SAFETY VALVES 3030

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 alphaneumerical 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);
- a progressive 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. (Polytetrafluoroethylene), 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.

### TABLE 1: General Characteristics of valves 3030

<table>
<thead>
<tr>
<th>Connections</th>
<th>Catalogue Number</th>
<th>Inlet male</th>
<th>Outlet male</th>
<th>Flow Diameter [mm]</th>
<th>Flow Section [mm²]</th>
<th>Lift [mm]</th>
<th>Discharge Coefficient “Kd”</th>
<th>PS [bar]</th>
<th>TS [°C]</th>
<th>Set Pressure Range [bar]</th>
<th>Overpressure</th>
<th>Blowdown</th>
<th>Risk Category according to PED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3030/44C</td>
<td>1/2” NPT</td>
<td>3/4” G</td>
<td>12</td>
<td>113</td>
<td>4,1</td>
<td>0,90</td>
<td>42</td>
<td>-50</td>
<td>42 / +150</td>
<td>5% of set pressure</td>
<td>15% of set pressure</td>
<td>IV</td>
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<tr>
<td></td>
<td>3030/66C</td>
<td>3/4” NPT</td>
<td>3/4” G</td>
<td>12</td>
<td>113</td>
<td>4,1</td>
<td>0,90</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3030/88C</td>
<td>1” NPT</td>
<td>1.1/4” G</td>
<td>19,5</td>
<td></td>
<td>6,8</td>
<td>0,83</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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 sector or product standards. EN 378-2: 2000 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 7.4). 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. 7.4).

EN 13136: 2001 Standard “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 makes available to users the instruments for pressure relief device sizing, among which the safety valves.

**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: 2000);

**Fluids:** the valves can be used with:
- refrigerant fluids, in the physical state of gas or vapour, belonging to Group II 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);

**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.

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**TABLE 2: Dimensions and Weights of valves 3030**

<table>
<thead>
<tr>
<th>Catalogue Number</th>
<th>Ø D</th>
<th>L</th>
<th>Ch</th>
<th>H1</th>
<th>H2</th>
<th>H3</th>
<th>Weight [g]</th>
</tr>
</thead>
<tbody>
<tr>
<td>3030/44C</td>
<td>38</td>
<td>38</td>
<td>28</td>
<td>44</td>
<td>115</td>
<td>159</td>
<td>780</td>
</tr>
<tr>
<td>3030/66C</td>
<td>38</td>
<td>38</td>
<td>28</td>
<td>44</td>
<td>115</td>
<td>159</td>
<td>780</td>
</tr>
<tr>
<td>3030/88C</td>
<td>50</td>
<td>56</td>
<td>40</td>
<td>44</td>
<td>115</td>
<td>159</td>
<td>780</td>
</tr>
</tbody>
</table>

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**D** Dimensions [mm]  
**H1** Height 1 [mm]  
**H2** Height 2 [mm]  
**H3** Height 3 [mm]  
**L** Length [mm]  
**Ch** Connection size [mm]
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:
  \[ Q_{md} = \frac{3600 \times \varphi \times A_{surf}}{h_{vap}} \]  
  \[ \text{[kg/h]} \]

  with:
  - \(\varphi\) = 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:
  \[ Q_{md} = \frac{60 \times V \times n \times \rho_{10} \times \eta_v}{p_o} \]  
  \[ \text{[kg/h]} \]

  with:
  - \(V\) = theoretical displacement of compressor [m³];
  - \(n\) = rotational frequency of compressor \([\text{min}^{-1}]\);
  - \(\rho_{10}\) = vapour density at refrigirant saturation pressure / dew point at 10 °C [kg/m³];
  - \(\eta_v\) = volumetric efficiency estimated at suction pressure and discharge pressure equivalent to the safety valve setting.

- **Excessive pressure caused by compressors.** The minimum required discharge capacity shall be determined by the following:
  \[ Q_{md} = \frac{60 \times V \times n \times \rho_{10} \times \eta_v}{p_o} \]  
  \[ \text{[kg/h]} \]

  with:
  - \(V\) = theoretical displacement of compressor [m³];
  - \(n\) = rotational frequency of compressor \([\text{min}^{-1}]\);
  - \(\rho_{10}\) = vapour density at refrigirant saturation pressure / dew point at 10 °C [kg/m³];
  - \(\eta_v\) = volumetric efficiency estimated at suction pressure and discharge pressure equivalent to the safety valve setting.

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

\[ p_b \leq p_o \left(\frac{2}{k+1}\right)^{\frac{k}{k-1}} \]  
[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:

\[ p_{critical} = 0.5 \times p_o \]  
[bar abs]

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:

\[ A_c = 3,469 \times \frac{Q_{md}}{C \times 0.9 \times K_d} \times \frac{\sqrt{v_o}}{p_o} \]  
[mm²]

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 \(T_0\) meaning with \(T_0\) fluid temperature at valve inlet, settled by the user or by the designer [m³/kg];
- \(C\) = function of isentropic coefficient \(k\) calculated from:

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

for this calculation the value of \(k\) shall be as measured at 25 °C. (Section 7.2.3, Standard EN 13136: 2001).

Values of \(k\) and calculated values of \(C\) for some refrigerants are given in table A.1 of the aforesaid standard.
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:

$$V = \frac{\pi}{4} \times 0.0825^2 \times 0.0698 \times 6 = 0.00224 \text{ [m}^3\text{]}$$

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%:

$$p_0 = p_{set} \times \left(1 + \frac{5}{100}\right) + 1 = 27,25 \text{ [bar abs]}$$

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:

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

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

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

Sizing of minimum flow area of the safety valve

$$A_c = 3,469 \times \frac{Q_{md}}{C \times 0,9 \times K_d \times \sqrt{\frac{p_0}{P_{set}}}} =$$

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

with:
- $C = 2,51$, corresponding to isentropic exponent k for R407C equal to 1,14, according to table A1 of standard EN 13136:2001;
- $K_d = 0,83$, certified coefficient of discharge for safety valve 3030/88;
- $\nu_o = 0,0104$ [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 valves is the model 3030/88 with the following characteristics:
- certified coefficient of discharge, $K_d = 0.83$;
- flow section, $A_c = 298 \, [\text{mm}^2]$;
- set pressure, $p_{set} = 25 \, \text{bar}$.

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

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

with:
- $D = \text{rotor diameter} \, [\text{m}]$;
- $L = \text{rotor length} \, [\text{m}]$.

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 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 standard states that this piping shall not generate, at discharge capacity, a back pressure exceeding 10% of pressure $p_o$, 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 standard, Chapter 7.4.

### Pressure loss in the upstream line
Calculation of pressure loss is given by:

$$\frac{\Delta p_{in}}{p_o} = 0.032 \times \left[ \frac{A}{A_{in}} \times C \times K_{dr} \right]^2 \times \xi$$

with:
- $A = \text{flow area of safety valve} \, [\text{mm}^2]$;
- $A_{in} = \text{inside area of inlet tube to valve} \, [\text{mm}^2]$;
- $K_{dr} = K_d \times 0.9$, derated coefficient of discharge;
- $C = \text{function of isentropic coefficient } k$;
- $\xi = \text{addition of pressure loss coefficients } \xi_n \text{ of any component and piping}$;

The coefficients $\xi_n$ are relevant to:
- pipe elements loss, as connections and bends;
- valves loss;
- loss along the pipe and are listed in EN 13136:2001 standard, Table A.4.

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**VALVE INSTALLATION**

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
**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:
- $d_n = 28$ [mm], inside diameter;
- $A_n = 616$ [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:
- $\xi_1 = 0.25$
- $\xi_2 = 0.02 \times 60/28 = 0.043$
- $\xi = 0.25 + 0.043 = 0.293$

Between safety valve and union it's installed a shut-off valve type 3033/88 (see page 43). 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 $\xi_R$ 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: $\xi_T = 0.293$.

We remember the main characteristics of safety valve 3030/88 and of refrigerant fluid R407C:
- $A = 298$ [mm$^2$]
- $K_{dr} = 0.83 \times 0.9 = 0.747$
- $C = 2.51$

Pressure loss in the upstream line is:

$$\frac{\Delta p}{p_0} = 0.032 \times \left(\frac{298}{616}\right) \times 2.51 \times 0.747 \times 0.933 = 0.0245$$

The obtained value is admissible because lower than the value of 0.03 forecast in EN 13136:2001 standard.

**Example:** Assume to install a discharge pipe on safety valve type 3030/88 of the previous example, using a steel tube nominal size 2”, with the following characteristics:
- $d_{out} = 53$ [mm], inside diameter;
- $A_{out} = 2206$ [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:
- $\xi_1 = 0.25$
- $\xi_2 = 0.02 \times 3000/53 = 1.13$
- $\xi = 0.25 + 1.13 = 1.38$

Pressure loss in the downstream line is:

$$\frac{\Delta p_{out}}{p_0} = \left[0.064 \times \xi \times \left(\frac{A_{out}}{A} \times C \times K_{dr} \times p_0\right)^{1/2}\right]^{1/2}$$

The obtained value is admissible because lower than the value of 0.10 forecast in EN 13136:2001 standard.
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. For this reason, during relief, no gas leak occurs into the atmosphere.

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. (Polytetrafluoroethylene), 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 screwed outside the body and is sealed to it with a punched copper rivet.
SAFETY VALVES

The following data are stamped on the cap:

- serial number.
- EC marking and the identification number of the notified body involved in the production control phase;
- valve model;
- flow section;
- Kd discharge coefficient.

**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: 2000);

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**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**

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systems and heat pumps – Pressure relief devices and their associated piping – Methods for calculation" 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 and installation of safety valves series 3060 see the previous chapter of safety valves series 3030.

<table>
<thead>
<tr>
<th>Catalogue Number</th>
<th>Ø D</th>
<th>L</th>
<th>Ch</th>
<th>H₁</th>
<th>H₂</th>
<th>H₃</th>
<th>Weight [g]</th>
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<td>33,5</td>
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<td>33,5</td>
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</tbody>
</table>

BALL SHUT-OFF VALVES FOR SAFETY VALVES

APPLICATIONS

We would like to remember to our customer that the running of pressure equipments and pressure assemblies is excluded by the scope of Directive 97/23/EC but it's regulated in compliance with national regulations of Member States of European Communities.

We think that these regulations, actually on updating with the Competent Bodies of all the states to avoid conflicts with the ESR of PED, could provide for periodical checks on the pressure equipments and assemblies. Any intervention for periodic checking or replacement of an installed safety valve becomes very difficult if the protected vessel is not equipped with a shut-off valve. The shut-off valves series 3033, installed between vessel and safety valve, allow to remove the valve for periodic checking or replacement without blowing off all the refrigerant from a section of the system. These valves can be used with the same fluids foreseen for safety valves series 3030 and 3060, in particularly:

- refrigerant fluids, in the physical state of gas or vapour, belonging to Group II 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);

CONSTRUCTION

Castel supplies to its customers the valves series 3033 in open position and the ball spindle is protected by means of a cap.
screwed to the body and sealed with lead to it. Any closing intervention on the valve forcibly causes the tampering of the seal and then these interventions shall be performed exclusively by:
- staff authorized to work on the system;
- public servant of a Competent Body. These persons will be responsible for the next valve reopening and the new cap sealing with their own lead.

The main parts of these valves are made with the following materials:
- hot forged brass EN 12420 – CW 617N for body;
- hot forged brass EN 12420 – CW 617N, chromium plated, for ball;
- steel, with proper surface protection, for the spindle;
- P.T.F.E. for seat ball gaskets;
- chloroprene rubber (CR) for outlet seal gaskets;
- glass reinforced PBT for cap that covers the spindle.

The changeover device must have sufficient capacity to protect the vessel alone. Valve type 3032/44 is supplied with:
- two female threaded connections 1/2” NPT with swivel nut, code Castel 3039/4;
- two O-Ring.

These components ensure the perfect alignment of two safety valves 3060/45. The valves series 3032 can be used with the same fluids foreseen for safety valves series 3030 and 3060, in particularly:

### APPLICATIONS

The changeover device type 3032 is a service valve for dual pressure relief valves that allows using one valve while isolating the other from the system. This device allows the user to work on the isolated valve, for periodic checking or replacement, while the system is completely operative and the other valve is in service.

N.B.: each safety valve placed on a

![Diagram of a changeover device and safety valves]

**TABLE 5: General Characteristics, Dimensions and Weights of valves 3033**

<table>
<thead>
<tr>
<th>Catalogue Number</th>
<th>Designed for valve</th>
<th>Kv Factor ( \text{m}^3/\text{h} )</th>
<th>TS °C</th>
<th>PS [bar]</th>
<th>Dimensions [mm]</th>
<th>Weight [g]</th>
<th>Risk Category according to PED</th>
</tr>
</thead>
<tbody>
<tr>
<td>3033/44</td>
<td>3606/45C 3030/44C</td>
<td>10</td>
<td>-50</td>
<td>13</td>
<td>1/2” NPT</td>
<td>101 73 59 100 178 246 710</td>
<td>Art. 3.3</td>
</tr>
<tr>
<td>3033/88</td>
<td>3603/88C</td>
<td>20</td>
<td>+150</td>
<td>20</td>
<td>1” NPT</td>
<td>107 77 72 123 323 1070</td>
<td></td>
</tr>
</tbody>
</table>

**SAFETY VALVES**
- refrigerant fluids, in the physical state of gas or vapour, belonging to Group II 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);

**CONSTRUCTION**

The valve 3032 is designed so that it is never possible to close off both ports at the same time, excluding all the two safety valves. Under working conditions, the shutter must be clamped against one of the two seats of the valve, front port or back port, in order to ensure always full discharge to the corresponding safety valve. Intermediate positions of the shutter are not acceptable in order not to affect the operation of both safety valves. The valve ensures a pressure drop perfectly compatible with the safety valve operation under conditions of discharge of saturated vapour as well as overheated vapour.

The main parts of these valves are made with the following materials:
- hot forged brass EN 12420 – CW 617N for body;
- steel, with proper surface protection, for the spindle;
- chloroprene rubber (CR) and aramidic fibers for gland seal;
- chloroprene rubber (CR) for outlet seal gaskets;
- glass reinforced PBT for cap that covers the spindle.

**TABLE 6: General Characteristics, Dimensions and Weights of valves 3032**

<table>
<thead>
<tr>
<th>Catalogue Number</th>
<th>Designed for valve</th>
<th>Kv Factor [m³/h]</th>
<th>TS [°C]</th>
<th>PS [bar]</th>
<th>Dimensions [mm]</th>
<th>Weight [g]</th>
<th>Risk Category according to PED</th>
</tr>
</thead>
<tbody>
<tr>
<td>3032/44</td>
<td>3060/45C</td>
<td>3.3</td>
<td>-50</td>
<td>+150</td>
<td>117 45 31 91 48</td>
<td>775</td>
<td>Art. 3.3</td>
</tr>
<tr>
<td>3032/66</td>
<td>3030/66C</td>
<td>9.0</td>
<td>-50</td>
<td>+150</td>
<td>95 52 48 133 80</td>
<td>1750</td>
<td></td>
</tr>
</tbody>
</table>

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![Diagram of valve 3032](image-url)