GENERAL DESCRIPTION

Valves series 3030 are safety devices according to the definition given in Article 1, Point 2.1.3, 2nd dash of 97/23/EC Directive and are the subject of Article 3, Point 1.4 of aforesaid Directive.

The valves above mentioned are standard type, unbalanced, direct-loaded safety valves. Valve opening is produced by the thrust the fluid under pressure exerts on the disc, when said thrust exceeds, under setting conditions, the opposing force of the spring acting on the disc.

Valves are identified by means of:

- a model number formed of an alphanumerical coding that includes:
  - in the first part the family identification (e.g. 3030/44C)
  - in the second part the setting pressure, expressed in bars, multiplied by 10 (e.g. 140)
- an alphanumerical serial number.

CONSTRUCTION

Body: squared, obtained through die forging and subsequent machining. It houses the following elements:

- the nozzle with flat sealing seat
- the disc guide
- the setting spring holder
- the threaded seat of the setting adjusting ring nut

In the body, above the disc guide, a small pressure relief hole is provided through which the spring holder is put into contact with the atmosphere. For this reason, during relief, a gas leak occurs through this orifice.
Utilized material: EN 12420-CW617N brass.

Disc: obtained through bar machining and equipped with gasket, it ensures the required sealing degree on the valve seat. The gasket is made in P.T.F.E. (Polytetrafluorethylene), a material that, during valve estimated service life, maintains a good strength and does not cause the disc to stick on the seat. The disc is properly guided in the body and the guide action can never fail; there are no glands or retaining rings that hamper the movement thereof.
Utilized material: EN 12164-CW614N brass.

Spring: it opposes the pressure and the fluid dynamic actions and always ensures valve re-closing after pressure relief. The spring coils, when the disc has reached the lift corresponding to the state of relief at full flow rate, are spaced apart by at least half the wire diameter and, in any case, by not less than 2 mm. The disc is equipped with a mechanic lock and when it attains it, the spring set does not exceed 85% of the total set.
Utilized material: DIN 17223-1 steel for springs.

Setting system: hexagonal head, threaded ring nut to be screwed inside the body top by compressing the spring below. On setting completion, the position attained by the ring nut is maintained unchanged laying, in the threaded coupling, a bonding agent with high mechanic strength and low viscosity features to make penetration thereof easier. The setting system is protected against subsequent unauthorized interventions by means of a cap nut that is screwed outside the body and is sealed with lead to it.

SCOPE

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

- Refrigerating system and heat pump components, for instance: condensers, liquid receivers, evaporators, liquid accumulators, positive displacement compressor discharge, heat exchangers, oil separators, piping. (reference: EN 378-2:2008 Standard)
- Simple pressure vessels (reference: 87/404/ EEC Directive)

Fluids: the valves can be used with:

- Refrigerant fluids, in the physical state of gas or vapour, belonging to Group 2 according to the definitions of 97/23/EC Directive, Article 9, Point 2.2 (with reference to 67/548/EEC Directive of June 27th, 1967).
- Air and nitrogen (reference: 87/404/EEC Directive)

MARKING

In conformity with the provisions of Article 15 of 97/23/EC Directive, the EC marking and the identification number of

the notified body involved in the production control phase are reported on the valve body.
Still on the body, the following information is indicated:

- Manufacturer's mark, address and manufacture country
- Valve model
- Flow section
- Kd discharge coefficient
- Indication of flow direction
- Max allowable pressure
- Allowable temperature range
- Set pressure
- Production date
- Serial number

VALVE SELECTION

97/23/EC Directive 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 max allowable pressure PS of the equipment they protect. In any case, a short pressure peak limited to 10% of admissible maximum pressure is permitted.
As to the selection and sizing of the suitable protection device, users shall refer to the specific product and sector standards.
EN ISO 4126-1: 2004 Standard: “Safety devices for protection against excessive pressure – Part 1: Safety valves”, harmonized with 97/23/EC Directive, specifies general requirements for safety valves irrespective of the fluid for which they are designed.
EN 378-2 : 2008 Standard “Refrigerating systems and heat pumps – safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation”, harmonized with 97/23/EC Directive, provides a general outline of the protection devices to be adopted in refrigerating systems and their features (par. 6.2.5). It also indicates the criteria for the selection of the device suitable to the type and sizes of the system component to be protected (par. 6.2.6).
EN 13136:2001/A1:2005 Standard “Refrigerating systems and heat pumps – Pressure relief devices and their associated piping – Methods for calculation”, harmonized with 97/23/EC Directive, highlights the possible causes of overpressure in a system and makes available to users the instruments for pressure relief device sizing, among which the safety valves.

SIZING OF SAFETY VALVES DESIGNED TO DISCHARGE GAS OR VAPOUR AT CRITICAL FLOW (Ref. . EN ISO 4126-1: 2004 and EN 13136 : 2001/A1:2005)

Critical flow occurs when the backpressure pb (the pressure existing immediately at the outlet of a safety valve) is below or equal to the critical pressure:

$$p_b \le p_o \left[\frac{2}{k+1}\right]^{\left(\frac{k}{k-1}\right)} \quad \text{[bar abs]}$$

with:

- p_o = actual relieving pressure, upstream the safety valve; it’s equal to the set pressure plus overpressure. That is a pressure increase over set pressure at which the disc has its total lift. [bar abs]
- k = isentropic exponent of gas or vapour, based on the actual flowing conditions at the safety valve inlet

If k is unknown or anyway difficult to establish it’s possible to suppose:

$$p_{critical} = 0{,}5 \times p_o \quad \text{[bar abs]}$$

TABLE 1: General Characteristics of valves 3030				
Catalogue Number		3030/44C	3030/66C	3030/88C
Connections	Inlet male	1/2" NPT	3/4" NPT	1" NPT
	Outlet male	3/4" G	3/4" G	1.1/4" G
Inlet connection wrench torque (min/max) [Nm]		21/30	32/45	50/65
Flow Diameter [mm]		12	12	19,5
Flow Section [mm^2]		113	113	298
Lift [mm]		4,1	4,1	6,8
Discharge Coefficient "Kd"		0,90	0,90	0,83
PS [bar]		55		
TS [°C]		- 50 / + 150		
Set Pressure Range [bar]		8 / 50		
Overpressure		5 % of set pressure		
Blowdown		15 % of set pressure		
Risk Category according to PED		IV		

A safety valve, which discharges to atmosphere, works in critical flow.
The safety valves designed to discharge gas or vapour at critical flow must be sized as follow:

$$A_c = 3{,}469 \times \frac{Q_{md}}{C \times 0{,}9 \times K_d} \times \sqrt{\frac{v_o}{p_o}} \qquad [mm^2]$$

with:

- A_c = minimum flow area of safety valve [mm²]
- Q_{md} = minimum required discharge capacity, of refrigerant, of safety valve [kg/h]
- K_d = certified coefficient of discharge
- p_o = actual relieving pressure, upstream the safety valve, see definition above. [bar abs]
- v_o = specific volume of gas or vapour at relieving conditions p_o e T_o, meaning with T_o fluid temperature at valve inlet, settled by the user or by the designer. [m³/kg]
- C = function of isentropic coefficient k calculated from:

$$C = 3{,}948 \times \sqrt{k \times \left|\frac{2}{k+1}\right|^{\frac{(k+1)}{(k-1)}}}$$

for this calculation the value of k shall be as measured at 25 °C. (Section 7.2.3, EN 13136:2001/A1:2005 Standard).
Values of k and calculated values of C for all the refrigerants are given in table A.1 of the aforesaid Standard. Following we show the values of k and C for the more useful refrigerants.

Refrigerant	Isentropic Coefficient k	Function of Isentropic Coefficient C
R22	1,17	2,54
R134a	1,12	2,50
R404A	1,12	2,50
R407C	1,14	2,51
R410A	1,17	2,54
R507	1,10	2,48

Calculation of minimum required discharge capacity of safety valve is closely linked to the type of system where the valve is installed, with the causes that may arouse the opening of safety valve, i.e.:

- External heat sources. The minimum required discharge capacity shall be determined by the following:

$$Q_{md} = \frac{3600 \times \varphi \times A_{surf}}{h_{vap}} \qquad [Kg/h]$$

with:

- φ = density of heat flow rate, it's assumed to be 10 [kW/m²]
- A_{surf} = external surface area of the vessel [m²]
- h_{vap} = heat of vaporization of liquid at p_o [kJ/kg]

- Internal heat sources. The minimum required discharge capacity shall be determined by the following:

$$Q_{md} = \frac{3600 \times Q_h}{h_{vap}} \qquad [Kg/h]$$

with Q_h = rate of heat production [KW]

- Excessive pressure caused by compressors. The minimum required discharge capacity shall be determined by the following:

$$Q_{md} = 60 \times V \times n \times \rho_{10} \times \eta_v \qquad [Kg/h]$$

with:

- V = theoretical displacement of compressor [m³]
- n = rotational frequency of compressor [min⁻¹]
- ρ_{10} = vapour density at refrigerant saturation pressure/ dew point at 10 °C [kg/m³]
- η_v = volumetric efficiency estimated at suction pressure and discharge pressure equivalent to the safety valve setting

EXAMPLE OF CALCULATION OF MINIMUM REQUIRED DISCHARGE CAPACITY Q_{md} AND SIZING OF THE SAFETY VALVE FOR THE HIGH PRESSURE SIDE OF A REFRIGERATING SYSTEM

System description

Compact refrigerating system designed to make refrigerated water and consisting of:

- open type reciprocating compressor.
- Water-cooled, shell-and-tube horizontally condenser with lower section of shell used as receiver.
- Shell-and-tube horizontally liquid cooler fed with a thermostatic valve.
- Refrigerant fluid R407C

Compressor data

- Bore 82,5 mm
- Stroke 69,8 mm
- Cylinder number 6
- Rotational frequency 1450 rpm
- Clearance 4%

The theoretical displacement of compressor is:

$$V = \frac{\pi}{4} \times 0{,}0825^2 \times 0{,}0698 \times 6 = 0{,}00224 \qquad [m^3]$$

Maximum allowable pressure of the condenser, refrigerant side : PS = 25 bar

Set pressure of the safety valve installed on the upper shell section of condenser:
p_{set} = 25 bar

Actual relieving pressure of safety valve, choosing one valve type 3030 with an overpressure of 5%:

$$p_o = p_{set} \times \left(1 + \frac{5}{100}\right) + 1 = 27{,}25 \qquad [bar\ abs]$$

Working conditions of compressor corresponding to the relieving of safety valve:
Condensing temperature: + 64 °C (27,25 bar abs)
Evaporating temperature: + 10 °C (6,33 bar abs)

These conditions, settled in any case by the designer, are considered the most unfavorable for the safety valve in consequence of functional defects as:

- Move mistake
- Non-working of automatic safety devices, set to operate before safety valve.

It shall be excluded

- Closeness the refrigerating system, the presence of flammable substances in so large quantities to be able to feed a fire.
- Inside the vessel, the presence of a heart source.

Calculation of minimum discharge capacity

Prudentially leaving the vapour overheating at the outlet of the liquid cooler out of account, the volumetric efficiency of compressor is:

$$\eta_v = 1 - 0{,}04 \frac{p_{discharge}}{p_{suction}} = 1 - 0{,}04 \frac{27{,}25}{6{,}33} = 0{,}83$$

and so the minimum required discharge capacity:

$$Q_{md} = 60 \times V \times n \times \rho_{10} \times \eta_v =$$

$$= 60 \times 0{,}00224 \times 1450 \times 26{,}34 \times 0{,}83 = 4260 \quad [Kg/h]$$

with ρ_{10} = 26,34 [kg/m^3], vapour density of R407C at saturation pressure / dew point at 10 °C

Sizing of minimum flow area of the safety valve

$$A_c = 3{,}469 \times \frac{Q_{md}}{C \times 0{,}9 \times K_d} \times \sqrt{\frac{v_o}{p_o}} =$$

$$= 3{,}469 \times \frac{4260}{2{,}51 \times 0{,}9 \times 0{,}83} \times \sqrt{\frac{0{,}0104}{27{,}25}} = 154 \quad [mm^2]$$

with:

- C = 2,51, corresponding to isentropic exponent k for R407C equal to 1,14, according to table A1 of EN 13136:2001/A1:2005 Standard
- K_d = 0,83, certified coefficient of discharge for safety valve 3030/88
- v_o = 0,0104 [m^3/kg], specific volume of overheating vapour upstream the safety valve during relieving.
  This value is referred to the following operating conditions, upstream the safety valve:
  - pressure p_o = 27,25 [bar abs]
  - temperature T_o = 100 [°C] (precautionary temperature, settled in any case by the designer)

Conclusion: the selected safety valve is the model 3030/88 with the following characteristics:

- certified coefficient of discharge, K_d = 0,83
- flow section, A_c = 298 [mm^2]
- set pressure, p_{set} = 25 bar

In case of single-screw compressor with injection of pressurized oil, the theoretical displacement is:

$$V_c = \frac{\pi \times D^2}{4} \times L \quad [m^3]$$

with:

- D = rotor diameter [m]
- L = rotor length [m]

VALVE INSTALLATION

Safety valves type 3030 are guaranteed for reproducibility of performance, this means that after the valves have operated, open/close, the initial setting conditions are maintained. Nevertheless it is advisable to replace valve 3030 once it has discharged because during release, piping debris, as metal shavings or solder impurities, can place on the valve gasket and then, inhibits the safety valve from reseating at its originally conditions.

As far as the installation of safety relief valves is concerned, the fundamental points listed below shall be taken into account:

- Safety valves shall be installed near an area of the system where vapours or gases are present and there is no fluid turbulence; the position shall be as upright as possible, with the inlet connector turned downwards.
- Vessels, joined together with piping rightly selected by the manufacturer and without any stop valve between them, may be considered as only one vessel for the installation of a safety valve.
- The union between the valve and the equipment to be protected shall be as short as possible. Furthermore, its passage section shall not be narrower than the valve inlet section. In any case, EN 13136:2001/A1:2005 Standard states that the pressure loss between protected vessel and safety valve, at discharge capacity, shall not exceed 3% of the setting value, including any accessory mounted on the upstream line.
- In selecting the safety valve location, it shall be taken into account that valve operation involves the discharge of the refrigerant fluid under pressure, sometimes even at high temperature. Where the risk exists to cause direct injuries to the persons nearby, an exhaust conveying piping shall be provided, which shall be sized in such a way as not to compromise valve operation. EN 13136:2001/A1:2005 Standard states that this piping shall not generate, at discharge capacity, a back pressure exceeding 10% of pressure po , for standard type valves, unbalanced.

To calculate the pressure loss either in the upstream line (between vessel and safety valve) or in the downstream line (between safety valve and atmosphere) refer to EN 13136:2001/A1:2005 Standard, Chapter 7.4.

Pressure loss in the upstream line

Calculation of pressure loss is given by:

$$\frac{\Delta p_{in}}{p_o} = 0{,}032 \times \left[\frac{A_c}{A_{in}} \times C \times K_{dr} \right]^2 \times \xi$$

with:

- A_c = minimum calculated flow area [mm^2]
- A_{in} = inside area of inlet tube to valve [mm^2]
- K_{dr} = K_d x 0,9 , derated coefficient of discharge
- C = function of isentropic coefficient k
- ξ = addition of pressure loss coefficients ξ_n of any component and piping
  The coefficients ξ_n are relevant to:
  - pipe elements loss, as connections and bends
  - valves loss
  - loss along the pipe

and are listed in EN 13136:2001/A1:2005 Standard, Table A.4.

Example: assume to install, on the condenser of the previous example, a safety valve type 3030/88, set to 25 bar, using a steel union with the following characteristics:

- d_{in} = 28 [mm] , inside diameter
- A_{in} = 616 [mm^2] inside area
- L = 60 [mm] , length
- Flush connection to the shell of condenser, with a broken edge

From table A.4 it's possible to have these data:

- $\xi_{1\ (inlet)} = 0,25$
- $\xi_{2\ (length)} = \lambda \times L/\ d_{in} = 0,02 \times 60/28 = 0,043$ with $\lambda = 0,02$ for steel tube
- $\xi_T = \xi_1 + \xi_2 = 0,25 + 0,04 = 0,293$

Between safety valve and union it's installed a shut-off valve type 3033/88.

The main characteristics of this valve are:

- d_R = 20 [mm], inside diameter
- A_R = 314 [mm^2], inside area
- kv = 20 [m^3/h], kv factor

Pressure loss coefficient ξ_R of shut-off valve is given by:

$$\xi_R = 2,592 \times \left[\frac{314}{20}\right]^2 \times 10^{-3} = 0,64$$

The total pressure loss coefficient is: $\xi_T + \xi_R = 0,933$

We remember the previous calculated flow area, the characteristics of safety valve 3030/88 and refrigerant fluid R407C:

- A_c = 154 [mm^2]
- K_{dr} = 0,83 x 0,9 =0,747
- C = 2,51

Pressure loss in the upstream line is:

$$\frac{\Delta p_{in}}{p_o} = 0,032 \times \left[\frac{154}{616} \times 2,51 \times 0,747\right]^2 \times 0,933 = 0,00656$$

The obtained value is admissible because lower than the value of 0,03 forecast in EN 13136:2001/A1:2005 Standard.

Pressure loss in the downstream line

Calculation of pressure loss is given by:

$$p_1 = \sqrt{0,064 \times \xi \times \left(\frac{A_c}{A_{out}} \times C \times K_{dr} \times p_o\right)^2 + p_2^{\,2}}$$

with:

- P_1 = inlet pressure to downstream line [bar abs]
- P_2 = outlet pressure to downstream line, equal to atmospheric pressure [bar abs]
- A_c = minimum calculated flow area [mm^2]
- A_{out} = inside area of outlet tube to valve [mm^2]
- K_{dr} = Kd x 0,9 , derated coefficient of discharge
- p_o = actual relieving pressure, upstream the safety valve [bar abs]
- C = function of isentropic coefficient k
- ξ = addition of pressure loss coefficients ξ_n of piping

  The coefficients ξ_n are relevant to:
  - pipe elements loss, bends
  - loss along the pipe

  and are listed in EN 13136:2001/A1:2005 Standard, Table A.4

Example: assume to install a discharge pipe on safety valve type 3030/88 of the previous example, using a steel tube nominal size 1.1/2"GAS with the following characteristics:

- d_{out} = 42,5 [mm], inside diameter
- A_{out} = 1418 [mm^2], inside area
- L = 3000 [mm], length
- pipe bend 90° with bending radius R equal to three times external diameter of tube

From table A.4 it's possible to have these data:

- $\xi_{1\ (bend)} = 0,25$
- $\xi_{2\ (length)} = \lambda \times L/\ din = 0,02 \times 3000/42,5 = 1,41$ with $\lambda = 0,02$ for steel tube
- $\xi_T = \xi_1 + \xi_2 = 0,25 + 1,41 = 1,66$

Pressure loss in the downstream line is:

$$p_1 = \sqrt{0,064 \times 1,66 \times \left(\frac{154}{1418} \times 2,51 \times 0,747 \times 27,25\right)^2 + 1^2} = 2,125 \ [bar]$$

$$= \frac{\Delta p_{out}}{p_o} = \frac{2,125 - 1}{27,25} = 0,041$$

The obtained value is admissible because lower than the value of 0,10 forecast in EN 13136:2001/A1:2005 Standard.

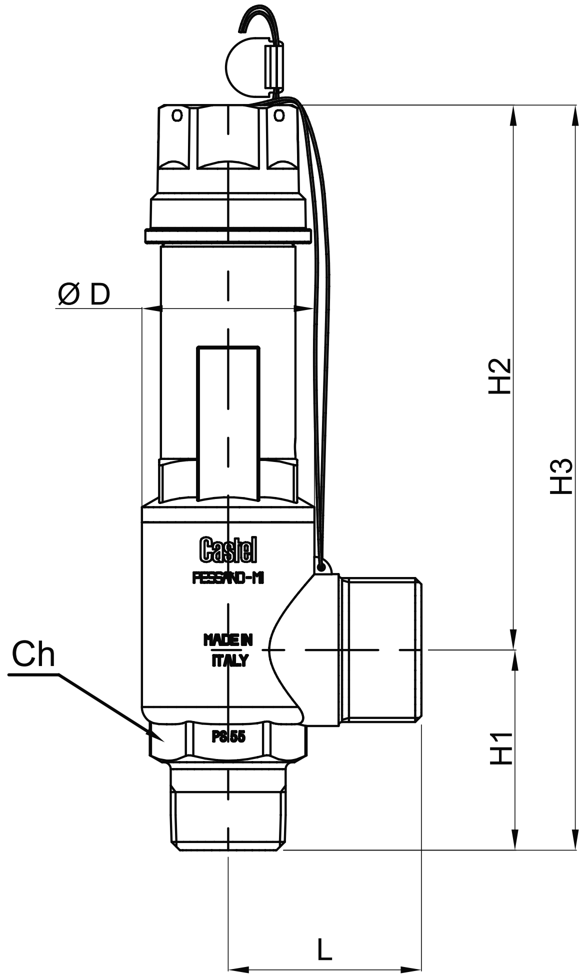

TABLE 2: Dimensions and Weights of valves 3030							
Catalogue Number	Dimensions [mm]						Weight [g]
	Ø D	L	Ch	H_1	H_2	H_3	
3030/44C	38	38	28	44	115	159	780
3030/66C	38	38	28	44	115	159	780
3030/88C	50	56	40	58	158	216	1960

GENERAL DESCRIPTION

Valves series 3060 are safety devices according to the definition given in Article 1, Point 2.1.3, 2nd dash of 97/23/EC Directive and are the subject of Article 3, Point 1.4 of aforesaid Directive.
The valves above mentioned are standard type, unbalanced, direct-loaded safety valves. Valve opening is produced by the thrust the fluid under pressure exerts on the disc, when said thrust exceeds, under setting conditions, the opposing force of the spring acting on the disc.
Valves are identified by means of:

- a model number formed of an alphanumerical coding that includes:
  - in the first part the family identification (e.g. 3060/45C)
  - in the second part the setting pressure, expressed in bars, multiplied by 10 (e.g. 140)
- an alphanumerical serial number.

CONSTRUCTION

Body: squared, obtained through die forging and subsequent machining. It houses the following elements:

- the nozzle with flat sealing seat
- the disc guide
- the setting spring holder
- the threaded seat of the setting adjusting ring nut

In the body, above the disc guide, a small pressure relief duct is provided through which the spring holder is put into contact with the output connection.
Utilized material: EN 12420-CW617N brass.

Disc: obtained through bar machining and equipped with gasket, it ensures the required sealing degree on the valve seat. The gasket is made in P.T.F.E. (Polytetrafluorethylene), a material that, during valve estimated service life, maintains a good strength and does not cause the disc to stick on the seat. The disc is properly guided in the body and the guide action can never fail; there are no glands or retaining rings that hamper the movement thereof.
Utilized material: EN 12164-CW614N brass

Spring: it opposes the pressure and the fluid dynamic actions and always ensures valve re-closing after pressure relief.
Utilized material: DIN 17223-1 steel for springs.

Setting system: hexagonal head, threaded ring nut to be screwed inside the body top by compressing the spring below. On setting completion, the position attained by the ring nut is maintained unchanged laying, in the threaded coupling, a bonding agent with high mechanic strength and low viscosity features to make penetration thereof easier. The setting system is protected against subsequent unauthorized interventions by means of a cap nut that is housed into the brass body and is fixed in this seat with an edge calking operation.

SCOPE

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

- Refrigerating system and heat pump components, for instance: condensers, liquid receivers, evaporators, liquid accumulators, positive displacement compressor discharge, heat exchangers, oil separators, piping. (reference: EN 378-2:2008 Standard)
- Simple pressure vessels (reference: 87/404/ EEC Directive)

Fluids: the valves can be used with:

- Refrigerant fluids, in the physical state of gas or vapour, belonging to Group 2 according to the definitions of 97/23/EC Directive, Article 9, Point 2.2 (with reference to 67/548/EEC Directive of June 27th, 1967).
- Air and nitrogen (reference: 87/404/EEC Directive)

MARKING

In conformity with the provisions of Article 15 of 97/23/EC Directive the following information are reported on the valve body.

- Manufacturer's mark, address and manufacture country
- Indication of flow direction
- Max allowable pressure
- Set pressure
- Allowable temperature range
- Production date

- Serial number

The following data are stamped on the cap:

- EC marking and the identification number of the notified body involved in the production control phase
- Valve model
- Flow section
- Kd discharge coefficient

VALVE SELECTION

97/23/EC Directive 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 max allowable pressure PS of the equipment they protect. In any case, a short pressure peak limited to 10% of admissible maximum pressure is permitted.

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

EN ISO 4126-1: 2004 Standard: “Safety devices for protection against excessive pressure – Part 1: Safety valves” , harmonized with 97/23/EC Directive, specifies general requirements for safety valves irrespective of the fluid for which they are designed.

EN 378-2 : 2008 Standard “Refrigerating systems and heat pumps – safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation”, harmonized with 97/23/EC Directive, provides a general outline of the protection devices to be adopted in refrigerating systems and their features (par. 6.2.5). It also indicates the criteria for the selection of the device suitable to the type and sizes of the system component to be protected (par. 6.2.6).

EN 13136:2001/A1:2005 Standard “ Refrigerating systems and heat pumps – Pressure relief devices and their associated piping – Methods for calculation” , harmonized with 97/23/EC Directive, highlights the possible causes of overpressure in a system and makes available to users the instruments for pressure relief device sizing, among which the safety valves.

For sizing of safety valves series 3060 see the previous chapter of safety valves series 3030.

VALVE INSTALLATION

Safety valves type 3060 are NOT guaranteed for reproducibility of performance, this means that after the valves have operated, open/close, the initial setting conditions are NOT maintained. Then it is necessary to replace valve 3060 once it has discharged.

For installation of safety valves series 3060 see the previous chapter of safety valves series 3030.

Utilized material: EN 12164-CW614N brass.

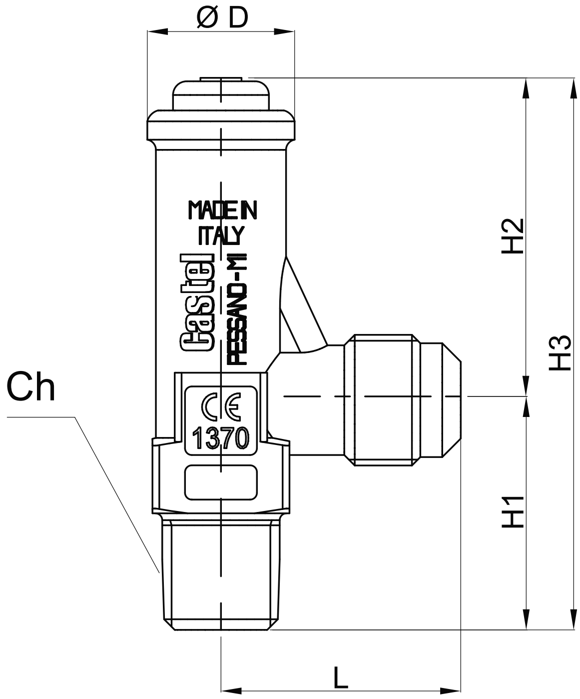

TABLE 3: General Characteristics of valves 3060								
Catalogue Number		3060/23C	3060/24C	3060/33C	3060/34C	3060/45C	3060/36C	3060/46C
Connections	Inlet male	1/4" NPT	1/4" NPT	3/8" NPT	3/8" NPT	1/2" NPT	3/8" NPT	1/2" NPT
	Outlet male	3/8" SAE	1/2" SAE	3/8" SAE	1/2" SAE	5/8" SAE	3/4" G	3/4" G
Inlet connection wrench torque (min/max) [Nm]		10/15	10/15	14/20	14/20	21/30	14/20	21/30
Flow Diameter [mm]		7,0				9,5	10,0	
Flow Section [mm^2]		38,5				70,9	78,5	
Discharge Coefficient "Kd"		0,63	0,69	0,63	0,69	0,45	0,92	0,93
PS [bar]		55						
TS [°C]		- 50 / + 120						
Set Pressure Range [bar]		9 / 50						
Overpressure		10 % of set pressure						
Risk Category according to PED		IV						

TABLE 4: Dimensions and Weights of valves 3060							
Catalogue Number	Dimensions [mm]						Weight [g]
	Ø D	L	Ch	H_1	H_2	H_3	
3060/23C	21,5	35	20	33,5	46,5	80	180
3060/24C	21,5	35	20	33,5	46,5	80	195
3060/33C	21,5	35	20	33,5	46,5	80	195
3060/34C	21,5	35	20	33,5	46,5	80	195
3060/45C	24,5	39,0	23	37	52,5	89	240
3060/36C	30	40	27	37	59,5	96,5	360
3060/46C	30	40	27	40	59,5	99,5	380