PROTEGO® Pressure/Vacuum Relief Valves End-of-Line



Section 5





Function and Description

The function of pressure/vacuum valves for relief and conservation and the corresponding applications is discussed in "Technical Fundamentals" (\rightarrow Sec. 1). This section discusses the PROTEGO[®] product line of pressure/vacuum relief valves in end-of-line applications.

These are special devices that function as an **end-of-line valve** to protect against unacceptable over-pressure and underpressure. If necessary, the valves are fitted with an attachment with flange connection so that a pipeline can be connected for releasing product vapors.

Pressure relief valves prevent vapor loss up to the adjusted set pressure and offer reliable protection against excess pressure.

Vacuum relief valves prevent the unallowable entrance of air up to the adjusted set pressure and offer reliable protection against vacuum.

Pressure/vacuum relief valves perform all of the above tasks. **PROTEGO® pressure/vacuum** relief valves have weight- loaded or spring-loaded valve pallets.

PROTEGO® pressure/vacuum relief valves with a full-lift pallet achieve full lift within 10% of the set pressure and then released the flow when the valve is fully open (Figs. 1 and 2).





This is achieved by precise coordination between the diameter and height of the valve pallet rim with the adapted, lapped valve seat. In addition, a flow-enhancing design reinforces the overall effect on the outflow side. These valve pallets are used in endof-line valves and in-line valves.

Given the right size, the unique **10% technology** of the valves enables a set pressure that is just 10% below the maximum allowable tank pressure. Through continuous investments in and commitment to research and development, PROTEGO[®] has succeeded in transferring this opening behavior, which is typical for safety valves, to low pressure ranges. This feature is ensured by valve seats made of high-quality stainless steel and with individually lapped valve pallets or valve seats with an air cushion seal in conjunction with high-quality FEP film. Up to the set pressure, the pressure in the tank is maintained with a tightness that is far above the usual standards due to the highly developed production technology. When extremely high venting rates are required due to fire on the outside surface of the tank or malfunctions in special tank equipment, additional **emergency pressure relief valves** must be used. Even in the low pressure range, the vent has the opening characteristic comparable to a typical high pressure safety relief valve. For tanks with emergency relief valves, the opening pressure of the relief valve needs to be below the set pressure of the emergency relief valves. The valve immediately opens to a full lift under a full load, like a classic safety valve, but in response to minimum changes in pressure. The full-lift pallets are the result of years of development, and the innovation engineering enables reliable valve pallet operation under a full load.

Diaphragm valves are pressure/vacuum relief valves with a flexible diaphragm. Due to their special design, they have proven to successfully operate in problematic products and at extremely low temperatures below freezing.

Special features and advantages

- Iarge volume flows with only a small pressure difference
- set pressure close to opening pressure (10% technology) for optimum pressure maintenance in the system
- seal superior to normal standards, resulting in minimal product loss
- valve pallet is guided inside the housing to protect against harsh weather conditions

Preferred Applications

PROTEGO[®] pressure/vacuum relief valves are are used as in-breathing and out-breathing valves, pressure relief valves, conservation valves, and for simple control and venting of tanks and equipment when an unallowable vacuum or pressure is exceeded. They are used for low pressures, i.e., in pressure ranges in which classic safety valves cannot be used due to their limited performance characteristics. PROTEGO[®] valves are available as pressure relief valves, vacuum relief valves, or as combined pressure/vacuum relief valves.

PROTEGO® diaphragm valves are used for problem products and low temperatures.

Pilot valves are advantageous for special control responses or when a tight seal is required up to the point at which the valve starts to open (-> Section 9).

High-velocity-vent valves are used on tanker ships and for special land uses (-> Section 7).

Installation and maintenance

The valves come with detailed installation and maintenance instructions.

Safety devices are installed for safe transportation. Make sure that the transportation locks are removed before installing the valves. Checklists help to ensure proper installation for optimal valve operation.

Selection

Selection of the correct valve is critical to the safe operation of the system.

Consider the following to select the appropriate valve:

Function – a pressure relief valve, a vacuum relief valve, or a combined pressure/vacuum relief valve with a pipe-away connection if needed.

Design – a combined end-of-line valve or separate pressure relief and vacuum relief valves with a perpendicular connection or horizontal connection. Since they are weight-loaded, they must be installed vertically.

The adjusted set pressure – the standard maximum allowable (tank) pressure minus 10% overpressure. This determines the combination of materials for the valve pallet.

Type of seal – for pallet valves according to the pressure level, either with an air cushion seal or a metal seal to provide an extremely tight seal.

Special operating conditions – for viscous and adhesive substances, frost-protected operation, or for use with polymerizing products.

The **nominal diameter** is usually determined by the flow rate which must be released to avoid an unallowable over-pressure and under-pressure. Certified flow rate diagrams are available. For correct sizing, the operating conditions, pressure loss in the pipelines (incl. other installed devices), and any possible backpressure must be considered.

Detailed procedures and examples for sizing are described in "Technical Fundamentals" (see Section 1).

Sizing

The **valve size** is such that the allowable pressures are not exceeded when releasing the required flow rate (Sec. 1). When determining the opening pressure of the valve, pressure losses in the connected pipes may also have to be considered.

Example 1

Given: Volume flow \dot{V}_{max} in m³/h / CFH (e.g. for in-breathing or out-breathing of a storage tank as the sum of the pumping and thermal capacity) and maximum allowable opening pressure (e.g., tank pressure) p_T in mbar / inch W.C.

Requested: Valve size DN

Procedure: The intersection point of \dot{V}_{max} and p_T determines the required valve size. Opening pressure = the maximum allowable tank pressure. The volume flow diagrams show the volume flow as a function of the opening pressure for a fully open valve.

The set pressure of the valve has to be determined so that the calculated volume flow can safely be released. For a valve with 10% overpressure to reach full lift, the set pressure would be 10% below the fully open pressure (e.g., maximum allowable tank pressure). Attention: pressure drop of piping systems and other installed devices has to be considered.

Many conventional valves need 100% overpressure to reach full lift. In these cases, the set pressure may be just half of the maximum allowable tank pressure. Consequently, these valves open earlier and cause unnecessary product losses.

Example 2

Alternatively, the valve performance has to be checked if the nominal size and maximum allowable pressure are specified.

Given: Connection nominal size and maximum allowable opening pressure (e.g., tank pressure) p in mbar / inch W.C.

Required: Volume flow in m^3/h / CFH, set pressure p_A in mbar / inch W.C.

Procedure: From the intersection point of the straight line of p and the valve performance curve of the specific valve size, the volume flow \dot{V}_{max} is determined. The volume flow of the set pressure p_A may be 10% (PROTEGO[®] technology), 40%, or 100% below the opening pressure p_T . Attention: pressure loss of piping systems and other installed devices has to be considered.



The required set pressure (= start of opening) is the opening pressure (valve fully open) minus the characteristic overpressure.

For PROTEGO[®] valves and end of line devices, the overpressure characteristic is 10% unless otherwise stated. Within 10% overpressure, the valve pallet will reach full lift. A further increase in performance is possible according to the pressure loss curve shown in the diagram.

Material selection is based on plant and engineering specifications.





PROTEGO® Pressure/Vacuum Relief Valves - End-of-Line

| | | | pressure setting | | tal connection connection | aling sealing | -standard ig parameters | al medium tion, corrosion, ion) | l jacket, coil | |
|--------------|--|-----------------------|--|--|---------------------------------------|------------------------------|----------------------------|--|------------------------|-----------|
| | Туре | Size | positive setting range mbar / inch W.C. | negative setting range mbar / inch W.C. | Design O = horizon X = vertical | O = soft sea X = metallic | O = for non- operatir | O = for critic (polimeriza crystallizati | O = Heating Heating | Page |
| Pressure I | Relief Valve | s, weight pal | let type | | | | | | | |
| Ţ | P/EL | 50 - 80 2" - 3" | +3.5 up to +210/ +1.4 up to +84 | | х | 0/X | | | 0 | 176 - 177 |
| Ŷ | P/ELR | 80 - 100 3" - 4" | +3.5 up to +210/ +1.4 up to +84 | | х | 0 / X | | | 0 | 178 - 179 |
| , <u></u> ∰≓ | SD/BS-H | 80-200 3" - 8" | +5 up to +210/ +2 up to +84 | | х | х | 0 | | 0 | 180 - 181 |
| T. | D/SVL | 50-300 2" - 12" | +2.0 up to +60/ +0.8 up to +24 | | х | 0/X | | | | 182 - 183 |
| | ER-V-LP | 200-700 8" - 28" | +3.4 up to +15/ +1.36 up to +6 | | х | 0 | | | 0 | 184 - 185 |
| Ī | ER/V | 200-700 8" - 28" | DN 200-350: +5 up to +40/ +2 up to +16 DN 400-700: +5 up to +25/ +2 up to +10 | | x | 0 | | | 0 | |
| Т° | ER/VH | 200-700 8" - 28" | DN 200-350: >+40 up to +60/ >+16 up to +24 DN 400-700: >+25 up to +60/ >+10 up to +24 | | x | 0 | | | | 186 - 187 |
| | ER/V-F | 200-700 8" - 28" | >+60 up to +500/ >+24 up to +200 | | х | 0 | | | | 188 - 189 |
| | D/KSM | 50-200 2" - 8" | +5.0 up to +100/ +2.0 up to +40 | | х | 0 | 0 | 0 | | 190 - 191 |
| Vacuum R | Vacuum Relief Valves, weight pallet type | | | | | | | | | |
| ÎĊ | SV/E-1-0 | 50 - 300 2" - 12" | | -2.0 up to -60 / -0.8 up to -24 | 0 | 0 / X | | | 0 | 192 - 193 |
| ₽ | SV/T-0-H | 80 - 250 3" - 10" | | -7.0 up to -50 / -2.8 up to -20 | х | х | 0 | | 0 | 194 - 196 |
| | V/KSM | 50-200 2" - 8" | | -5.0 up to -100 / -2.0 up to -40 | 0 | 0 | 0 | 0 | | 198 - 199 |
| | V/SV | 40 - 300 1½" - 12" | | -2.0 up to -60 / -0.8 up to -24 | х | о/х | | | 0 | |

| | Туре | Size | pressure positive setting range mbar / inch W.C. | setting negative setting range mbar / inch W.C. | Design O = horizontal connection X = vertical connection | O = soft sealing X = metallic sealing | O = for non-standard operating parameters | O = for critical medium (polimerization, corrosion, crystallization) | O = Heating jacket, Heating coil | Page |
|------------------|----------------|-----------------------|--|---|--|--|--|--|-------------------------------------|-----------|
| Pressure ar | nd Vacuum Reli | ef Valves, w | eight pallet type | | | | | | | |
| Ĵ | PV/EL | 50 - 80 2" - 3" | +2.0 up to +210/ +0.8 up to +84 | -3.5 up to -35 / -1.4 up to -14 | 0 | 0/X | | | 0 | 200 - 202 |
| Î | PV/ELR | 80 - 100 3" - 4" | +2.0 up to +210/ +0.8 up to +84 | -3.5 up to -50 / -1.4 up to -20 | ο | 0/X | | | 0 | 204 - 206 |
| . | VD/SV | 40 - 300 1½" - 12" | +2.0 up to +60 / +0.8 up to +24 | -2.0 up to -60 / -0.8 up to -24 | x | 0/X | | | 0 | 208 - 210 |
| ۳ <mark>ا</mark> | VD/SV-PA(L) | 50 - 300 2" - 12" | +2.0 up to +60 / +0.8 up to +24 | -2.0 up to -60 / -0.8 up to -24 | x | 0/X | | | 0 | 212 - 215 |
| B | VD/KSM | 50 - 200 2" - 8" | +5.0 up to +100 / +2.0 up to +40 | -5.0 up to -100 / -2.0 up to -40 | x | 0 | ο | 0 | | 216 - 218 |
| ВĤ | VD/KSM-PA | 50 - 200 2" - 8" | +5.0 up to +100 / +2.0 up to +40 | -5.0 up to -100 / -2.0 up to -40 | x | 0 | ο | ο | | 220 - 222 |
| Pressure ar | nd Vacuum Reli | ef Valves, pi | lot-operated | | | | | | | |

| VN-A-PCPF | \rightarrow Section 9 | | | 408 - 411 416 |
|-----------|-----------------------------------|---|-------------------|------------------|
| VN-A-PCPM | \rightarrow Section 9 NE | w | | 412 - 416 |
| PM-HF | \rightarrow Section 9 | | | ● |
| PM/(D)S | \rightarrow Section 9 | | □标□ 落成炎 □除者 | NEW |





PROTEGO® P/EL



up to +84 inch W.C. Higher pressure settings upon request.

Function and Description

The P/EL type PROTEGO® valve is a highly developed pressure relief valve. It is primarily used as a safety device for relieving pressure in tanks, containers, and process engineering equipment. The valve protects against unallowable overpressure and prevents excessive product loss close to the set pressure.

The device will start to open as soon as the set pressure is reached and only requires 10% overpressure to full lift. Continuous investments in and a commitment to research and development have allowed PROTEGO® to develop a low-pressure valve which has the same opening characteristic as a high-pressure safety relief valve.

With this "full lift type" technology, the valve can be set at just 10% below the maximum allowable working pressure of the tank and still safely vent the required flow.

Due to our highly developed manufacturing technology, the tank pressure is maintained up to the set pressure with a tightness that is far above the usual standards. This feature is achieved by valve seats made of high-quality stainless steel with precisely lapped valve pallets (1) or with an air cushion seal (2) in conjunction with high quality FEP diaphragm.

The valve pallets are also available with a PTFE seal to prevent the valve pallets from sticking when sticky products are used, and they enable the use of corrosive substances. After the overpressure is released, the valve re-seats and provides a tight seal.

The optimized fluid dynamic design of the valve body and valve pallet is a result of many years of research, resulting in a stable operation of the valve pallet, optimized performance, and reduced product losses.

Special Features and Advantages

- · 10% technology for minimum pressure increase up to full lift
- · extreme tightness, resulting in lowest possible product losses and reduced environmental pollution
- · set pressure close to opening pressure for optimum pressure maintenance in the system
- · high flow capacity
- · valve pallet is guided inside the housing to protect against harsh weather conditions
- · can be used in explosion hazardous areas
- · automatic condensate drain

Design Types and Specifications

The valve pallet is weight-loaded. At set pressures greater than 80 mbar (32.1 inch W.C.), an extended model is used.

There are two different designs:

| Pressure valve in basic design | P/EL |
|------------------------------------|----------|
| Pressure valve with heating jacket | P/EL - H |

Additional special devices available upon request.







Vents - 10% Technology (Flyer pdf)

Leak Rate/10% Technology (Flyer pdf)



The optimized valve pallet (Flyer pdf)

Dimensions in mm / inches

Table 1: Dimensions

| To select the n | To select the nominal size (DN), use the flow capacity chart on the following page. | | | | | | | | |
|----------------------|---|---------------------------------|---------------------------------|---------------------------------|--|--|--|--|--|
| DN | 50 / 2" | 50 / 2" | 80 / 3" | 80 / 3" | | | | | |
| Set pressure | ≤ +80 mbar ≤ +32.1 inch W.C. | > +80 mbar > +32.1 inch W.C. | ≤ +80 mbar ≤ +32.1 inch W.C. | > +80 mbar > +32.1 inch W.C. | | | | | |
| а | 218 / 8.58 | 218 / 8.58 | 218 / 8.58 | 218 / 8.58 | | | | | |
| b | 287 / 11.30 | 452 / 17.80 | 289 / 11.38 | 454 / 17.87 | | | | | |
| Simo a maia ma fam u | mensions for measure webles with booting is shot upon request | | | | | | | | |

Dimensions for pressure valves with heating jacket upon request.

| Table 2: Material selection for housing | | | | | | | | | |
|---|-----------------|------------------------------------|---------------------------------|--|--|--|--|--|--|
| Design | В | С | | | | | | | |
| Housing Heating jacket (P/EL-H) | Steel Steel | Stainless Steel Stainless Steel | | | | | | | |
| Valve seat | Stainless Steel | Stainless Steel | Special materials upon request. | | | | | | |
| Weather hood | Steel | Stainless Steel | | | | | | | |
| Protective mesh screen | Stainless Steel | Stainless Steel | | | | | | | |

| Table 3: Material selection for pressure valve pallet | | | | | | | | |
|---|------------------------------------|-------------------------------------|------------------------------------|------------------------------------|--|--|--|--|
| Design | А | В | С | D | Special materials | | | |
| Pressure range (mbar) (inch W.C.) | +3.5 up to +5.0 +1.4 up to +2.0 | >+5.0 up to +14 >+1.4 up to +5.6 | >+14 up to +210 >+5.6 up to +84 | >+14 up to +210 >+5.6 up to +84 | (Aluminum-coated, Titanium, Hastelloy) and higher | | | |
| Valve pallet | Aluminum | Stainless Steel | Stainless Steel | Stainless Steel | pressure settings upon | | | |
| Sealing | FEP | FEP | Metal to Metal | PTFE | request. | | | |

Table 4: Flange connection type

EN 1092-1; Form B1

ASME B16.5 CL 150 R.F.

Flow Capacity Chart



The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig. Volume flow V in (m³/h) and CFH refer to the standard reference conditions of air in ISO 6358 (20°C, 1bar). For conversion to other densities and temperatures, refer to Sec. 1: "Technical Fundamentals."



for safety and environment

Other types upon request.

80

Überdruckventil



PROTEGO® P/ELR



Druckeinstellungen:

Überdruck: +3,5 mbar bis +210 mbar Höhere Druckeinstellungen auf Anfrage.

Funktion und Beschreibung

Das Ventil des Typs PROTEGO[®] P/ELR ist ein hoch entwickeltes Überdruckventil für gute Strömungsleistungen. Es wird vor allem als Sicherheitsarmatur zur Entlüftung von Tanks, Behältern und verfahrenstechnischen Apparaten eingesetzt. Das Ventil bietet Schutz vor unzulässigem Überdruck bzw. verhindert unzulässige Produktverluste bis nahe zum Ansprechdruck.

Bei Erreichen des Ansprechdrucks beginnt das Ventil zu öffnen und erreicht innerhalb 10% Drucksteigerung bzw. Öffnungsdruckdifferenz Vollhub. PROTEGO[®] ist es durch gezielte Investitionen in Forschung und Entwicklung gelungen, dieses für Sicherheitsventile typische Öffnungsverhalten auch auf niedrige Druckbereiche zu übertragen. Mit dieser "Vollhub-Technologie" besteht die Möglichkeit, den Ansprechdruck nur 10% unter den zulässigen Tankdruck zu setzen, um den erforderlichen Mengenstrom abzuführen.

Bis zum Ansprechdruck wird die Druckhaltung im Tank gewährleistet mit einer Dichtheit, die aufgrund der hoch entwickelten Fertigungstechnologie weit über den üblichen Standards liegt. Diese Eigenschaft wird u.a. durch Ventilsitze aus hochwertigem Edelstahl und mit exakt eingeschliffenem Ventilteller (1) oder mit Luftpolsterdichtung (2) in Verbindung mit hochwertiger FEP-Folie gewährleistet. Optional sind die Ventilteller mit PTFE-Abdichtung lieferbar, um bei entsprechenden Produkten ein Ankleben der Ventilteller zu verhindern oder einen Einsatz bei aggressiven Medien zu ermöglichen. Nachdem der Überdruck abgeführt wurde, schließt das Ventil wieder und bleibt dicht.

Die strömungstechnische Optimierung des Ventilkörpers sowie die konstruktive Gestaltung des Vollhubtellers sind das Ergebnis jahrelanger Entwicklungsarbeit, aus der ein stabiles Arbeiten des Ventiltellers und optimale Performance sowie Reduzierung von Produktverlusten resultieren.

Besondere Merkmale und Vorteile

- 10% Technologie für geringste Drucksteigerung bis zum Vollhub
- extreme Dichtheit und damit geringstmögliche Produktverluste und reduzierte Umweltbelastungen
- Ansprechdruck nah beim Öffnungsdruck, dadurch optimale Druckhaltung im System
- hohe Strömungsleistung
- Führung der Ventilteller innerhalb des Gehäuses und damit Schutz vor Witterungseinflüssen
- im explosionsgefährdeten Bereich einsetzbar
- selbsttätiger Kondensatabfluss

Ausführungsarten und Spezifikationen

Der Ventilteller ist gewichtsbelastet. Bei Ansprechdrücken >80 mbar wird eine verlängerte Bauform verwendet.

Es stehen zwei Ausführungen zur Auswahl:

Überdruckventil in Grundausführung

P/ELR - – P/ELR - H

Weitere Sonderarmaturen auf Anfrage

Überdruckventil mit Heizmantel





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Leak Rate/10% Technology (Flyer pdf)



Der optimale Ventilteller (Flyer pdf)

Abmessungen in mm

Tabelle 1: Maßtabelle

| Zur Auswahl der Nennweite (DN) benutzen Sie bitte das Volumenstromdiagramm auf der folgenden Seite | | | | | | | |
|--|------------|------------|------------|------------|--|--|--|
| DN | 80 / 3" | 80 / 3" | 100 / 4" | 100 / 4" | | | |
| Überdruck | ≤ +80 mbar | > +80 mbar | ≤ +80 mbar | > +80 mbar | | | |
| а | 353 | 353 | 353 | 353 | | | |
| b | 350 | 510 | 350 | 510 | | | |

Baumaße für das Überdruckventil mit Heizmantel auf Anfrage

| Tabelle 2: Materialauswahl für Gehäuse | | | | | | | | |
|--|----------------|------------------------|------------------------------|--|--|--|--|--|
| Ausführung | В | С | | | | | | |
| Gehäuse Heizmantel (P/ELR-H) | Stahl Stahl | Edelstahl Edelstahl | | | | | | |
| Ventilsitze | Edelstahl | Edelstahl | Sonderwerkstoffe auf Anfrage | | | | | |
| Abdeckhaube | Stahl | Edelstahl | | | | | | |
| Schutzgitter | Edelstahl | Edelstahl | | | | | | |

| Tabelle 3: Auswahl Material Überdruckventilteller | | | | | | | | | |
|---|---------------|---------------|---------------|---------------|---------------------------------|--|--|--|--|
| Ausführung | А | В | С | D | | | | | |
| Druckstufe (mbar) | +3,5 bis +5,0 | >+5,0 bis +14 | >+14 bis +210 | >+14 bis +210 | Sonderwerkstoffe (Alu-coatiert, | | | | |
| Ventilteller | Aluminium | Edelstahl | Edelstahl | Edelstahl | Druckeinstellungen auf Anfrage | | | | |
| Abdichtung | FEP | FEP | metallisch | PTFE | 5 5 | | | | |

Tabelle 4: Flanschanschlussart

EN 1092-1; Form B1

ASME B16.5 CL 150 R.F.

Volumenstromdiagramm



Dieses Volumenstromdiagramm ist mit einer kalibrierten und TÜV-zertifizierten Strömungsmessanlage ermittelt worden.

Der Volumenstrom V in m³/h bezieht sich auf den technischen Normzustand von Luft nach ISO 6358 (20°C, 1bar). Umrechnung auf andere Dichte und Temperatur siehe Kap. 1: Technische Grundlagen.



andere Anschlüsse auf Anfrage



in heat jacketed design

PROTEGO® SD/BS-H



Pressure Settings:

+5.0 mbar up to +210 mbar +2.0 inch W.C. up to +84 inch W.C. Higher pressure settings upon request.

Function and Description

The SD/BS-H type PROTEGO® valve is a highly developed pressure relief valve with a heating jacket down to the flange. It is primarily used as pressure relief device for vessels and process engineering equipment under difficult operating conditions. This includes extreme weather conditions or products that tend to form polymers at certain temperatures, stick together, or form deposits that negatively influence function (such as bitumen, tar, dust). The valve offers reliable protection against overpressure and prevents excessive loss of product vapors close to the set pressure.

The device will start to open as soon as the set pressure is reached and only requires 10% overpressure to full lift. Continuous investments in and a commitment to research and development have allowed PROTEGO® to develop a low pressure valve which has the same opening characteristic as a high pressure safety relief valve. With this "full lift type" technology, the valve can be set at just 10% below the maximum allowable working pressure of the tank and still safely vent the required mass flow.

Due to our highly developed manufacturing technology, the tank pressure is maintained up to set pressure with a tightness that is far superior to the conventional standard. This feature is achieved by valve seats made of high-grade stainless steel with precisely lapped valve pallets and a sturdy housing design.After the excess pressure is released, the valve re-seats and provides a tight seal again.

Special Features and Advantages

- 10% technology for minimum pressure increase up to full lift
- · extreme tightness, resulting in lowest possible product losses and reduced environmental pollution
- set pressure close to opening pressure for optimum pressure maintenance in the system
- high flow capacity
- · valve pallet is guided inside the housing to protect against harsh weather conditions
- can be used in areas subject to an explosion hazard
- · complete heating jacket up to the flange to avoid ice build-up
- maximum allowable heating medium temperature of 320°C / 608°F (at 6 bar / 87 psi)
- · available in a special design with a heatable valve cover
- · for low pressure settings, an optimized valve pallet cover prevents the set pressure from being adjusted due to dust deposits or condensate
- sturdy housing design
- · available in a special design with lifting device

Design Types and Specifications

The valve pallet is weight-loaded. Starting at a set pressure of 30 mbar, a wing guide is also used.

SD/BS - H Pressure valve in basic design with heating jacket

Additional special devices available upon request.

| Table 1: L | Dimensions Dimensions | | | | | | | | | | |
|---------------|---|-------------|----------------------------|----------------------------|-----------|----------------------------|----------------------------|-------------|--|--|--|
| To select t | To select the nominal size (DN), use the flow capacity chart on the following page. | | | | | | | | | | |
| DN1 | DN2 | а | b | b | С | d | d | е | | | |
| | | | ≤ 30 mbar ≤12 inch W.C. | > 30 mbar >12 inch W.C. | | ≤ 30 mbar ≤12 inch W.C. | > 30 mbar >12 inch W.C. | | | | |
| 80 / 3" * | 15 / ½" | 325 / 12.80 | 400 / 15.75 | 515 / 20.28 | 70 / 2.76 | 250 / 9.84 | 390 / 15.35 | 250 / 9.84 | | | |
| 100 / 4" | 15 / ½" | 325 / 12.80 | 400 / 15.75 | 505 / 19.88 | 60 / 2.36 | 250 / 9.84 | 380 / 14.96 | 250 / 9.84 | | | |
| 150 / 6" | 15 / 1⁄2" | 405 / 15.94 | 460 / 18.11 | 595 / 23.43 | 60 / 2.36 | 315 / 12.40 | 470 / 18.50 | 290 / 11.42 | | | |
| 200 / 8" | 15 / 1⁄2" | 510 / 20.08 | 470 / 18.50 | 575 / 22.64 | 65 / 2.56 | 305 / 12.01 | 445 / 17.52 | 340 / 13.39 | | | |
| * also availa | also available with special flange DN 50 / 2" | | | | | | | | | | |

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Vents - 10% Technology (Flyer pdf) Leak Rate/10% Technology (Flyer pdf)

| Table 2: Material selection for housing | | | | | | | | |
|---|-----------------|------------------------------------|---------------------------------|--|--|--|--|--|
| Design | A | В | | | | | | |
| Housing Heating Jacket | Steel Steel | Stainless Steel Stainless Steel | Special materials upon request. | | | | | |
| Valve Seat | Stainless Steel | Stainless Steel | | | | | | |

| Table 3: Material selection for pressure valve pallet | | | | | | | | | | | |
|---|------------------------------|---------------------------------|-----------------------------------|-----------|--|--|--|--|--|--|--|
| Design | А | В | С | | | | | | | | |
| Pressure range (mbar) (inch W.C.) | +5 up to +25 +2 up to +10 | >+10 up to +30 >+4 up to +12 | >+30 up to +210 >+12 up to +84 | Special r | | | | | | | |
| Valve pallet | Aluminum | Stainless Steel | Stainless Steel | settings | | | | | | | |
| Valve pallet hood | Stainless Steel | Stainless Steel | - | | | | | | | | |
| Sealing | Metal to Metal | Metal to Metal | Metal to Metal | | | | | | | | |

Special materials and higher pressure settings upon request.

Table 4: Flange connection type

EN 1092-1; Form B1

ASME B16.5 CL 150 R.F.

Other types upon request.

Flow Capacity Chart



The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig. Volume flow \dot{V} in (m³/h) and CFH refer to the standard reference conditions of air in ISO 6358 (20°C, 1bar). For conversion to other densities and temperatures, refer to Sec. 1: "Technical Fundamentals."



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PROTEGO® D/SVL



Pressure settings:

+2.0 mbar up to +60 mbar +0.8 inch W.C. up to +24 inch W.C. Higher pressure settings upon request.

Function and Description

The D/SVL type PROTEGO[®] valve is a high performance pressure relief valve. It is primarily used as a safety device for relieving pressure in tanks, containers, and process engineering equipment. The valve offers reliable protection against overpressure and prevents excessive loss of product vapors close to the set pressure.

The device will start to open as soon as the set pressure is reached and only requires 10% overpressure to full lift. Continuous investments in and a commitment to research and development have allowed PROTEGO[®] to develop a low pressure valve which has the same opening characteristic as a high pressure safety relief valve. With this "full lift type" technology, the valve can be set at just 10% below the maximum allowable working pressure of the tank and still safely vent the required mass flow.

Due to the highly developed manufacturing technology, the tank pressure is maintained up to the set pressure with a tightness that is far superior to the conventional standard. This feature is achieved by valve seats made of high quality stainless steel and with precisely lapped valve pallets (1), or with an air cushion seal (2) in conjunction with high quality FEP diaphragm. The valve pallets are also available with a PTFE seal to prevent the valve pallet from sticking when sticky products are used, and they enable the use of corrosive substances. After the overpressure is released, the valve re-seats and provides a tight seal again. The optimized fluid dynamic design of the valve body and valve pallet is a result of many years of research, resulting in a stable operation of the valve pallet, optimized performance, and reduced product losses.

Special Features and Advantages

- 10% technology for minimum pressure increase up to full lift
- extreme tightness, resulting in lowest possible product losses and reduced environmental pollution
- set pressure close to opening pressure for optimum pressure maintenance in the system
- particularly high flow capacity
- valve pallet is guided inside the housing to protect against harsh weather conditions
- · can be used in explosion hazardous areas
- best technology for API tanks

Design Types and Specifications

The valve pallet is weight-loaded. Higher pressures with a special spring-loaded design are available upon request.

Pressure valve in basic design D/SVL -

Additional special devices available upon request.

| Table 1: | Table 1: Dimensions Dimensions in mm / inches | | | | | | | | | | |
|---|---|-------------|-------------|-------------|-------------|-------------|-------------|--|--|--|--|
| To select the nominal size (DN), use the flow capacity chart on the following page. | | | | | | | | | | | |
| DN | 50 / 2" | 80 / 3" | 100 / 4" | 150 / 6" | 200 / 8" | 250 / 10" | 300 / 12" | | | | |
| а | 336 / 13.23 | 412 / 16.22 | 444 / 17.48 | 564 / 22.20 | 664 / 26.20 | 687 / 27.05 | 687 / 27.05 | | | | |
| b | 200 / 7.87 | 295 / 11.61 | 295 / 11.61 | 465 / 18.31 | 550 / 21.65 | 650 / 25.59 | 650 / 25.59 | | | | |







Vents - 10% Technology (Flyer pdf) Leak Rate/10% Technology (Flyer pdf) The optimized valve pallet (Flyer pdf)

| Table 2: Material selection for housing | | | | | | | | | |
|---|-----------------|-----------------|---------------------------------|--|--|--|--|--|--|
| Design | А | В | | | | | | | |
| Housing | Steel | Stainless Steel | | | | | | | |
| Valve seat | Stainless Steel | Stainless Steel | Special materials upon request. | | | | | | |
| Sealing | PTFE | PTFE | | | | | | | |
| Weather hood | Stainless Steel | Stainless Steel | | | | | | | |

| Table 3: Material selection for pressure valve pallet | | | | | | | | | | | |
|---|------------------------------------|-------------------------------------|-----------------------------------|----------------------------------|-----------------------------------|----------------------------------|--|--|--|--|--|
| Design | А | В | С | D | E | F | | | | | |
| Pressure (mbar) range (inch W.C.) | +2.0 up to +3.5 +0.8 up to +1.4 | >+3.5 up to +14 >+1.4 up to +5.6 | >+14 up to +35 >+5.6 up to +14 | >+35 up to +60 >+14 up to +24 | >+14 up to +35 >+5.6 up to +14 | >+35 up to +60 >+14 up to +24 | | | | | |
| Valve | Aluminum | Stainless Steel | Stainless Steel | Stainless Steel | Stainless Steel | Stainless Steel | | | | | |
| Sealing | FEP | FEP | Metal to Metal | Metal to Metal | PTFE | PTFE | | | | | |

Special materials and higher pressure settings upon request.

| Table 4: Flange connection type | | | | |
|--|------------|---|---|---|
| EN 1092-1; Form B1 | | Other types upon rea | west | |
| ASME B16.5 CL 150 R.F. | | e alor groe apointed | | |
| Flow Capacity Chart | - DN 50/2" | - _{DN 80/3"} - _{DN 100/4"} | - DN 130/6" - DN 200/8" - DN 280/8" | - DN 300/12" |
| airflow in thousands of CFH | | | | |
| (upu) enseat (upu) enseat (u | | | | - 50 - 30 - 20 - 10 - 5 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 |
| flow rate V (m ³ /h) | | | 2256 | 5-L |

The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig. Volume flow \dot{V} in (m³/h) and CFH refer to the standard reference conditions of air in ISO 6358 (20°C, 1bar). For conversion to other densities and temperatures, refer to Sec. 1: "Technical Fundamentals."



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Pressure settings:

DN 200/8" to DN 300/12" : +3.4 mbar up to +40 mbar +1.4 inch W.C. up to +16 inch W.C. DN 350/14" to DN 700/28": +3.4 mbar up to +25 mbar +1.4 inch W.C. up to +10 inch W.C.

For higher pressure settings, see types ER/V, ER/VH and ER/V-F.

Function and Description

The PROTEGO® type ER-V-LP valve is a sophisticated pressure relief valve for applications in which a high flow efficiency is of the essence. It is primarily used as an emergency pressure relief valve on storage tanks, vessels, silos, and process engineering equipment. It offers reliable protection against excessive overpressure and prevents excessive product loss at pressures as high as close to the set pressure. It is designed to release particularly large quantities to prevent the vessel from rupturing in an emergency case.

The valve will start to open as soon as the set pressure is reached and only requires a 10% pressure increase or opening pressure differential until full lift. Continuous investments in and a commitment to research and development have enabled PROTEGO[®] to develop a new valve pallet technology for which a patent has been granted. This patented valve pallet technology enables the typical safety valve characteristics to be applied to low pressure ranges while also maintaining a low leakage rate.

Adopting this new patented valve pallet technology permits the valve to be set to just 10% below the maximum allowable working pressure of the tank and still vent the required flow.

Due to the sophisticated manufacturing technology, the tank pressure is maintained up to the set pressure, with a tightness that is far above the common standards. Once the excess pressure is released, the valve re-seats and seals tight again.

Special Features and Advantages

- patented valve pallet technology guarantees excellent tightness resulting in the lowest possible product losses and reduced environmental impact
- · 10% technology for minimum pressure increase until full lift
- · set pressure close to opening pressure for optimum pressure maintenance in the system
- · high flow efficiency
- valve pallet is guided inside the housing to protect against harsh weather conditions
- · can be used in explosion hazardous areas
- sturdy housing design
- · secured movable components
- · best technology for API tanks

Design Types and Specifications

The valve pallet is weight-loaded. Higher set pressures are achieved with types ER/V and ER/VH (lever-operated) valves or Type ER/V-F (spring-loaded) valves.

Pressure valve in basic design

ER-V-LP

Additional special devices available upon request.





(Flyer pdf)

| Table | Fable 1: Dimensions Dimensions in mm / inches | | | | | | | | | |
|---|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--|
| To select the nominal size (DN), use the flow capacity chart on the following page. | | | | | | | | | | |
| DN | 200 / 8" | 250 / 10" | 300 / 12" | 350 / 14" | 400 / 16" | 450 / 18" | 500 / 20" | 600 / 24" | 700 / 28" | |
| а | 343 / 13.50 | 406 / 15.98 | 483 / 19.02 | 533 / 20.98 | 597 / 23.50 | 635 / 25.00 | 699 / 27.52 | 813 / 32.01 | 837 / 32.95 | |
| b | 378 / 14.88 | 399 / 15.71 | 409 / 16.10 | 440 / 17.32 | 455 / 17.91 | 464 / 18.27 | 481 / 18.94 | 556 / 21.89 | 571/22.48 | |

| Table 2: Material selection | | | | | | | | |
|-----------------------------|-----------------|-----------------|---------------------------------|--|--|--|--|--|
| Design | А | В | | | | | | |
| Housing | Steel | Stainless Steel | | | | | | |
| Valve seat | Stainless Steel | Stainless Steel | Special materials upon request. | | | | | |
| Valve pallet | Stainless Steel | Stainless Steel | | | | | | |
| Sealing | Stainless Steel | Stainless Steel | | | | | | |

Table 3: Flange connection type

| EN 1092-1; Form B1 | Other types upon request |
|------------------------|---------------------------|
| ASME B16.5 CL 150 R.F. | Other types upon request. |

Flow Capacity Chart



The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig. Volume flow \dot{V} in (m³/h) and CFH refer to the standard reference conditions of air in ISO 6358 (20°C, 1bar). For conversion to other densities and temperatures, refer to Sec. 1: "Technical Fundamentals."



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PROTEGO® ER/VH



Pressure settings:

| DN 200/8" | :>+35 mbar | up to +60 | mbar |
|---------------------------|------------------|-----------|-----------|
| | >+14 inch W.C. | up to +24 | inch W.C. |
| DN 250/10" to DN 350/14": | >+30 mbar | up to +60 | mbar |
| | >+12 inch W.C. | up to +24 | inch W.C. |
| DN 400/16" to DN 700/28": | >+25 mbar | up to +60 | mbar |
| | >+10 inch W.C. | up to +24 | inch W.C. |
| Higher and lower pressure | settings upon re | equest. | |

Function and Description

The ER/VH type PROTEGO[®] valve is a highly developed emergency pressure relief valve with high flow capacity. It is primarily used as a safety device for emergency pressure relief for storage tanks, containers, silos, and process engineering equipment. It offers reliable protection against overpressure and prevents excessive product vapor loss close to the set pressure. It is designed to release particularly large amounts to prevent the vessel from rupturing in an emergency case. Higher set pressures are achieved by a lever with a lockable weight load. The position of the weight is set at the factory. Starting at DN 500, the devices can also be used as manhole covers.

When the set pressure is reached, the valve starts to open and is fully open within 10% overpressure. This unique 10% "full lift type technology" enables a pressure setting that is only 10% below the maximum allowable working pressure or design pressure of the tank. Even in the low pressure range, the vent has the opening characteristic comparable to a typical high pressure safety relief valve. The full lift type pallets are a result of many years of development. The valve pallet is mounted on one side.

Due to the highly developed manufacturing technology, the tank pressure is maintained up to the set pressure with a tightness that is far superior to the conventional standard. This feature is achieved by valve seats made of stainless steel with an inserted O-ring seal, a precisely lapped valve pallet, and a sturdy housing design. After the excess pressure is released, the valve re-seats and provides a tight seal again.

Special Features and Advantages

- 10% technology for minimum pressure increase up to full lift
- excellent tightness resulting in lowest possible product losses and reduced environmental pollution
- set pressure close to opening pressure for optimum pressure maintenance in the system
- · high flow capacity
- · can be used in explosion hazardous areas
- · sturdy housing design
- · secured housing cover with lever and lockable weight load
- best technology for API tanks

Design Types and Specifications

The valve pallet is weight-loaded. Lower pressures are generally achieved without a lever design (see ER-V-LP, ER/V), and higher pressures are achieved with spring-loading (see ER/V-F).

Pressure valve in basic design ER/VH

Additional special devices available upon request.



Vents - 10% Technology (Flyer pdf)

| Table 1: Dimensions Dimensions in mm / inches | | | | | | | | | | |
|---|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--|
| To select the nominal size (DN), use the flow capacity chart on the following page. | | | | | | | | | | |
| DN | 200 / 8" | 250 / 10" | 300 / 12" | 350 / 14" | 400 / 16" | 450 / 18" | 500 / 20" | 600 / 24" | 700 / 28" | |
| а | 305 / | 375 / | 425 / | 445 / | 495 / | 545 / | 615 / | 715 / | 795 / | |
| | 12.01 | 14.76 | 16.73 | 17.52 | 19.49 | 21.46 | 24.21 | 28.15 | 31.30 | |
| b | 350 / | 375 / | 395 / | 380 / | 400 / | 410 / | 430 / | 400 / | 425 / | |
| EN | 13.78 | 14.76 | 15.56 | 14.96 | 15.375 | 16.314 | 16.93 | 15.75 | 16.73 | |
| b | 390 / | 409 / | 442 / | 439 / | 455 / | 478 / | 500 / | 471 / | 420 / | |
| ASME | 15.36 | 16.10 | 17.40 | 17.28 | 17.91 | 18.82 | 19.69 | 18.54 | 16.54 | |
| с | 200 / | 240 / | 265 / | 285 / | 310 / | 330 / | 360 / | 410 / | 450 / | |
| | 7.87 | 9.45 | 10.43 | 11.22 | 12.20 | 12.99 | 14.17 | 16.14 | 17.72 | |
| d | 590 / | 735 / | 780 / | 845 / | 890 / | 1070 / | 1090 / | 1140 / | 1380 / | |
| | 23.23 | 28.94 | 30.71 | 33.27 | 35.04 | 42.13 | 42.91 | 44.88 | 54.33 | |

| Table 2: Material selection | | | | | | | | |
|-----------------------------|---|-----------------|--|--|--|--|--|--|
| Design | А | В | | | | | | |
| Housing | Steel | Stainless Steel | | | | | | |
| Valve seat | Stainless Steel | Stainless Steel | | | | | | |
| Valve pallet | Stainless Steel or Steel-Stainless Steel | Stainless Steel | | | | | | |
| Sealing | FPM | FPM | | | | | | |
| Weight | Steel | Stainless Steel | | | | | | |

Table 3: Flange connection typeEN 1092-1; Form B1ASME B16.5 CL 150 R.F.

Special materials upon request.

Flow Capacity Chart





The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig. Volume flow \dot{V} in (m³/h) and CFH refer to the standard reference conditions of air in ISO 6358 (20°C, 1bar). For conversion to other densities and temperatures, refer to Sec. 1: "Technical Fundamentals."

PROTEGO





PROTEGO® ER/V-F



Pressure settings:

>+60 mbar up to +500 mbar

>+24 inch W.C. up to +200 inch W.C.

Higher pressure settings upon request.

For lower pressure settings, see types ER-V-LP, ER/V, and ER/VH.

Function and Description

The ER/V-F type PROTEGO[®] valve is a highly developed emergency pressure relief valve with high flow capacity. It is primarily used as a safety device for emergency pressure relief for storage tanks, containers, silos, and process engineering equipment. It offers reliable protection against overpressure and prevents excessive product vapor loss close to the set pressure. It is designed to release particularly large amounts to prevent the vessel from rupturing in an emergency case. The springloading allows for higher set pressures than those with the ER-V-LP, ER/V, or ER/VH. The device will start to open as soon as the set pressure is reached and only requires 10% overpressure to reach full lift. Continuous investments in and a commitment to research and development have allowed PROTEGO® to develop a low pressure valve which has the same opening characteristic as a high pressure safety relief valve. This "full lift type" technology allows the valve to be set at just 10% below the maximum allowable working pressure of the tank and still safely vent the required mass flow.

Due to the highly developed manufacturing technology, the tank pressure is maintained up to the set pressure with a tightness that is far superior to the conventional standard. This feature is achieved by valve seats made of high-grade steel with an inserted O-ring seal, a precisely lapped valve pallet, and a sturdy housing design. After the excess pressure is released, the valve re-seats and provides a tight seal again.

Special Features and Advantages

- · 10% technology for minimum pressure increase up to full lift
- excellent tightness resulting in lowest possible product losses and reduced environmental pollution
- set pressure close to opening pressure for optimum pressure maintenance in the system
- · high flow capacity
- valve pallet is guided inside the housing to protect against harsh weather conditions
- · can be used in explosion hazardous areas
- sturdy housing design
- · spring-loaded for high set pressures
- best technology for API tanks

Design Types and Specifications

The valve pallet is spring-loaded. Lower pressures are achieved with the ER-V-LP, ER/V, and ER/VH designs.

Pressure valve in basic design ER/V-F

Additional special devices available upon request.



Technology Vents (Flyer pdf)

Table 1: Dimensions

Dimensions in mm / inches

To select the nominal size (DN), use the flow capacity chart on the following page.

| DN | 200 / 8" | 250 / 10" | 300 / 12" | 350 / 14" | 400 / 16" | 450 / 18" | 500 / 20" | 600 / 24" | 700 / 28" |
|-----------|--|---|---|--|---|---|---|---|---|
| а | 465 / 18.31 | 550 / 21.65 | 650 / 25.59 | 650 / 25.59 | 800 / 31.50 | 800 / 31.50 | 1000 / 39.37 | 1000 / 39.37 | 1200 / 47.24 |
| b EN | 860 / 33.86 (≤370 mbar ≤148 inchW.C.) | 860 / 33.86 (≤240 mbar ≤96 inchW.C.) | 1170 / 46.06 (≤240 mbar ≤96 inchW.C.) | 1170 / 46.06 (≤270 mbar ≤108 inchW.C.) | 1150 / 45.28 (≤220 mbar ≤88 inchW.C.) | 1175 / 46.26 (≤170 mbar ≤68 inchW.C.) | 1430 / 56.30 (≤130 mbar ≤52 inchW.C.) | 1425 / 56.10 (≤140 mbar ≤56 inchW.C.) | 1690 / 66.54 (≤140 mbar ≤56 inchW.C.) |
| b EN | 980 / 38.58 (>370 mbar >148 inchW.C.) | 980 / 38.58 (>240 mbar >96 inchW.C.) | 1490 / 58.66 (>240 mbar >96 inchW.C.) | 1490 / 58.66 (>270 mbar ≤108 inchW.C.) | 1490 / 58.66 (>220 mbar ≤88 inchW.C.) | 1515 / 59.65 (>170 mbar >68 inchW.C.) | 1660 / 65.35 (>130 mbar >52 inchW.C.) | 1655 / 65.16 (>140 mbar >56 inchW.C.) | 1910 / 75.20 (>140 mbar >56 inchW.C.) |
| b ASME | 900 / 35.43 (≤370 mbar ≤148 inchW.C.) | 894 / 35.20 (≤240 mbar ≤96 inchW.C.) | 1217 / 47.91 (≤240 mbar ≤96 inchW.C.) | 1229 / 48.39 (≤270 mbar ≤108 inchW.C.) | 1205 / 47.44 (≤220 mbar ≤88 inchW.C.) | 1243 / 48.94 (≤170 mbar ≤68 inchW.C.) | 1500 / 59.06 (≤130 mbar ≤52 inchW.C.) | 1496 / 58.90 (≤140 mbar ≤56 inchW.C.) | |
| b ASME | 1020 / 40.16 (>370 mbar >148 inchW.C.) | 1014 / 39.92 (>240 mbar >96 inchW.C.) | 1537 / 60.51 (>240 mbar >96 inchW.C.) | 1549 / 60.98 (>270 mbar ≤108 inchW.C.) | 1545 / 60.83 (>220 mbar ≤88 inchW.C.) | 1583 / 62.32 (>170 mbar >68 inchW.C.) | 1730 / 68.11 (>130 mbar >52 inchW.C.) | 1726 / 67.95 (>140 mbar >56 inchW.C.) | |

| Table 2: Material selection | | | | | |
|-----------------------------|---|-----------------|--|--|--|
| Design | A | В | | | |
| Housing | Steel | Stainless Steel | | | |
| Valve seat | Stainless Steel | Stainless Steel | | | |
| Valve pallet | Stainless Steel or Steel-Stainless Steel | Stainless Steel | | | |
| Sealing | FPM | FPM | | | |
| Pressure spring | Stainless Steel | Stainless Steel | | | |
| Weather hood | Steel | Stainless Steel | | | |

Table 3: Flange connection type EN 1092-1; Form B1 Other types upon request. ASME B16.5 CL 150 R.F.

Special materials upon request.

Flow Capacity Chart





The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig. Volume flow V in (m³/h) and CFH refer to the standard reference conditions of air in ISO 6358 (20°C, 1bar). For conversion to other densities and temperatures, refer to Sec. 1: "Technical Fundamentals."

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PROTEGO



Pressure Relief Valve

made of plastic







Pressure settings:

| +6.0 mbar | up to | +100 mbar (DN 50/2") |
|----------------|-------|-----------------------------------|
| +2.4 inch W.C. | up to | +40 inch W.C. |
| +4.0 mbar | up to | +100 mbar (DN 80/3") |
| +1.6 inch W.C. | up to | +40 inch W.C. |
| +4.5 mbar | up to | +100 mbar (DN 100/4" - DN 200/8") |
| +1.8 inch W.C. | up to | +40 inch W.C. |

Higher pressure settings upon request.

Function and Description

Table 1: Dimension

The PROTEGO® valve D/KSM is a state-of-the-art pressure relief valve with excellent flow performance made out of high grade synthetic material. It is primarily used as a safety fitting for relieving pressure in tanks, containers, and process engineering equipment. The valve prevents emission losses almost up to the set pressure. The valve is a perfect solution for corrosive, polymerizing, or sticky substances. The device will start to open as soon as the set pressure is reached and only required 10% overpressure to reach full lift. Continuous investments in and a commitment to research and development have allowed PROTEGO[®] to develop a low pressure valve which has the same opening characteristic as a high pressure safety relief valve. This "full lift type" technology allows the valve to be set at just 10% below the maximum allowable working pressure (MAWP) of the tank and still safely vent the required mass flow.

Due to our highly developed manufacturing technology, the tank pressure is maintained up to the set pressure with a tightness that is far superior to the conventional standard. This feature is achieved by special valve seats made of high quality synthetic material or PTFE. After the excess pressure is released, the valve re-seats and provides a tight seal.

The optimized fluid dynamic design of the valve body and valve pallet is a result of many years of research, resulting in a stable operation of the valve pallet, optimized performance, and reduced product losses.

Special Features and Advantages

- 10% technology for minimum pressure increase up to full lift
- extreme tightness, resulting in lowest possible product losses and reduced environmental pollution
- set pressure close to opening pressure for optimum pressure maintenance in the system
- valve pallet is guided inside the housing to protect against harsh weather conditions
- non-corrosive
- especially suitable for aggressive, sticky, or polymerizing substances
- · weight reduction in comparison to steel/stainless steel
- high surface quality
- automatic condensate drain
- · different plastics can easily be combined
- maintenance-friendly design

Design Types and Specifications

The valve pallet is weight-loaded, and the highest pressure levels are only achieved with metal discs.

Pressure valve in basic design

D/KSM-

naiona in mm / inch

Additional special devices available upon request.

| To select the nominal size (DN), use the flow capacity charts on the following page. | | | | | | | |
|--|-------------------------|-------------|----------------|----------------|----------------|--|--|
| DN | 50 / 2" | 80 / 3" | 100 / 4" | 150 / 6" | 200 / 8" | | |
| | 276 / 14 90 521 / 20 51 | | 563 / 22.17 | 687 / 27.05 | 052/27/49 | | |
| a | 3707 14.00 | 521/20.51 | (543 / 21.38)* | (681 / 26.81)* | 952 / 57.46 | | |
| h | 190 / 7 00 | 250 / 0. 94 | 200 / 11 91 | 350 / 13.78 | 560 / 22.05 | | |
| d | 10077.09 | 2507 9.64 | 3007 11.01 | (405 / 15.94)* | (500 / 19.68)* | | |
| Dimensions in brackets only for PVDF. | | | | | | | |



(Flyer pdf)



Vents - 10% Technology (Flyer pdf)



Leak Rate/10% Technology (Flyer pdf)

| Tabelle 2: Material selection for housing | | | | | |
|---|---------|---------|------|---------|--|
| Design | А | В | С | | |
| Housing | PE | PP | PVDF | | |
| Valve seats | PE | PP | PVDF | Special | |
| Sealing | FPM | FPM | FPM | | |
| Valve pallet | A, C, D | B, C, D | C, D | | |

materials upon request.

| Table 3: Material selection for pressure valve pallet | | | | | | |
|---|-----------------------------------|-----------------------------------|----------------------------------|---------------------------------|--|--|
| Design | А | В | С | D | | |
| Pressure range (mbar) (inch W.C.) | +6.0 up to +16 +2.4 up to +6.4 | +5.5 up to +16 +2.2 up to +6.4 | +9.5 up to +30 +3.8 up to +12 | +30 up to +100 +12 up to +40 | | |
| Valve pallet | PE | PP | PVDF | Hastelloy | | |
| Sealing | PTFE | PTFE | PTFE | PTFE | | |
| Spindle guide | PE | PP | PVDF | Hastelloy | | |
| Weights | PE | PP | PVDF | Hastelloy | | |

Special materials and other pressure settings are available upon request.

Table 4: Flange connection type

EN 1092-1, Form A

Flow Capacity Chart

ASME B16.5 CL 150 F.F.

Other types upon request.

å

- DN 50/2" DN 80/3"



The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig. Volume flow V in (m³/h) and CFH refer to the standard reference conditions of air in ISO 6358 (20°C, 1bar). For conversion to other densities and temperatures, refer to Sec. 1: "Technical Fundamentals."



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PROTEGO® SV/E-1-0





Vacuum settings:

-2.0 mbar up to -60 mbar -0.8 inch W.C. up to -24 inch W.C. Higher vacuum settings upon request.

Function and Description

The SV/E-1-0 type PROTEGO[®] valve is a highly developed vacuum relief valve with excellent flow performance. It is primarily used as a safety device for relieving vacuum in tanks, containers, and process engineering equipment. The valve offers reliable protection against vacuum and prevents in-breathing of air close to the set pressure.

The device will start to open as soon as the set pressure is reached and only requires 10% overpressure to reach full lift. Continuous investments in and a commitment to research and development have allowed PROTEGO[®] to develop a low pressure valve which has the same opening characteristics as a high pressure safety relief valve.

This "full lift type" technology allows the valve to be set at just 10% below the maximum allowable working pressure of the tank and still safely vent the required mass flow.

Due to our highly developed manufacturing technology, the tank pressure is maintained up to set pressure with a tightness that is far superior to the conventional standard. This feature is achieved by valve seats made of high quality stainless steel and with precisely lapped valve pallets (1) or with an air cushion seal (2) in conjunction with high quality FEP diaphragm. The valve pallets are also available with a PTFE seal to prevent the valve pallets from sticking when sticky products are used, and they enable the use of corrosive substances. After the vacuum is released, the valve reseats and provides a tight seal again.

Special Features and Advantages

- · 10% technology for minimum pressure increase up to full lift
- extreme tightness, resulting in lowest possible product losses and reduced environmental pollution
- set pressure close to opening pressure for optimum pressure maintenance in the system
- high flow capacity
- valve pallet is guided inside the housing to protect against harsh weather conditions
- · can be used in explosion hazardous areas
- automatic condensate drain
- · best technology for API tanks

Design Types and Specifications

The valve pallet is weight-loaded. Higher vacuum with a special spring-loaded design available upon request.

There are two different designs:

| Vacuum valve in basic design | SV/E-1-0 |
|----------------------------------|--------------|
| Vacuum valve with heating jacket | SV/E-1-0 - H |
| | |

Additional special devices available upon request.

| Table 1: | Table 1: Dimensions Dimensions in mm / inches | | | | | | | |
|-----------|---|------------|-------------|-------------|-------------|-------------|-------------|--|
| To selec | To select the nominal size (DN), use the flow capacity chart on the following page. | | | | | | | |
| DN | 50 / 2" | 80 / 3" | 100 / 4" | 150 / 6" | 200 / 8" | 250 / 10" | 300 / 12" | |
| а | 140 / 5.51 | 170 / 6.69 | 190 / 7.48 | 230 / 9.06 | 300 / 11.81 | 325 / 12.80 | 425 / 16.73 | |
| b | 75 / 2.95 | 85 / 3.35 | 95 / 3.74 | 120 / 4.72 | 140 / 5.51 | 165 / 6.50 | 205 / 8.07 | |
| с | 205 / 8.07 | 205 / 8.07 | 285 / 11.22 | 360 / 14.17 | 405 / 15.94 | 460 / 18.11 | 500 / 19.69 | |
| d | 170 / 6.69 | 235 / 9.25 | 280 / 11.02 | 335 /13.19 | 445 / 17.52 | 505 / 19.88 | 505 / 19.88 | |
| е | 215 / 8.46 | 215 / 8.46 | 255 / 10.04 | 335 / 13.19 | 425 / 16.73 | 460 / 18.11 | 625 / 24.61 | |
| Dimension | Dimensions for vacuum relief valve with heating jacket upon request. | | | | | | | |

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Vents - 10% Technology (Flyer pdf)

Leak Rate/10% Technology (Flyer pdf)

The optimized valve pallet (Flyer pdf)

| Table 2: Material selection for housing | | | | | | |
|---|-----------------|------------------------------------|-----------------|--|--|--|
| Design | В | С | D* | | | |
| Housing Heating jacket (SV/E-1-0-H) | Steel Steel | Stainless Steel Stainless Steel | Aluminum – | The housings are also available with an ECTFE-coating. | | |
| Valve seat | Stainless Steel | Stainless Steel | Stainless Steel | Special materials upon request. | | |
| Sealing | PTFE | PTFE | PTFE | | | |
| Design D upon request | | | | | | |

esign D upon request.

| Table 3: Material selection for vacuum valve pallet | | | | | | | |
|---|------------------------------------|------------------------------------|-----------------------------------|----------------------------------|-----------------------------------|----------------------------------|--|
| Design | А | В | С | D | E | F | |
| vacuum range (mbar) (inch W.C.) | -2.0 up to -3.5 -0.8 up to -1.4 | <-3.5 up to -14 <-1.4 up to 5.6 | <-14 up to -35 <-5.6 up to -14 | <-35 up to -60 <-14 up to -24 | <-14 up to -35 <-5.6 up to -14 | <-35 up to -60 <-14 up to -24 | |
| Valve pallet | Aluminum | Stainless Steel | Stainless Steel | Stainless Steel | Stainless Steel | Stainless Steel | |
| Sealing | FEP | FEP | Metal to Metal | Metal to Metal | PTFE | PTFE | |

Special materials (Alu-coated, Titanium, Hastelloy) and higher vacuum settings are available upon request.

| Table 4: Flange connection type | |
|---------------------------------|---------------------------|
| EN 1092-1; Form B1 | Other turner upon request |
| ASME B16.5 CL 150 R.F. | Other types upon request. |

Flow Capacity Chart

KA / 5 / 0620 / GB



The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig. Volume flow V in (m³/h) and CFH refer to the standard reference conditions of air in ISO 6358 (20°C, 1bar). For conversion to other densities and temperatures, refer to Sec. 1: "Technical Fundamentals."



for safety and environment





PROTEGO® SV/T-0-H



Vacuum settings:

-7 mbar up to -50 mbar -2.8 inch W.C. up to -20 inch W.C. Higher and lower vacuum settings upon request.

Function and Description

The SV/T-0-H type PROTEGO® valve is a highly developed vacuum relief valve with a valve housing that is equipped with a heating jacket that can be heated up to the flange. It is primarily used as a safety device for in-breathing in tanks, containers, and process engineering equipment under difficult operating conditions. This includes extreme weather conditions or products that tend to form polymers at certain temperatures, stick together, or form deposits that negatively influence function (such as bitumen, tar, dust). The valve offers reliable protection against vacuum and prevents air intake almost up to the set vacuum.

When the set vacuum is reached, the valve starts to open and reaches full lift within a 40% vacuum increase. Up to the set vacuum, the tank vacuum is maintained with a seal that is far superior to the conventional standard due to the highly developed manufacturing technology. This feature is achieved by valve seats made of high quality stainless steel with precisely lapped valve pallets and a sturdy housing design. After the vacuum is released, the valve re-seats and again provides a tight seal.

Special Features and Advantages

- excellent tightness resulting in lowest possible product losses and reduced environmental pollution
- high flow capacity
- valve pallet is guided inside the housing to protect against harsh weather conditions
- can be used in explosion hazardous areas
- complete heating jacket up to the flange to avoid ice build-up
- maximum allowable heating medium temperature of 320°C / 608°F (at 6 bar/87 psi)
- · a special design that preheats incoming air is also available
- · available in a special design with a heatable valve cover
- a valve pallet cover prevents the adjustment of the set pressure due to dust deposits or condensate
- · sturdy housing design
- available in a special design with lifting device

Design Types and Specifications

The valve pallet is weight-loaded.

| Vacuum valve in basic design with heating | SV/T - 0 - H |
|---|--------------|
| jacket | |

Additional special devices available upon request.

| Table 1: Dime | Table 1: Dimensions Dimensions in mm / inches | | | | | | |
|--|---|-------------|-------------|-------------|--------------|--|--|
| To select the nominal size (DN), use the capacity chart on the following page. | | | | | | | |
| DN1 | 80 / 3" * | 100 / 4" | 150 / 6" | 200 / 8" | 250 / 10" | | |
| DN2 | 15 / ½" | 15 / ½" | 15 / 1⁄2" | 15 / ½" | 15 / ½" | | |
| а | 570 / 22.44 | 570 / 22.44 | 720 / 28.35 | 920 / 36.22 | 1050 / 41.34 | | |
| b | 275 / 10.83 | 275 / 10.83 | 355 / 13.98 | 405 / 15.94 | 508 / 20.00 | | |
| с | 70 / 2.76 | 70 / 2.76 | 60 / 2.36 | 70 / 2.76 | 70 / 2.76 | | |
| d | 440 / 17.32 | 440 / 17.32 | 590 / 23.23 | 790 / 31.10 | 920 / 36.22 | | |
| e | 450 / 17.72 | 450 / 17.72 | 650 / 25.59 | 750 / 29.53 | 950 / 37.40 | | |
| f | 225 / 8.86 | 225 / 8.86 | 260 / 10.24 | 300 / 11.91 | 350 / 13.78 | | |

* Also available with special flange DN 50 / 2"

| Table 2: Material selection for housing | | | | | |
|---|-----------------|------------------------------------|---------------------------------|--|--|
| Design | А | В | | | |
| Housing Heating jacket | Steel Steel | Stainless Steel Stainless Steel | Special materials upon request. | | |
| Valve seat | Stainless Steel | Stainless Steel | | | |
| Sealing | PTFE | PTFE | | | |

| Table 3: Material selection for vacuum valve pallet | | | | | | | |
|---|----------------------------------|---------------------------------|--------------------------------|--------------------------------------|--|--|--|
| Design | А | В | С | | | | |
| Vacuum range (mbar) (inch W.C.) | -7.0 up to -25 -2.8 up to -10 | -10 up to -30 -4.0 up to -12 | -30 up to -50 -12 up to -20 | Special materials and other vacuum | | | |
| Valve pallet | Aluminum | Stainless Steel | Stainless Steel | settings are available upon request. | | | |
| Valve pallet hood | Stainless Steel | Stainless Steel | Stainless Steel | | | | |
| Sealing | Metal to Metal | Metal to Metal | Metal to Metal | | | | |

Table 4: Flange connection type

EN 1092-1; Form B1 ASME B16.5 CL 150 R.F.

Other types upon request.





PROTEGO[®] SV/T-0-H



Remark

opening pressure resp. tank design pressure

1.4

Set pressure = the valve starts to open

Opening pressure = set pressure plus overpressure

Overpressure = pressure increase over the set pressure

set pressure =

The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig. Volume flow \dot{V} in (m³/h) and CFH refer to the standard reference conditions of air in ISO 6358 (20°C, 1bar). For conversion to other densities and temperatures, refer to Sec. 1: "Technical Fundamentals."

Notes:









PROTEGO® V/KSM



Vacuum settings:

| -6.0 mbar | up to -100 mbar (DN 50/2") |
|----------------|---------------------------------------|
| -2.4 inch W.C. | up to -40 inch W.C. |
| -4.0 mbar | up to -100 mbar (DN 80/3") |
| -1.6 inch W.C. | up to -40 inch W.C. |
| -4.5 mbar | up to -100 mbar (DN 100/4" - DN 200/8 |
| -1.8 inch W.C. | up to -40 inch W.C. |

Higher pressure settings upon request.

Function and Description

The PROTEGO[®] valve V/KSM is a state-of-the-art vacuum relief valve with excellent flow performance made of high-grade synthetic material. It is used as a safety device to relieve vacuum in tanks, containers, and process engineering equipment. It prevents the in-breathing of air until reaching the set pressure. The valve is a perfect solution for corrosive, polymerizing, or sticky substances.

The device will start to open as soon as the set pressure is reached and is fully open within 10% pressure increase. Continuous investments in and a commitment to research and development have allowed PROTEGO® to develop a low

pressure valve which has the same opening characteristic as a high pressure safety relief valve. This "full lift type" technology allows the valve to be set at just 10% below the maximum allowable working vacuum (MAWV) of the tank and still safely vent the required mass flow.

Due to our highly developed manufacturing technology, the tank pressure is maintained up to the set pressure with a seal that is far superior to the conventional standard. This feature is achieved by valve seats made of high-performance plastics and a high grade PTFE seal. After the vacuum is released, the valve re-seats and provides a tight seal.

The optimized fluid dynamic design of the valve body and valve pallet is a result of many years of research, resulting in a stable operation of the valve pallet, optimized performance, and reduced product losses.

Special Features and Advantages

- · 10% technology for minimum pressure increase up to full lift
- extreme tightness, resulting in lowest possible product losses and reduced environmental pollution
- set pressure close to opening pressure for optimum pressure maintenance in the system
- valve pallet is guided inside the housing to protect against harsh weather conditions
- non-corrosive
- especially suitable for aggressive, sticky, or polymerizing substances
- · weight reduction in comparison to steel/stainless steel
- high surface quality
- · automatic condensate drain
- different plastics can easily be combined
- maintenance-friendly design

Design Types and Specifications

The valve pallet is weight-loaded, and the highest pressure levels are only achieved with metal discs.

Vacuum valve in basic design V/KSM-

Additional special devices available upon request.

Table 1: Dimensions

To select the nominal size (DN), use the flow capacity chart on the following page. 50 / 2" 80 / 3" 100 / 4" 200 / 8" DN 150 / 6" 87 / 3.43 126 / 4.96 180 / 7.09 а 57 / 2.24 77 / 3.03 (115 / 4.53)* (146 / 5.75)* (175 / 6.89)* 373 / 14.69 460 / 18.11 469 / 18.46 259 / 10.20 376 / 14.80 b (338 / 13.31)* (427 / 16.81)* (437 / 17.20)* 150 / 5.91 225 / 8.86 350 / 13.78 С 200 / 7.87 280 / 11.02 350 / 13.78 560 / 22.05 d 180 / 7.09 250 / 9.84 300 / 11.81 (500 / 19.68)* (405 / 15.94)*

* Dimensions in parentheses are for devices made of PVDF.

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Dimensions in mm / inches







Vents for corrosive vapor service (Flyer pdf)

Vents - 10% Technology (Flyer pdf)

Leak Rate/10% Technology (Flyer pdf)

| Table 2: Material selection for | r housing | | | |
|---------------------------------|-----------|---------|------|------------|
| Design | А | В | С | |
| Housing | PE | PP | PVDF | |
| Valve seat | PE | PP | PVDF | Special ma |
| Sealing | FPM | FPM | FPM | |
| Valve pallet | A, C, D | B, C, D | C, D | |

aterials upon request.

ś

| Table 3: Material selection for vacuum valve pallet | | | | | |
|---|-----------------------------------|-----------------------------------|----------------------------------|---------------------------------|--|
| Design | А | В | С | D | |
| Vacuum range (mbar) (inch W.C.) | -6.0 up to -16 -2.4 up to -6.4 | -5.5 up to -16 -2.2 up to -6.4 | -9.5 up to -30 -3.8 up to -12 | -30 up to -100 -12 up to -40 | |
| Valve pallet | PE | PP | PVDF | Hastelloy | |
| Sealing | PTFE | PTFE | PTFE | PTFE | |
| Spindle guide | PE | PP | PVDF | Hastelloy | |
| Weight | PE | PP | PVDF | Hastelloy | |

Special materials and other vacuum settings are available upon request.

| Table 4: Flange connection type | |
|---------------------------------|---------------------------|
| EN 1092-1; Form A | Other types upon request |
| ASME B16.5 CL 150 F.F. | Other types upon request. |

Flow Capacity Chart



The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig. Volume flow V in (m³/h) and CFH refer to the standard reference conditions of air in ISO 6358 (20°C, 1bar). For conversion to other densities and temperatures, refer to Sec. 1: "Technical Fundamentals."



PROTEGO

for safety and environment

vacuum - inch W.C.





PROTEGO[®] PV/EL



| Detail X | |
|-----------------|--|
| _ | |

Settings:

| Pressure: | +2.0 mbar | up to | +210 mbar |
|-----------|----------------|-------|----------------|
| | +0.8 inch W.C. | up to | +84 inch W.C. |
| Vacuum: | -14 mbar | up to | -35 mbar |
| | -5.6 inch W.C. | up to | -14 inch W.C. |
| vacuum: | -3.5 mbar | up to | -14 mbar |
| | -1.4 inch W.C. | up to | -5.6 inch W.C. |

for presssure up to max. + 150 mbar / 60.2 inch W.C. Higher and lower settings upon request.

Function and Description

The PV/EL type PROTEGO[®] valve is a highly developed combined pressure and vacuum relief valve. It is primarily used as a safety device for relieving pressure and vacuum in tanks, containers, and process engineering equipment. The valve offers reliable protection against unallowable overpressure and underpressure. Product loss close to the set pressure is avoided and unallowable product entry is prevented.

The device will start to open as soon as the set pressure is reached and only requires 10% overpressure to full lift. Continuous investments in and a commitment to research and development have allowed PROTEGO[®] to develop a low pressure valve which has the same opening characteristic as a high pressure safety relief valve. This "full lift type" technology allows the valve to be set at just 10% below the maximum allowable working pressure or vacuum (MAWP or MAWV) of the tank and still safely vent the required mass flow. The opening characteristic is the same for pressure and vacuum relief.

Due to the highly developed manufacturing technology, the tank pressure is maintained up to the set pressure with a tightness that is far superior to the conventional standard. This feature is achieved by valve seats made of high quality stainless steel and with precisely lapped valve pallets (1) or with an air cushion seal (2) in conjunction with high quality FEP diaphragm. The valve pallets are also available with a PTFE seal to prevent the valve pallet from sticking when sticky products are used, and they enable the use of corrosive substances. After the overpressure is released or the vacuum is balanced, the valve re-seats and provides a tight seal.

The optimized fluid dynamic design of the valve body and valve pallet is a result of many years of research, resulting in a stable operation of the valve pallet, optimized performance, and reduced product losses.

Special Features and Advantages

- · 10% technology for minimum pressure increase up to full lift
- extreme tightness, resulting in lowest possible product losses and reduced environmental pollution
- set pressure close to opening pressure for optimum pressure maintenance in the system
- · high flow capacity
- valve pallet is guided inside the housing to protect against harsh weather conditions
- · can be used in explosion hazardous areas
- · automatic condensate drain
- available in a special design with lifting device
- · maintenance-friendly design

Design Types and Specifications

The valve pallets are weight-loaded. At set pressures greater than 60 mbar (24.1 inch W.C.), an extended design is used.

There are two different designs

| Pressure/vacuum relief valve in basic design | PV/EL - 🗕 |
|--|-----------|
|--|-----------|

Pressure/vacuum relief valve with heating jacket **PV/EL** - **H**

Additional special devices available upon request.

Any combination of vacuum and pressure levels is possible. When the difference between the pressure and vacuum exceeds 150 mbar / 60.2 inch W.C., special valve pallets are used.





Vents - 10% Technology (Flyer pdf)

Leak Rate/10% Technology (Flyer pdf)



The optimized valve pallet (Flyer pdf)

Dimensions in mm / inches

| Table 1: Dime | Dimensions in mm / inches | | | | | |
|--|---------------------------------|---------------------------------|---------------------------------|---------------------------------|------------------------------|--|
| To select the nominal size (DN), please use the flow capacity charts on the following pages. | | | | | | |
| DN | 50 / 2" | 50 / 2" | 80 / 3" | 80 / 3" | | |
| Set pressure | ≤ +60 mbar ≤ +24.1 inch W.C. | > +60 mbar > +24.1 inch W.C. | ≤ +60 mbar ≤ +24.1 inch W.C. | > +60 mbar > +24.1 inch W.C. | Dimensions for pressure/ | |
| а | 308 / 12.13 | 443 / 17.44 | 308 / 12.13 | 443 / 17.44 | vacuum relief valve with | |
| b | 108 / 4.25 | 108 / 4.25 | 108 / 4.25 | 108 / 4.25 | heating jacket upon request. | |
| с | 165 / 6.50 | 165 / 6.50 | 167 / 6.57 | 167 / 6.57 | | |
| d | 218 / 8.58 | 218 / 8.58 | 218 / 8.58 | 218 / 8.58 | | |

| Table 2: Material selection for housing | | | | | |
|---|-----------------|------------------------------------|---------------------------------|--|--|
| Design | В | С | | | |
| Housing Heating jacket (PV/EL-H) | Steel Steel | Stainless Steel Stainless Steel | | | |
| Valve seat | Stainless Steel | Stainless Steel | Special materials upon request. | | |
| Weather hood | Steel | Stainless Steel | | | |
| Protective mesh screen | Stainless Steel | Stainless Steel | | | |

| Table 3: Material selection for pressure valve pallet | | | | | | |
|---|------------------------------------|-------------------------------------|------------------------------------|------------------------------------|-----------------------------|--|
| Design | А | В | С | D | | |
| Pressure range (mbar) (inch W.C.) | +2.0 up to +3.5 +0.8 up to +1.4 | >+3.5 up to +14 >+1.4 up to +5.6 | >+14 up to +210 >+5.6 up to +84 | >+14 up to +210 >+5.6 up to +84 | Special material and higher | |
| Valve pallet | Aluminum | Stainless Steel | Stainless Steel | Stainless Steel | set pressure upon request. | |
| Sealing | FEP | FEP | Metal to Metal | PTFE | | |

| Table 4: Material selection for vacuum valve pallet | | | | | | | | |
|---|------------------------------------|-------------------------------------|-----------------------------------|-----------------------------------|-----------------------------|--|--|--|
| Design | А | В | С | D | | | | |
| Vacuum range (mbar) (inch W.C.) | -3.5 up to -5.0 -1.4 up to -2.0 | <-5.0 up to -14 <-2.0 up to -5.6 | <-14 up to -35 <-5.6 up to -14 | <-14 up to -35 <-5.6 up to -14 | Special material and higher | | | |
| Valve pallet | Aluminum | Stainless Steel | Stainless Steel | Stainless Steel | set vacuum upon request. | | | |
| Sealing | FEP | FEP | Metal to Metal | PTFE | | | | |

| Table 5: Flange connection type |
|---------------------------------|
| EN 1092-1: Form B1 |

ASME B16.5 CL 150 R.F.

Other types upon request.





Flow Capacity Charts

PROTEGO® PV/EL







The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig. Volume flow \dot{V} in (m³/h) and CFH refer to the standard reference conditions of air in ISO 6358 (20°C, 1bar). For conversion to other densities and temperatures, refer to Sec. 1: "Technical Fundamentals."

Notes:









PROTEGO® PV/ELR



Settings:

| Pressure: | +2.0 mbar | up to | +210 mbar |
|-----------|----------------|-------|----------------|
| | +0.8 inch W.C. | up to | +84 inch W.C. |
| Vacuum: | -14 mbar | up to | -50 mbar |
| | -5.6 inch W.C. | up to | -20 inch W.C. |
| Vacuum: | -3.5 mbar | up to | -14 mbar |
| | -1.4 inch W.C. | up to | -5.6 inch W.C. |

for presssure up to max. + 150 mbar / 60.2 inch W.C. Higher and lower settings upon request.

Function and Description

The PV/ELR type PROTEGO[®] valve is a highly developed combined pressure and vacuum relief valve with excellent flow performance. Typically, the valve is installed in the in-breathing and out-breathing lines of tanks, vessels, and process equipment to protect against unallowable overpressure and underpressure. The valve prevents emission losses almost up to the set pressure and air intake almost up to the set vacuum.

The device will start to open as soon as the set pressure is reached and only requires 10% overpressure to full lift. Continuous investments in and a commitment to research and development have allowed PROTEGO[®] to develop a low pressure valve which has the same opening characteristic as a high pressure safety relief valve. This "full lift type" technology allows the valve to be set at just 10% below the maximum allowable working pressure or vacuum (MAWP or MAWV) of the tank and still safely vent the required mass flow. The opening characteristic is the same for pressure and vacuum relief.

Due to the highly developed manufacturing technology, the tank pressure is maintained up to the set pressure, with a tightness that is far superior to the conventional standard. This feature is achieved by valve seats made of high quality stainless steel and with precisely lapped valve pallets (1) or with an air cushion seal (2) in conjunction with high quality FEP diaphragm. The valve pallets are also available with a PTFE seal to prevent the valve pallet from sticking when sticky products are used, and they enable the use of corrosive substances. After the overpressure is released or the vacuum is balanced, the valve re-seats and provides a tight seal.

The optimized fluid dynamic design of the valve body and valve pallet is a result of many years of research, resulting in a stable operation of the valve pallet, optimized performance, and reduced product losses.

Special Features and Advantages

- · 10% technology for minimum pressure increase up to full lift
- extreme tightness, resulting in lowest possible product losses and reduced environmental pollution
- set pressure close to opening pressure for optimum pressure maintenance in the system
- · high flow capacity
- valve pallet is guided inside the housing to protect against harsh weather conditions
- · can be used in explosion hazardous areas
- automatic condensate drain
- compact, space-saving design
- · available in a special design with lifting device
- · maintenance-friendly design

Design Types and Specifications

The valve pallets are weight-loaded. At set pressures greater than 35 mbar (14 inch W.C.), an extended design is used.

There are two different designs:

Pressure/vacuum relief valve in basic design

PV/ELR - -PV/ELR - H

Pressure/vacuum relief valve with heating jacket **PV/ELR - H**

Additional special devices available upon request.

Any combination of vacuum and pressure levels is possible. When the difference between the pressure and vacuum exceeds 150 mbar / 60.2 inch W.C., special valve pallets are used.





Vents - 10% Technology (Flyer pdf)

Leak Rate/10% Technology (Flyer pdf)



The optimized valve pallet (Flyer pdf)

Dimensions in mm / inches

| Table 1: Dimensions Dimensions in mm / inches | | | | | | | | | |
|--|-------------------------------|-------------------------------|-------------------------------|-------------------------------|------------------------------|--|--|--|--|
| To select the nominal size (DN), please use the flow capacity charts on the following pages. | | | | | | | | | |
| DN | 80 / 3" | 80 / 3" | 100 / 4" | 100 / 4" | | | | | |
| Set pressure | ≤ +35 mbar ≤ +14 inch W.C. | > +35 mbar > +14 inch W.C. | ≤ +35 mbar ≤ +14 inch W.C. | > +35 mbar > +14 inch W.C. | Dimensions for pressure/ | | | | |
| а | 345 / 13.58 | 475 / 18.70 | 345 / 13.58 | 475 / 18.70 | vacuum relief valve with | | | | |
| b | 146 / 5.75 | 146 / 5.75 | 146 / 5.75 | 146 / 5.75 | heating jacket upon request. | | | | |
| с | 218 / 8.58 | 218 / 8.58 | 218 / 8.58 | 218 / 8.58 | | | | | |
| d | 353 / 13.90 | 353 / 13.90 | 353 / 13.90 | 353 / 13.90 | | | | | |

| Table 2: Material selection for housing | | | | | | | |
|---|-----------------|------------------------------------|---------------------------------|--|--|--|--|
| Design | В | С | | | | | |
| Housing Heating jacket (PV/ELR-H) | Steel Steel | Stainless Steel Stainless Steel | | | | | |
| Valve seat | Stainless Steel | Stainless Steel | Special materials upon request. | | | | |
| Weather hood | Steel | Stainless Steel | | | | | |
| Protective mesh screen | Stainless Steel | Stainless Steel | | | | | |

| Table 3: Material selection for pressure valve pallet | | | | | | | | |
|---|------------------------------------|-------------------------------------|------------------------------------|------------------------------------|-----------------------------|--|--|--|
| Design | А | В | С | D | | | | |
| Pressure range (mbar) (inch W.C.) | +2.0 up to +3.5 +0.8 up to +1.4 | >+3.5 up to +14 >+1.4 up to +5.6 | >+14 up to +210 >+5.6 up to +84 | >+14 up to +210 >+5.6 up to +84 | Special material and higher | | | |
| Valve pallet | Aluminum | Stainless Steel | Stainless Steel | Stainless Steel | set pressure upon request. | | | |
| Sealing | FEP | FEP | Metal to Metal | PTFE | | | | |

| Table 4: Material selection for vacuum valve pallet | | | | | | | | |
|---|------------------------------------|-------------------------------------|-----------------------------------|-----------------------------------|-----------------------------|--|--|--|
| Design | А | В | С | D | | | | |
| Vacuum range (mbar) (inch W.C.) | -3.5 up to -5.0 -1.4 up to -2.0 | <-5.0 up to -14 <-2.0 up to -5.6 | <-14 up to -50 <-5.6 up to -20 | <-14 up to -50 <-5.6 up to -20 | Special material and higher | | | |
| Valve pallet | Aluminum | Stainless Steel | Stainless Steel | Stainless Steel | set vacuum upon request. | | | |
| Sealing | FEP | FEP | Metal to Metal | PTFE | | | | |

| Table 5: Flange connection type | |
|---------------------------------|---------------------------|
| EN 1092-1; Form B1 | Other types upon request |
| ASME B16.5 CL 150 R.F. | Other types upon request. |



KA / 5 / 0320 / GB



Flow Capacity Charts

PROTEGO® PV/ELR



The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig. Volume flow \dot{V} in (m³/h) and CFH refer to the standard reference conditions of air in ISO 6358 (20°C, 1bar). For conversion to other densities and temperatures, refer to Sec. 1: "Technical Fundamentals."

Notes:





Pressure and Vacuum Relief Valve



PROTEGO[®] VD/SV





Function and Description

The VD/SV type PROTEGO[®] valve is a highly developed pressure and vacuum relief valve with excellent flow performance. Typically, the valve is installed in the in-breathing and out-breathing lines of tanks, vessels, and process equipment to protect against unallowable overpressure and underpressure. The valve prevents emission losses almost up to the set pressure and prevents air intake almost up to the set vacuum.

The device will start to open as soon as the set pressure is reached and only requires 10% overpressure to full lift. Continuous investments in and a commitment to research and development have allowed PROTEGO® to develop a low pressure valve which has the same opening characteristic as a high pressure safety relief valve. This "full lift type" technology allows the valve to be set at just 10% below the maximum allowable working pressure or vacuum (MAWP or MAWV) of the tank and still safely vent the required mass flow. The opening characteristic is the same for pressure and vacuum relief.

Due to our highly developed manufacturing technology, the tank pressure is maintained up to set pressure with a tightness that is far superior to the conventional standard. This feature is achieved by valve seats made of high quality stainless steel and with precisely lapped valve pallets (1) or with an air cushion seal (2) in conjunction with high quality FEP diaphragm. The valve pallets are also available with a PTFE seal to prevent the them from sticking when sticky products are used and to enable the use of corrosive substances. After the overpressure is released or the vacuum is balanced, the valve re-seats and provides a tight seal.

The optimized fluid dynamic design of the valve body and valve pallet is a result of many years of research, resulting in a stable operation of the valve pallet, optimized performance, and reduced product losses.

Special Features and Advantages

- · 10% technology for minimum pressure increase up to full lift
- extreme tightness, resulting in lowest possible product losses and reduced environmental pollution
- set pressure close to opening pressure for optimum pressure maintenance in the system
- · very high flow capacity
- valve pallet is guided inside the housing to protect against harsh weather conditions
- · can be used in explosion hazardous areas
- automatic condensate drain
- · maintenance-friendly design
- · best technology for API tanks

Design Types and Specifications

The valve pallets are weight-loaded. Higher pressures with a special spring-loaded design upon request.

There are two different designs:

Pressure/vacuum valve in basic design

Pressure/vacuum relief valve with heating jacket VD/SV-H

Additional special devices available upon request.

Any combination of vacuum and pressure levels is possible. When the difference between the pressure and vacuum exceeds 150 mbar / 60.2 inch W.C., special valve pallets are used.

VD/SV- -





Vents - 10% Technology (Flyer pdf) Leak Rate/10% Technology (Flyer pdf)





The optimized valve pallet (Flyer pdf)

Dimensions in mm / inches

Table 1: Dimensions

| To select the nominal size (DN), use the flow capacity chart on the following page. | | | | | | | | |
|---|-------------|-------------|-------------|-------------|-------------|-------------|--------------|--------------|
| DN | 40 / 1 1⁄2" | 50 / 2" | 80 / 3" | 100 / 4" | 150 / 6" | 200 / 8" | 250 / 10" | 300 / 12" |
| а | 396 / 15.59 | 396 / 15.59 | 497 / 19.57 | 519 / 20.43 | 654 / 25.75 | 757 / 29.80 | 802 / 31.57 | 802 / 31.57 |
| b | 355 / 13.98 | 355 / 13.98 | 448 / 17.64 | 548 / 21.57 | 788 / 31.02 | 900 / 35.43 | 1030 / 40.55 | 1030 / 40.55 |
| с | 200 / 7.87 | 200 / 7.87 | 295 / 11.61 | 295 / 11.61 | 465 / 18.31 | 550 / 21.65 | 650 / 25.59 | 650 / 25.59 |

Dimensions of pressure and vacuum relief valves with heating jacket upon request.

| Table 2: Material selection for housing | | | | | | | | |
|---|-----------------|-----------------|------------------------------------|---|--|--|--|--|
| Design | А | В | С | | | | | |
| Housing Heating jacket (VD/SV-H) | Aluminum – | Steel Steel | Stainless Steel Stainless Steel | The housings are also available with an | | | | |
| Valve seat | Stainless Steel | Stainless Steel | Stainless Steel | ectre-coating. | | | | |
| Sealing | PTFE | PTFE | PTFE | Special materials upon request. | | | | |
| Weather hood | Stainless Steel | Stainless Steel | Stainless Steel | | | | | |

| Table 3: Material selection for pressure valve pallet | | | | | | | | |
|---|------------------------------------|-------------------------------------|-----------------------------------|----------------------------------|-----------------------------------|----------------------------------|--|--|
| Design | А | В | С | D | E | F | | |
| Pressure range (mbar) (inch W.C.) | +2.0 up to +3.5 +0.8 up to +1.4 | >+3.5 up to +14 >+1.4 up to +5.6 | >+14 up to +35 >+5.6 up to +14 | >+35 up to +60 >+14 up to +24 | >+14 up to +35 >+5.6 up to +14 | >+35 up to +60 >+14 up to +24 | | |
| Valve pallet | Aluminum | Stainless Steel | Stainless Steel | Stainless Steel | Stainless Steel | Stainless Steel | | |
| Sealing | FEP | FEP | Metal to Metal | Metal to Metal | PTFE | PTFE | | |

Special material and higher set pressure upon request.

| Table 4: Material selection for vacuum valve pallet | | | | | | | | | |
|---|------------------------------------|-------------------------------------|-----------------------------------|-----------------------------------|----------------------------------|----------------------------------|--|--|--|
| Design | А | В | С | D | E | F | | | |
| Vacuum range (mbar) (inch W.C.) | -2.0 up to -3.5 -0.8 up to -1.4 | <-3.5 up to -14 <-1.4 up to -5.6 | <-14 up to -35 <-5.6 up to -14 | <-14 up to -35 <-5.6 up to -14 | <-35 up to -60 <-14 up to -24 | <-35 up to -60 <-14 up to -24 | | | |
| Valve pallet | Aluminum | Stainless Steel | Stainless Steel | Stainless Steel | Stainless Steel | Stainless Steel | | | |
| Sealing | FEP | FEP | Metal to Metal | PTFE | Metal to Metal | PTFE | | | |

Special material and higher vacuum upon request.

Table 5: Flange connection type

| ΕN | 1092-1; | Form B | 1 |
|----|---------|--------|---|
| | | | |

ASME B16.5 CL 150 R.F.

Other types upon request.



Pressure and Vacuum Relief Valve



Flow Capacity Charts

PROTEGO® VD/SV



The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig. Volume flow \dot{V} in (m³/h) and CFH refer to the standard reference conditions of air in ISO 6358 (20°C, 1bar). For conversion to other densities and temperatures, refer to Sec. 1: "Technical Fundamentals."

Notes:







with Pipe-Away Connection



PROTEGO® VD/SV-PA(L)



Function and Description

The VD/SV-PA(L) type PROTEGO[®] valve is a highly developed pressure and vacuum relief valve with excellent flow performance. Typically, the valve is installed in the in-breathing and out-breathing lines of tanks, vessels, and process equipment to protect against unallowable overpressure and underpressure. The valve prevents emission losses almost up to the set pressure and prevents air intake almost up to the set vacuum. The product vapors can be released through a collective line connected to the line flange on the pressure side.

The device will start to open as soon as the set pressure is reached and only requires 10% overpressure to full lift. Continuous investments in and a commitment to research and development have allowed PROTEGO® to develop a low pressure valve which has the same opening characteristic as a high pressure safety relief valve. This "full lift type" technology allows the valve to be set at just 10% below the maximum allowable working pressure or vacuum (MAWP or MAWV) of the tank and still safely vent the required mass flow. The opening characteristic is the same for pressure and vacuum relief.

Due to our highly developed manufacturing technology, the tank pressure is maintained up to set pressure with a tightness that is far superior to the conventional standard. This feature is valve seats made of high quality stainless steel and achieved by valve seats made of high quality stainless steel and with precisely lapped valve pallets (1) or with an air cushion seal (2) in conjunction with high quality FEP diaphragm. The valve pallets are also available with a PTFE seal to prevent the valve pallets from sticking when sticky products are used and to enable the use of corrosive substances. After the excess pressure is released or the vacuum is balanced, the valve reseats and provides a tight seal.

The optimized fluid dynamic design of the valve body and valve pallet is a result of many years of research, resulting in a stable operation of the valve pallet, optimized performance, and reduced product losses.

Special Features and Advantages

- 10% technology for minimum pressure increase up to full lift
- extreme tightness, resulting in lowest possible product losses and reduced environmental pollution
- set pressure close to opening pressure for optimum pressure maintenance in the system
- · very high flow capacity
- · can be used in explosion hazardous areas
- · automatic condensate drain
- · maintenance-friendly design
- best technology for API tanks

Design Types and Specifications

The valve pallets are weight-loaded. Higher pressures with a special spring-loaded design are available. Choose the model (L) if the discharge nozzle has a nominal diameter that is greater than the nominal diameter of the tank filler neck.

| I here are four different designs: | |
|---|--------------|
| Pressure/vacuum valve in basic design | VD/SV-PA |
| Pressure/vacuum valve with heating jacket | VD/SV-PA - H |
| Pressure/vacuum relief valve with DN2 > DN1 | VD/SV-PAL |
| Pressure/vacuum relief valve with DN2 > DN1 with heating jacket | VD/SV-PAL- H |

Additional special devices available upon request.

Any combination of vacuum and pressure is possible. When the difference between the pressure and vacuum exceeds 150 mbar (60.2 inch W.C.), special valve pallets are used.



(Flyer pdf)



Vents - 10% Technology

Leak Rate/10% Technology (Flyer pdf)



Coated Devices (Flyer pdf)



The optimized valve pallet (Flyer pdf)

Dimensions in mm / inches

Table 1: Dimensions

To select the nominal size (DN), use the flow capacity chart on the following page. VD/SV-PA

| DN 1 | 50 / 2" | 80 / 3" | 100 / 4" | 150 / 6" | 200 / 8" | 250 / 10" | 300 / 12" |
|-----------|-------------|-------------|-------------|-------------|-------------|--------------|--------------|
| DN 2 | 50 / 2" | 80 / 3" | 100 / 4" | 150 / 6" | 200 / 8" | 250 / 10" | 300 / 12" |
| а | 405 / 15.95 | 480 / 18.90 | 600 / 23.62 | 805 / 31.69 | 925 / 36.42 | 1010 / 39.76 | 1010 / 39.76 |
| b | 390 / 15.35 | 485 / 19.09 | 550 / 21.65 | 660 / 25.98 | 780 / 30.71 | 875 / 34.45 | 875 / 34.45 |
| с | 150 / 5.91 | 180 / 7.09 | 200 / 7.87 | 250 / 9.84 | 300 / 11.81 | 305 / 12.01 | 305 / 12.01 |
| d | 240 / 9.45 | 300 / 11.81 | 330 / 12.99 | 390 / 15.35 | 480 / 18.90 | 555 / 21.85 | 582 / 22.91 |
| е | 165 / 6.50 | 192 / 7.56 | 240 / 9.45 | 350 / 13.78 | 390 / 15.35 | 460 / 18.11 | 460 / 18.11 |
| VD/SV-PAL | | | | | | | |
| DN 1 | 50 / 2" | 80 / 3" | 100 / 4" | 150 / 6" | 200 / 8" | 250 / 10" | 300 / 12" |
| DN 2 | 80 / 3" | 100 / 4" | 150 / 6" | 200 / 8" | 250 / 10" | 300 / 12" | 350 / 14" |
| а | 395 / 15.55 | 445 / 17.52 | 565 / 22.24 | 770 / 30.31 | 895 / 35.24 | 1010 / 39.76 | 1010 / 39.76 |
| b | 400 / 15.74 | 485 / 19.09 | 550 / 21.65 | 655 / 25.79 | 775 / 30.51 | 875 / 34.45 | 885 / 34.45 |
| с | 140 / 5.51 | 143 / 5.63 | 165 / 6.50 | 216 / 8.50 | 267 / 10.51 | 305 / 12.01 | 305 /12.01 |
| d | 255 / 10.04 | 308 / 12.13 | 355 / 13.98 | 417 / 16.42 | 505 / 19.88 | 582 / 22.91 | 603 / 23.74 |
| e | 165 / 6.50 | 192 / 7.56 | 240 / 9.45 | 350 / 13.78 | 390 /15.35 | 460 / 18.11 | 460 / 18.11 |

Dimensions of pressure and vacuum relief valves with heating jacket upon request.

| Table 2: Material selection for housing | | | | | | | |
|---|-----------------|-----------------|------------------------------------|--|--|--|--|
| Desing | А | В | С | | | | |
| Housing Heating jacket (VD/SV-PA(L)-H) | Aluminum – | Steel Steel | Stainless Steel Stainless Steel | The housings are also available with an ECTFE-coating. | | | |
| Valve seat | Stainless Steel | Stainless Steel | Stainless Steel | Special materials upon request. | | | |
| Sealing | PTFE | PTFE | PTFE | | | | |

| Table 3: Material selection for pressure valve pallet | | | | | | | |
|---|------------------------------------|-------------------------------------|-----------------------------------|----------------------------------|-----------------------------------|----------------------------------|--|
| Design | А | В | С | D | E | F | |
| Pressure range (mbar) (inch W.C.) | +2.0 up to +3.5 +0.8 up to +1.4 | >+3.5 up to +14 >+1.4 up to +5.6 | >+14 up to +35 >+5.6 up to +14 | >+35 up to +60 >+14 up to +24 | >+14 up to +35 >+5.6 up to +14 | >+35 up to +60 >+14 up to +24 | |
| Valve pallet | Aluminum | Stainless Steel | Stainless Steel | Stainless Steel | Stainless Steel | Stainless Steel | |
| Sealing | FEP | FEP | Metal to Metal | Metal to Metal | PTFE | PTFE | |
| Special material (Alu coater | 1 Titan Hastellov |) and higher set r | pressure upon rec | nuest | | | |

, Titan, Hastelloy) and higher set pressure upon request.

| Table 4: Material selection for vacuum valve pallet | | | | | | | |
|---|------------------------------------|-------------------------------------|-----------------------------------|----------------------------------|-----------------------------------|----------------------------------|--|
| Design | А | В | С | D | E | F | |
| Vacuum range (mbar) (inch W.C.) | -2.0 up to -3.5 -0.8 up to -1.4 | <-3.5 up to -14 <-1.4 up to -5.6 | <-14 up to -35 <-5.6 up to -14 | <-35 up to -60 <-14 up to -24 | <-14 up to +35 <-5.6 up to +14 | <-35 up to -60 <-14 up to -24 | |
| Valve pallet | Aluminum | Stainless Steel | Stainless Steel | Stainless Steel | Stainless Steel | Stainless Steel | |
| Sealing | FEP | FEP | Metal to Metal | Metal to Metal | PTFE | PTFE | |
| nagial material (Alu agatas | Titon Hestelley |) and higher eats | | ueet | | | |

Special material (Alu coated, Titan, Hastelloy) and higher set vacuum upon request.

Table 5: Flange connection type

EN 1092-1; Form B1

ASME B16.5 CL 150 R.F.

Other types upon request.



for safety and environment

Pressure and Vacuum Relief Valve



Flow Capacity Charts

PROTEGO® VD/SV-PA(L)



The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig. Volume flow \dot{V} in (m³/h) and CFH refer to the standard reference conditions of air in ISO 6358 (20°C, 1bar). For conversion to other densities and temperatures, refer to Sec. 1: "Technical Fundamentals."

Flow Capacity Charts

PROTEGO® VD/SV-PA(L)



pressure - inch W.C.



KA / 5 / 0320 / GB



made of plastic

PROTEGO® VD/KSM





Settings:

| Pressure: | | |
|----------------|-------|-----------------------------------|
| +6.0 mbar | up to | +100 mbar (DN 50/2") |
| +2.4 inch W.C. | up to | +40 inch W.C. |
| +4.0 mbar | up to | +100 mbar (DN 80/3") |
| +1.6 inch W.C. | up to | +40 inch W.C. |
| +4.5 mbar | up to | +100 mbar (DN 100/4" - DN 200/8") |
| +1.8 inch W.C. | up to | +40 inch W.C. |
| Vacuum: | | |
| -6.0 mbar | up to | -100 mbar (DN 50/2") |

| -0.0 110ai | upio | |
|-----------------------------|----------------|---------------------------------------|
| -2.4 inch W.C. | up to | -40 inch W.C. |
| -4.0 mbar -1.6 inch W.C. | up to up to | -100 mbar (DN 80/3") -40 inch W.C. |
| -4.5 mbar | up to | -100 mbar (DN 100/4" - DN 200/8") |
| -1.8 inch W.C. | up to | -40 inch W.C. |

Higher and lower settings upon request.

Function and Description

The PROTEGO[®] valve VD/KSM is a state-of-the-art pressure and vacuum relief valve with excellent flow performance made of high-grade synthetic material. Typically, the valve is installed in the in-breathing and out-breathing lines of tanks, vessels, and process apparatus to protect against unallowable overpressure or underpressure. The valve prevents emission losses almost up to the set pressure. The valve is a perfect solution for corrosive, polymerizing, or sticky substances. The device will start to open as soon as the set pressure is reached and only requires 10% overpressure to full lift. Continuous investments in and a commitment to research and development have allowed PROTEGO® to develop a low pressure valve which has the same opening characteristic as a high pressure safety relief valve. This "full lift type" technology allows the valve to be set at just 10% below the maximum allowable working pressure and vacuum (MAWP and MAWV) of the tank and still safely vent the required mass flow. The opening characteristic for pressure and vacuum side is the same.

Due to our highly developed manufacturing technology, the tank pressure is maintained up to set pressure with a tightness that is far superior to the conventional standard. This feature is achieved by special valve seats made of high quality synthetic material or PTFE. After the excess pressure is released or vacuum is balanced, the valve re-seats and provides a tight seal. The optimized fluid dynamic design of the valve body and valve pallet is a result of many years of research, resulting in a stable operation of the valve pallet, optimized performance, and reduced product losses.

Special Features and Advantages

- · 10% technology for minimum pressure increase up to full lift
- extreme tightness, resulting in lowest possible product losses and reduced environmental pollution
- set pressure close to opening pressure for optimum pressure maintenance in the system
- valve pallet is guided inside the housing to protect against harsh weather conditions
- non-corrosive
- especially suitable for aggressive, sticky, or polymerizing substances
- · weight reduction in comparison to steel/stainless steel
- automatic condensate drain
- high surface quality
- · different plastics can easily be combined
- · maintenance-friendly design

Design Types and Specifications

The valve pallets are weight-loaded, and the highest pressure levels are only achieved with metal discs.

Pressure/vacuum valve in basic design VD/KSM-

Additional special devices available upon request.





Vents for corrosive vapor service (Flyer pdf)

Vents - 10% Technology (Flyer pdf)



Leak Rate/10% Technology (Flyer pdf)

Dimensions in mm / inches

Table 1: Dimensions

To select the nominal size (DN), use the flow capacity chart on the following page.

| DN | 50 / 2" | 80 / 3" | 100 / 4" | 150 / 6" | 200 / 8" |
|----|-------------|-------------|----------------------------|----------------------------|------------------------------|
| а | 376 / 14.80 | 521 / 20.51 | 563 / 22.17 (542 / 21.34)* | 670 / 26.38 (681 / 26.81)* | 917 / 36.10 (952 / 37.48)* |
| b | 430 / 16.93 | 575 / 22.64 | 700 / 27.56 (675 / 26.57)* | 825 / 32.48 (880 / 34.65)* | 1190 / 46.85 (1100 / 43.31)* |
| с | 180 / 7.09 | 250 / 9.84 | 300 / 11.81 | 350 / 13.78 (405 / 15.94)* | 560 / 22.05 (500 / 19.68)* |

* Dimensions in parentheses are for devices made of PVDF.

| Table 2: Material selection for the housing | | | | | | | |
|---|---------|---------|------|---------------------------------|--|--|--|
| Design | А | В | С | | | | |
| Housing | PE | PP | PVDF | | | | |
| Valve seat | PE | PP | PVDF | Special materials upon request | | | |
| Sealing | FPM | FPM | FPM | Special materials upon request. | | | |
| Pressure valve pallet | A, C, D | B, C, D | C, D | | | | |
| Vacuum valve pallet | A, C, D | B, C, D | C, D | | | | |

| Table 3: Material selection for pressure valve pallet | | | | | | | |
|---|-----------------------------------|-----------------------------------|----------------------------------|---------------------------------|--|--|--|
| Design | А | В | С | D | | | |
| Pressure range (mbar) (inch W.C.) | +6.0 up to +16 +2.4 up to +6.4 | +5.5 up to +16 +2.2 up to +6.4 | +9.5 up to +30 +3.8 up to +12 | +30 up to +100 +12 up to +40 | | | |
| Valve pallet | PE | PP | PVDF | Hastelloy | | | |
| Sealing | PTFE | PTFE | PTFE | PTFE | | | |
| Spindle guide | PE | PP | PVDF | Hastelloy | | | |
| Weight | PE | PP | PVDF | Hastelloy | | | |

Special materials and other pressure settings are available upon request.

| Table 4: Material selection for vacuum valve pallet | | | | | | | |
|---|-----------------------------------|-----------------------------------|----------------------------------|---------------------------------|--|--|--|
| Design | А | В | С | D | | | |
| Vacuum range (mbar) (inch W.C.) | -6.0 up to -16 -2.4 up to -6.4 | -5.5 up to -16 -2.2 up to -6.4 | -9.5 up to -30 -3.8 up to -12 | -30 up to -100 -12 up to -40 | | | |
| Valve pallet | PE | PP | PVDF | Hastelloy | | | |
| Sealing | PTFE | PTFE | PTFE | PTFE | | | |
| Spindle guide | PE | PP | PVDF | Hastelloy | | | |
| Weight | PE | PP | PVDF | Hastelloy | | | |

Special materials and other vacuum settings are available upon request.

Table 5: Flange connection type

EN 1092-1; Form A

ASME B16.5 CL 150 F.F.

Other types upon request.



KA / 5 / 0320 / GB

Pressure and Vacuum Relief Valve



Flow Capacity Charts

PROTEGO® VD/KSM



The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig. Volume flow \dot{V} in (m³/h) and CFH refer to the standard reference conditions of air in ISO 6358 (20°C, 1bar). For conversion to other densities and temperatures, refer to Sec. 1: "Technical Fundamentals."

Notes:







made of plastic



PROTEGO® VD/KSM-PA



Settings: Pressure:

| +6.0 mbar | up to | +100 mbar (DN 50/2") |
|----------------|-------|-----------------------------------|
| +2.4 inch W.C. | up to | +40 inch W.C. |
| +4.0 mbar | up to | +100 mbar (DN 80/3") |
| +1.6 inch W.C. | up to | +40 inch W.C. |
| +4.5 mbar | up to | +100 mbar (DN 100/4" - DN 200/8") |
| +1.8 inch W.C. | up to | +40 inch W.C. |

Vacuum:

| -6.0 mbar | up to | -100 mbar (DN 50/2") |
|-----------------------------|----------------|--|
| -2.4 inch W.C. | up to | -40 inch W.C. |
| -4.0 mbar -1.6 inch W.C. | up to up to | -100 mbar (DN 80/3") -40 inch W.C. |
| -4.5 mbar -1.8 inch W.C. | up to up to | -100 mbar (DN 100/4" - DN 200/8") -40 inch W.C. |
| Higher and lowe | r settin | igs upon request. |

Function and Description

The PROTEGO[®] valve VD/KSM-PA is a state-of-the-art pressure and vacuum relief valve with excellent flow performance made of high-grade synthetic material. Typically, the valve is installed in the in-breathing and out-breathing lines of tanks, vessels, and process equipment to protect against unallowable overpressure and under pressure.

The valve prevents emission losses almost up to the set pressure. The valve is a perfect solution for corrosive, polymerizing, or sticky substances. The device will start to open as soon as the set pressure is reached and only requires 10% overpressure to full lift. Continuous investments in and a commitment to research and development have allowed PROTEGO® to develop a low pressure valve which has the same opening characteristic as a high pressure safety relief valve. This "full lift type" technology allows the valve to be set at just 10% below the maximum allowable working pressure and vacuum (MAWP and MAWV) of the tank and still safely vent the required mass flow. The opening characteristic for the pressure and vacuum sides is the same.

Due to our highly developed manufacturing technology, the tank pressure is maintained up to the set pressure with a tightness that is far superior to the conventional standard. This feature is achieved by special valve seats made of high quality synthetic material or PTFE. After the excess pressure is released or the vacuum is balances, the valve re-seats and provides a tight seal.

The optimized fluid dynamic design of the valve body and valve pallet is a result of many years of research, resulting in a stable operation of the valve pallet, optimized performance, and reduced product losses.

Special Features and Advantages

- · 10% technology for minimum pressure increase up to full lift
- extreme tightness, resulting in lowest possible product losses and reduced environmental pollution
- set pressure close to opening pressure for optimum pressure maintenance in the system
- valve pallet is guided inside the housing to protect against harsh weather conditions
- non-corrosive
- especially suitable for aggressive, sticky, or polymerizing substances
- weight reduction in comparison to steel/stainless steel
- automatic condensate drain
- high surface quality
- · different plastics can easily be combined
- · maintenance-friendly design

Design Types and Specifications

The valve pallets are weight-loaded, and the highest pressure levels are only achieved with metal discs.

Pressure/vacuum valve in basic design VD/KSM-PA-

Additional special devices available upon request.





Vents for corrosive vapor service (Flyer pdf)

Table 1: Dimensions

Vents - 10% Technology (Flyer pdf)



Leak Rate/10% Technology (Flyer pdf)

Dimensions in mm / inches

| To select the nominal size (DN), use the flow capacity chart on the following page. | | | | | |
|---|-------------|-------------|----------------------------|----------------------------|------------------------------|
| DN1 | 50 / 2" | 80 / 3" | 100 / 4" | 150 / 6" | 200 / 8" |
| DN2 | 50 / 2" | 80 / 3" | 100 / 4" | 150 / 6" | 200 / 8" |
| а | 490 / 19.29 | 650 / 25.59 | 775 / 30.51 (750 / 29.53)* | 930 / 36.61 (958 / 37.72)* | 1260 / 49.61 (1200 / 47.24)* |
| b | 376 / 14.80 | 521 / 20.51 | 563 / 22.17 (523 / 20.59)* | 670 / 26.38 (651 / 25.63)* | 879 / 34.61 (912 / 35.91)* |
| с | 150 / 5.91 | 200 / 7.87 | 225 / 8.86 | 280 / 11.02 | 350 / 13.78 |
| d | 200 / 7.87 | 245 / 9.65 | 300 / 11.81 | 370 / 14.57 | 590 / 23.23 (650 / 25.59)* |
| е | 180 / 7.09 | 250 / 9.84 | 300 / 11.81 | 350 / 13.78 (405 / 15.94)* | 560 / 22.05 (500 / 19.68)* |

* Dimensions in parentheses are for devices made of PVDF.

| Table 2: Material selection for the housing | | | | | |
|---|---------|---------|------|---------------------------------|--|
| Design | А | В | С | | |
| Housing | PE | PP | PVDF | | |
| Valve seat | PE | PP | PVDF | Special materials upon regues | |
| Sealing | FPM | FPM | FPM | Special materials upon request. | |
| Pressure valve pallet | A, C, D | B, C, D | C, D | | |
| Vacuum valve pallet | A, C, D | B, C, D | C, D | | |

| Table 3: Material selection for pressure valve pallet | | | | | |
|---|-----------------------------------|-----------------------------------|----------------------------------|---------------------------------|--|
| Design | А | В | C | D | |
| Pressure range (mbar) (inch W.C.) | +6.0 up to +16 +2.4 up to +6.4 | +5.5 up to +16 +2.2 up to +6.4 | +9.5 up to +30 +3.8 up to +12 | +30 up to +100 +12 up to +40 | |
| Valve pallet | PE | PP | PVDF | Hastelloy | |
| Sealing | PTFE | PTFE | PTFE | PTFE | |
| Spindle guide | PE | PP | PVDF | Hastelloy | |
| Weight | PE | PP | PVDF | Hastelloy | |

Special materials and other pressure settings are available upon request.

| Table 4: Material selection for vacuum valve pallet | | | | | |
|---|-----------------------------------|-----------------------------------|----------------------------------|---------------------------------|--|
| Design | А | В | С | D | |
| Vacuum range (mbar) (inch W.C.) | -6.0 up to -16 -2.4 up to -6.4 | -5.5 up to -16 -2.2 up to -6.4 | -9.5 up to -30 -3.8 up to -12 | -30 up to -100 -12 up to -40 | |
| Valve pallet | PE | PP | PVDF | Hastelloy | |
| Sealing | PTFE | PTFE | PTFE | PTFE | |
| Spindle guide | PE | PP | PVDF | Hastelloy | |
| Weight | PE | PP | PVDF | Hastelloy | |

Special materials and other vacuum settings are available upon request.

Table 5: Flange connection type

EN 1092-1; Form A

ASME B16.5 CL 150 F.F.

Other types upon request.



Pressure and Vacuum Relief Valve



Flow Capacity Charts

PROTEGO[®] VD/KSM-PA



The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig. Volume flow \dot{V} in (m³/h) and CFH refer to the standard reference conditions of air in ISO 6358 (20°C, 1bar). For conversion to other densities and temperatures, refer to Sec. 1: "Technical Fundamentals."

Notes:







