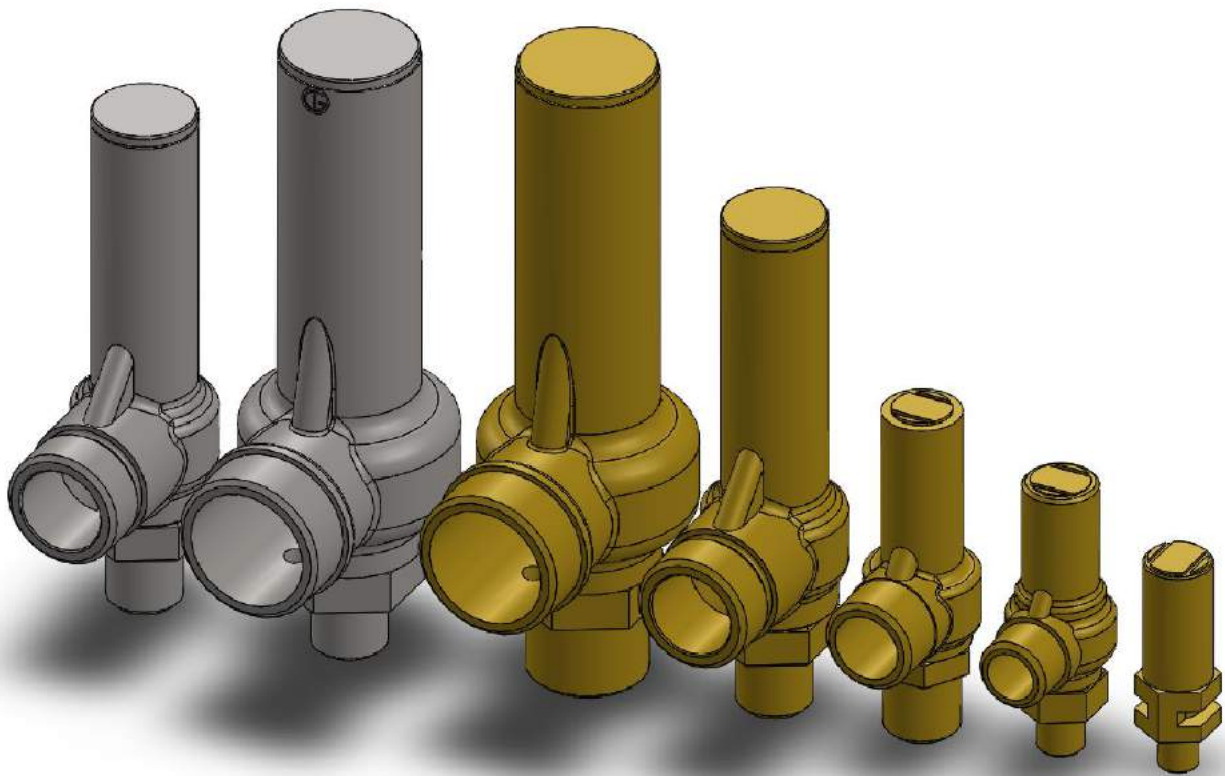


 Safety Valves





Safety valves for refrigerants

IGLOO safety valves are installed in the pressure vessels according to Directive: 2009/105/EC and in the refrigeration system or heat pump components in reference of EN 378-2:2016 to protect against possible overpressure of the apparatuses such as condensers, liquid receivers, evaporators, liquid accumulators, positive displacement compressor, discharge, heat exchangers, oil separators, or piping, with regard to the operating conditions for which they have been designed.



Working principle

IGLOO safety valves 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.

Construction

IGLOO safety valves are identified by means of:

- The body
According to the discharge capability required and the pressure in the system it is possible to combine the orifice size of the safety valve from 7mm up to 25mm and the set pressure up to 150 bar and select from a wide variety of body in brass or stainless steel.
- The connections
The inlet and outlet connections can be configured in different combinations from 1/4" to 1.1/2" with cylindrical (GAS ISO-228) or tapered (NPT) threads.
- The fluids can be in vapour or gaseous state of the following families
HCFC (R22)
HFC (R134a, R404A, R407C, R410A, R507)
HFO and HFO/HFC mixtures (R1234ze, R448A, R449A, R450A, and R452A)
CO₂ (R744)

Models for Ammonia NH₃ (R717) or other fluids, or with others non-standard connections are available only upon request.

Normative references

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 specific application non listed above, please ask to IGLOO technical department that will support you to select the right product.

Documentation

IGLOO safety valves are supplied with the following documentation:

- 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.
- The general Compliance Statement referring to a specific model of with a specific setting.

Certificates

IGLOO safety valves are approved and comply with the requirements of the European Directive 97/23/EC (PED), ASME VIII Div.1; on request testing can be performed by the most prestigious authorities such as TÜV, RINA, Bureau Veritas, ABS and Lloyd's Register.

Safety valves for refrigerants

Approvals

CE (PED, RoHS, REACH), EAC, ATEX and others on request.

Technical data

The fluids can be in vapour or gaseous state of the following families:

HCFC (R22)

HFC (R134a, R404A, R407C, R410A, R507)

HFO and HFO/HFC mixtures (R1234ze, R448A, R449A, R450A, and R452A)

HC (R290, R600, R600a)

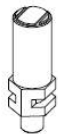
CO₂ (R744)

Note: Models for Ammonia NH₃ (R717) or other fluids are available upon request.

ALR series	Free discharge	-196 ÷ +250 °C -321 ÷ +482 °F	3-60 bar 885 psig	Typical use: HFC, HFO, HC
BLR series	Piped discharge			
CLR series	Piped discharge		100-150 bar 2 200 psig	Typical use: CO ₂

Ordering

ALR series, free discharge for CO₂, HFC, HFO, HC and mixtures up to 60 bar



Part number	Connections		Orifice	Coefficient of discharge	Pressure Range (bar)	PED 2014/68/EU
	inlet	outlet				Risk Category
ALR-7-B.xxxx	NPT 1/4"	-	diameter 7,0 mm area 38,5 mm ²	0,81	3,0 ÷ 60,0	IV
ALR-7-C.xxxx	NPT 3/8"	-				
ALR-10-C.xxxx	NPT 3/8"	-	diameter 10,0 mm area 78,5 mm ²	0,77		
ALR-10-D.xxxx	NPT 1/2"	-				

BLR series, piped discharge for CO₂, HFC, HFO, HC and mixtures up to 60 bar



Part number	Connections		Orifice	Coefficient of discharge	Pressure Range (bar)	PED 2014/68/EU
	inlet	outlet				Risk Category
BLR-7-B.xxxx	NPT 1/4"	GAS 1/2"	Diameter 7,0 mm Area 38,5 mm ²	0,81	3,0 ÷ 60,0	IV
BLR-7-C.xxxx	NPT 3/8"					
BLR-10-C.xxxx	NTP 3/8"	GAS 3/4"	Diameter 10,0 mm Area 78,5 mm ²	0,86		
BLR-10-D.xxxx	NPT 1/2"					
BLR-14-D.xxxx	NPT 1/2"	GAS 1"	Diameter 13,5 mm Area 143 mm ²	0,86		
BLR-14-E.xxxx	NPT 3/4"					
BLR-14-F.xxxx	NPT 1"					
BLR-20-F.xxxx	NPT 1"	GAS 1.1/4"	Diameter 20,0 mm Area 314 mm ²	0,83	3,0 ÷ 60,0	IV
BLR-20-G.xxxx	NPT 1.1/4"					
BLR-25-G.xxxx	NPT 1.1/4"	GAS 1.1/2"	Diameter 25,0 mm Area 491 mm ²	0,78		
BLR-25-H.xxxx	NPT 1.1/2"					

Safety valves for refrigerants

Ordering

CLR series, piped discharge for CO₂ up to 150 bar



Part number	Connections		Orifice	Coefficient of discharge	Pressure Range (bar)	PED 2014/68/EU
	inlet	outlet				Risk Category
CLR-10-D.xxxxx	NPT 1/2"	GAS 1.1/4"	Diameter 10,0 mm Area 78,5 mm ²	0,86	100,0 ÷ 150,0	IV
CLR-10-E.xxxxx	NPT 3/4"					
CLR-10-F.xxxxx	NPT 1"					
CLR-10-G.xxxxx	NPT 1.1/4"					
CLR-14-F.xxxxx	NPT 1"	GAS 1.1/2"	Diameter 14,0 mm Area 154 mm ²			
CLR-14-G.xxxxx	NPT 1.1/4"					

Note: Models for Ammonia, other fluids or pressure up to 600 bar are available upon request. The body of standard safety valves is made of brass, but models in stainless are also available upon request.

Set pressure

When ordering the safety valve a set pressure must be specified. For IGLOO safety valves we have adopted a so called mnemonic code, where the part number is made by 2 parts separated by a dot:

[valve_body].[set_pressure]

The **[set_pressure]** is an integer number equivalent to x100 times the pressure expressed in bar, as shown in the examples below.

Examples:

- 1) Valve body: ALR-10-C → ALR-10-C.2800
Set pressure: 28,0 bar (or 29,0 barg)
- 2) Valve body: BLR-7-B → BLR-7-B.3150
Set pressure: 31,5 bar (or 32,5 barg)
- 3) Valve body: BLR-20-F → BLR-20-F.1610
Set pressure: 16,1 bar (or 17,1 barg)
- 4) Valve body: CLR-14-G → CLR-14-G.13060
Set pressure: 130,6 bar (or 131,6 barg)

Safety valves for refrigerants

Calculation: Pressure, according to ISO 4126-1:2014, Amendment 1 of 2016

Overpressure = Pset +10%

Blowdown = Pset -15%

Helium tightness = 95% of Pset

Example:

Pset = 30,0 bar

- *The valve is helium leak-tested at 95% of Pset, equivalent to 28,5 bar*
- *When the pressure will rise the valve will start to open at 30 bar and will be totally open before reaching 30+10%=33,0 bar (overpressure).*
- *Then, when the pressure will fall, the valve will return completely closed before reaching 30-15%= 25,5 bar (blowdown).*

Calculation: Discharge capacity (Flow rate)

Q_m = Massic flowrate (kg/h)

Q_v = Volumic flowrate (can be m³/h, l/h, l/min or l/sec)

P₀ = Absolute opening pressure (barg) = Pset + 10% + 1

C = Function of isentropic exponent

A = Orifice area (mm²)

Kdr = Coefficient of discharge

M = Molar mass (g/mol)

T₀ = Temperature (°C)

Z = Compressibility factor of the fluid

ϕ = Fluid volumic mass at the calculation temperature (kg/mc)

$$Q_m = P_0 C A Kdr \sqrt{\frac{M}{T_0 Z}} \quad (\text{kg/h})$$

$$Q_v = \frac{P_0 C A Kdr}{\zeta} \sqrt{\frac{M}{T_0 Z}} \quad (\text{m}^3/\text{h})$$

$$Q_v' = \frac{1000 P_0 C A Kdr}{\zeta} \sqrt{\frac{M}{T_0 Z}} \quad (\text{l/h})$$

$$Q_v'' = \frac{P_0 C A Kdr}{0,06 \zeta} \sqrt{\frac{M}{T_0 Z}} \quad (\text{l/min})$$

$$Q_v''' = \frac{P_0 C A Kdr}{3,6 \zeta} \sqrt{\frac{M}{T_0 Z}} \quad (\text{l/sec})$$

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