



HANDBOOK  
**SAFETY DEVICES**

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 **Castel**<sup>®</sup>  
Italian technology

# CHAPTER 3

## SAFETY VALVES IN SERIES 3061



### GENERAL DESCRIPTION

The valves in series 3061 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. 3061/3)
  - the type of inlet connection (for ex. C = NPT)
  - the set pressure, expressed in bar, multiplied by 10 (for ex. 200)
- 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 apparatuses 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 3061 can be used with:

- 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:
- 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 3061 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](http://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 3061 with a specific setting, for ex. 3061/2C250 or 3061/4C420.

## 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.

To select the safety valves in series 3061, please see Chapter 5 "Selection Criteria for Safety Valves" in this technical handbook.

Table 14 provides the maximum discharge capacities of safety valves, models 3061/2, 3061/3 and 3061/4, as a function of various refrigerants and varying  $P_{set}$  for the valve, considering  $T_0$  = Steam saturation temperature at discharge pressure,  $P_0$ .

## VALVE INSTALLATION

**Safety valves type 3061 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 3061 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.

**TABLE 12 : General Characteristics of valves 3061**

Catalogue Number		3061/2C	3061/3C	3061/4C
Connections	Inlet male	1/4" NPT	3/8" NPT	1/2" NPT
	Outlet male	3/8" G	1/2" G	1/2" G
Inlet connection wrench torque (min/max) [Nm]		10/15	14/20	21/30
Flow Diameter [mm]		7,5	7,5	7,5
Flow Section [mm <sup>2</sup> ]		44,2	44,2	44,2
Lift [mm]		-	-	-
Discharge Coefficient "Kd"		0,89	0,89	0,89
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 13: Dimensions and Weights of valves 3061**

Catalogue Number	Dimensions [mm]						Weight [g]
	Ø D	L	Ch	H <sub>1</sub>	H <sub>2</sub>	H <sub>3</sub>	
3061/2C	28,5	33,5	23	30	61	91	200
3061/3C	28,5	33,5	23	30	61	91	230
3061/4C	28,5	33,5	23	35	61	96	260

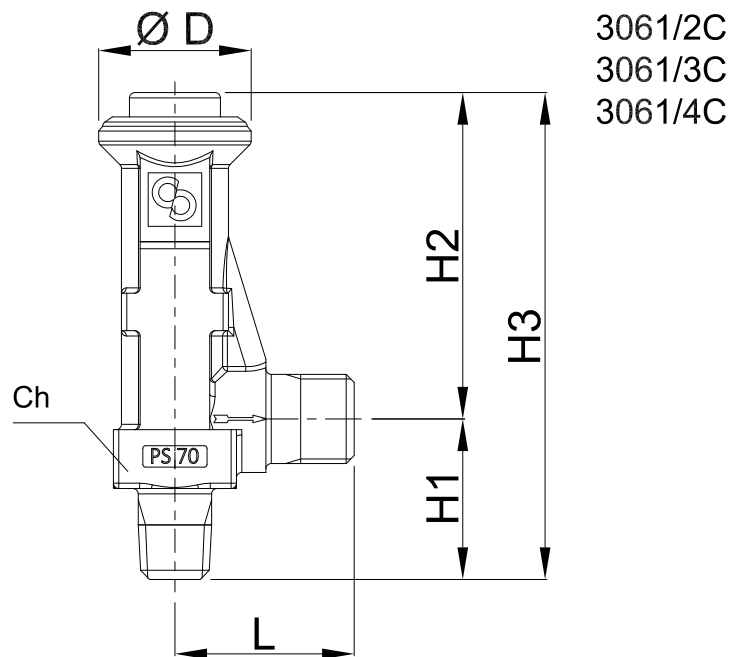


TABLE 14: Maximum discharge capacity of valves 3061

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	749	33,7	702	15,8	574	27,0	768	33,9	700	16,5	671
12,0	14,2	53,0	815	36,9	762	18,6	624	30,2	837	36,9	761	19,4	729
13,0	15,3	56,0	883	39,9	823	21,3	674	33,1	908	39,7	823	22,1	789
14,0	16,4	58,9	951	42,8	885	23,9	724	35,9	979	42,4	886	24,7	849
15,0	17,5	61,7	1021	45,5	948	26,3	775	38,5	1051	44,9	950	27,2	909
16,0	18,6	64,3	1091	48,1	1011	28,6	827	41,0	1125	47,3	1014	29,5	971
17,0	19,7	66,8	1163	50,6	1075	30,8	879	43,4	1201	49,6	1079	31,8	1033
18,0	20,8	69,2	1236	53,0	1139	33,0	931	45,7	1278	51,8	1145	33,9	1096
19,0	21,9	71,5	1311	55,3	1204	35,0	984	48,0	1357	54,0	1213	36,0	1159
20,0	23,0	73,7	1387	57,5	1271	37,0	1038	50,1	1439	56,0	1281	37,9	1224
21,0	24,1	75,9	1465	59,7	1338	38,9	1092	52,1	1522	58,0	1350	39,9	1290
22,0	25,2	77,9	1545	61,7	1406	40,7	1147	54,1	1608	59,9	1421	41,7	1356
23,0	26,3	79,9	1627	63,7	1475	42,5	1202	56,0	1698	61,7	1492	43,5	1424
24,0	27,4	81,9	1711	65,7	1545	44,2	1258	57,9	1790	63,4	1566	45,2	1493
25,0	28,5	83,7	1798	67,6	1616	45,8	1315	59,7	1887	65,2	1641	46,9	1563
26,0	29,6	85,6	1888	69,4	1689	47,4	1373	61,4	1988	66,8	1717	48,5	1635
27,0	30,7	87,3	1982	71,2	1763	49,0	1431	63,1	2096	68,4	1796	50,1	1708
28,0	31,8	89,0	2079	72,9	1838	50,5	1491	64,7	2211	70,0	1876	51,6	1783
29,0	32,9	90,7	2182	74,6	1915	52,0	1551	66,3	2336	71,5	1959	53,1	1860
30,0	34,0	92,3	2290	76,2	1994	53,5	1613	67,8	2475	72,9	2044	54,6	1938
31,0	35,1	93,9	2406	77,8	2075	54,9	1675	69,3	2637	74,4	2132	56,0	2019
32,0	36,2	95,4	2532	79,4	2158	56,3	1739	70,7	2845	75,7	2224	57,4	2102
33,0	37,3	96,9	2672	80,9	2244	57,6	1803	72,1	3294	77,1	2319	58,7	2189
34,0	38,4	98,3	2836	82,4	2332	58,9	1869			78,4	2419	60,1	2278
35,0	39,5	99,2	2977	83,9	2424	60,2	1937			79,7	2525	61,4	2371
36,0	40,6	99,5	3052	85,3	2519	61,5	2006			80,9	2638	62,6	2468
37,0	41,7	99,7	3132	86,7	2619	62,7	2077			82,1	2761	63,8	2571
38,0	42,8			88,0	2724	63,9	2149			83,2	2896	65,0	2681
39,0	43,9			89,4	2836	65,1	2224			84,3	3052	66,2	2798
40,0	45,0			90,7	2957	66,2	2301			85,3	3246	67,4	2928
41,0	46,1			92,0	3090	67,3	2381			86,1	3567	68,5	3074
42,0	47,2			93,2	3242	68,5	2463					69,6	3248
43,0	48,3			94,4	3427	69,5	2550					70,7	3488
44,0	49,4			95,6	3705	70,6	2640						
45,0	50,5					71,7	2735						
46,0	51,6					72,7	2836						
47,0	52,7					73,7	2945						
48,0	53,8					74,7	3065						
49,0	54,9					75,6	3201						
50,0	56,0					76,6	3364						
51,0	57,1					77,5	3593						
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 14: Maximum discharge capacity of valves 3061

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	707	31,0	711	55,2	766	28,7	776	25,8	769	50,2	791
12,0	14,2	34,1	768	34,0	773	58,5	836	31,8	845	28,9	838	53,7	862
13,0	15,3	36,9	832	36,9	836	61,7	903	34,6	915	31,9	909	56,9	935
14,0	16,4	39,6	896	39,5	901	64,6	976	37,4	986	34,7	980	59,9	1010
15,0	17,5	42,1	958	42,1	966	67,5	1047	39,9	1058	37,3	1053	62,9	1086
16,0	18,6	44,6	1025	44,5	1031	70,1	1118	42,4	1131	39,8	1127	65,6	1164
17,0	19,7	46,9	1093	46,8	1098	72,7	1195	44,7	1205	42,2	1203	68,3	1244
18,0	20,8	49,1	1156	49,1	1166	75,2	1271	47,0	1281	44,5	1280	70,8	1327
19,0	21,9	51,2	1229	51,2	1235	77,5	1346	49,1	1358	46,8	1360	73,2	1411
20,0	23,0	53,3	1294	53,2	1305	79,8	1426	51,2	1437	48,9	1441	75,6	1499
21,0	24,1	55,2	1363	55,2	1376	82,0	1512	53,2	1518	50,9	1525	77,8	1590
22,0	25,2	57,1	1437	57,1	1449	84,1	1594	55,1	1601	52,9	1612	80,0	1685
23,0	26,3	58,9	1516	58,9	1523	86,2	1682	57,0	1686	54,8	1702	82,1	1784
24,0	27,4	60,7	1590	60,7	1599	88,1	1777	58,7	1774	56,7	1795	84,1	1890
25,0	28,5	62,4	1670	62,4	1677	90,1	1862	60,5	1864	58,5	1893	86,1	2002
26,0	29,6	64,1	1741	64,1	1757	91,9	1954	62,1	1958	60,2	1995	88,0	2125
27,0	30,7	65,7	1831	65,7	1838	93,7	2075	63,7	2055	61,9	2104	89,8	2261
28,0	31,8	67,2	1912	67,2	1923	95,4	2184	65,3	2157	63,5	2221	91,6	2421
29,0	32,9	68,7	1998	68,7	2009	97,1	2303	66,8	2265	65,1	2349	93,3	2631
30,0	34,0	70,2	2090	70,2	2099	98,8	2402	68,3	2379	66,6	2492		
31,0	35,1	71,6	2167	71,6	2192	100,3	2543	69,7	2506	68,1	2663		
32,0	36,2	73,0	2271	73,0	2292	101,9	2745	68,3	6559	69,6	2893		
33,0	37,3	74,3	2384	74,3	2390			72,3	2793				
34,0	38,4	75,6	2478	75,6	2508			73,5	2980				
35,0	39,5	76,9	2610	76,9	2629								
36,0	40,6	78,1	2719	78,1	2760								
37,0	41,7	79,2	2878	79,2	2909								
38,0	42,8	80,3	3058	80,3	3090								
39,0	43,9			80,7	3884								
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												

TABLE 14: Maximum discharge capacity of valves 3061

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	768	38,1	505	92,3	527	78,8	540	-32,5	566
12,0	14,2	64,5	837	41,6	549	96,3	574	82,7	588	-30,2	614
13,0	15,3	67,7	907	44,9	594	100,1	622	86,4	636	-27,9	662
14,0	16,4	70,8	979	48,0	639	103,7	670	89,9	686	-25,8	710
15,0	17,5	73,7	1051	51,0	684	107,2	719	93,3	737	-23,8	759
16,0	18,6	76,5	1126	53,8	731	110,4	769	96,5	788	-21,8	807
17,0	19,7	79,1	1201	56,5	778	113,5	820	99,6	841	-20,0	856
18,0	20,8	81,7	1279	59,2	826	116,5	872	102,5	895	-18,2	905
19,0	21,9	84,1	1358	61,7	874	119,4	925	105,3	950	-16,5	955
20,0	23,0	86,4	1440	64,1	924			108,0	1007	-14,9	1005
21,0	24,1	88,7	1524	66,4	974			110,6	1065	-13,3	1055
22,0	25,2	90,9	1611	68,7	1026			113,2	1125	-11,7	1105
23,0	26,3	93,0	1701	70,8	1078			115,6	1187	-10,2	1156
24,0	27,4	95,0	1795	73,0	1132			118,0	1252	-8,8	1207
25,0	28,5	97,0	1893	75,0	1188			120,3	1320	-7,4	1259
26,0	29,6	98,9	1997	77,0	1245			122,5	1391	-6,0	1311
27,0	30,7	100,7	2107	78,9	1303			124,7	1467	-4,7	1363
28,0	31,8	102,5	2226	80,8	1364			126,8	1549	-3,4	1416
29,0	32,9	104,3	2358	82,6	1427			128,8	1640	-2,2	1469
30,0	34,0	106,0	2508	84,4	1493			130,8	1743	-0,9	1523
31,0	35,1	107,6	2695	86,2	1563			132,7	1873	0,3	1577
32,0	36,2	109,2	3023	87,9	1636			134,5	2129	1,4	1632
33,0	37,3			89,5	1715					2,6	1687
34,0	38,4			91,1	1801					3,7	1743
35,0	39,5			92,7	1898					4,8	1799
36,0	40,6			94,2	2012					5,9	1856
37,0	41,7			95,7	2166					6,9	1914
38,0	42,8									8,0	1972
39,0	43,9									9,0	2032
40,0	45,0									10,0	2091
41,0	46,1									11,0	2152
42,0	47,2									11,9	2214
43,0	48,3									12,9	2276
44,0	49,4									13,8	2339
45,0	50,5									14,7	2404
46,0	51,6									15,6	2469
47,0	52,7									16,5	2536
48,0	53,8									17,3	2604
49,0	54,9									18,2	2673
50,0	56,0									19,0	2744
51,0	57,1									19,9	2817
52,0	58,2									20,7	2891
53,0	59,3									21,5	2968
54,0	60,4									22,3	3046
55,0	61,5									23,0	3128
56,0	62,6									23,8	3212
57,0	63,7									24,6	3300
58,0	64,8									25,3	3391
59,0	65,9									26,0	3487
60,0	67,0									26,8	3590

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