



Type 441 DIN 442 DIN

Flanged Safety Relief Valves
– spring loaded



Capacities

LESER

The-Safety-Valve.com

Approvals

Approvals		
	DN _i	20 – 200
	DN _o	32 – 300
	Actual Orifice diameter d ₀ [mm]	18 – 165
	Actual Orifice area A ₀ [mm ²]	254 – 21382
Europe		Coefficient of discharge K _{dr}
DIN EN ISO 4126-1	Approval No.	072020111Z0008/0/08-2
	S/G	0,7
	L	0,45
Germany		Coefficient of discharge α _w
AD 2000-Merkblatt A2	Approval No.	TÜV SV 576
	S/G	0,7
	L	0,45
United States		Coefficient of discharge K
ASME Sec. VIII	Approval No.	M37044
	S/G	0,699
	Approval No.	M37055
	L	0,521
Canada		Coefficient of discharge K
Canada: CRN	Approval No.	OG1182.9C
	S/G	0,699
	L	0,521
China		Coefficient of discharge α _w
CSBQTS	Approval No.	
	S/G	0,7
	L	0,45
Russia		Coefficient of discharge α _w
GGTN/ GOSGOTECHNADZOR GOST R	Approval No.	PPC 00-18458
	S/G	0,7
	L	0,45
Classification societies		Homepage
Bureau Veritas	BV	www.bureauveritas.com
Det Norske Veritas	DNV	www.dnv.com
Germanischer Lloyd	GL	www.gl-group.com
Lloyd' s register EMEA	LREMEA	www.lr.org
Registro Italiano Navale	RINA	www.rina.org

The valid certification number is changed with every renewal.

A sample certificate including the valid certification number can be taken from the homepage of the classification societies.

Capacities – Steam

Capacities for saturated steam according to AD 2000-Merkblatt A2, based on set pressure plus 10 % overpressure.
Capacities at 1 bar (14,5 psig) and below are based on 0,1 bar (1,45 psig) overpressure.

Metric Units		AD 2000-Merkblatt A2 [kg/h]											
	DN _I	20	20	25	32	40	50	65	80	100	125	150	200
	DN _O	32	40	40	50	65	80	100	125	150	200	250	300
	Actual Orifice diameter d ₀ [mm]	18	18	23	29	37	46	60	74	92	98	125	165
	Actual Orifice area A ₀ [mm ²]	254	254	416	661	1075	1662	2827	4301	6648	7543	12272	21382
	LEO _{S/G} ^{*)} [inch ²]	0,283	0,283	0,462	0,734	1,195	1,847	3,142	4,779	7,387	8,382	13,637	23,761
Set pressure [bar]		Capacities [kg/h]											
	0,1	0	0	0	0	0	0	0	0	0	0	0	0
	0,2	86	86	140	223	363	561	954	1451	2243	2545	4140	7214
	0,5	137	137	224	356	579	895	1523	2316	3580	4062	6609	11516
	1	199	199	326	518	843	1302	2215	3370	5209	5910	9616	16755
	2	318	318	519	825	1343	2075	3531	5371	8302	9420	15326	26704
	3	428	428	699	1111	1808	2794	4754	7232	11178	12683	20635	35954
	4	534	534	871	1385	2254	3485	5928	9018	13938	15816	25731	44834
	5	639	639	1043	1658	2699	4172	7097	10796	16687	18934	30804	53673
	6	744	744	1214	1930	3142	4856	8262	12568	19426	22042	35861	62484
	7	846	846	1381	2196	3574	5525	9399	14297	22098	25074	40794	71080
	8	950	950	1551	2466	4014	6205	10556	16057	24818	28161	45816	79830
	9	1054	1054	1721	2736	4454	6884	11712	17815	27535	31244	50831	88569
	10	1158	1158	1891	3006	4893	7562	12866	19571	30250	34324	55842	97300
	12	1366	1366	2230	3545	5770	8919	15174	23081	35675	40480	65858	114751
	14	1569	1569	2562	4073	6629	10247	17433	26518	40987	46507	75664	131837
	16	1776	1776	2900	4610	7505	11600	19735	30020	46400	52650	85657	149249
	18	1984	1984	3239	5149	8382	12955	22041	33526	51820	58800	95663	166683
	20	2191	2191	3578	5688	9260	14312	24350	37039	57249	64960	105685	184145
	22	2393	2393	3907	6212	10111	15629	26590	40446	62515	70935	115407	201085
	24	2601	2601	4247	6752	10991	16988	28903	43964	67953	77106	125445	218576
	26	2810	2810	4588	7294	11873	18351	31222	47491	73405	83292		
	28	3019	3019	4930	7837	12757	19718	33547	51029	78873	89496		
	30	3229	3229	5272	8382	13644	21089	35880	54577	84358			
	32	3440	3440	5616	8929	14534	22465	38220	58137	89860			
	34	3641	3641	5945	9451	15384	23779	40455	61537	95115			
	36	3853	3853	6290	10000	16278	25160	42806	65112	100641			
	38	4065	4065	6637	10551	17175	26547	45165	68701	106188			
	40	4278	4278	6985	11104	18076	27939	47533	72303	111756			

^{*)} LEO_{S/G} = LESER Effective Orifice steam/gas please refer to page 00/11
How to use capacity-sheets refer to page 00/09

Capacities – Steam

Capacities for saturated steam according to ASME Section VIII (UV), based on set pressure plus 10% overpressure.
Capacities at 2,07 bar (30 psig) and below are based on 0,207 bar (3 psig) overpressure.

US Units		ASME Section VIII [lb/ h]											
	DN _i	20	20	25	32	40	50	65	80	100	125	150	200
	DN _o	32	40	40	50	65	80	100	125	150	200	250	300
	Actual Orifice diameter d ₀ [inch]	0,71	0,71	0,91	1,14	1,46	1,81	2,36	2,91	3,62	3,86	4,92	6,5
	Actual Orifice area A ₀ [inch ²]	0,394	0,394	0,644	1,024	1,667	2,576	4,383	6,666	10,304	11,691	19,021	33,142
	LEO _{S/G} ^{*)} [inch ²]	0,283	0,283	0,462	0,734	1,195	1,847	3,142	4,779	7,387	8,382	13,637	23,761
Set pressure [psig]		Capacities [lb/h]											
15				757	1204	1959	3028	5152	7837	12113	13744	22361	38962
20				873	1388	2259	3492	5941	9037	13968	15849	25785	44928
30				1105	1756	2859	4419	7519	11436	17677	20058	32632	56859
40				1360	2162	3519	5439	9254	14076	21757	24687	40165	69983
50				1615	2567	4179	6459	10989	16716	25837	29317	47697	83107
60				1870	2973	4839	7479	12725	19356	29917	33947	55229	96231
70				2125	3378	5499	8499	14460	21995	33997	38576	62761	109355
80				2380	3783	6159	9519	16196	24635	38078	43206	70293	122479
90				2635	4189	6819	10539	17931	27275	42158	47836	77825	135603
100				2890	4594	7479	11559	19666	29915	46238	52466	85357	148727
120				3400	5405	8799	13600	23137	35194	54398	61725	100422	174975
140				3910	6216	10118	15640	26608	40474	62558	70984	115486	201223
160				4420	7027	11438	17680	30079	45753	70719	80244	130550	227471
180				4930	7838	12758	19720	33550	51033	78879	89503	145615	253719
200				5440	8648	14078	21760	37020	56312	87039	98762	160679	279967
220				5950	9459	15398	23800	40491	61592	95200	108022	175743	306215
240				6460	10270	16718	25840	43962	66871	103360	117281	190808	332463
260				6970	11081	18038	27880	47433	72151	111520	126540	205872	358711
280				7480	11892	19358	29920	50904	77430	119680	135800	220936	384960
300				7990	12703	20677	31960	54375	82710	127841	145059	236001	411208
320				8500	13513	21997	34000	57845	87989	136001	154319	251065	437456
340				9010	14324	23317	36040	61316	93269	144161	163578	266129	463704
360				9520	15135	24637	38080	64787	98548	152321	172837	281194	489952
380				10030	15946	25957	40120	68258	103828	160482	182097		
400				10540	16757	27277	42161	71729	109107	168642	191356		
420				11050	17567	28597	44201	75199	114387	176802			
440				11560	18378	29917	46241	78670	119666	184963			
460				12070	19189	31236	48281	82141	124946	193123			
480				12580	20000	32556	50321	85612	130225	201283			
500				13090	20811	33876	52361	89083	135505	209443			
550				14365	22838	37176	57461	97760	148704	229844			
580				15130	24054	39156	60521	102966	156623	242085			

^{*)} LEO_{S/G} = LESER Effective Orifice steam/gas please refer to page 00/11
How to use capacity-sheets refer to page 00/09

Capacities – Air

Capacities for air according to AD 2000-Merkblatt A2, based on set pressure plus 10 % overpressure at 0 °C and 1013 mbar.
Capacities at 1 bar (14,5 psig) and below are based on 0,1 bar (1,45 psig) overpressure.

Metric Units		AD 2000-Merkblatt A2 [m _n ³ /h]											
	DN _i	20	20	25	32	40	50	65	80	100	125	150	200
	DN _O	32	40	40	50	65	80	100	125	150	200	250	300
	Actual Orifice diameter d ₀ [mm]	18	18	23	29	37	46	60	74	92	98	125	165
	Actual Orifice area A ₀ [mm ²]	254	254	416	661	1075	1662	2827	4301	6648	7543	12272	21382
	LEO _{S/G} ^{*)} [inch ²]	0,283	0,283	0,462	0,734	1,195	1,847	3,142	4,779	7,387	8,382	13,637	23,761
Set pressure [bar]		Capacities [m _n ³ /h]											
	0,1	0	0	0	0	0	0	0	0	0	0	0	0
	0,2	99	99	162	258	420	649	1105	1680	2597	2947	4794	8354
	0,5	161	161	263	418	680	1051	1789	2721	4206	4772	7764	13528
	1	238	238	388	617	1004	1552	2641	4017	6209	7045	11461	19970
	2	384	384	627	996	1622	2507	4265	6487	10026	11377	18509	32251
	3	523	523	854	1357	2209	3414	5809	8836	13657	15497	25212	43930
	4	656	656	1071	1703	2773	4286	7291	11091	17143	19452	31647	55142
	5	790	790	1289	2050	3337	5157	8774	13346	20629	23407	38082	66354
	6	923	923	1507	2396	3900	6029	10257	15601	24114	27362	44516	77565
	7	1057	1057	1725	2742	4464	6900	11739	17857	27600	31317	50951	88777
	8	1190	1190	1943	3089	5028	7771	13222	20112	31086	35273	57386	99989
	9	1323	1323	2161	3435	5592	8643	14704	22367	34571	39228	63821	111201
	10	1457	1457	2379	3781	6155	9514	16187	24622	38057	43183	70255	122413
	12	1724	1724	2814	4474	7283	11257	19152	29132	45028	51093	83125	144836
	14	1991	1991	3250	5167	8411	13000	22117	33642	52000	59003	95994	167260
	16	2257	2257	3686	5859	9538	14743	25082	38153	58971	66914	108863	189684
	18	2524	2524	4121	6552	10666	16486	28047	42663	65942	74824	121733	212107
	20	2791	2791	4557	7245	11793	18228	31012	47173	72913	82734	134602	234531
	22	3058	3058	4993	7938	12921	19971	33977	51683	79885	90644	147472	256954
	24	3325	3325	5429	8630	14048	21714	36943	56194	86856	98555	160341	279378
	26	3592	3592	5864	9323	15176	23457	39908	60704	93827	106465		
	28	3859	3859	6300	10016	16304	25200	42873	65214	100799	114375		
	30	4125	4125	6736	10708	17431	26942	45838	69725	107770			
	32	4392	4392	7171	11401	18559	28685	48803	74235	114741			
	34	4659	4659	7607	12094	19686	30428	51768	78745	121713			
	36	4926	4926	8043	12786	20814	32171	54733	83255	128684			
	38	5193	5193	8478	13479	21941	33914	57698	87766	135655			
	40	5460	5460	8914	14172	23069	35657	60663	92276	142626			

^{*)} LEO_{S/G} = LESER Effective Orifice steam/gas please refer to page 00/11
How to use capacity-sheets refer to page 00/09

Capacities – Air

Capacities for air according to ASME Section VIII (UV), based on set pressure plus 10 % overpressure at 16 °C (60 °F).
Capacities at 2,07 bar (30 psig) and below are based on 0,207 bar (3 psig) overpressure.

US Units		ASME Section VIII [I.S.C.F.M.]											
	DN _i	20	20	25	32	40	50	65	80	100	125	150	200
	DN _o	32	40	40	50	65	80	100	125	150	200	250	300
	Actual Orifice diameter d ₀ [inch]	0,71	0,71	0,91	1,14	1,46	1,81	2,36	2,91	3,62	3,86	4,92	6,5
	Actual Orifice area A ₀ [inch ²]	0,394	0,394	0,644	1,024	1,667	2,576	4,383	6,666	10,304	11,691	19,021	33,142
	LEO _{S/G} ^{*)} [inch ²]	0,283	0,283	0,462	0,734	1,195	1,847	3,142	4,779	7,387	8,382	13,637	23,761
Set pressure [psig]		Capacities [S.C.F.M.]											
15				270	429	698	1079	1835	2792	4315	4896	7965	2780
20				311	494	805	1244	2116	3219	4976	5646	9185	3142
30				394	626	1019	1574	2679	4074	6297	7145	11624	3764
40				484	770	1254	1938	3297	5014	7750	8794	14307	4346
50				575	915	1489	2301	3915	5954	9204	10444	16990	4859
60				666	1059	1724	2664	4533	6895	10657	12093	19673	5323
70				757	1204	1959	3028	5152	7835	12111	13742	22356	5749
80				848	1348	2194	3391	5770	8775	13564	15391	25039	6146
90				939	1492	2430	3754	6388	9715	15018	17041	27722	6519
100				1029	1637	2665	4118	7006	10656	16471	18690	30406	6872
120				1211	1926	3135	4845	8243	12536	19378	21988	35772	7528
140				1393	2215	3605	5571	9479	14417	22285	25287	41138	8131
160				1574	2504	4076	6298	10716	16298	25192	28585	46504	8692
180				1756	2792	4546	7025	11952	18178	28099	31884	51870	9220
200				1938	3081	5016	7751	13189	20059	31006	35182	57236	9718
220				2120	3369	5486	8478	14425	21939	33913	38481	62602	10193
240				2301	3659	5957	9205	15662	23820	36820	41779	67968	10646
260				2483	3948	6427	9932	16898	25700	39727	45078	73334	11081
280				2665	4237	6897	10658	18135	27581	42633	48376	78701	11499
300				2846	4526	7368	11385	19371	29462	45540	51675	84067	11902
320				3028	4815	7838	12112	20608	31342	48447	54973	89433	12293
340				3210	5104	8308	12839	21844	33223	51354	58272	94799	12671
360				3391	5392	8778	13565	23081	35103	54261	61570	100165	13039
380				3573	5681	9249	14292	24317	36984	57168	64869		
400				3755	5970	9719	15019	25554	38864	60075	68167		
420				3936	6259	10189	15745	26791	40745	62982			
440				4118	6548	110660	16472	28027	42626	65889			
460				4300	6837	11130	17199	29264	44506	68796			
480				4481	7126	11600	17926	30500	46387	71703			
500				4663	7415	12070	18652	31737	48267	74610			
550				5117	8137	13246	20469	34828	52969	81877			
580				5390	8570	13952	21559	36683	55790	86237			

^{*)} LEO_{S/G} = LESER Effective Orifice steam/gas please refer to page 00/11
How to use capacity-sheets refer to page 00/09

Capacities – Water

Capacities for water according to AD 2000-Merkblatt A2, based on set pressure plus 10 % overpressure at 20 °C (68 °F).
Capacities at 1 bar (14,5 psig) and below are based on 0,1 bar (1,45 psig) overpressure.

Metric Units		AD 2000-Merkblatt A2 [10 ³ kg/h]											
	DN _I	20	20	25	32	40	50	65	80	100	125	150	200
	DN _O	32	40	40	50	65	80	100	125	150	200	250	300
	Actual Orifice diameter d ₀ [mm]	18	18	23	29	37	46	60	74	92	98	125	165
	Actual Orifice area A ₀ [mm ²]	254	254	416	661	1075	1662	2827	4301	6648	7543	12272	21382
	LEOL ^{*)} [inch ²]	0,316	0,316	0,516	0,821	1,336	2,062	3,513	5,343	8,259	9,371	15,246	26,565
Set pressure [bar]		Capacities [10 ³ kg/h]											
0,1		2,60	2,60	4,25	6,76	11,0	17,0	28,9	44,0	68,0	77,2	126	219
0,2		3,19	3,19	5,21	8,28	13,5	20,8	35,5	53,9	83,3	94,6	154	268
0,5		4,51	4,51	7,37	11,7	19,1	29,5	50,1	76,3	118	134	218	379
1		6,11	6,11	9,97	15,9	25,8	39,9	67,9	103	160	181	295	513
2		8,64	8,64	14,1	22,4	36,5	56,4	96,0	146	226	256	417	726
3		10,6	10,6	17,3	27,5	44,7	69,1	118	179	276	314	510	889
4		12,2	12,2	19,9	31,7	51,6	79,8	136	206	319	362	589	1027
5		13,7	13,7	22,3	35,5	57,7	89,2	152	231	357	405	659	1148
6		15,0	15,0	24,4	38,8	63,2	97,7	166	253	391	444	722	1257
7		16,2	16,2	26,4	42,0	68,3	106	180	273	422	479	779	1358
8		17,3	17,3	28,2	44,8	73,0	113	192	292	451	512	833	1452
9		18,3	18,3	29,9	47,6	77,4	120	204	310	479	543	884	1540
10		19,3	19,3	31,5	50,1	81,6	126	215	326	505	573	932	1623
12		21,2	21,2	34,6	54,9	89,4	138	235	358	553	627	1021	1778
14		22,9	22,9	37,3	59,3	96,6	149	254	386	597	678	1102	1921
16		24,4	24,4	39,9	63,4	103	160	272	413	638	724	1178	2053
18		25,9	25,9	42,3	67,3	110	169	288	438	677	768	1250	2178
20		27,3	27,3	44,6	70,9	115	178	304	462	714	810	1317	2296
22		28,7	28,7	46,8	74,4	121	187	318	484	748	849	1382	2408
24		29,9	29,9	48,9	77,7	126	195	333	506	782	887	1443	2515
26		31,1	31,1	50,9	80,9	132	203	346	526	814	923		
28		32,3	32,3	52,8	83,9	137	211	359	546	844	958		
30		33,5	33,5	54,6	86,8	141	219	372	565	874			
32		34,6	34,6	56,4	89,7	146	226	384	584	903			
34		35,6	35,6	58,2	92,5	151	233	396	602	931			
36		36,7	36,7	59,8	95,1	155	239	407	619	957			
38		37,7	37,7	61,5	97,7	159	246	418	636	984			
40		38,6	38,6	63,1	100	163	252	429	653	1009			

^{*)} LEO_L = LESER Effective Orifice liquids please refer to page 00/12
How to use capacity-sheets refer to page 00/09

Capacities – Water

Capacities for water according to ASME Section VIII (UV), based on set pressure plus 10 % overpressure at 21 °C (70 °F).
Capacities at 2,07 bar (30 psig) and below are based on 0,207 bar (3 psig) overpressure.

US Units		ASME Section VIII [US-G.P.M.]											
	DN _i	20	20	25	32	40	50	65	80	100	125	150	200
	DN _o	32	40	40	50	65	80	100	125	150	200	250	300
	Actual Orifice diameter d _o [inch]	0,71	0,71	0,91	1,14	1,46	1,81	2,36	2,91	3,62	3,86	4,92	6,5
	Actual Orifice area A _o [inch ²]	0,394	0,394	0,644	1,024	1,667	2,576	4,383	6,666	10,304	11,691	19,021	33,142
	LEO _L *) [inch ²]	0,316	0,316	0,516	0,821	1,336	2,062	3,513	5,343	8,259	9,371	15,246	26,565
Set pressure [psig]		Capacities [US-G.P.M.]											
15				54,0	85,9	140	216	368	559	864	981	1595	2780
20				61,1	97,1	158	244	416	632	977	1109	1803	3142
30				73,1	116	189	293	498	757	1170	1328	2160	3764
40				84,5	134	219	338	575	874	1351	1533	2494	4346
50				94,4	150	244	378	643	977	1511	1714	2789	4859
60				103	164	268	414	704	1071	1655	1878	3055	5323
70				112	178	289	447	760	1156	1787	2028	3300	5749
80				119	190	309	478	813	1236	1911	2168	3527	6146
90				127	201	328	507	862	1311	2027	2300	3741	6519
100				134	212	346	534	909	1382	2136	2424	3944	6872
120				146	233	379	585	996	1514	2340	2656	4320	7528
140				158	251	409	632	1075	1635	2528	2868	4666	8131
160				169	269	437	676	1150	1748	2702	3066	4989	8692
180				179	285	464	717	1219	1854	2866	3252	5291	9220
200				189	300	489	755	1285	1955	3021	3428	5577	9718
220				198	315	513	792	1348	2050	3169	3596	5850	10193
240				207	329	535	827	1408	2141	3310	3756	6110	10646
260				215	342	557	861	1465	2229	3445	3909	6359	11081
280				223	355	578	894	1521	2313	3575	4057	6599	11499
300				231	368	599	925	1574	2394	3700	4199	6831	11902
320				239	380	618	955	1626	2472	3822	4337	7055	12293
340				246	391	637	985	1676	2549	3939	4470	7272	12671
360				253	403	656	1013	1724	2622	4054	4600	7483	13039
380				260	414	674	1041	1772	2694	4165	4726		
400				267	425	691	1068	1818	2764	4273	4848		
420				274	435	708	1095	1862	2833	4378			
440				280	445	725	1120	1906	2899	4481			
460				286	455	741	1146	1949	2964	4582			
480				293	465	757	1170	1991	3028	4681			
500				299	475	773	1194	2032	3091	4777			
550				313	498	811	1253	2131	3241	5010			
580				322	511	832	1286	2189	3329	5145			

*) LEO_L = LESER Effective Orifice liquids please refer to page 00/12
How to use capacity-sheets refer to page 00/09

Determination of coefficient of discharge in case of lift restriction or back pressure

Diagram for evaluation of ratio of lift / flow diameter (h/d_0)
in reference to the coefficient of discharge (K_{dr}/α_w)

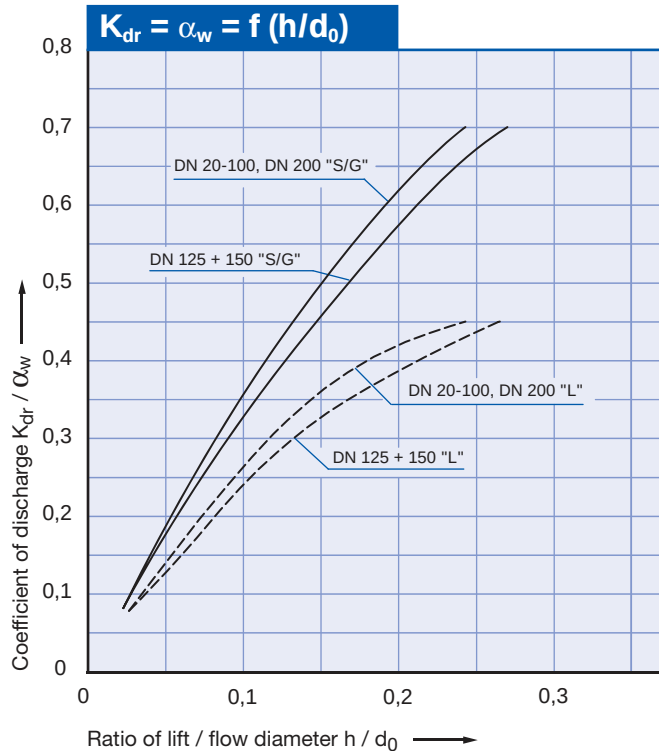
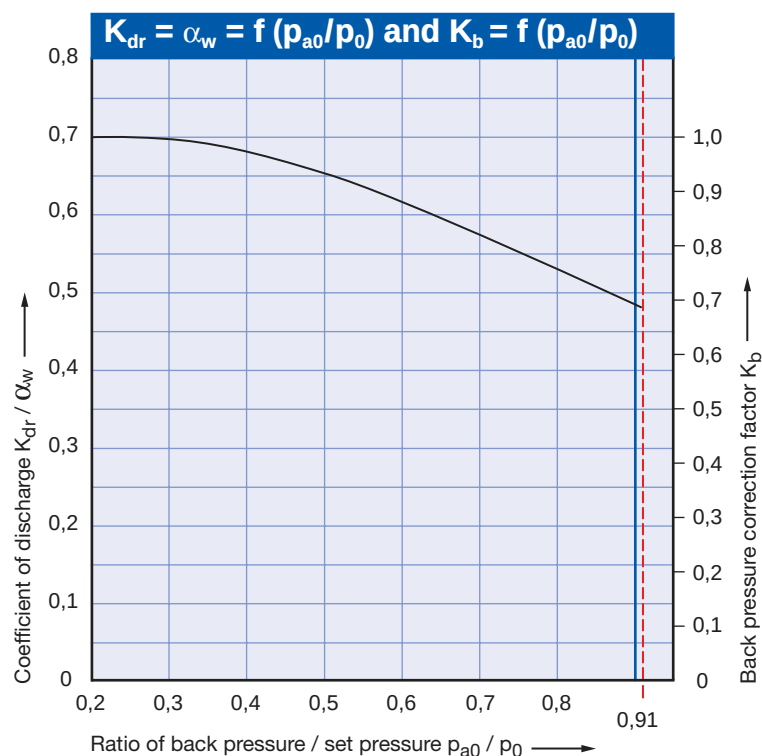


Diagram for evaluation of coefficient of discharge (K_{dr}/α_w) or K_b
in reference to the ratio of back pressure / set pressure (p_{a0}/p_0)



h = Lift [mm]
 d_0 = Flow diameter [mm] of selected safety valve, refer to table article numbers
 h/d_0 = Ratio of lift / flow diameter
 p_{a0} = Back pressure [bar_a]
 p_0 = Set pressure [bar_a]
 p_{a0}/p_0 = Ratio of back pressure / set pressure
 K_{dr} = Coefficient of discharge acc. to DIN EN ISO 4126-1
 α_w = Coefficient of discharge acc. to AD 2000-Merkblatt A2
 K_b = Back pressure correction factor acc. to API 520 topic 3.3