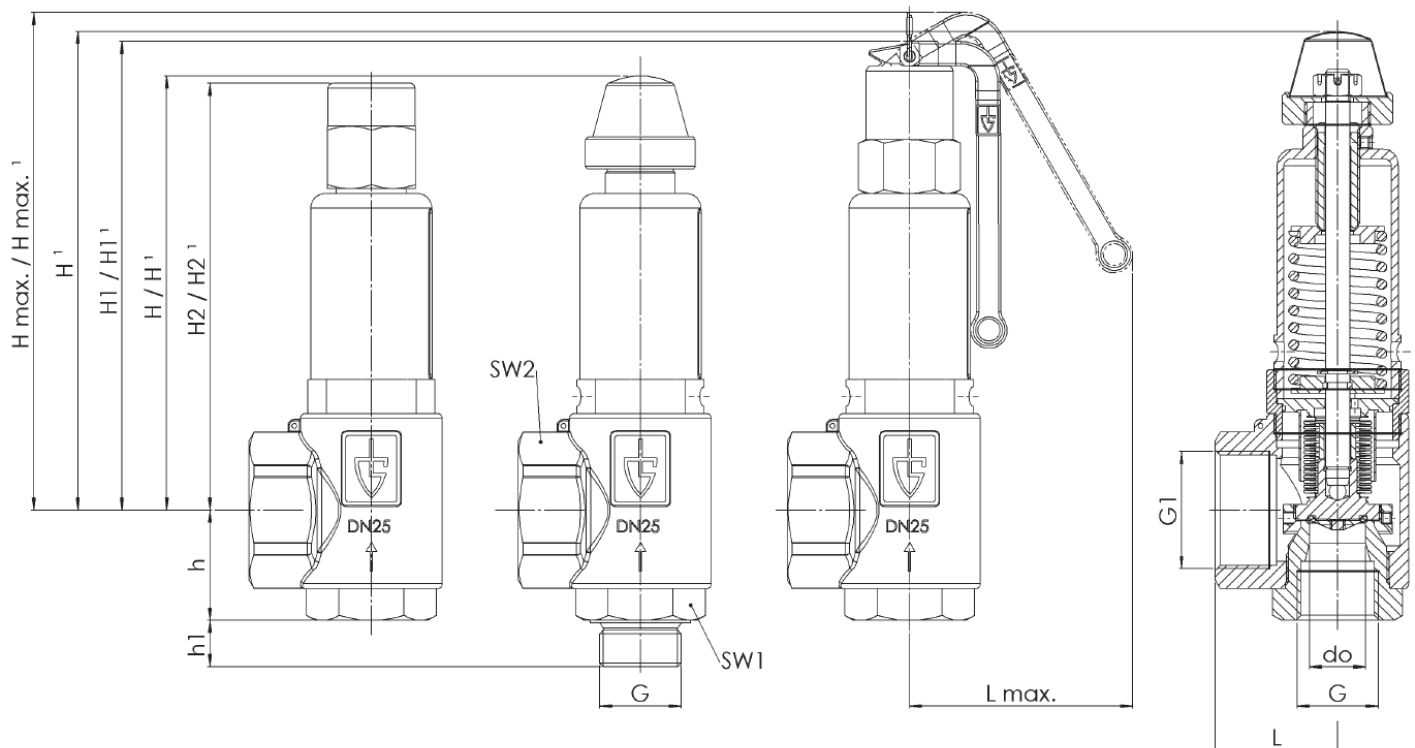
¹Dimension for the version with bellows.

²Version with bellows only available from 1 bar. Flow coefficients with bellows is 0,24.

³Flow coefficients for blow-off pressures > 3,0 bar.

⁴Rated slope value for D/G in scfm/psia; for F in gpm/root(psid) psid = differential pressure before and after the valve.

■ **MAIN DIMENSIONS, INSTALLATION DIMENSIONS**



■ CAPACITY TABLE ACC. TO ISO 4126-1 / AD2000 A2

Series 451: Blowing-off rates at 10% above set pressure										
Nominal diameter DN		15				do = 15,8			20	
		Bellows								
Set pressure bar		I	II	without III	with III	I	II	III	I	II
Air I Nm ³ /h	0,5	56**	42**	2,3**	1,9**	64**	48**	2,9**	127	96
	1	87	69	3,1	2,5	120	96	4,0	189	151
	1,5	113	90	3,8	3,1	166	132	4,9	252	200
	2	141	111	4,4	3,6	205	161	5,6	316	249
	2,5	165	129	5,0	4,0	250	196	6,3	383	300
Steam II kg/h	3	189	148	5,4	4,4	298	233	6,9	447	349
	3,5	214	166	5,9	4,7	336	262	7,4	504	392
	4	238	184	6,3	5,0	375	291	8,0	561	435
	4,5	262	203	6,7	5,3	413	319	8,4	618	478
	5	286	221	7,0	5,6	451	348	8,9	675	521
Water III m ³ /h	5,5	310	239	7,4	5,9	489	377	9,3	732	564
	6	335	257	7,7	6,2	527	406	9,7	790	608
	6,5	359	275	8,0	6,4	565	434	10,1	847	650
	7	383	293	8,3	6,6	604	462	10,5	904	692
	7,5	407	311	8,6	6,9	642	491	10,9	961	735
	8	431	329	8,9	7,1	680	519	11,3	1018	777
	8,5	456	347	9,2	7,3	718	547	11,6	1075	820
	9	480	365	9,4	7,5	756	576	11,9	1132	862
	9,5	504	383	9,7	7,7	794	604	12,3	1190	905
	10	528	401	9,9	7,9	833	632	12,6	1247	947
	11	577	437	10,4	8,3	909	688	13,2	1361	1031
	12	625	472	10,9	8,7	985	744	13,8	1475	1115
	13	674	508	11,3	9,1	1061	801	14,3	1590	1199
	14	722	544	11,8	9,4	1138	857	14,9	1704	1284
	15	770	580	12,2	9,7	1214	914	15,4	1818	1368
	16	819	616	12,6	10,1	1290	970	15,9	1932	1453
	17	867	650	13,0	10,4	1367	1025	16,4	2047	1535
	18	916	686	13,3	10,7	1443	1081	16,9	2161	1619
	19	964	721	13,7	11,0	1519	1137	17,3	2275	1703
	20	1013	757	14,0	11,2	1596	1193	17,8	2390	1787
	21	1061	793	14,4	11,5	1672	1250	18,2	2504	1872
	22	1109	829	14,7	11,8	1748	1306	18,7	2618	1956
	23	1158	865	15,1	12,1	1825	1363	19,1	2732	2040
	24	1206	900	15,4	12,3	1901	1419	19,5	2847	2125
	25	1255	936	15,7	12,6	1977	1475	19,9	2961	2209
	26	1303	972*	16,0	12,8	2054	1532	20,3	3075	2294*
	27	1352	1008*	16,3	13,1	2130	1589	20,7	3190	2379*
	28	1400	1044*	16,6	13,3	2206	1646	21,1	3304	2465*
	29	1449	1081*	16,9	13,5	2283	1703	21,4	3418	2550*
	30	1497	1114*	17,2	13,8	2359	1755	21,8	3532	2628*
	32	1594	1186*	17,8	14,2	2511	1869	22,5	3761	2799*
	34	1691	1258*	18,3	14,7	2664	1982	23,2	3990	2969*
	36	1788	1330*	18,8	15,1	2817	2096	23,9	4218	3139*
	38	1884	1402*	19,4	15,5	2969	2209	24,5	4447	3309*
	40	1981	1474*	19,9	15,9	3122	2323	25,2	4675	3479*
	42	2078	1547*	20,4	16,3	3275	2437	25,8	4904	3650*
	44	2175	1619*	20,8	16,7	3427	2551	26,4	5132	3821*
	46	2272	1692*	21,3	17,0	3580	2666	27,0	5361	3992*
	48	2369	1764*	21,8	17,4	3732	2780	27,6	5589	4163*
	50	2466	1837*	22,2	17,8	3885	2895	28,1	5818	4335*
	52	2562	1910*	22,7	18,1	4038	3009	28,7	6047	4506*
	54	2659	1984*	23,1	18,5	4190	3126	29,2	6275	4681*
	56	2756	2061*	23,5	18,8	4343	3248	29,8	6504	4868*
	58	2853	2136*	23,9	19,1	4496	3366	30,3	6732	5040*
	60	2950	2209*	24,3	19,5	4648	3481	30,8	6961	5213*
	62	3047	2282*	24,7	19,8	4801	3596	31,3	7189	5385*
	64	3144	2355*	25,1	20,1	4954	3711	31,8	7418	5558*
	66	3240	2428*	25,5	20,4	5106	3827	32,3	7647	5730*
	68	3337	2502*	25,9	20,7	5259	3943	32,8	7875	5905*
	70	3434	2578*	26,3	21,0	5411	4062	33,3	8104	6082*

*) only possible with metal-to-metal sealing

**) Version with bellows only available from 1 bar

■ CAPACITY TABLE ACC. TO ISO 4126-1 / AD2000 A2

CONTINUATION - Series 451: Blowing-off rates at 10% above set pressure								
Nominal diameter DN		25			32			
Set pressure bar		I	II	III	I	II	III	
Air I Nm ³ /h	0,5	199	150	8,8	353	266	15,4	
	1	291	232	12,0	515	411	20,8	
	1,5	390	309	14,7	683	542	25,5	
	2	489	385	16,9	832	656	29,4	
	2,5	583	457	18,9	1012	793	32,9	
Steam II kg/h	3	681	532	20,8	1182	924	36,0	
	3,5	768	597	22,4	1333	1036	38,9	
	4	855	663	24,0	1484	1151	41,6	
	4,5	942	729	25,4	1635	1265	44,1	
	5	1029	794	26,8	1786	1378	46,5	
Water III m ³ /h	5,5	1116	860	28,1	1937	1492	48,8	
	6	1203	926	29,3	2088	1607	50,9	
	6,5	1290	990	30,5	2239	1719	53,0	
	7	1377	1054	31,7	2390	1830	55,0	
	7,5	1464	1119	32,8	2542	1943	56,9	
	8	1552	1184	33,9	2693	2056	58,8	
	8,5	1639	1249	34,9	2844	2168	60,6	
	9	1726	1314	35,9	2995	2281	62,4	
	9,5	1813	1379	36,9	3146	2392	64,1	
	10	1900	1443	37,9	3297	2504	65,8	
	11	2074	1571	39,7	3599	2727	69,0	
	12	2248	1699	41,5	3902	2948	72,0	
	13	2422	1827	43,2	4204	3172	75,0	
	14	2596	1957	44,8	4506	3396	77,8	
	15	2771	2085	46,4	4808	3618	80,5	
	16	2945	2214	47,9	5111	3842	83,2	
	17	3119	2339	49,4	5413	4059	85,7	
	18	3293	2467	50,8	5715	4281	88,2	
	19	3467	2594	52,2	6017	4503	90,6	
	20	3641	2723	53,6	6320	4726	93,0	
	21	3816	2852	54,9	6622	4950	95,3	
	22	3990	2981	56,2	6924	5173	97,5	
	23	4164	3109	57,5	7226	5396	99,7	
	24	4338	3238	58,7	7529	5619	101,9	
	25	4512	3366	59,9	7831	5842	104,0	
	26	4686	3496*	61,1	8133	6067*	106,0	
	27	4860	3626*	62,3	8435	6293*	108,0	
	28	5035	3756*	63,4	8738	6518*	110,0	
	29	5209	3886*	64,5	9040	6744*	112,0	
	30	5383	4005*	65,6	9342	6951*	113,9	
	32	5731	4265*	67,8	9947	7401*	117,6	
	34	6080	4524*	69,9	10551	7851*	121,2	
	36	6428	4783*	71,9	11156	8301*	124,8	
	38	6776	5042*	73,9	11760	8751*	128,2	
	40	7124	5301*	75,8	12365	9200*	131,5	
	42	7473	5562*	77,6	12969	9653*	134,8	
	44	7821	5823*	79,5	13574	10105*	137,9	
	46	8169	6083*	81,3	14178	10558*	141,0	
	48	8518	6344*	83,0	14783	11011*	144,1	
	50	8866	6606*	84,7	15387	11464*	147,0	
	52	9214	6867*	86,4	15992	11917*	149,9	
	54	9563	7134*	88,0	16596	12380*	152,8	
	56	9911	7412*	89,7	17200	12864*	155,6	
	58	10259	7681*	91,2	17805	13330*	158,4	
	60	10608	7943*	92,8	18409	13786*	161,1	
	62	10956	8206*	94,3	19014	14242*	163,7	
	64	11304	8469*	95,8	19618	14699*	166,3	
	66	11652	8732*	97,3	20223	15155*	168,9	
	68	12001	8998*	98,8	20827	15616*	171,5	
	70	12349	9269*	100,2	21432	16086*	174,0	

*) only possible with metal-to-metal sealing

**) Version with bellows only available from 1 bar