



HANDBOOK
SAFETY DEVICES

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 **Castel**[®]
Italian technology

CHAPTER 4

SAFETY VALVES IN SERIES 3065



GENERAL DESCRIPTION

The valves in series 3065 are unbalanced, conventional direct-loaded safety valves. The valve is opened by the thrust from the fluid under pressure below the shutter, when said thrust exceeds, under the calibrated conditions, the opposing force of the spring acting on the shutter.

Valves are identified by means of:

- a model number formed of an alphanumeric code that includes:
 - the family identity (for ex. 3065/4)
 - the type of inlet connection (for ex. C = NPT)
 - the set pressure, expressed in bar, multiplied by 10 (for ex. 140)
- an alphanumeric serial number

CONSTRUCTION

Body: squared, obtained through hot moulding and subsequent machining. It houses the following elements:

- the nozzle with flat sealing seat
- the shutter guide
- the set spring slot
- the threaded seat of the setting adjustment ring nut

In the body, above the shutter guide, a small pressure relief hole is provided through which the spring slot communicates with the exit connection. For this reason, during relief, there is a no gas leak through this orifice.

Material used: EN 12420-CW617N brass

Shutter: obtained through machining from bar stock and fit with gasket, it ensures the required degree of tightness on the valve seat. The gasket is made from modified PTFE (Polytetrafluorethylene), a material that, during the valve's estimated service life, maintains good strength and does not cause the shutter to stick on the seat. The shutter is properly guided in the body and the guide action cannot fail. There are no glands or retaining rings that hamper its movement.

Material used: EN 12164-CW614N brass

Spring: it opposes the pressure and the fluid dynamic forces, and always ensures closing of the valve following pressure relief. When the shutter has reached the maximum height determined by the mechanical stop, the spring compression does not exceed 80% of the total compression. All the springs are compliant with the compression helical spring requirements defined in EN ISO 4126-7:2013.

Material used: EN 10270-2 - FD steel for springs.

Calibration system: hex-head threaded ring nut to be screwed inside the upper portion of the head, compressing the spring below. When calibration is complete, the position of the ring nut is maintained unchanged by applying to the threaded coupling a high mechanical strength and low viscosity bonding agent. The low viscosity promotes penetration. The calibration system is protected against subsequent tampering by means of a threaded cap nut, screwed on outside the brass body and blocked in place through re-flanging.

SCOPE

Use: protection against possible overpressure of the apparatus listed below, with regard to the operating conditions for which they have been designed:

- Refrigeration system or heat pump components, for instance: condensers, liquid receivers, evaporators, liquid accumulators, positive displacement compressor discharge, heat exchangers, oil separators, or piping (reference standard: EN 378-2:2016)
- Simple pressure vessels (reference Directive: 2009/105/EC)

Fluids: the valves in series 3065 can be used with:

- a. Refrigerant fluids in vapour or gaseous state belonging to Group 2:
 - HCFC (R22)
 - HFC (R134a , R404A , R407C , R410A , R507)
 - HFO and HFO/HFC mixtures (R1234ze , R448A , R449A , R450A , and R452A)
 - R744

with reference to Article 13, Para. 1(b) of Directive 2014/68/EU (EC Regulation No. 1272/2008).

- b. Refrigerant fluids in vapour or gaseous state belonging to Group 1:
- HFC (R32)
 - HFO (R1234yf)
 - HC (R290 , R600 , R600a)

with reference to Article 13, Para. 1(a) of Directive 2014/68/EU (EC Regulation No. 1272/2008).

- c. Air and nitrogen (reference Directive: 2009/105/EC)

For specific applications with refrigerant fluids not listed above, please contact Castel Technical Department.

MARKING

In compliance with the provisions of Article 19 of Directive 2014/68/EC, the following information is cast on the valve body:

- Manufacturer's mark
- Country of manufacturing
- Indication of flow direction
- Maximum allowable pressure

Again, on the body, the following information is laser marked:

- Valve model
- Serial number
- Set pressure
- Allowable temperature range
- Kd discharge coefficient
- Flow section
- Production date
- CE marking
- Identification number of the notified body involved in the production control phase

DOCUMENTATION

The safety valves in series 3065 are supplied with the following documentation provided in the packaging:

- operating instructions for the user, containing all information useful for safety in terms of assembly, commissioning, use, and maintenance.
- Compliance Statement for the equipment according to Directive 2014/68/EU, required in Article 17 and issued in compliance with Annex IV of the same directive.
- Calibration certificate for the safety valve, printed on the reverse side of the Compliance Statement.

N.B.: on the website: www.castel.it use the "Certifications" pull-down menu to access the web-page "**Castel**

Certification Download Center". On this page, you can download:

- the Compliance Statement / Calibration Certificate for each valve by entering the 7-digit alphanumeric serial number.
- the general Compliance Statement referring to a specific model of valve 3065 with a specific setting, for ex. 3065/4C250 or 3065/6C420.

VALVE SELECTION

Directive 2014/68/EC requires that pressure equipment, in which permissible limits are reasonably likely to be exceeded, shall be fitted with suitable protection devices, for instance safety devices such as safety valves. Such devices shall prevent pressure from permanently exceeding the maximum allowable pressure (PS) of the equipment they protect. In any case, a short pressure peak limited to 10% of maximum allowable pressure is permitted.

As to the selection and sizing of the suitable protection device, users shall refer to the specific product and sector standards listed below:

- EN ISO 4126-1: 2013: "Safety devices for protection against excessive pressure – Part 1: Safety valves" indicates the general requirements for safety valves regardless of the fluid for which they were designed.
- EN 378-2:2016 "Refrigerating systems and heat pumps – Safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation" provides a general outline of the protection devices to be used in refrigerating systems and their characteristics (Para. 6.2.5) and the criteria for the selection of the device suitable for the type and size of the system component to be protected (Para. 6.2.6).
- EN 13136:2013: "Refrigerating systems and heat pumps – Pressure relief devices and their associated piping – Methods for calculation" highlights the possible causes of overpressure in a system and provides users with the tools for sizing pressure relief devices, among which safety valves.

For sizing of the safety valves in series 3065, please see Chapter 5 "Selection Criteria for Safety Valves" in this technical handbook.

Table 17 provides the maximum discharge capacities of safety valves, models 3065/4 and 3065/6, as a function of various refrigerants and varying P_{set} for the valve, considering $T_0 =$ Steam saturation temperature at discharge pressure, P_0 .

TABLE 15 : General Characteristics of valves 3065

Catalogue Number		3065/4C	3065/6C
Connections	Inlet male	1/2" NPT	3/4" NPT
	Outlet male	1" G	1" G
Inlet connection wrench torque (min/max) [Nm]		21/30	32/45
Flow Diameter [mm]		13,0	13,0
Flow Section [mm ²]		132,7	132,7
Lift [mm]		6,3	6,3
Discharge Coefficient "Kd"		0,87	0,87
PS [bar]		70	
TS [°C]		- 50 / + 150	
TA [°C]		- 40 / + 50	
Set Pressure Range at atmospheric back pressure Pset [bar]		11 / 60	
Overpressure		+ 10 % of Pset	
Blowdown		- 15 % of Pset	
Helium tightness		- 20 % of Pset (11 bar < Pset < 14 bar)	
		- 15 % of Pset (14,1 bar < Pset < 24 bar)	
		- 10 % of Pset (24,1 bar < Pset < 60 bar)	
Estimated service life		9 years	
Risk Category according to PED Recast		IV	

TABLE 16: Dimensions and Weights of valves 3065

Catalogue Number	Dimensions [mm]						Weight [g]
	Ø D	L	Ch	H ₁	H ₂	H ₃	
3065/4C	38,5	40	32	40	72	112	520
3065/6C	38,5	40	32	40	72	112	520

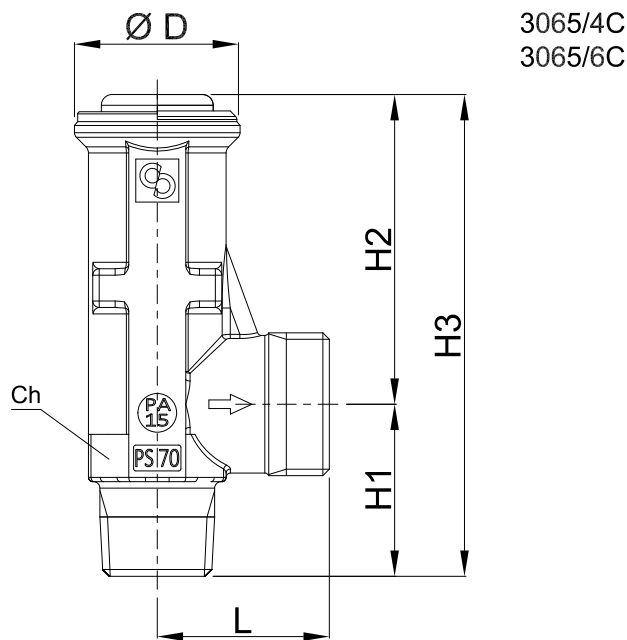


TABLE 17: Maximum discharge capacity of valves 3065

Pset [bar]	Po [barsass]	R134a		R22		R32		R404A		R407C		R410A	
		To [°C]	Qm [kg/h]	To [°C]	Qm [kg/h]	To [°C]	Qm [kg/h]	To [°C]	Qm [kg/h]	To [°C]	Qm [kg/h]	To [°C]	Qm [kg/h]
11,0	13,1	49,8	2200	33,7	2061	15,8	1686	27,0	2257	33,9	2056	16,5	1970
12,0	14,2	53,0	2395	36,9	2239	18,6	1832	30,2	2460	36,9	2236	19,4	2143
13,0	15,3	56,0	2593	39,9	2419	21,3	1979	33,1	2666	39,7	2418	22,1	2317
14,0	16,4	58,9	2794	42,8	2600	23,9	2127	35,9	2875	42,4	2603	24,7	2493
15,0	17,5	61,7	2998	45,5	2784	26,3	2277	38,5	3088	44,9	2789	27,2	2671
16,0	18,6	64,3	3206	48,1	2969	28,6	2428	41,0	3306	47,3	2978	29,5	2851
17,0	19,7	66,8	3417	50,6	3156	30,8	2580	43,4	3528	49,6	3170	31,8	3033
18,0	20,8	69,2	3632	53,0	3346	33,0	2735	45,7	3755	51,8	3364	33,9	3218
19,0	21,9	71,5	3851	55,3	3538	35,0	2890	48,0	3987	54,0	3562	36,0	3405
20,0	23,0	73,7	4075	57,5	3732	37,0	3048	50,1	4226	56,0	3762	37,9	3595
21,0	24,1	75,9	4304	59,7	3929	38,9	3207	52,1	4471	58,0	3966	39,9	3788
22,0	25,2	77,9	4538	61,7	4129	40,7	3368	54,1	4724	59,9	4173	41,7	3984
23,0	26,3	79,9	4779	63,7	4332	42,5	3531	56,0	4986	61,7	4384	43,5	4183
24,0	27,4	81,9	5027	65,7	4538	44,2	3696	57,9	5258	63,4	4599	45,2	4386
25,0	28,5	83,7	5282	67,6	4747	45,8	3863	59,7	5542	65,2	4819	46,9	4592
26,0	29,6	85,6	5547	69,4	4961	47,4	4033	61,4	5840	66,8	5044	48,5	4803
27,0	30,7	87,3	5821	71,2	5178	49,0	4205	63,1	6156	68,4	5274	50,1	5017
28,0	31,8	89,0	6107	72,9	5400	50,5	4379	64,7	6494	70,0	5510	51,6	5237
29,0	32,9	90,7	6408	74,6	5626	52,0	4556	66,3	6861	71,5	5753	53,1	5463
30,0	34,0	92,3	6726	76,2	5858	53,5	4737	67,8	7270	72,9	6004	54,6	5693
31,0	35,1	93,9	7067	77,8	6096	54,9	4920	69,3	7747	74,4	6263	56,0	5931
32,0	36,2	95,4	7436	79,4	6340	56,3	5107	70,7	8358	75,7	6532	57,4	6175
33,0	37,3	96,9	7849	80,9	6591	57,6	5297	72,1	9674	77,1	6812	58,7	6428
34,0	38,4	98,3	8329	82,4	6851	58,9	5491			78,4	7107	60,1	6691
35,0	39,5	99,2	8744	83,9	7120	60,2	5689			79,7	7418	61,4	6964
36,0	40,6	99,5	8966	85,3	7400	61,5	5892			80,9	7749	62,6	7251
37,0	41,7	99,7	9199	86,7	7693	62,7	6100			82,1	8109	63,8	7552
38,0	42,8			88,0	8002	63,9	6313			83,2	8507	65,0	7874
39,0	43,9			89,4	8331	65,1	6533			84,3	8965	66,2	8220
40,0	45,0			90,7	8686	66,2	6759			85,3	9536	67,4	8600
41,0	46,1			92,0	9077	67,3	6993			86,1	10476	68,5	9029
42,0	47,2			93,2	9522	68,5	7236					69,6	9541
43,0	48,3			94,4	10066	69,5	7489					70,7	10246
44,0	49,4			95,6	10882	70,6	7754						
45,0	50,5					71,7	8033						
46,0	51,6					72,7	8330						
47,0	52,7					73,7	8651						
48,0	53,8					74,7	9003						
49,0	54,9					75,6	9402						
50,0	56,0					76,6	9881						
51,0	57,1					77,5	10554						
52,0	58,2												
53,0	59,3												
54,0	60,4												
55,0	61,5												
56,0	62,6												
57,0	63,7												
58,0	64,8												
59,0	65,9												
60,0	67,0												

Continued

TABLE 17: Maximum discharge capacity of valves 3065

Pset [bar]	Po [barsass]	R448A		R449A		R450A		R452A		R507		R1234yf	
		To [°C]	Qm [kg/h]	To [°C]	Qm [kg/h]	To [°C]	Qm [kg/h]	To [°C]	Qm [kg/h]	To [°C]	Qm [kg/h]	To [°C]	Qm [kg/h]
11,0	13,1	31,1	2075	31,0	2087	55,2	2250	28,7	2279	25,8	2260	50,2	2322
12,0	14,2	34,1	2254	34,0	2271	58,5	2456	31,8	2482	28,9	2463	53,7	2533
13,0	15,3	36,9	2443	36,9	2457	61,7	2653	34,6	2687	31,9	2669	56,9	2748
14,0	16,4	39,6	2631	39,5	2645	64,6	2867	37,4	2895	34,7	2879	59,9	2967
15,0	17,5	42,1	2814	42,1	2836	67,5	3075	39,9	3106	37,3	3093	62,9	3191
16,0	18,6	44,6	3011	44,5	3029	70,1	3284	42,4	3321	39,8	3311	65,6	3420
17,0	19,7	46,9	3212	46,8	3226	72,7	3510	44,7	3540	42,2	3533	68,3	3655
18,0	20,8	49,1	3396	49,1	3425	75,2	3735	47,0	3763	44,5	3761	70,8	3897
19,0	21,9	51,2	3611	51,2	3627	77,5	3953	49,1	3990	46,8	3994	73,2	4146
20,0	23,0	53,3	3802	53,2	3833	79,8	4187	51,2	4222	48,9	4234	75,6	4403
21,0	24,1	55,2	4004	55,2	4043	82,0	4441	53,2	4459	50,9	4481	77,8	4670
22,0	25,2	57,1	4221	57,1	4256	84,1	4681	55,1	4702	52,9	4735	80,0	4949
23,0	26,3	58,9	4453	58,9	4474	86,2	4939	57,0	4952	54,8	4999	82,1	5241
24,0	27,4	60,7	4672	60,7	4697	88,1	5218	58,7	5210	56,7	5273	84,1	5551
25,0	28,5	62,4	4905	62,4	4925	90,1	5470	60,5	5475	58,5	5559	86,1	5881
26,0	29,6	64,1	5114	64,1	5159	91,9	5740	62,1	5750	60,2	5860	88,0	6241
27,0	30,7	65,7	5379	65,7	5400	93,7	6094	63,7	6037	61,9	6180	89,8	6642
28,0	31,8	67,2	5617	67,2	5647	95,4	6415	65,3	6336	63,5	6523	91,6	7112
29,0	32,9	68,7	5870	68,7	5902	97,1	6766	66,8	6652	65,1	6899	93,3	7729
30,0	34,0	70,2	6140	70,2	6165	98,8	7056	68,3	6988	66,6	7321		
31,0	35,1	71,6	6365	71,6	6440	100,3	7471	69,7	7360	68,1	7821		
32,0	36,2	73,0	6671	73,0	6733	101,9	8061	68,3	19265	69,6	8498		
33,0	37,3	74,3	7004	74,3	7019			72,3	8203				
34,0	38,4	75,6	7278	75,6	7368			73,5	8752				
35,0	39,5	76,9	7667	76,9	7721								
36,0	40,6	78,1	7986	78,1	8107								
37,0	41,7	79,2	8453	79,2	8545								
38,0	42,8	80,3	8982	80,3	9076								
39,0	43,9			80,7	11407								
40,0	45,0												
41,0	46,1												
42,0	47,2												
43,0	48,3												
44,0	49,4												
45,0	50,5												
46,0	51,6												
47,0	52,7												
48,0	53,8												
49,0	54,9												
50,0	56,0												
51,0	57,1												
52,0	58,2												
53,0	59,3												
54,0	60,4												
55,0	61,5												
56,0	62,6												
57,0	63,7												
58,0	64,8												
59,0	65,9												
60,0	67,0												

Continued

TABLE 17: Maximum discharge capacity of valves 3065

Pset [bar]	Po [barsass]	R1234ze		R290		R600		R600a		R744 (CO2)	
		To [°C]	Qm [kg/h]	To [°C]	Qm [kg/h]	To [°C]	Qm [kg/h]	To [°C]	Qm [kg/h]	To [°C]	Qm [kg/h]
11,0	13,1	61,1	2256	38,1	1483	92,3	1549	78,8	1585	-32,5	1663
12,0	14,2	64,5	2459	41,6	1612	96,3	1686	82,7	1726	-30,2	1804
13,0	15,3	67,7	2665	44,9	1744	100,1	1826	86,4	1869	-27,9	1944
14,0	16,4	70,8	2875	48,0	1876	103,7	1968	89,9	2015	-25,8	2086
15,0	17,5	73,7	3088	51,0	2010	107,2	2112	93,3	2164	-23,8	2228
16,0	18,6	76,5	3306	53,8	2147	110,4	2259	96,5	2315	-21,8	2371
17,0	19,7	79,1	3529	56,5	2285	113,5	2408	99,6	2470	-20,0	2515
18,0	20,8	81,7	3757	59,2	2425	116,5	2561	102,5	2628	-18,2	2659
19,0	21,9	84,1	3990	61,7	2568	119,4	2718	105,3	2790	-16,5	2805
20,0	23,0	86,4	4230	64,1	2714			108,0	2956	-14,9	2951
21,0	24,1	88,7	4477	66,4	2862			110,6	3128	-13,3	3098
22,0	25,2	90,9	4732	68,7	3013			113,2	3304	-11,7	3247
23,0	26,3	93,0	4997	70,8	3168			115,6	3487	-10,2	3396
24,0	27,4	95,0	5272	73,0	3326			118,0	3677	-8,8	3546
25,0	28,5	97,0	5561	75,0	3489			120,3	3877	-7,4	3698
26,0	29,6	98,9	5865	77,0	3656			122,5	4086	-6,0	3850
27,0	30,7	100,7	6189	78,9	3828			124,7	4309	-4,7	4004
28,0	31,8	102,5	6539	80,8	4007			126,8	4550	-3,4	4159
29,0	32,9	104,3	6926	82,6	4192			128,8	4816	-2,2	4316
30,0	34,0	106,0	7368	84,4	4386			130,8	5120	-0,9	4474
31,0	35,1	107,6	7916	86,2	4590			132,7	5502	0,3	4633
32,0	36,2	109,2	8880	87,9	4806			134,5	6255	1,4	4793
33,0	37,3			89,5	5037					2,6	4956
34,0	38,4			91,1	5290					3,7	5120
35,0	39,5			92,7	5574					4,8	5285
36,0	40,6			94,2	5910					5,9	5453
37,0	41,7			95,7	6363					6,9	5622
38,0	42,8									8,0	5794
39,0	43,9									9,0	5967
40,0	45,0									10,0	6143
41,0	46,1									11,0	6321
42,0	47,2									11,9	6502
43,0	48,3									12,9	6685
44,0	49,4									13,8	6871
45,0	50,5									14,7	7060
46,0	51,6									15,6	7253
47,0	52,7									16,5	7449
48,0	53,8									17,3	7648
49,0	54,9									18,2	7852
50,0	56,0									19,0	8061
51,0	57,1									19,9	8274
52,0	58,2									20,7	8492
53,0	59,3									21,5	8717
54,0	60,4									22,3	8948
55,0	61,5									23,0	9187
56,0	62,6									23,8	9434
57,0	63,7									24,6	9692
58,0	64,8									25,3	9961
59,0	65,9									26,0	10243
60,0	67,0									26,8	10543

VALVE INSTALLATION

Safety valves type 3065 guarantee repeatable performance. This means that, after the valves have operated, open/close, the initial setting conditions are maintained. Nevertheless, it is advisable to replace a 3065 valve once it has discharged as during release debris, such as metal shavings or solder impurities, can

deposit on the valve gasket. This can inhibit the safety valve from returning to its original conditions.

To calculate the pressure loss in either the upstream line (between vessel and safety valve) or the downstream line (between safety valve and atmosphere) refer to Chapter 5 “Selection Criteria for Safety Valves” in this technical handbook.

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ed. 001-DS-ENG

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