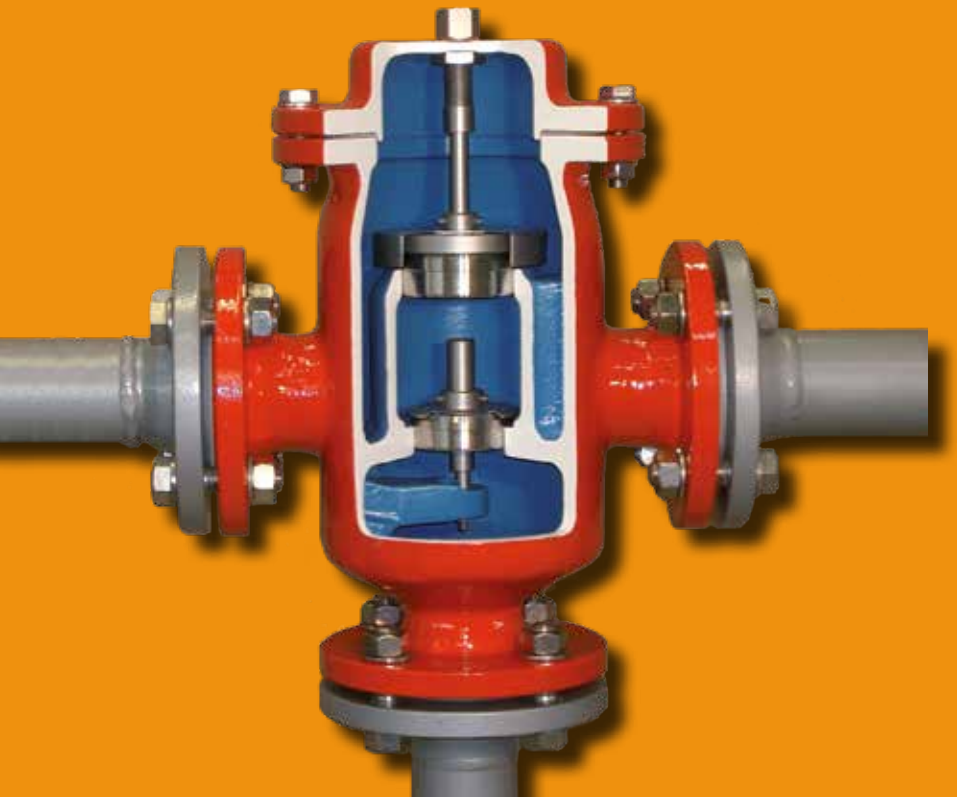
PROTEGO® Pressure and Vacuum Relief Valves

In-line



Section 6

PROTEGO

for safety and environment

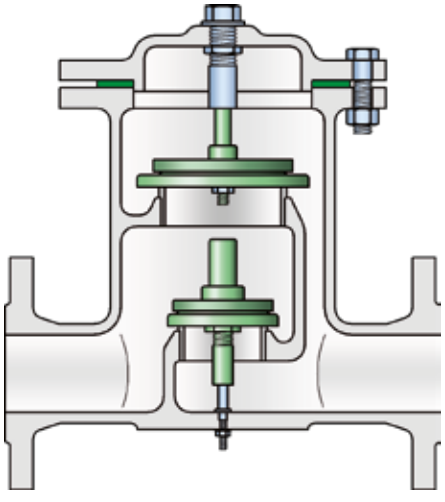
Pressure and Vacuum Relief Valves – In-Line

The working principle and application of pressure and vacuum relief valves on tanks and process equipment is discussed in “Technical Fundamentals” (Section 1). This section introduces in-line pressure and vacuum relief valves which can act in a pressure containing, relief, or back flow protection function if installed on a tank or other process equipment.

Function and Description

These devices are direct acting weight-loaded or spring-loaded in-line valves, pallet type, used to protect plant equipment (tanks, vessels, process equipment, piping etc.) against excessive overpressure or underpressure. In-line valves may also be installed as end-of-line valves. In these cases, the opening to the atmosphere has to be protected against weather influences, dirt particles or foreign bodies/animals (Figure 1).

Figure 1:
Pressure and Vacuum Relief Valve
PROTEGO® DV/ZT



PROTEGO® pressure relief valves provide protection against unallowable overpressure and prevent emission losses until shortly before the set pressure is reached.

PROTEGO® vacuum relief valves provide safety against unallowable low vacuum and prevent the intake of air until shortly before the set pressure is reached.

Combined PROTEGO® pressure and vacuum relief valves fulfill both of these functions.

The design of the **PROTEGO®** valves allows full lift to be reached at a maximum of 10% overpressure. This full lift type technology allows the valve to be set at just 10% below the allow- able fully open pressure (consider MAWP and possible pressure drop of piping and other devices) and still safely release the required mass flow. Typical overpressure for conventional valves is 40% to 100% (API 2000). These valves open earlier and re-seat later which will result in undesirable product losses.

Special features and advantages

Continuous investment in and a commitment to research and development has allowed PROTEGO® to design valves with the following advantages:

- 10% full-lift technology results in product savings (reduction of product losses greater than 30% possible)
- PROTEGO® valves open later and re-seat earlier than conventional valves, resulting in optimized pressure management and conservation of inert gases
- high flow capacity reduces costs through the use of smaller valves
- seal significantly above the normal standards
- valve pallet is guided inside the housing to protect against harsh weather conditions
- can be used in explosion hazardous areas
- maintenance-friendly design

To reduce leak rates to a minimum and fulfill the highest expectation of the industry, the valve seats and pallets are manufactured from high quality stainless steel and lapped in a highly developed manufacturing process. For low pressure settings, valve pallets are equipped with high quality FEP-diaphragm.

Preferred applications

- as pressure maintaining valve, e.g. for inert gas blanketing
- as pressure reducing valve, e.g. for connection to inert gas supply systems
- for controlled venting of plant or storage tanks in vapor collection systems
- as backflow protection for connection to exhaust air systems or inert gas systems

Installation and servicing

All PROTEGO® valves are supplied with detailed installation and maintenance instructions. Please take note of the separate instructions for removing transportation protection if they have been installed to protect the PROTEGO® valves. We have developed special checklists for the correct installation of PROTEGO® valves.

Selection

For safely operating and protecting the plant the correct selection and sizing of the PROTEGO® device is necessary. The valves are mainly characterized by the following criteria:

Function: Pressure relief, vacuum relief or combined pressure and vacuum relief

Operating principle: Weight or spring-loaded valve pallet, depending on set pressure

Design type: Right angle or straight through design, horizontal or vertical connection to the protected object. The devices are spring or weight-loaded and therefore have to be installed with the valve pallets in horizontal position. The maximum and minimum pressure settings depend on the specific design.

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Sealing: Depending on the set pressures, either metal sealing or soft sealing provide an extremely tight seal.

Operating conditions and critical substances: Polymerization problems, condensation problems, operating temperature, operating pressure, and volume flow are the main criteria for choosing the correct devices.

Depending on the application, it may be important to select a device with a **heating jacket**; but please note that not all devices are available with this feature. On-site electrical trace heating is an alternative.

Based on this initial selection, additional details such as materials, coatings, etc. can be requested or defined in the data sheet.

If no suitable device can be found, please contact us. Special designs and approvals are available.

The **valve size** results from the volume flow which has to be vented to avoid an increase above the maximum allowable overpressure or underpressure. Certified volume flow diagrams are available for the design of the valves. In addition to operating conditions, the correct design must consider the pressure losses in the pipelines (including other installed devices) as well as external backpressures that may influence the set pressure and opening behavior. Detailed procedures and examples for the design are described in "Technical Fundamentals" (see Section 1).

Design

The valve must be dimensioned so that the permissible pressures are not exceeded when releasing the required flow (Section 1). When determining the opening pressure of the valve, pressure losses in the connected pipelines 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 pump capacity and the thermal breathing requirement) and maximum allowable opening pressure (e.g., tank pressure) p in mbar / inch W.C

Required: 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 be safely released. For a valve which needs 10% overpressure to reach full lift, the set pressure may be chosen at 10% below the fully open pressure (e.g., maximum allowable tank pressure). **Attention:** pressure drop of piping systems and other installed devices have 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 opening pressure. Consequently, these valves open earlier and cause unnecessary product loss.

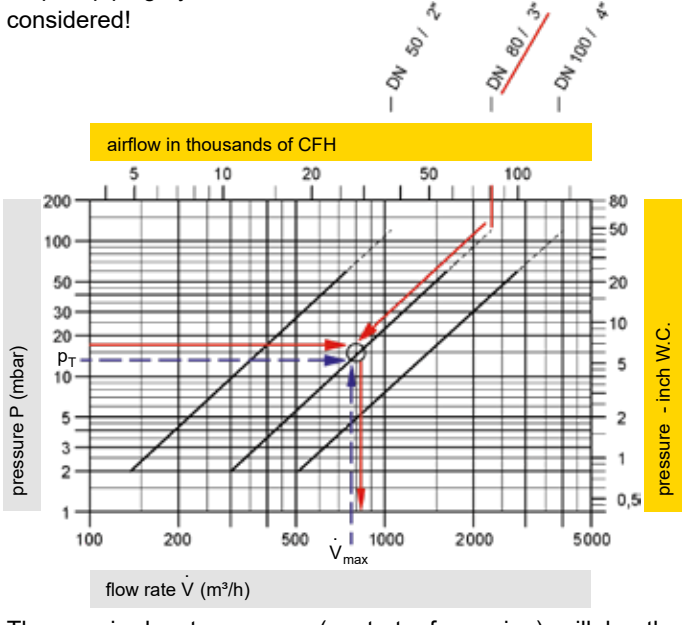
Example 2

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

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

Required: Volume flow in m³/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), or 40%, or 100% below the opening pressure p_T. **Attention:** pressure drop of piping systems and other installed devices have to be considered!



The required set pressure (= start of opening) will be 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 flow performance will follow the pressure volume flow diagram.

Material selection is based on plant and engineering specifications.

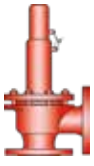
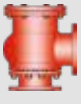
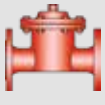
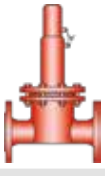
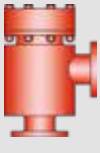
Guidelines for calculating the volume flow and considering the density influence are given in "Technical Fundamentals" (see Section 1).

After completing all steps, the device can be completely specified and ordered.

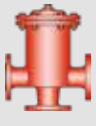
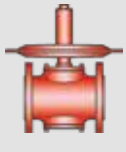
For special cases, the data sheet from Section 1 must be completed so we can provide an accurate quotation.

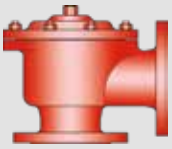
PROTEGO® Pressure and Vacuum Relief Valves – In-Line

Catalog

	Type	Size	Pressure setting positive or negative setting range mbar / inch W.C.	○ = weight-loaded X = spring-loaded	Design ○ = straight through design X = right angle design	○ = soft sealing X = metallic sealing	○ = for critical substances (polymerization, corrosion, crystallization)	○ = heating jacket	Page
Pressure or Vacuum Relief Valves									
	DZ/E	25 - 300 1" - 12"	±2.0 up to ±60 ±0.8 up to ±24	○	X	○ / X		○	230 - 232
	DZ/E-F	25 - 300 1" - 12"	±60 up to ±500 ±24 up to ±200	X	X	X		○	234 - 236
	DZ/EA	50 - 150 2" - 6"	±5 up to ±50 ±2 up to ±20	○	X	X	○		238- 239
	DZ/EA-F	50 - 150 2" - 6"	±60 up to ±500 ±24 up to ±200	X	X	X	○		240 - 242
	DZ/T	25 - 300 1" - 12"	±2.0 up to ±60 ±0.8 up to ±24	○	○	○ / X		○	244 - 246
	DZ/T-F	25 - 300 1" - 12"	±60 up to ±500 ±24 up to ±200	X	○	X		○	248 - 250
	R/KSM	50 - 200 2" - 8"	±5 up to ±100 ±2 up to ±40	○	X	○			252 - 253

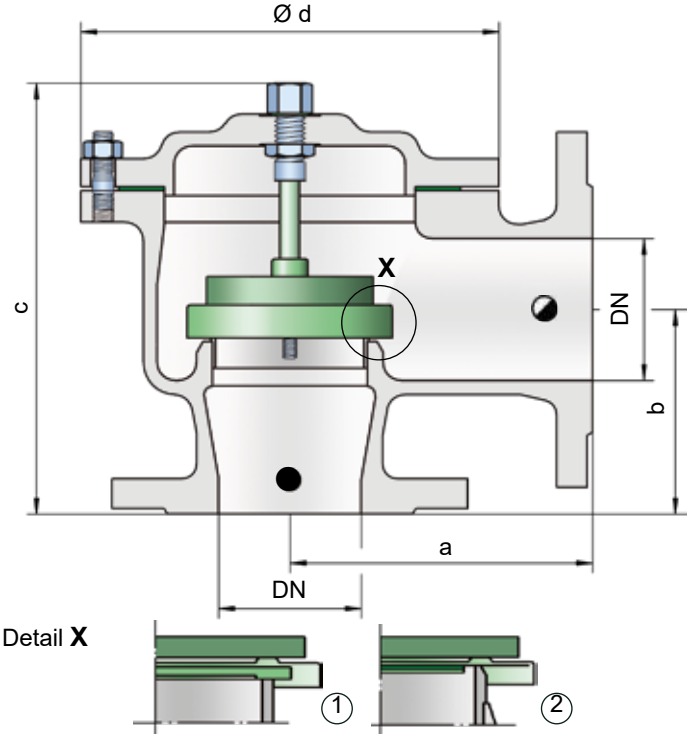
All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

	Type	Size	Pressure setting positive setting range mbar / inch W.C.	Pressure setting negative setting range mbar / inch W.C.	○ = weight-loaded X = spring-loaded	Design ○ = straight through design X = right angle design	○ = soft sealing X = metallic sealing	○= for critical substances (polymerization, corrosion, crystallization)	○ = heating jacket	Page
Pressure and Vacuum Relief Valves										
	DV/ZT	40 - 150 1½" - 6"	upper valve pallet ±2.0 up to ±60 ±0.8 up to ±24	lower valve pallet ±3.5 up to ±50 ±1.4 up to ±20	○	○	○ / X		○	254 - 256
	DV/ZT-F	40 - 150 1½" - 6"	+60 up to +500 +24 up to +200	-3.5 up to -50 -1.4 up to -20	X	○	X		○	258 - 260
	DV/ZU	40 - 150 1½" - 6"	+2.0 up to +60 +0.8 up to +24	-3.5 up to -50 -1.4 up to -20	○	○ / X	○ / X		○	262 - 264
	DV/ZU-F	40 - 150 1½" - 6"	+60 up to +500 +24 up to +200	-3.5 up to -50 -1.4 up to -20	X	○ / X	X		○	266 - 268
	DV/ZW	40 - 150 1½" - 6"	+2.0 up to +60 +0.8 up to +24	-3.5 up to -50 -1.4 up to -20	○	○	○ / X		○	270 - 272
	DV/ZW-F	40 - 150 1½" - 6"	+60 up to +500 +24 up to +200	-3.5 up to -50 -1.4 up to -20	X	○	X		○	274 - 276
Blanketing Valve										
	ZM-R	15 - 100 ½" - 4"	up to +500 up to +200	up to -200 up to -80	X	○	○			278 - 283



Pressure or Vacuum Relief Valve, In-Line

PROTEGO® DZ/E



● = Tank connection for pressure relief function

◒ = Tank connection for vacuum relief function

Flow direction marked at the housing by →

Pressure or vacuum settings:

DN 25 and 32	±3.5 mbar	up to	±60 mbar
DN 1" and 1¼"	±1.4 inch W.C.	up to	±24 inch W.C.
DN 40 up to 300	±2.0 mbar	up to	±60 mbar
DN 1½" up to 12"	± 0.8 inch W.C.	up to	±24 inch W.C.

For higher set pressure or vacuum, refer to type DZ/E-F.

Function and Description

The PROTEGO® in-line valve DZ/E is a state-of-the-art pressure or vacuum relief valve with a right angle design. Typically, the valve is installed in the in-breathing or out-breathing lines of tanks, vessels, and process equipment to protect against unallowable overpressure or underpressure. The valve prevents emission losses almost up to the set pressure and prevents unacceptable product entry.

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 the set pressure with a tightness that is far above the conventional standard. This feature is ensured by valve seats made of high quality stainless steel and with individually lapped valve pallets (1), or with an air cushion seal (2), in conjunction with a high quality FEP diaphragm. The valve pallets are also available with a PTFE seal to prevent 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 work, resulting in 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
- based on 10% technology, set pressure is close to opening pressure for optimum pressure maintenance in the system as compared to conventional 40% or 100% technology
- high flow capacity reduces costs through the use of smaller valves
- can be used as pressure or vacuum relief valve
- compact, space-saving right-angle design
- can be used in explosion hazardous areas
- sturdy housing design (PN 10)
- maintenance-friendly design

Designs and Specifications

The valve pallet is weight-loaded. **Higher set pressures for pressure and vacuum are achieved by using spring-loaded type DZ/E-F.**

Two different right angle designs are available:

In-line pressure or vacuum relief valve, standard design	**DZ/E -** **–**
In-line pressure or vacuum relief valve with heating jacket	**DZ/E -** **H**

Additional special devices available upon request.

Within piping systems, the influence of backpressure has to be considered when deciding the set pressure and opening characteristics. For special design solutions (e.g., partial load operation), the valve can be supplied with standard valve pallets (with proportional opening function).

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Vents - 10% Technology
(Flyer pdf)

Leak Rate/10% Technology
(Flyer pdf)

Coated Devices
(Flyer pdf)

The optimized valve pallet
(Flyer pdf)

Table 1: Dimensions Dimensions in mm / inches

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

DN	25 / 1"	32 / 1 ¼"	40 / 1 ½"	50 / 2"	80 / 3"	100 / 4"	150 / 6"	200 / 8"	250 / 10"	300 / 12"
a	110 / 4.33	110 / 4.33	125 / 4.92	125 / 4.92	170 / 6.69	190 / 7.48	230 / 9.06	275 / 10.83	325 / 12.80	350 / 13.78
b	75 / 2.95	75 / 2.95	90 / 3.54	90 / 3.54	115 / 4.53	120 / 4.72	160 / 6.30	225 / 8.86	275 / 10.83	300 / 11.81
c	180 / 7.09	180 / 7.09	230 / 9.06	230 / 9.06	245 / 9.65	260 / 10.24	335 / 13.19	505 / 19.88	575 / 22.64	630 / 24.80
d	150 / 5.91	150 / 5.91	170 / 6.69	170 / 6.69	235 / 9.25	280 / 11.02	335 / 13.19	420 / 16.54	505 / 19.88	565 / 22.24

Dimensions for pressure or vacuum relief valve with heating jacket upon request.

Table 2: Material selection for housing

Design	A	B	C
Housing Heating jacket (DZ/E-H-...)	Steel Steel	Stainless Steel Stainless Steel	Hastelloy Stainless Steel
Valve seat	Stainless Steel	Stainless Steel	Hastelloy
Gasket	PTFE	PTFE	PTFE
Valve pallet **DN 40 - 300 / 1 ½" - 12"**	A, C, E, F	A, C, E, F	B, D, G
Valve pallet **DN 25 - 32 / 1" - 1 ¼"**	H, I, J	H, I, J	–

The housings are also available with an ECTFE-coating.

Special materials upon request.

Table 3: Material selection for valve pallet

DN 40 - 300 / 1 ½" - 12"

Design	A	B	C	D	E	F	G
Pressure range (mbar) (inch W.C.)	±2.0 up to ±3.5 ±0.8 up to ±1.4	±2.0 up to ±3.5 ±0.8 up to ±1.4	±3.5 up to ±14 ±1.4 up to ±5.6	±3.5 up to ±14 ±1.4 up to ±5.6	±14 up to ±60 ±5.6 up to ±24	±14 up to ±60 ±5.6 up to ±24	±14 up to ±60 ±5.6 up to ±24
Valve pallet	Aluminum	Titanium	Stainless Steel	Titanium	Stainless Steel	Stainless Steel	Hastelloy
Sealing	FEP	FEP	FEP	FEP	Metal to Metal	PTFE	Metal to Metal

DN 25 - 32 / 1" - 1 ¼"

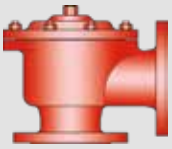
Design	H	I	J
Pressure range (mbar) (inch W.C.)	±3,5 up to ±15 ±1.4 up to ±6.0	±15 up to ±60 ±6.0 up to ±24	±15 up to ±60 ±6.0 up to ±24
Valve pallet	PTFE	Stainless Steel	Stainless Steel
Sealing	PTFE	Metal to Metal	PTFE

Special materials upon request.

For higher set pressure or vacuum, refer to type DZ/E-F.

Table 4: Flange connection type

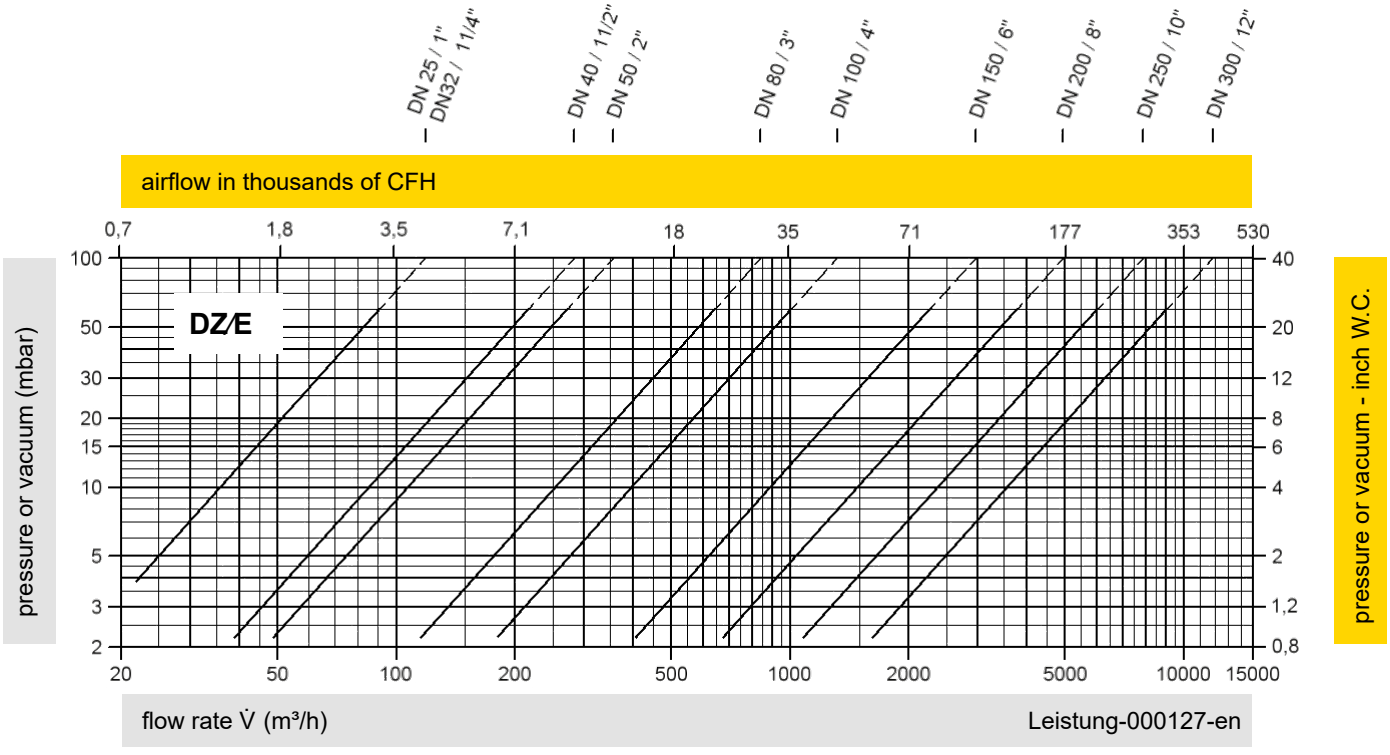
EN 1092-1; Form B1	Other types upon request.
ASME B16.5 CL 150 R.F.	



Pressure or Vacuum Relief Valve, In-Line

Flow Capacity Chart

PROTEGO® DZ/E

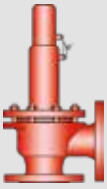


The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig.

Volume flow V̇ 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.”

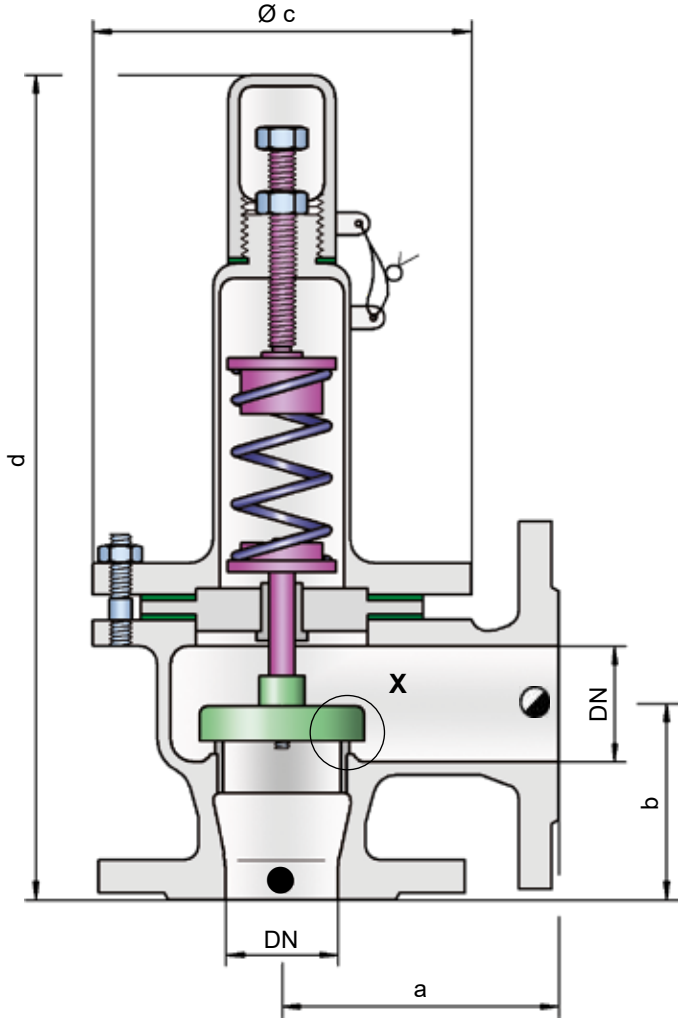
All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Notes:



Pressure or Vacuum Relief Valve, In-Line

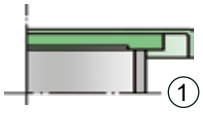
PROTEGO® DZ/E-F



● = Tank connection for pressure relief function

◒ = Tank connection for vacuum relief function

Detail **X**



Flow direction marked at the housing by →

Pressure or vacuum settings:

±60 mbar	up to	±500 mbar (DN 25/1" up to 200/8")
±24 inch W.C.	up to	±200 inch W.C.
±60 mbar	up to	±400 mbar (DN 250/10")
±24 inch W.C.	up to	±160 inch W.C.
±60 mbar	up to	±300 mbar (DN 300/12")
±24 inch W.C.	up to	±120 inch W.C.

Devices with higher set pressure or vacuum are available upon request. For lower set pressures or vacuum, refer to type DZ/E.

Function and Description

The PROTEGO® in-line valve DZ/E-F is a state-of-the-art pressure or vacuum relief valve in a right angle design for higher system pressures. Typically, the valve is installed in the in-breathing or out-breathing lines of tanks, vessels, and opening pressure which results in best possible process equipment to protect against unallowable overpressure or underpressure. The valve prevents emission losses almost up to the set pressure and prevents unacceptable product entry. As this device is equipped with a spring, higher set pressures are achieved than with the DZ/E.

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 above the conventional standard. This feature is ensured by valve seats made of high quality stainless steel and with individually lapped valve pallets (1) and a sturdy housing design. 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 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
- based on 10% technology, set pressure is close to opening pressure for optimum pressure maintenance in the system as compared to conventional 40% or 100% technology
- high flow capacity reduces costs through the use of smaller valves
- can be used as pressure or vacuum relief valve
- compact, space-saving right-angle design
- can be used in explosion hazardous areas
- sturdy housing design (PN 10)
- spring-loaded for high set pressures
- maintenance-friendly design

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Vents - 10% Technology (Flyer pdf)

Leak Rate/10% Technology (Flyer pdf)

Coated Devices (Flyer pdf)

The optimized valve pallet (Flyer pdf)

Designs and Specifications

The valve pallet is spring-loaded. Lower set pressures for pressure and vacuum are achieved by using the weight-loaded type DZ/E.

Two different right angle designs are available:

In-line pressure or vacuum relief valve, standard design **DZ/E-F - –**

In-line pressure or vacuum relief valve with heating jacket **DZ/E-F - H**

Additional special devices available upon request.

Within piping systems the influence of backpressure has to be considered when deciding the set pressure and opening characteristics. For special design solutions (e.g., partial load operation), the valve can be supplied with standard discs (with proportional opening function).

Spring-loaded PV-Valves Maintenance-friendly design (Flyer pdf)

Table 1: Dimensions Dimensions in mm / inches

To select the nominal size (DN), please use the flow capacity charts on the following pages.

DN	25 / 1"	32 / 1 ¼"	40 / 1 ½"	50 / 2"	65 / 2 ½" 80 / 3"	100 / 4"	150 / 6"	200 / 8"	250 / 10"	300 / 12"
a	110 / 4.33	110 / 4.33	125 / 4.92	125 / 4.92	170 / 6.69	190 / 7.48	230 / 9.06	275 / 10.83	325 / 12.80	350* / 13.78
b	75 / 2.95	75 / 2.95	90 / 3.54	90 / 3.54	115 / 4.53	120 / 4.72	160 / 6.30	225 / 8.86	275 / 10.83	300 / 11.81
c	150 / 5.91	150 / 5.91	170 / 6.69	170 / 6.69	235 / 9.25	280 / 11.02	335 / 13.19	420 / 16.54	505 / 19.88	565 / 22.24
d	435 / 17.13	435 / 17.13	445 / 17.52	445 / 17.52	620 / 24.41	700 / 27.56	970 / 38.19	1205 / 47.44	1275 / 52.36	1330 / 52.36

Dimensions for pressure or vacuum relief valve with heating jacket upon request.

* for ANSI 12" = 400 mm / 15.75 inches

Table 2: Material selection for housing

Design	A	B
Housing Heating jacket (DZ/E-F-H-...)	Steel Steel	Stainless Steel Stainless Steel
Valve seat	Stainless Steel	Stainless Steel
Gasket	PTFE	PTFE
Valve pallet	A	A

The housings are also available with an ECTFE coating.

Special materials upon request.

Table 3: Material of valve pallet

Design	A
Pressure range (mbar) (inch W.C.)	±60 up to ±500 ±24 up to ±200
Valve pallet	Stainless Steel
Sealing	Metal to Metal
Spring	Stainless Steel

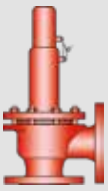
Special materials upon request.

Devices with higher set pressure or vacuum are available upon request. For lower set pressures or vacuum, refer to type DZ/E.

Table 4: Flange connection type

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

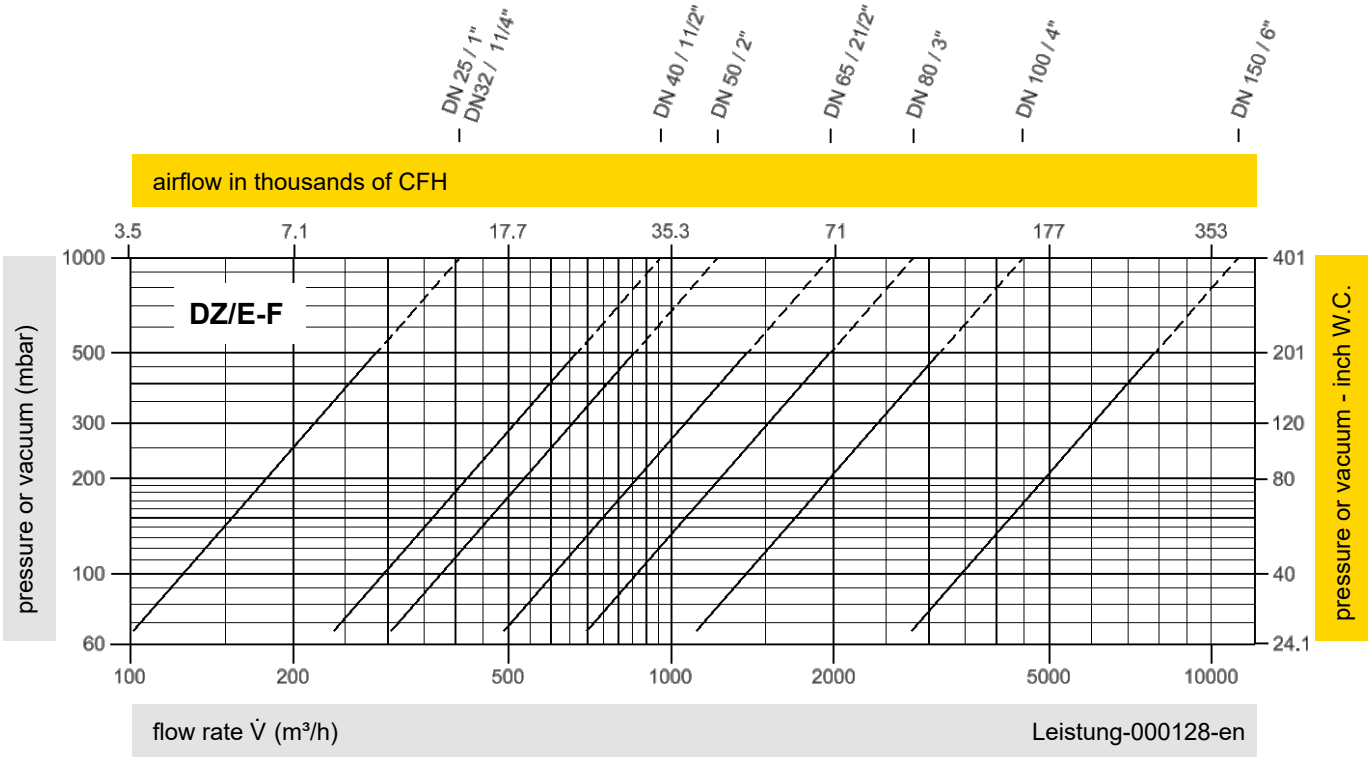
Other types upon request.

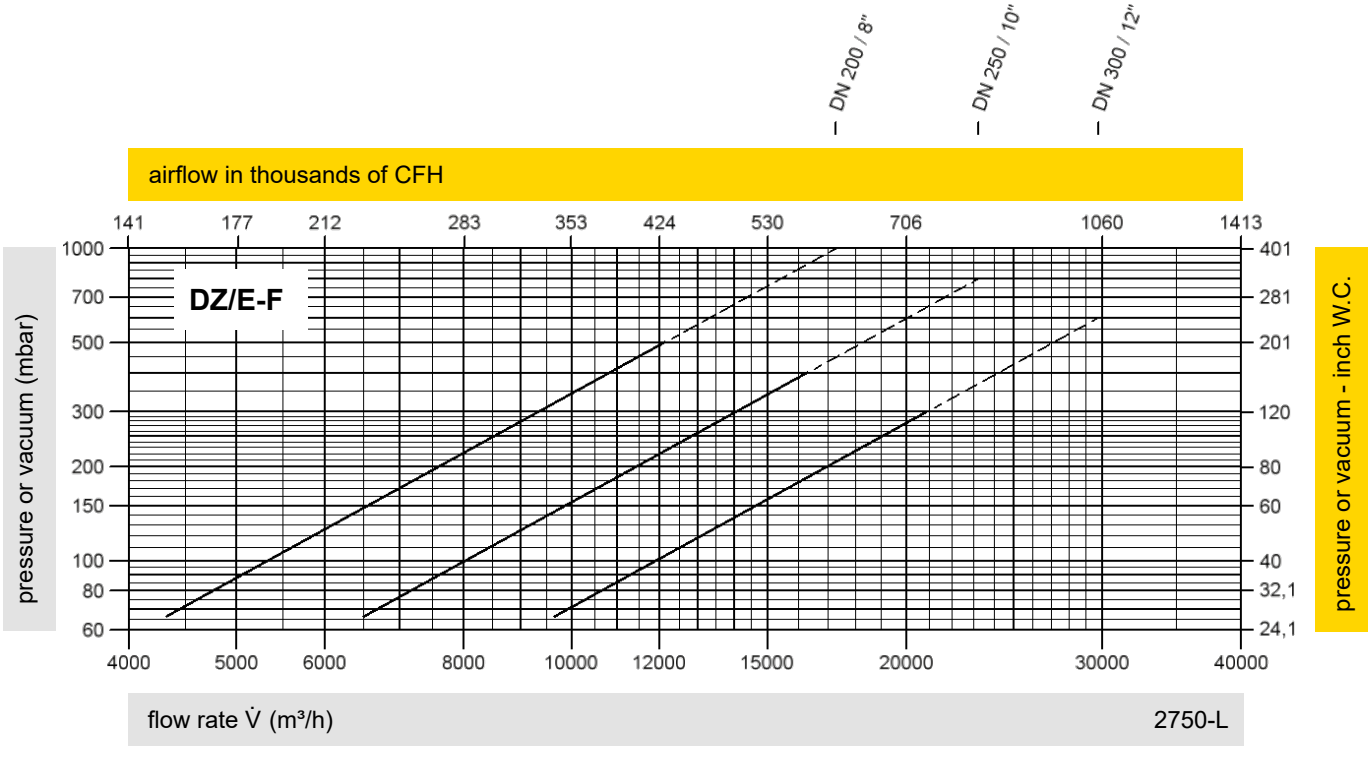


Pressure or Vacuum Relief Valve, In-Line

Flow Capacity Chart

PROTEGO® DZ/E-F



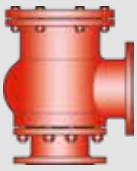


The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig.

Volume flow V̇ 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.”

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

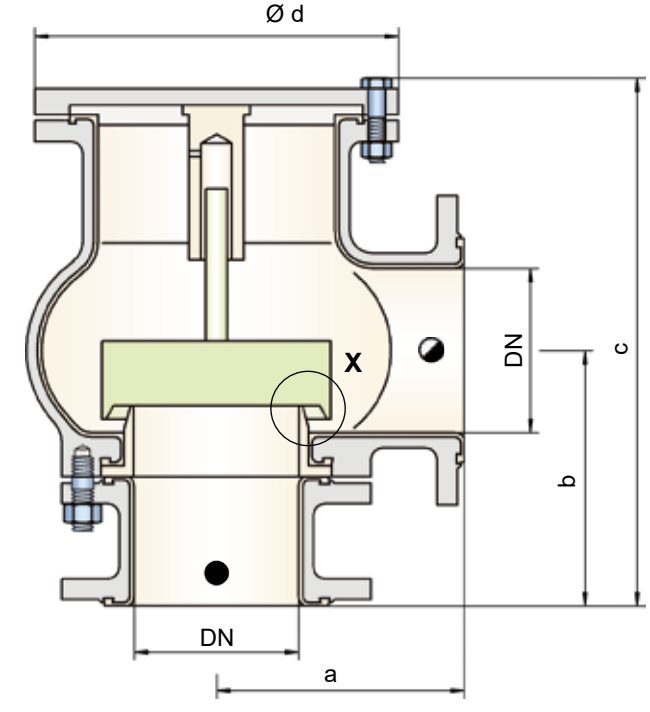
Notes:



Pressure or Vacuum Relief Valve, In-Line

with ETFE Lining

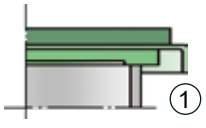
PROTEGO® DZ/EA



● = Tank connection for pressure relief function

◒ = Tank connection for vacuum relief function

Detail **X**



Flow direction marked at the housing by →

Pressure or vacuum settings:

±5.0 mbar up to ±50 mbar
±2.0 inch W.C. up to ±20 inch W.C.

For higher set pressure or vacuum, refer to type DZ/EA-F.

Function and Description

The lined PROTEGO® in-line valve DZ/EA is a state-of-the-art pressure or vacuum relief valve in a right angle design. The lining makes this model a perfect solution for corrosive, polymerizing, or sticky substances. All internal parts are manufactured from PTFE or other highly corrosion resistant materials. Typically, the valve is installed in the in-breathing or out-breathing lines of tanks, vessels, and process equipment to protect against unallowable overpressure or underpressure. The valve prevents emission losses almost up to the set pressure and prevents unacceptable product entry.

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 the set pressure with a tightness that is far above to the conventional standard. This feature is ensured by specially finished PTFE valve seats, or by the use of Hastelloy valve seats, and with individually lapped valve pallets (1). After the overpressure 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 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
- based on 10% technology, set pressure is close to opening pressure for optimum pressure maintenance in the system as compared to conventional 40% or 100% technology
- inner lining and material selection makes this type suitable for highly corrosive, polymerizing, or sticky substances
- high flow capacity reduces costs through the use of smaller valves
- can be used as pressure or vacuum relief valve
- compact, space-saving right-angle design
- sturdy housing design (PN 10)
- maintenance-friendly design

Design and Specification

The valve pallet is weight-loaded. **Higher set pressures for pressure and vacuum are achieved by using spring-loaded type DZ/EA-F.**

In-line pressure or vacuum relief valve, standard design	**DZ/EA**

Additional special devices available upon request.

Within piping systems, the influence of backpressure has to be considered when deciding the set pressure and opening characteristics. For special design solutions (e.g., partial load operation), the valve can be supplied with standard valve pallets (with proportional opening function).

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Vents - 10% Technology (Flyer pdf)

Leak Rate/10% Technology (Flyer pdf)

Coated Devices (Flyer pdf)

The optimized valve pallet (Flyer pdf)

Table 1: Dimensions Dimensions in mm / inches

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

DN	50 / 2"	80 / 3"	100 / 4"	150 / 6"
a	168 / 6.61	180 / 7.09	200 / 7.87	228 / 8.98
b	167 / 6.57	177 / 6.97	200 / 7.87	232 / 9.13
c	330 / 12.99	390 / 15.35	445 / 17.52	485 / 19.09
d	200 / 7.87	240 / 9.45	280 / 11.02	335 / 13.19

Table 2: Material selection for housing

Design	C	D
Housing	Steel	Steel
Lining	ETFE	ETFE
Cover	Steel	Steel
Valve seat	PTFE	Hastelloy
Valve pallet	A	A, B

Semi-conductive material and special material (e.g., PFA) upon request.

Special materials upon request.

Table 3: Material selection for valve pallet

Design	A	B
Pressure range (mbar) (inch W.C.)	±5 up to ±50 ±2 up to ±20	±5 up to ±50 ±2 up to ±20
Valve pallet	PTFE	Hastelloy
Sealing	PTFE	Metal to Metal

Special materials upon request.

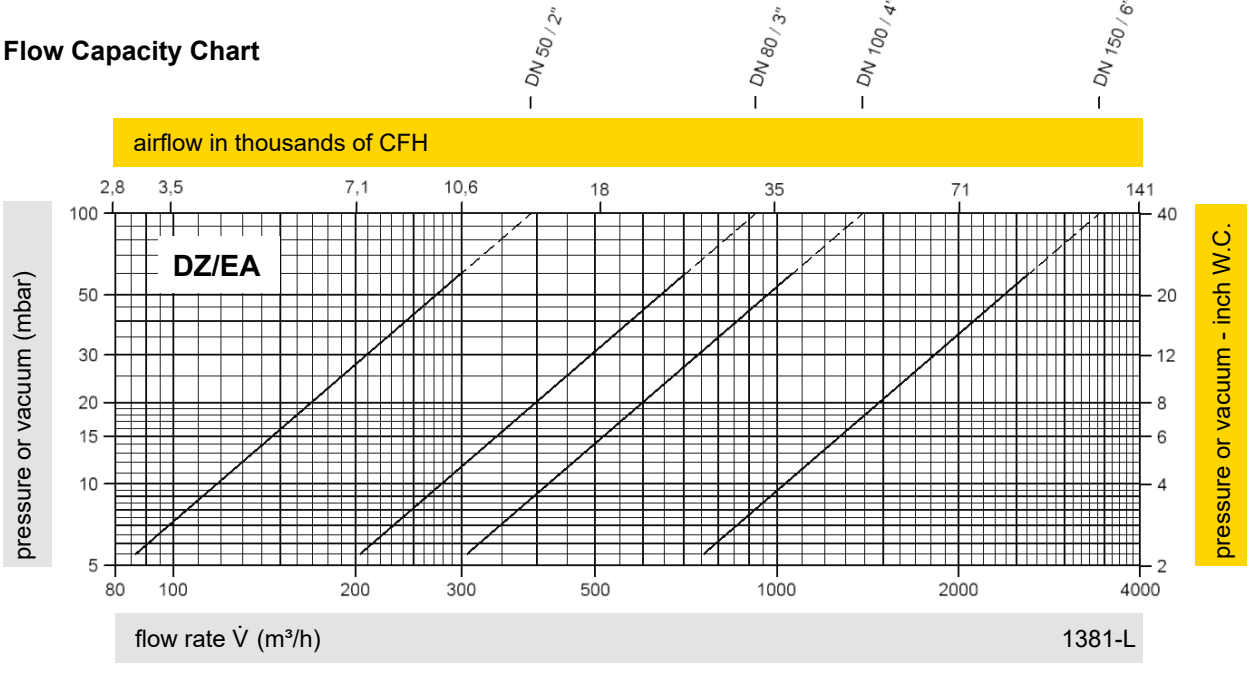
For higher set pressure or vacuum, refer to type DZ/EA-F.

Table 4: Flange connection type

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

Other types upon request.

Flow Capacity Chart



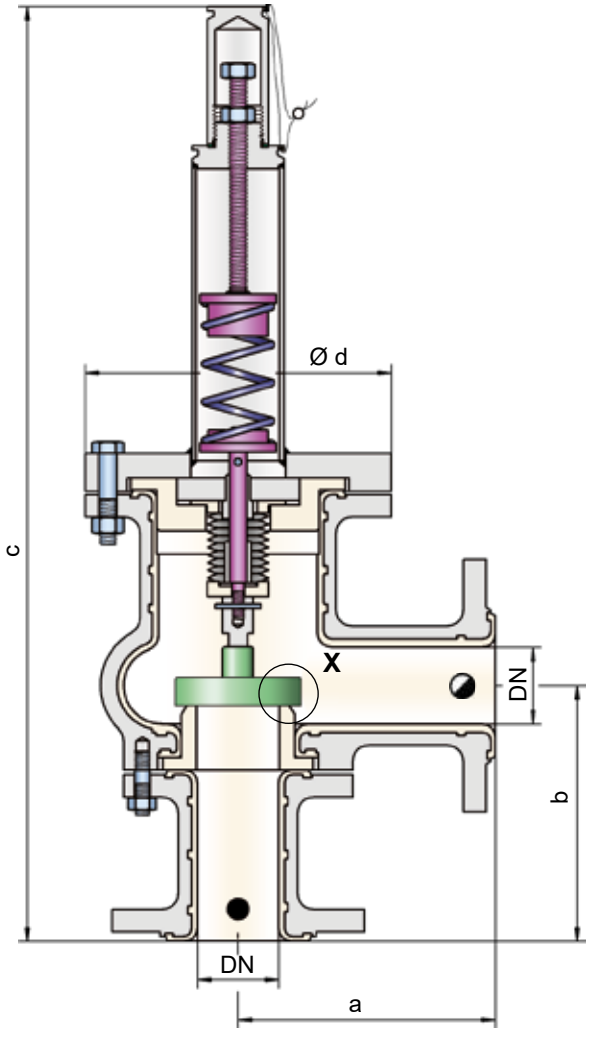
The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig.
Volume flow V̇ in (m³/h) and CFH refer to the standard reference conditions of air in ISO 6358 (20°C, 1bar).
For conversion to other densities and temperatures, refer to Sec. 1: “Technical Fundamentals.”

PROTEGO
for safety and environment

Pressure or Vacuum Relief Valve, In-Line

with ETFE Lining

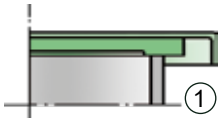
PROTEGO® DZ/EA-F



● = Tank connection for pressure relief function

◒ = Tank connection for vacuum relief function

Detail **X**



Flow direction marked at the housing by →

Pressure or vacuum settings:

±60 mbar	up to	±500 mbar
±24 inch W.C.	up to	±200 inch W.C.

For lower set pressure or vacuum, refer to type DZ/EA.

Function and Description

The lined PROTEGO® in-line valve DZ/EA-F is a state-of-the-art pressure or vacuum relief valve in a right angle design for higher set pressures. The lining makes this model a perfect solution for corrosive, polymerizing, or sticky substances. All inner parts are manufactured from PTFE or other highly corrosion resistant materials. Typically, the valve is installed in the in-breathing or out-breathing lines of tanks, vessels, and process equipment to protect against unallowable overpressure or underpressure.

The valve prevents emission losses almost up to the set pressure and prevents unacceptable product entry. This spring-loaded model allows higher set pressures than the DZ/EA.

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. Due to our highly developed manufacturing technology, the tank pressure is maintained up to set pressure with a tightness that is far above the conventional standard. This feature is ensured by the use of Hastelloy valve seats and with individually lapped valve pallets (1). 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 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
- based on 10% technology, set pressure is close to opening pressure for optimum pressure maintenance in the system as compared to conventional 40% or 100% technology
- inner lining and material selection makes this type suitable for highly corrosive, polymerizing, or sticky substances
- high flow capacity reduces costs through the use of smaller valves
- can be used as pressure or vacuum relief valve
- compact, space-saving right-angle design
- sturdy housing design (PN 10)
- spring-loaded for high set pressures
- maintenance-friendly design

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Vents - 10% Technology (Flyer pdf)

Leak Rate/10% Technology (Flyer pdf)

Coated Devices (Flyer pdf)

The optimized valve pallet (Flyer pdf)

Designs and Specifications

The vent pallet is spring-loaded. Lower set pressures for pressure and vacuum are achieved by using the type DZ/EA.

In-line pressure or vacuum relief valve, standard design **DZ/EA-F**

Additional special devices available upon request.

Within piping systems, the influence of backpressure has to be considered when deciding the set pressure and opening characteristics. For special design solutions (e.g., partial load operation), the valve can be supplied with standard valve pallets (with proportional opening function).

Table 1: Dimensions Dimensions in mm / inches

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

DN	50 / 2"	80 / 3"	100 / 4"	150 / 6"
a	168 / 6.61	180 / 7.09	200 / 7.87	228 / 8.98
b	167 / 6.57	177 / 6.97	200 / 7.87	232 / 9.13
c	615 / 24.21	785 / 30.91	915 / 36.02	1160 / 45.67
d	200 / 7.87	240 / 9.45	280 / 11.02	335 / 13.19

Table 2: Material for housing

Design	B
Housing	Steel
Lining	ETFE
Cover	Steel
Valve seat	Hastelloy
Guiding disc	PTFE
Valve pallet	A

Semi-conductive material and special material (e.g., PFA) upon request.

Table 3: Material for valve pallet

Design	A
Pressure range (mbar) (inch W.C.)	±60 up to ±500 ±24 up to ±200
Valve pallet	Hastelloy
Spindle / Guiding	Hastelloy
Sealing	Metal to Metal

Special materials upon request.

Devices with higher set pressure or vacuum are available upon request. For lower set pressures or vacuum, refer to type DZ/EA.

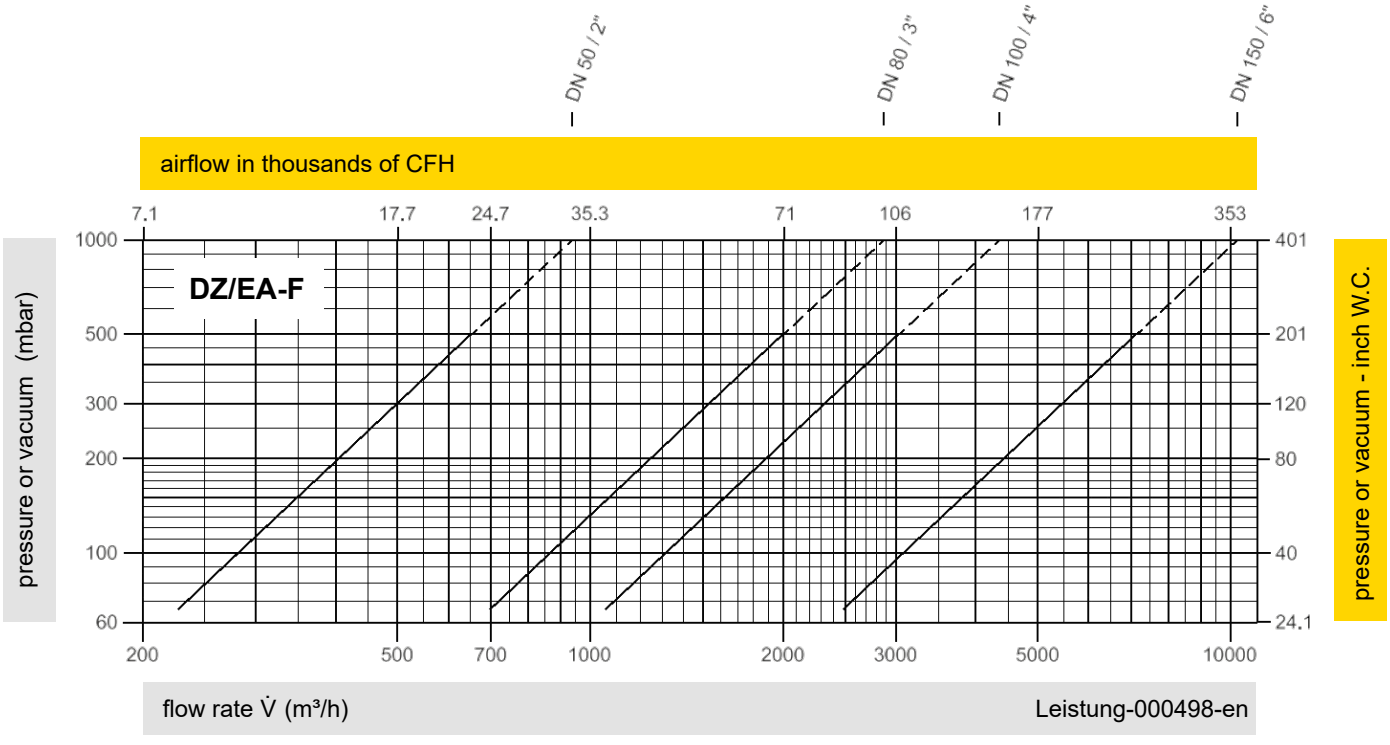
Table 4: Flange connection type

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

Pressure or Vacuum Relief Valve with ETFE Lining, In-Line

Flow Capacity Chart

PROTEGO® DZ/EA-F

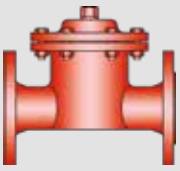


The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig.

Volume flow V̇ 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.”

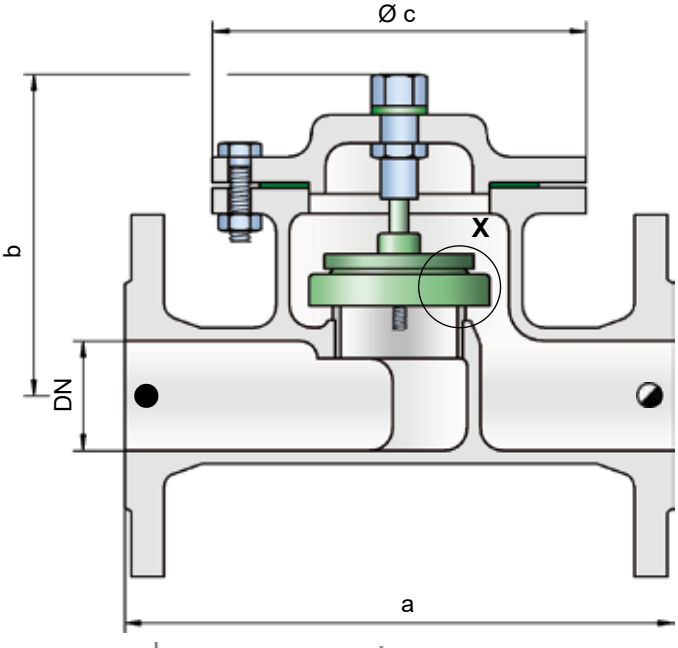
All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Notes:

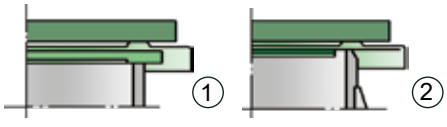


Pressure or Vacuum Relief Valve, In-Line

PROTEGO® DZ/T



Detail **X**



● = Tank connection for pressure relief function

◒ = Tank connection for vacuum relief function

Flow direction marked at the housing by →

Pressure or vacuum settings:

DN 25 and 32	±3.5 mbar	up to	±60 mbar
DN 1" and 1 ¼"	±1.4 inch W.C.	up to	±24 inch W.C.
DN 40 up to 300	±2.0 mbar	up to	±60 mbar
DN 1 ½"up to 12"	±0.8 inch W.C.	up to	±24 inch W.C.

For higher set pressure or vacuum, refer to type DZ/T-F

Function and Description

The PROTEGO® in-line valve DZ/T is a state-of-the-art pressure or vacuum relief valve. Typically, the valve is installed in the in-breathing or out-breathing lines of tanks, vessels, and process equipment to protect against unallowable overpressure or underpressure. The valve prevents emission losses almost up to the set pressure and prevents unacceptable product entry. 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. Due to our highly developed manufacturing technology, the tank pressure is maintained up to set pressure with a tightness that is far above the conventional standard. This feature is ensured by valve seats made of high quality stainless steel and with individually 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 fluids. 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 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
- based on 10% technology, set pressure is close to opening pressure for optimum pressure maintenance in the system as compared to conventional 40% or 100% technology
- high flow capacity reduces costs through the use of smaller valves
- can be used as pressure or vacuum relief valve
- can be used in explosion hazardous areas
- sturdy housing design (PN 10)
- maintenance-friendly design

Designs and Specifications

The valve pallet is weight-loaded. **Higher set pressures for pressure and vacuum are achieved by using spring-loaded type DZ/T-F.**

Two different designs are available:

In-line pressure or vacuum relief valve, standard design	**DZ/T -** **–**
In-line pressure or vacuum relief valve with heating jacket	**DZ/T -** **H**

Additional special devices available upon request.

Within piping systems, the influence of backpressure has to be considered when deciding the set pressure and opening characteristics. For special design solutions (e.g., partial load operation), the valve can be supplied with standard valve pallets (with proportional opening function).

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Vents - 10% Technology (Flyer pdf)

Leak Rate/10% Technology (Flyer pdf)

Coated Devices (Flyer pdf)

The optimized valve pallet (Flyer pdf)

Table 1: Dimensions Dimensions in mm / inches

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

DN	25 / 1"	32 / 1 ¼"	40 / 1 ½"	50 / 2"	65 / 2 ½"	80 / 3"	100 / 4"	150 / 6"	200 / 8"	250 / 10"	300 / 12"
a	220/8.66	220/8.66	250/9.84	250/9.84	340/13.39	340/13.39	380/14.96	460/18.11	550/21.65	650/25.59	700/27.56
b	140/5.51	140/5.51	190/7.48	190/7.48	210/8.27	210/8.27	240/9.45	305/12.01	460/18.11	515/20.28	555/21.85
c	150/5.91	150/5.91	170/6.69	170/6.69	235/9.25	235/9.25	280/11.02	335/13.19	420/16.54	505/19.88	565/22.24

Dimensions for pressure or vacuum relief valve with heating jacket upon request.

Table 2: Material selection for housing

Design	A	B	C
Housing Heating jacket (DZ/T-H-...)	Steel Steel	Stainless Steel Stainless Steel	Hastelloy Stainless Steel
Valve seat	Stainless Steel	Stainless Steel	Hastelloy
Gasket	PTFE	PTFE	PTFE
Valve pallet DN 40 - 300 / 1 ½" - 12"	A, C, E, F	A, C, E, F	B, D, G
Valve pallet DN 25 - 32 / 1" - 1 ¼"	H, I, J	H, I, J	–

The housings are also available with an ECTFE coating.

Special materials upon request.

Table 3: Material selection for valve pallet

DN 40 - 300 / 1 ½" - 12"

Design	A	B	C	D	E	F	G
Pressure range (mbar) (inch W.C.)	±2.0 up to ±3.5 ±0.8 up to ±1.4	±2.0 up to ±3.5 ±0.8 up to ±1.4	±3.5 up to ±14 ±1.4 up to ±5.6	±3.5 up to ±14 ±1.4 up to ±5.6	±14 up to ±60 ±5.6 up to ±24	±14 up to ±60 ±5.6 up to ±24	±14 up to ±60 ±5.6 up to ±24
Valve pallet	Aluminum	Titanium	Stainless Steel	Titanium	Stainless Steel	Stainless Steel	Hastelloy
Sealing	FEP	FEP	FEP	FEP	Metal to Metal	PTFE	Metal to Metal

DN 25 - 32 / 1" - 1 ¼"

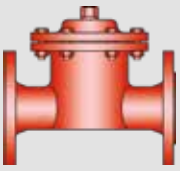
Design	H	I	J
Pressure range (mbar) (inch W.C.)	±3,5 up to ±15 ±1.4 up to ±6.0	±15 up to ±60 ±6.0 up to ±24	±15 up to ±60 ±6.0 up to ±24
Valve pallet	PTFE	Stainless Steel	Stainless Steel
Sealing	PTFE	Metal to Metal	PTFE

Special materials upon request.

For higher set pressure or vacuum, refer to type DZ/T-F.

Table 3: Flange connection type

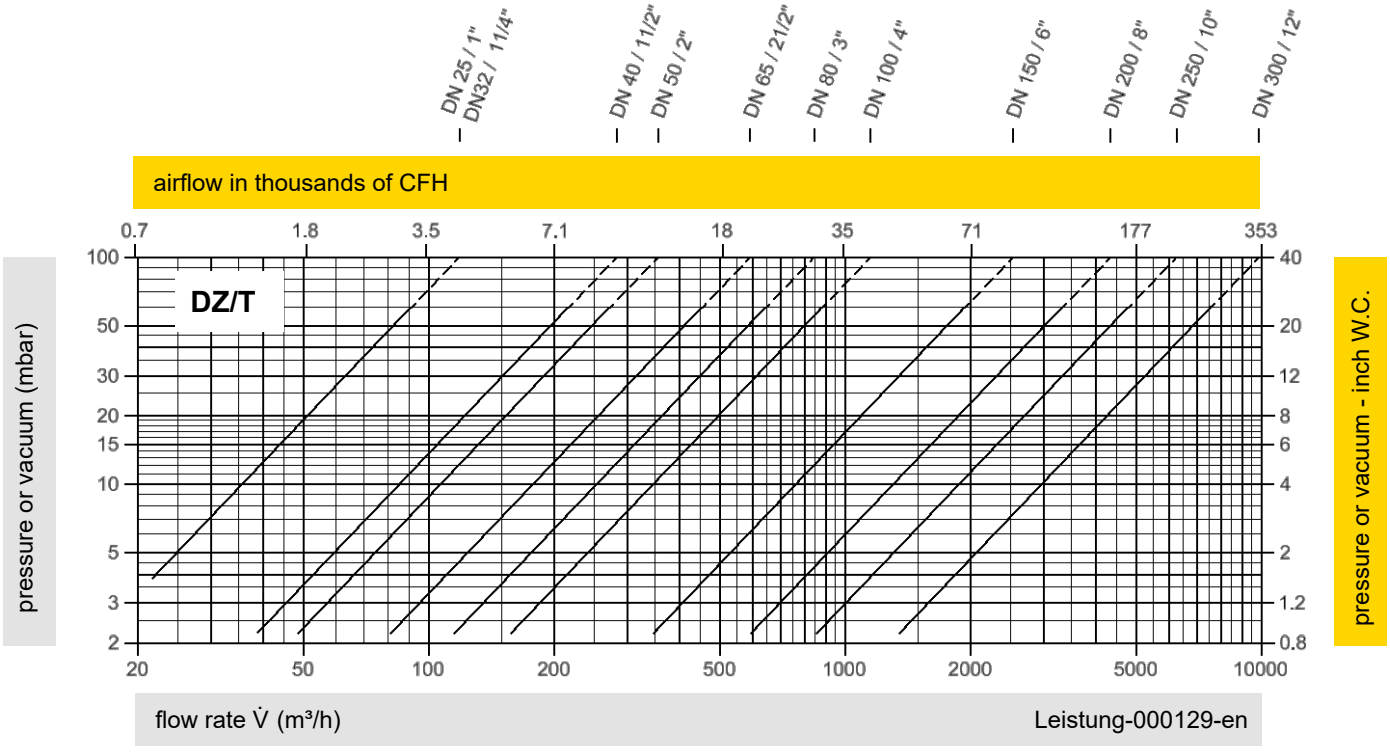
EN 1092-1; Form B1	Other types upon request.
ASME B16.5 CL 150 R.F.	



Pressure or Vacuum Relief Valve, In-Line

Flow Capacity Chart

PROTEGO® DZ/T

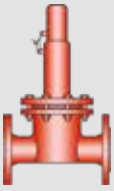


The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig.

Volume flow V̇ 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.”

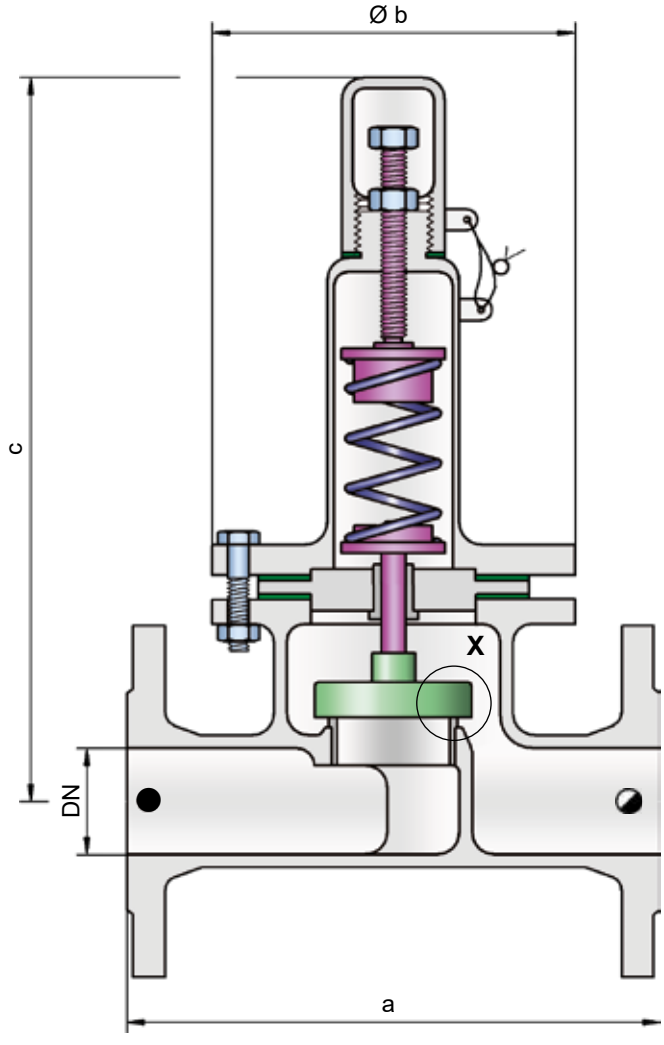
All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Notes:



Pressure or Vacuum Relief Valve, In-Line

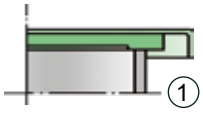
PROTEGO® DZ/T-F



● = Tank connection for pressure relief function

◑ = Tank connection for vacuum relief function

Detail **X**



Flow direction marked at the housing by ➞

Pressure or vacuum settings:

±60 mbar	up to	±500 mbar (DN 25/1" up to 200/8")
±24 inch W.C.	up to	±200 inch W.C.
±60 mbar	up to	±400 mbar (DN 250/10")
±24 inch W.C.	up to	±160 inch W.C.
±60 mbar	up to	±300 mbar (DN 300/12")
±24 inch W.C.	up to	±120 inch W.C.

Devices with higher set pressure or vacuum are available upon request. For lower set pressures or vacuum, refer to type DZ/T.

Function and Description

The PROTEGO® in-line valve DZ/T-F is a state-of-the-art pressure or vacuum relief valve for higher system pressures. Typically, the valve is installed in the in-breathing or out-breathing lines of tanks, vessels, and process equipment to protect against unallowable overpressure or underpressure. The valve prevents emission losses almost up to the set pressure and prevents unacceptable product. This spring-loaded model allows higher set pressures than the DZ/T.

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 above the conventional standard. This feature is ensured by valve seats made of high quality stainless steel and with individually lapped valve pallets (1) and sturdy housing design. 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 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
- based on 10% technology, set pressure is close to opening pressure for optimum pressure maintenance in the system as compared to conventional 40% or 100% technology
- high flow capacity reduces costs through the use of smaller valves
- can be used as pressure or vacuum relief valve
- can be used in explosion hazardous areas
- sturdy housing design (PN 10)
- spring-loaded for high set pressures
- maintenance-friendly design

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Vents - 10% Technology (Flyer pdf)

Leak Rate/10% Technology (Flyer pdf)

Coated Devices (Flyer pdf)

The optimized valve pallet (Flyer pdf)

Designs and Specifications

The valve pallet is spring-loaded. Lower set pressures for pressure and vacuum are achieved by using the weight-loaded type DZ/T.

Two different designs are available:

In-line pressure or vacuum relief valve, standard design **DZ/T-F - [–]**

In-line pressure or vacuum relief valve with heating jacket **DZ/T-F - [H]**

Additional special devices available upon request.

Within piping systems, the influence of backpressure has to be considered when deciding the set pressure and opening characteristics. For special design solutions (e.g., partial load operation), the valve can be supplied with standard valve pallets (with proportional opening function).

Spring-loaded PV-Valves Maintenance-friendly design (Flyer pdf)

Table 1: Dimensions Dimensions in mm / inches

To select the nominal size (DN), please use the flow capacity charts on the following pages.

DN	25 / 1"	32 / 1 ¼"	40 / 1 ½"	50 / 2"	80 / 3"	100 / 4"	125 / 5"	150 / 6"
a	220 / 8.66	220 / 8.66	250 / 9.84	250 / 9.84	340 / 13.39	380 / 14.96	460 / 18.11	460 / 18.11
b	150 / 5.91	150 / 5.91	170 / 6.69	170 / 6.69	235 / 9.25	280 / 11.02	335 / 13.19	335 / 13.19
c	395 / 15.55	395 / 15.55	420 / 16.54	420 / 16.54	570 / 22.44	680 / 26.77	940 / 37.01	940 / 37.01

DN	200 / 8”	250 / 10”	300 / 12”
a	550 / 21.65	650 / 25.59	700 / 27.56
b	420 / 16.54	505 / 19.88	565 / 22.24
c	1160 / 45.67	1215 / 47.83	1255 / 49.41

Dimensions for pressure or vacuum relief valve with heating jacket upon request.

Table 2: Material selection for housing

Design	A	B
Housing Heating jacket (DZ/T-F-H-...)	Steel Steel	Stainless Steel Stainless Steel
Valve seat	Stainless Steel	Stainless Steel
Gasket	PTFE	PTFE
Valve pallet	A	A

The housings are also available with an ECTFE coating. Special materials upon request.

Table 3: Material of valve pallet

Design	A
Pressure range (mbar) (inch W.C.)	±60 up to ±500 ±24 up to ±200
Valve pallet	Stainless Steel
Sealing	Metal to Metal
Pressure spring	Stainless Steel

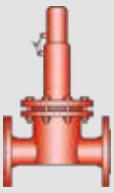
Special materials upon request.

Devices with higher set pressure or vacuum are available upon request. For lower set pressures or vacuum, refer to type DZ/T.

Table 4: Flange connection type

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

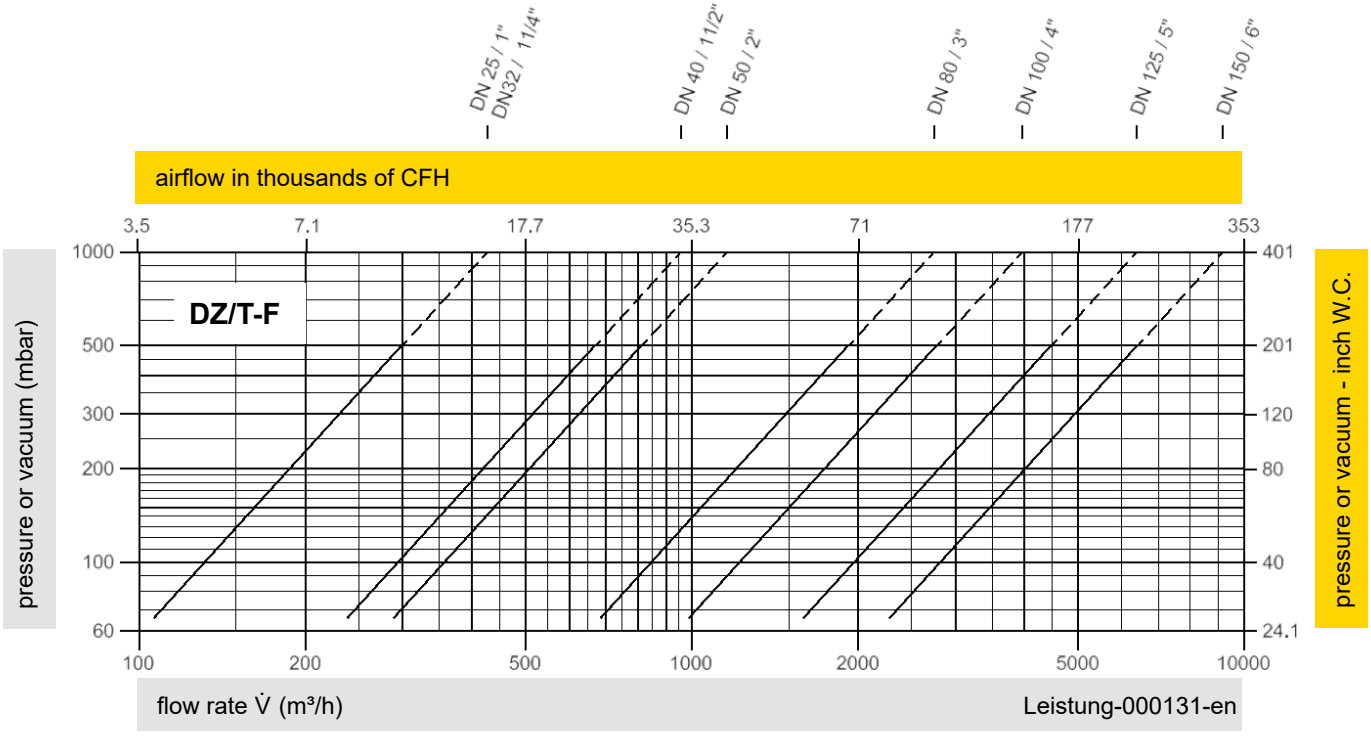
Other types upon request.

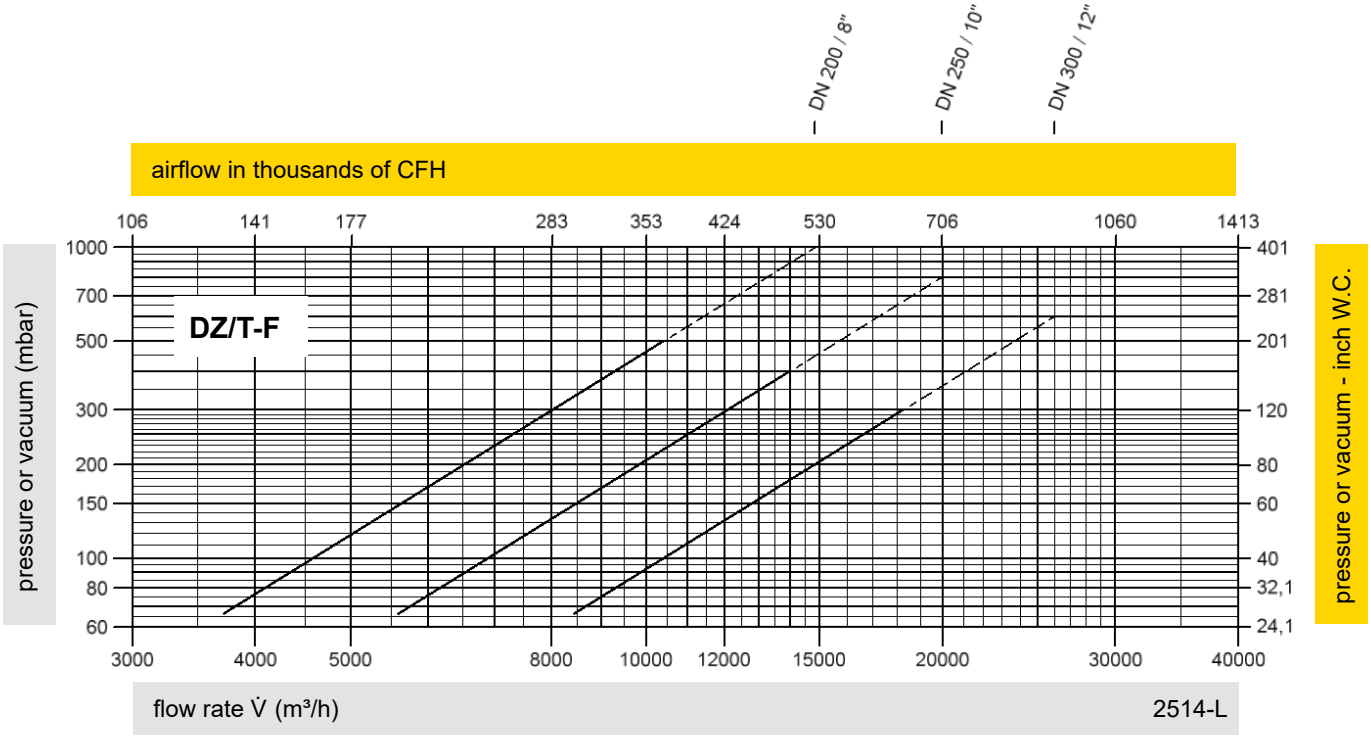


Pressure or Vacuum Relief Valve, In-Line

Flow Capacity Charts

PROTEGO® DZ/T-F



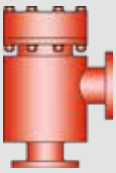


The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig.

Volume flow V̇ 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.”

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

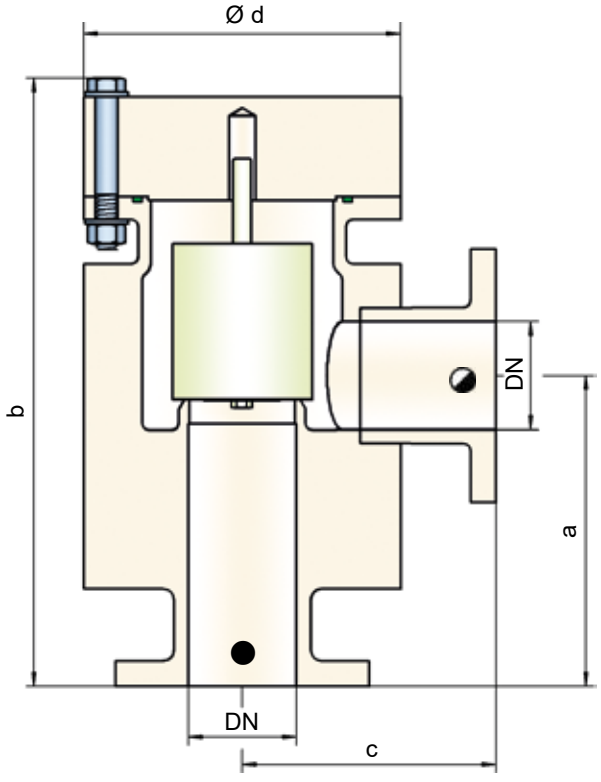
Notes:



Pressure or Vacuum Relief Valve, In-Line

made of plastic

PROTEGO® R/KSM



● = Tank connection for pressure relief function

◒ = Tank connection for vacuum relief function

Flow direction marked at the housing by →

Pressure or 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.

Function and Description

The PROTEGO® in-line valve R/KSM is a state-of-the-art pressure or vacuum relief valve in a right angle design made out of high-grade synthetic material. Typically, the valve is installed in the in-breathing or out-breathing lines of tanks, vessels, and process equipment to protect against unallowable overpressure or underpressure. The valve prevents emission losses almost up to the set pressure and prevents unacceptable product entry. 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 or vacuum (MAWP or 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 the set pressure with a tightness that is far above to the conventional standard. This feature is ensured by special valve seats made of high quality synthetic material or PTFE. 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 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
- based on 10% technology, set pressure is close to opening pressure for optimum pressure maintenance in the system as compared to conventional 40% or 100% technology
- can be used as pressure or vacuum relief valve
- compact, space-saving right-angle design
- high flow capacity reduces costs through the use of smaller valves
- non-corrosive
- weight reduction in comparison to steel/stainless steel
- high surface quality
- different plastics can easily be combined
- maintenance-friendly design

Design and Specification

The valve pallet is weight-loaded. Higher set pressures are achieved with metal valve pallets.

In-line pressure or vacuum relief valve, standard design **R/KSM -**

Additional special devices available upon request.

Within piping systems, the influence of backpressure has to be considered when deciding the set pressure and opening characteristics.

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Vents - 10% Technology (Flyer pdf)

Leak Rate/10% Technology (Flyer pdf)

Vents for corrosive vapor service (Flyer pdf)

Table 1: Dimensions Dimensions in mm / inches

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

DN	50 / 2"	80 / 3"	100 / 4"	150 / 6"	200 / 8"
a	200 / 7.87	245 / 9.65	300 / 11.81	370 / 14.57	625 / 24.61 (650 / 25.59)*
b	376 / 14.80	521 / 20.51	563 / 22.17 (523 / 20.59)*	687 / 27.05 (651 / 25.63)*	914 / 35.98 (912 / 35.91)*
c	150 / 5.91	200 / 7.87	225 / 8.86	280 / 11.02	350 / 13.78
d	180 / 7.09	250 / 9.84	300 / 11.81	350 / 13.78 (405 / 15.94)*	560 / 22.05 (500 / 19.68)*

* Dimensions in parentheses only for PVDF

Table 2: Material selection for housing

Design	A	B	C
Housing	PE	PP	PVDF
Valve seat	PE	PP	PVDF
Gasket	FPM	FPM	FPM
Valve pallet	A, C, D	B, C, D	C, D

Special materials upon request.

Table 3: Material selection for valve pallet

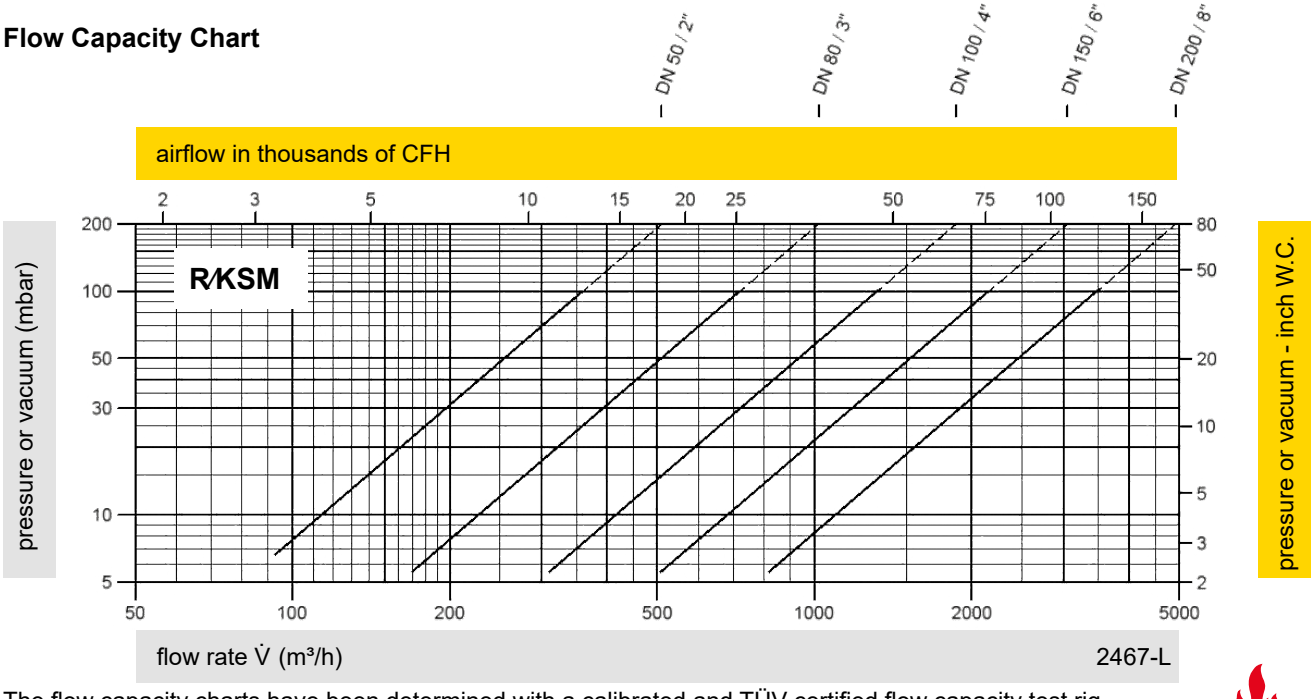
Design	A	B	C	D
Pressure range (mbar) (inch W.C.)	±6.0 up to ±16 ±2.4 up to ±6.4	±5.5 up to ±16 ±2.2 up to ±6.4	±9.5 up to ±30 ±3.8 up to ±12	±30 up to ±100 ±12 up to ± 40
Valve pallet	PE	PP	PVDF	Hastelloy
Sealing	PTFE	PTFE	PTFE	PTFE
Spindle guide	PE	PP	PVDF	Hastelloy

Special materials and devices with higher set pressure or vacuum 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.	

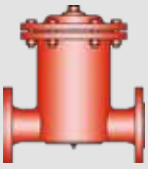
Flow Capacity Chart



The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig.

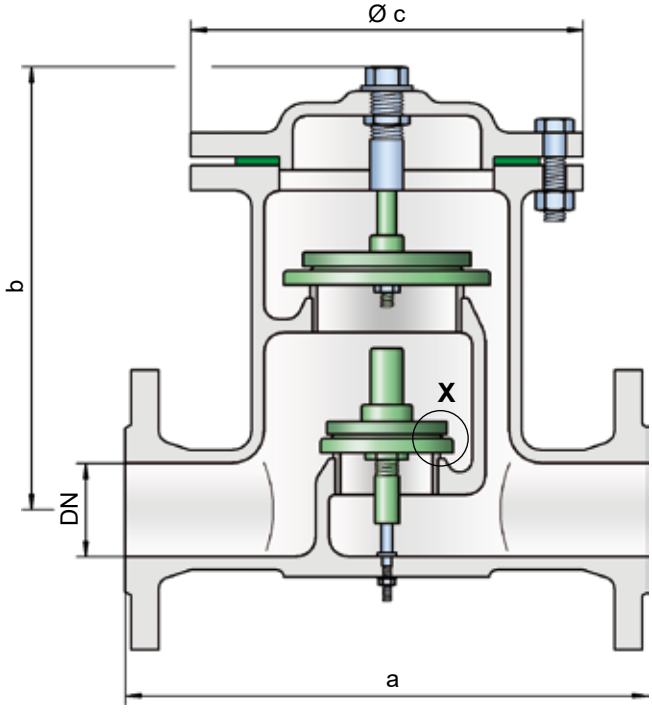
Volume flow V̇ in (m³/h) and CFH refer to the standard reference conditions of air in ISO 6358 (20°C, 1bar). For conversion to other densities and temperatures, refer to Sec. 1: “Technical Fundamentals.”

PROTEGO
for safety and environment

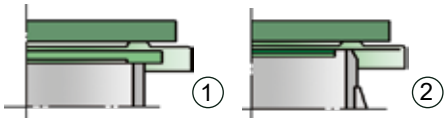


Pressure and Vacuum Relief Valve, In-Line

PROTEGO® DV/ZT



Detail **X**



Tank connection depends upon flow capacity, set pressure, and set vacuum for in-breathing and out-breathing.

Pressure or vacuum settings:

Upper valve pallet:	±2.0 mbar	up to ±60 mbar
	±0.8 inch W.C.	up to ±24 inch W.C.
Lower valve pallet:	±3.5 mbar	up to ±50 mbar
	±1.4 inch W.C.	up to ±20 inch W.C.

For higher set pressure, refer to type DV/ZT-F. Lower set vacuum upon request.

Function and Description

The PROTEGO® in-line valve DV/ZT is a state-of-the-art pressure and vacuum relief valve. 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 provides protection from product entry into the system. For structural reasons, the lower valve pallet is one size smaller than the upper valve pallet.

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.

Due to our highly developed manufacturing technology, the tank pressure is maintained up to set pressure with a tightness that is far above the conventional standard. This feature is ensured by valve seats made of high quality stainless steel and with individually 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 fluids. 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 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
- based on 10% technology, set pressure is close to opening pressure for optimum pressure maintenance in the system as compared to conventional 40% or 100% technology
- high flow capacity reduces costs through the use of smaller valves
- can be used in explosion hazardous areas
- sturdy housing design (PN 10)
- maintenance-friendly design

Designs and Specifications

The valve pallets are weight-loaded. **Higher set pressures are achieved by using spring-loaded type DV/ZT-F.**

Two different designs are available:

In-line pressure and vacuum relief valve, standard design	**DV/ZT -** –
In-line pressure and vacuum relief valve with heating jacket	**DV/ZT -** H

Additional special devices available upon request.

Within piping systems, the influence of backpressure has to be considered when deciding the set pressure and opening characteristics. For special design solutions (e.g., partial load operation), the valve can be supplied with standard valve pallets (with proportional opening function).

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Vents - 10% Technology (Flyer pdf)

Leak Rate/10% Technology (Flyer pdf)

Coated Devices (Flyer pdf)

The optimized valve pallet (Flyer pdf)

Table 1: Dimensions Dimensions in mm / inches

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

DN	40 / 1 ½"	50 / 2"	80 / 3"	100 / 4"	150 / 6"
a	280 / 11.02	280 / 11.02	340 / 13.39	390 / 15.35	520 / 20.47
b	270 / 10.63	270 / 10.63	290 / 11.42	355 / 13.98	425 / 16.73
c	210 / 8.27	210 / 8.27	280 / 11.02	310 / 12.20	390 / 15.35

Larger sizes upon request.
Dimensions for pressure and vacuum relief valve with heating jacket upon request.

Table 2: Material selection for housing

Design	A	B
Housing Heating jacket (DV/ZT-H-...)	Steel Steel	Stainless Steel Stainless Steel
Valve seat	Stainless Steel	Stainless Steel
Gasket	PTFE	PTFE

The housings are also available with an ECTFE coating.
Special materials upon request.

Table 3: Material selection for upper valve pallet

Design	A	B	C	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 ±60 ±5.6 up to ±24	±14 up to ±60 ±5.6 up to ±24
Valve pallet	Aluminum	Stainless Steel	Stainless Steel	Stainless Steel
Sealing	FEP	FEP	Metal to Metal	PTFE

Special materials upon request.
For higher set pressures refer to type DV/ZT-F

Table 4: Material selection for lower valve pallet

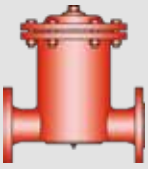
Design	A	B	C	D	E	F
Pressure range (mbar) (inch W.C.)	±3.5 up to ±5.0 ±1.4 up to ±2.0	±5.0 up to ±14 ±2.0 up to ±5.6	±14 up to ±35 ±5.6 up to ±14	±35 up to ±50 ±14 up to ±20	±14 up to ±35 ±5.6 up to ±14	±35 up to ±50 ±14 up to ±20
Valve pallet	Aluminum	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
Sealing	FEP	FEP	Metal to Metal	Metal to Metal	PTFE	PTFE

Special materials and lower set vacuum upon request.

Table 5: Flange connection type

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

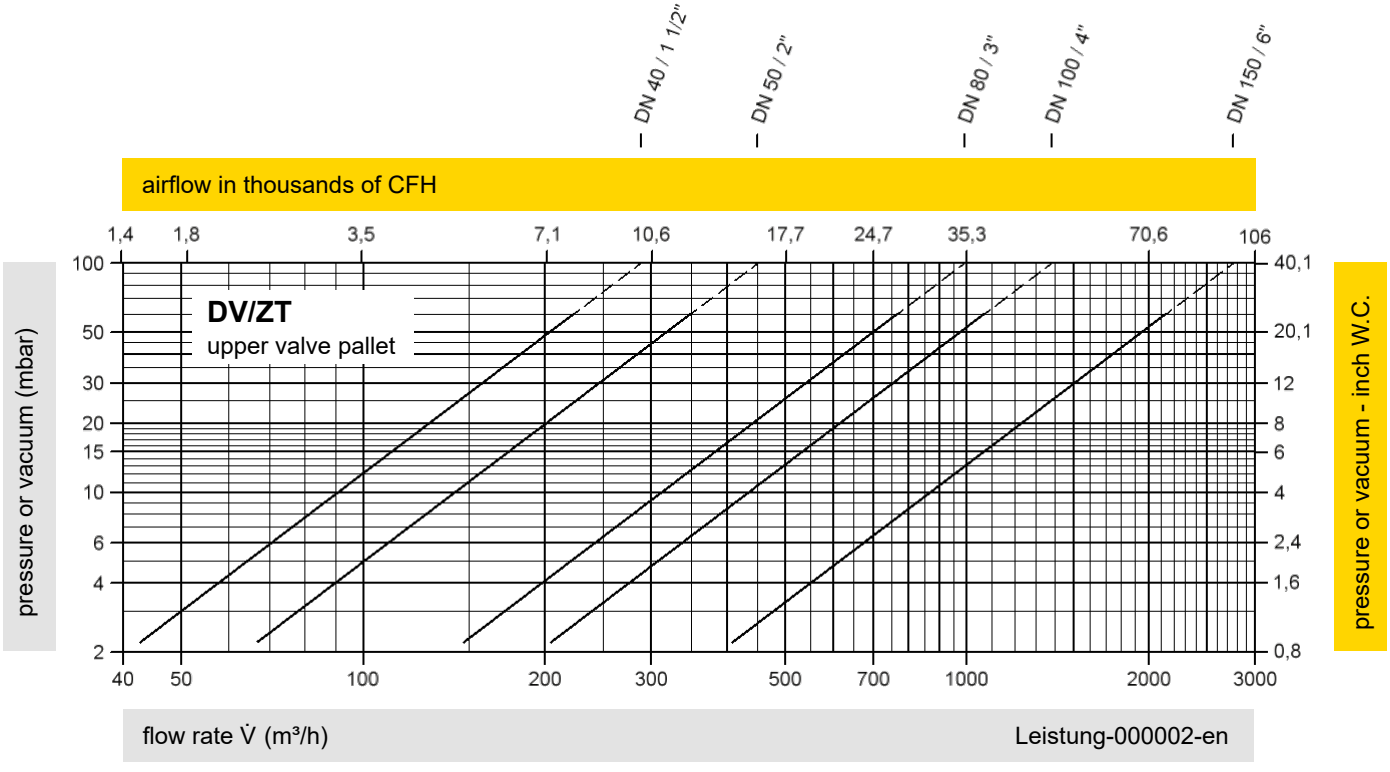
Other types upon request.

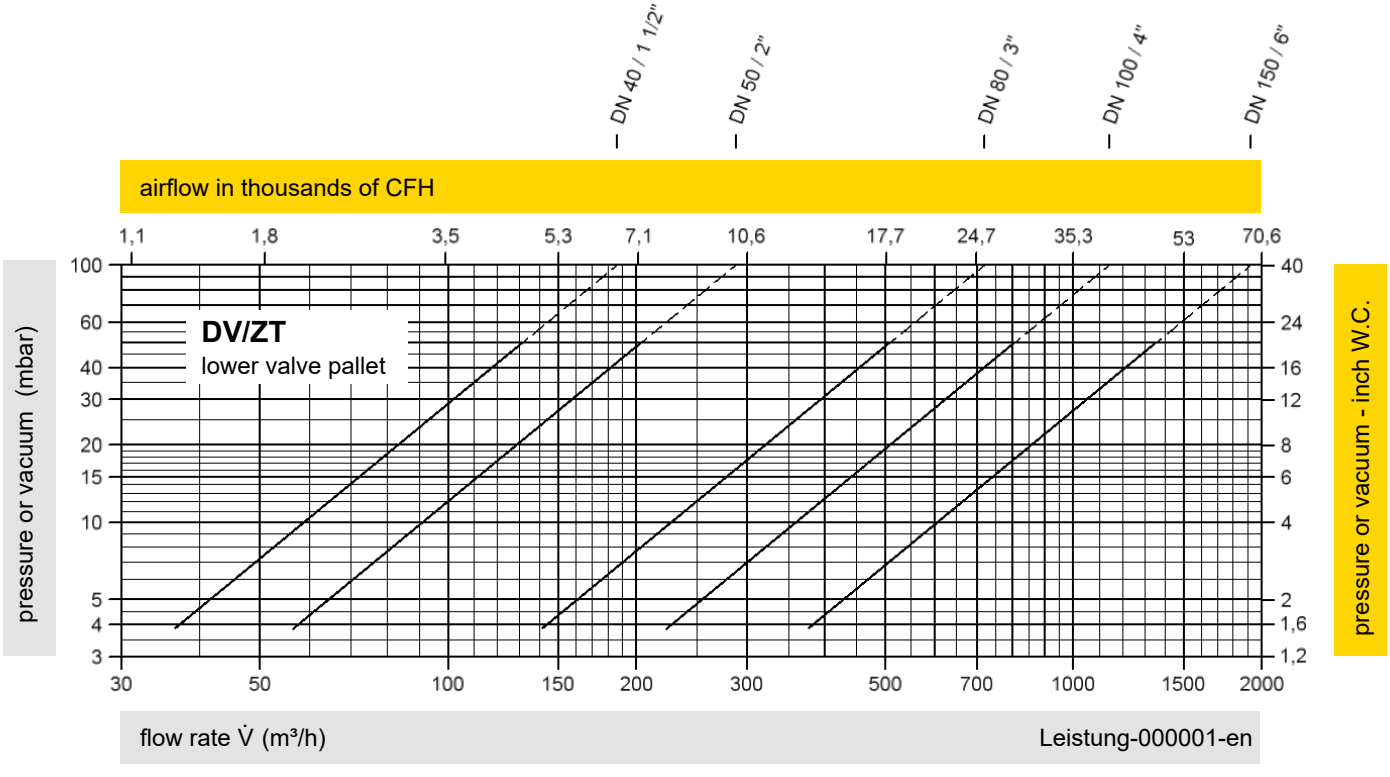


Pressure and Vacuum Relief Valve, In-Line

Flow Capacity Charts

PROTEGO® DV/ZT



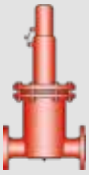


The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig.

Volume flow V̇ 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.”

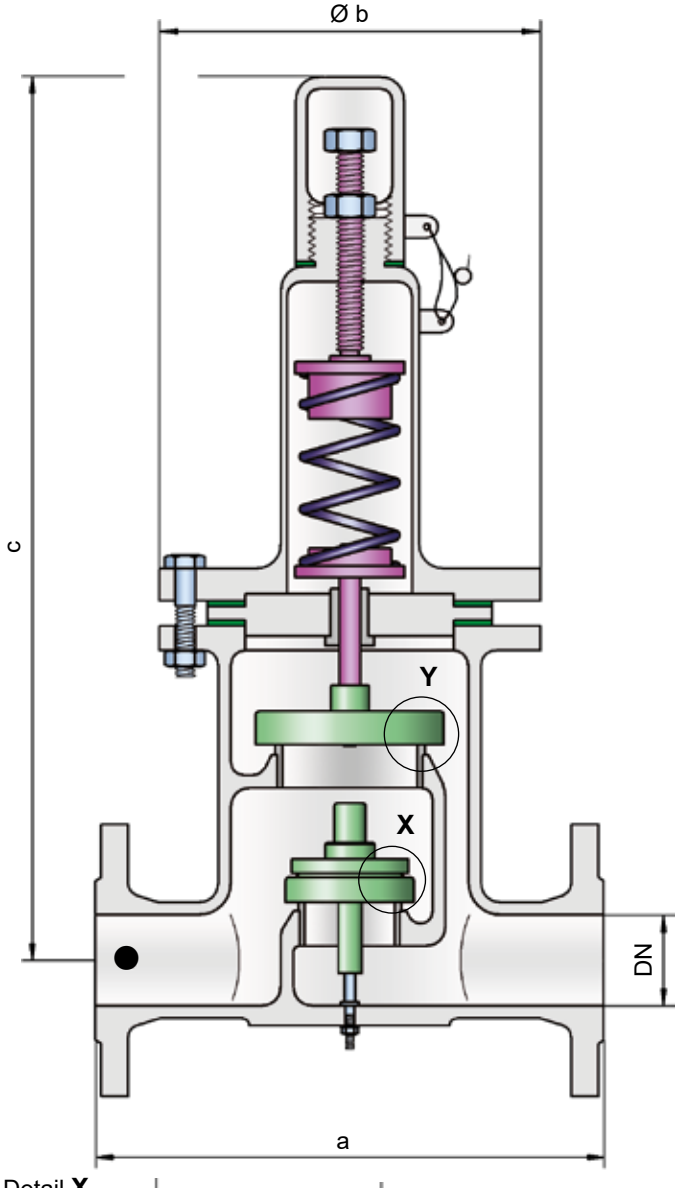
All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Notes:

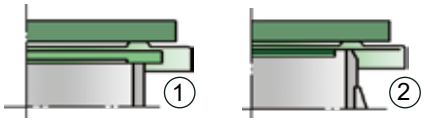


Pressure and Vacuum Relief Valve, In-Line

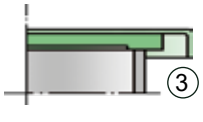
PROTEGO® DV/ZT-F



Detail **X**



Detail **Y**



● = Tank connection

Settings:

Pressure:

+60 mbar up to +500 mbar (DN 40/1 ½“ up to 150/6“)
+24 inch W.C. up to +200 inch W.C.
>+60 mbar up to +400 mbar (DN200/8”;DN 250/10”)
>+24 inch W.C. up to +160 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.
by set pressure up to +150 mbar / +60 inch W.C.

For lower set pressure, refer to type DV/ZT.
Higher set pressure and lower set vacuum upon request.

Function and Description

The PROTEGO® in-line valve DV/ZT-F is a state-of-the-art pressure and vacuum relief valve. 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 unacceptable product entry system. For structural reasons, the vacuum valve pallet is one size smaller than the pressure valve pallet. Due to the spring-loaded design, higher set pressures can be achieved.

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. Due to our highly developed manufacturing technology, the tank pressure is maintained up to set pressure with a tightness that is far above to the conventional standard. This feature is ensured by valve seats made of high quality stainless steel and with individually lapped valve pallets (1) (3), or with an air cushion seal (2), in conjunction with high quality FEP diaphragm and a sturdy housing design. After the overpressure is released of 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 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
- based on 10% technology, set pressure is close to opening pressure for optimum pressure maintenance in the system as compared to conventional 40% or 100% technology
- high flow capacity reduces costs through the use of smaller valves
- can be used in explosion hazardous areas
- sturdy housing design (PN 10)
- spring-loaded on overpressure side for higher set pressures
- maintenance-friendly design

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Vents - 10% Technology (Flyer pdf)

Leak Rate/10% Technology (Flyer pdf)

Coated Devices (Flyer pdf)

The optimized valve pallet (Flyer pdf)

Designs and Specifications

The pressure valve pallet is spring-loaded, and the vacuum valve pallet weight-loaded. Lower set pressures for the pressure side are achieved through weight-loaded type DV/ZT.

Two different designs are available:

In-line pressure and vacuum relief valve, standard design **DV/ZT-F** [–]

In-line pressure and vacuum relief valve with heating jacket **DV/ZT-F -** [H]

Additional special devices available upon request.

Within piping systems, the influence of backpressure has to be considered when deciding the set pressure and opening characteristics. For special design solutions (e.g., partial load operation), the valve can be supplied with standard valve pallets (with proportional opening function).

Spring-loaded PV-Valves Maintenance-friendly design (Flyer pdf)

Table 1: Dimensions Dimensions in mm / inches

To select the nominal size (DN), please use the flow capacity charts on the following pages.

DN	40 / 1 ½"	50 / 2"	80 / 3"	100 / 4"	150 / 6"	200 / 8"	250 / 10"
a	280 / 11.02	280 / 11.02	340 / 13.39	390 / 15.35	520 / 20.47	650 / 25.59	750 / 29.53
b	210 / 8.27	210 / 8.27	280 / 11.02	310 / 12.20	390 / 15.35	565 / 22.24	610 / 24.02
c	605 / 23.82	605 / 23.82	730 / 28.74	870 / 34.25	1170 / 46.06	1030 / 40.55	1335 / 52.56

Larger sizes upon request.
Dimensions for pressure and vacuum relief valve with heating jacket upon request.

Table 2: Material selection for housing

Design	A	B
Housing Heating jacket (DV/ZT-F-H-...)	Steel Steel	Stainless Steel Stainless Steel
Valve seat	Stainless Steel	Stainless Steel
Gasket	PTFE	PTFE

The housings are also available with an ECTFE coating.
Special materials upon request.

Table 3: Material of pressure valve pallet

Design	A
Pressure range (mbar) (inch W.C.)	>+60 up to +500 >+24 up to +200
Valve pallet	Stainless Steel
Sealing	Metal to Metal
Pressure spring	Stainless Steel

Special materials upon request.

For lower set pressure, use type DV/ZT.
Higher set pressure and lower set vacuum upon request.

Table 4: Material selection for vacuum valve pallet

Design	A*	B*	C	D
Pressure 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	<-35 up to -50 <-14 up to -20
Valve pallet	Aluminum	Stainless Steel	Stainless Steel	Stainless Steel
Sealing	FEP	FEP	Metal to Metal	Metal to Metal

Special materials and lower set vacuum upon request.

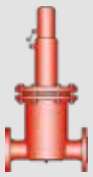
* by set pressure up to +150 mbar / +60 inch W.C.

Table 5: Flange connection type

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

Other types upon request.

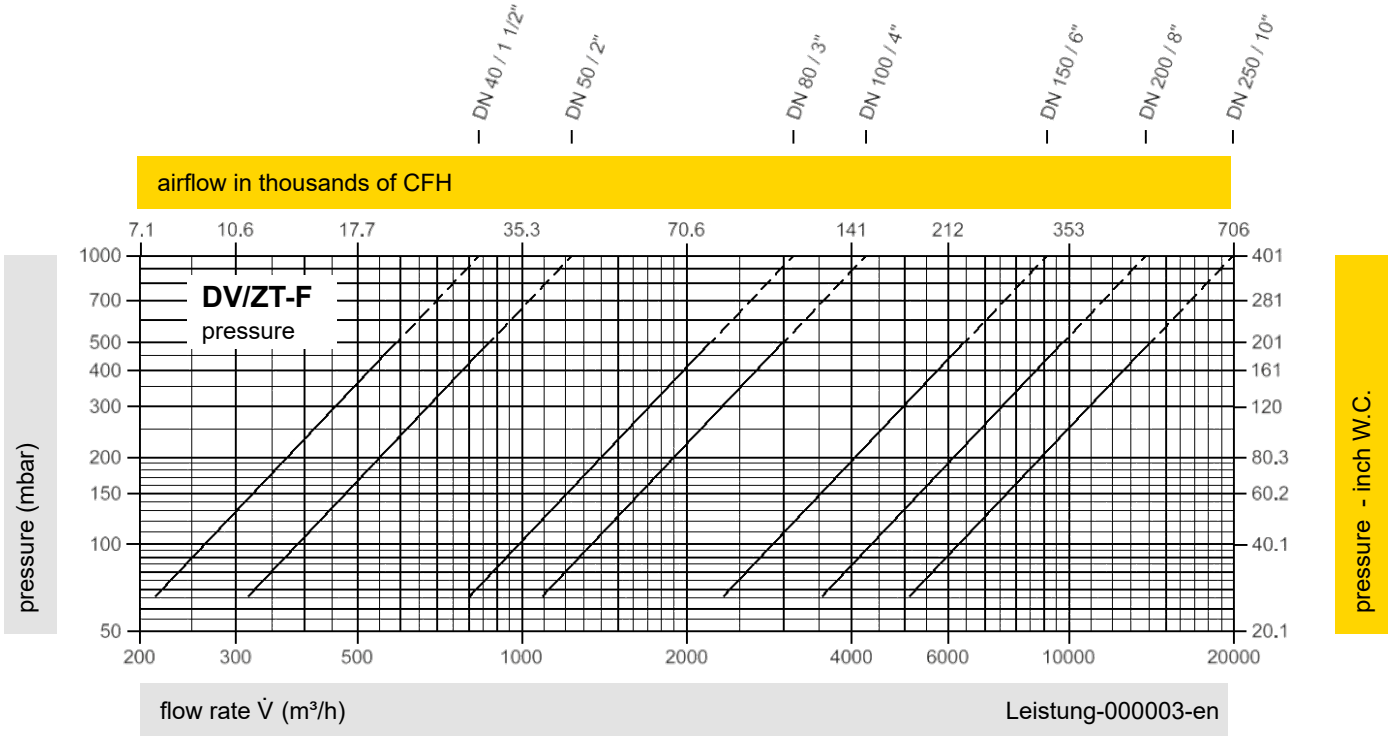
PROTEGO
for safety and environment

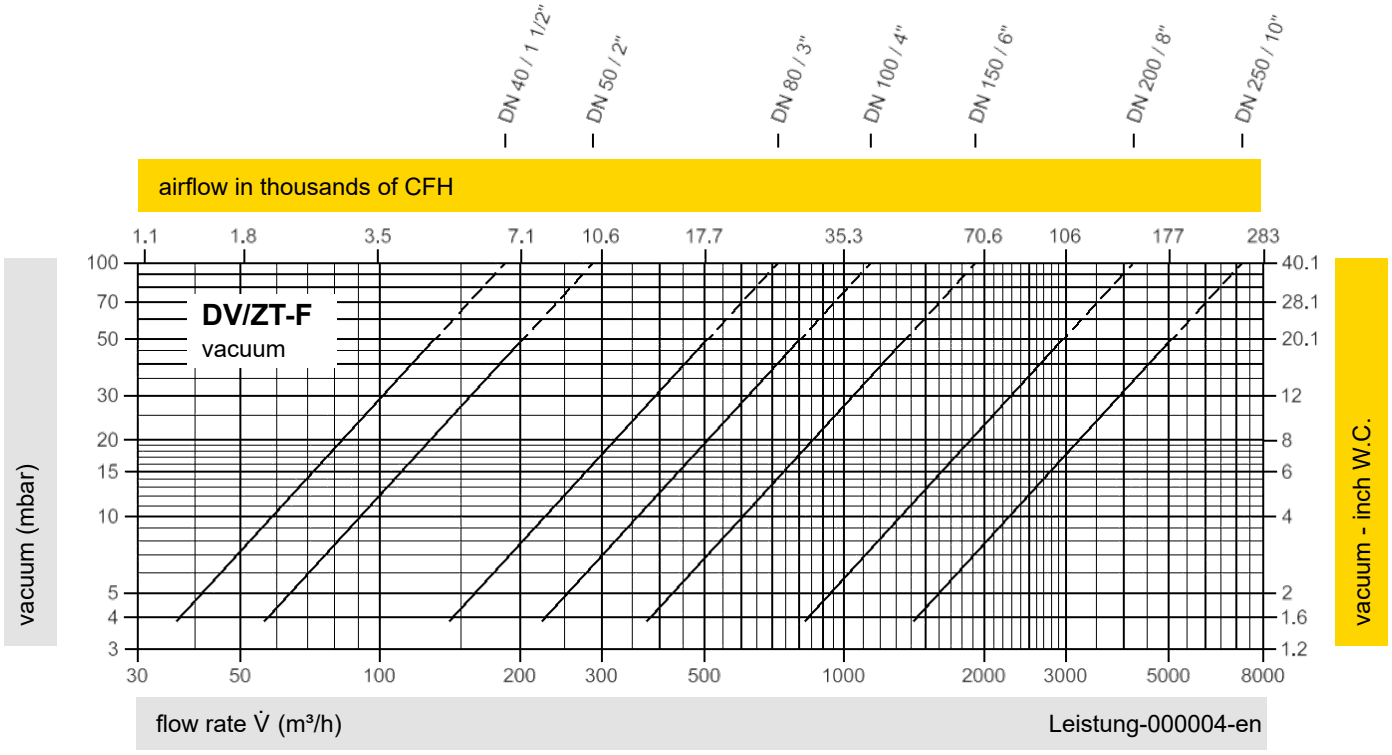


Pressure and Vacuum Relief Valve, In-Line

Flow Capacity Charts

PROTEGO® DV/ZT-F



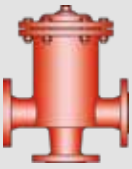


The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig.

Volume flow V̇ 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.”

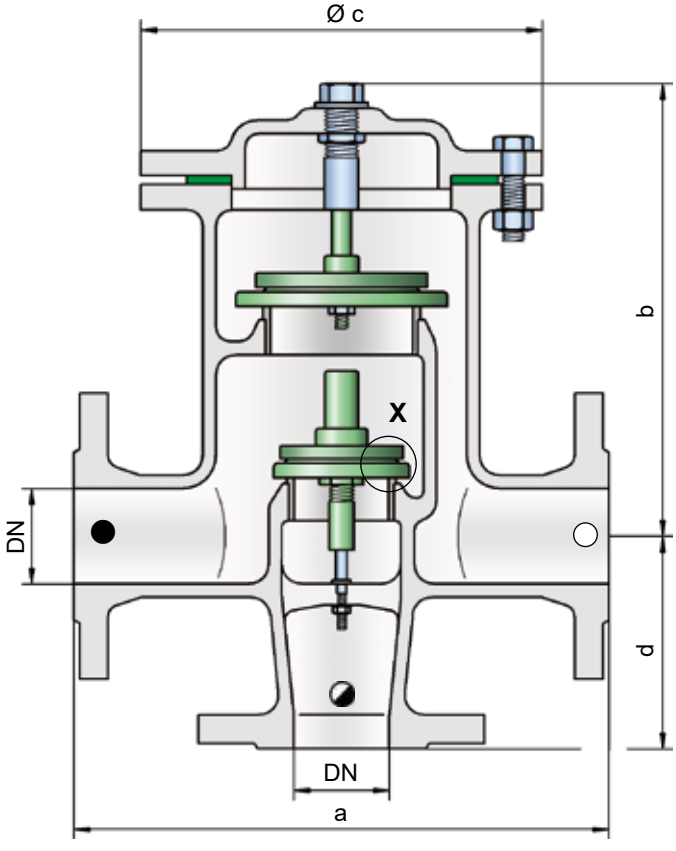
All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Notes:

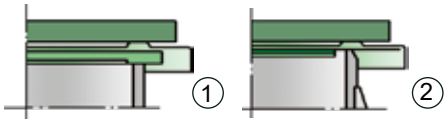


Pressure and Vacuum Relief Valve, In-Line

PROTEGO® DV/ZU



Detail **X**



● = Tank connection

◪ = In-breathing

○ = Out-breathing

Settings:

Pressure: +2.0 mbar up to +60 mbar
+0.8 inch W.C. up to +24 inch W.C.

Vacuum: -3.5 mbar up to -50 mbar
-1.4 inch W.C. up to -20 inch W.C.

For higher set pressure, refer to type DV/ZU-F.
Lower set vacuum upon request.

Function and Description

The PROTEGO® in-line valve DV/ZU is a state-of-the-art pressure and vacuum relief valve with separate flange connections for pressure and vacuum breathing. 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 unacceptable product entry. It is designed in a way that if the set pressure is exceeded, the vapors are released into an exhaust pipe (e.g., vent header). If the set vacuum is exceeded, atmospheric air is pulled into the system. For structural reasons, the vacuum valve pallet is one size smaller than the pressure valve pallet.

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 of the pressure and vacuum side is basically the same. However, the in-breathing will start as soon as the differential pressure between the connected in-breathing line and the tank is greater than the set pressure of the vacuum pallet. Due to our highly developed manufacturing technology, the tank pressure is maintained up to set pressure with a tightness that is far above the conventional standard. This feature is ensured by valve seats made of high quality stainless steel and with individually 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 fluids. 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 vent body and vent pallet is a result of many years of research, resulting in 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
- based on 10% technology, set pressure is close to opening pressure for optimum pressure maintenance in the system as compared to conventional 40% or 100% technology
- high flow capacity reduces costs through the use of smaller valves
- separate connections for in-breathing and out-breathing pipes
- can be used in explosion hazardous areas
- sturdy housing design (PN 10)
- maintenance-friendly design

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Vents - 10% Technology (Flyer pdf)

Leak Rate/10% Technology (Flyer pdf)

Coated Devices (Flyer pdf)

The optimized valve pallet (Flyer pdf)

Designs and Specifications

The valve pallets are weight-loaded. **Higher set pressures are achieved by using spring-loaded type DV/ZU-F.**

Two different designs are available:

In-line pressure and vacuum relief valve, standard design **DV/ZU - –**

In-line pressure and vacuum relief valve with heating jacket **DV/ZU - H**

Additional special devices available upon request.

Within piping systems, the influence of backpressure has to be considered when deciding the set pressure and opening characteristics. For special design solutions (e.g., partial load operation), the valve can be supplied with standard valve pallets (with proportional opening function).

Table 1: Dimensions Dimensions in mm / inches

To select the nominal size (DN), please use the flow capacity charts on the following pages.

DN	40 / 1 ½"	50 / 2"	80 / 3"	100 / 4"	150 / 6"
a	280 / 11.02	280 / 11.02	340 / 13.39	390 / 15.35	520 / 20.47
b	230 / 9.06	230 / 9.06	240 / 9.45	290 / 11.42	330 / 12.99
c	210 / 8.27	210 / 8.27	280 / 11.02	310 / 12.20	390 / 15.35
d	165 / 6.50	165 / 6.50	200 / 7.87	240 / 9.45	300 /11.81

Larger sizes upon request.
Dimensions for pressure and vacuum relief valve with heating jacket upon request.

Table 2: Material selection for housing

Design	A	B
Housing Heating jacket (DV/ZU-H-...)	Steel Steel	Stainless Steel Stainless Steel
Valve seat	Stainless Steel	Stainless Steel
Gasket	PTFE	PTFE

The housings are also available with an ECTFE coating.

Special materials upon request.

Table 3: Material selection for pressure valve pallet

Design	A	B	C	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 +60 >+5.6 up to +24	>+14 up to +60 >+5.6 up to +24
Valve pallet	Aluminum	Stainless Steel	Stainless Steel	Stainless Steel
Sealing	FEP	FEP	Metal to Metal	PTFE

Special materials upon request.

For higher set pressures, refer to type DV/ZU-F.

Table 4: Material selection for vacuum valve pallet

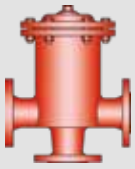
Design	A	B	C	D	E	F
Pressure range (mbar) (inch W.C.)	-3.5 up to -5.0 -1.4 up to -2.0	<-5.0 up to -14 <-2.0 up to -5.6	<-14 up to -35 <-5.6 up to -14	<-35 up to -50 <-14 up to -20	<-14 up to -35 <-5.6 up to -14	<-35 up to -50 <-14 up to -20
Valve pallet	Aluminum	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
Sealing	FEP	FEP	Metal to Metal	Metal to Metal	PTFE	PTFE

Special materials and lower set vacuum upon request.

Table 5: Flange connection type

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

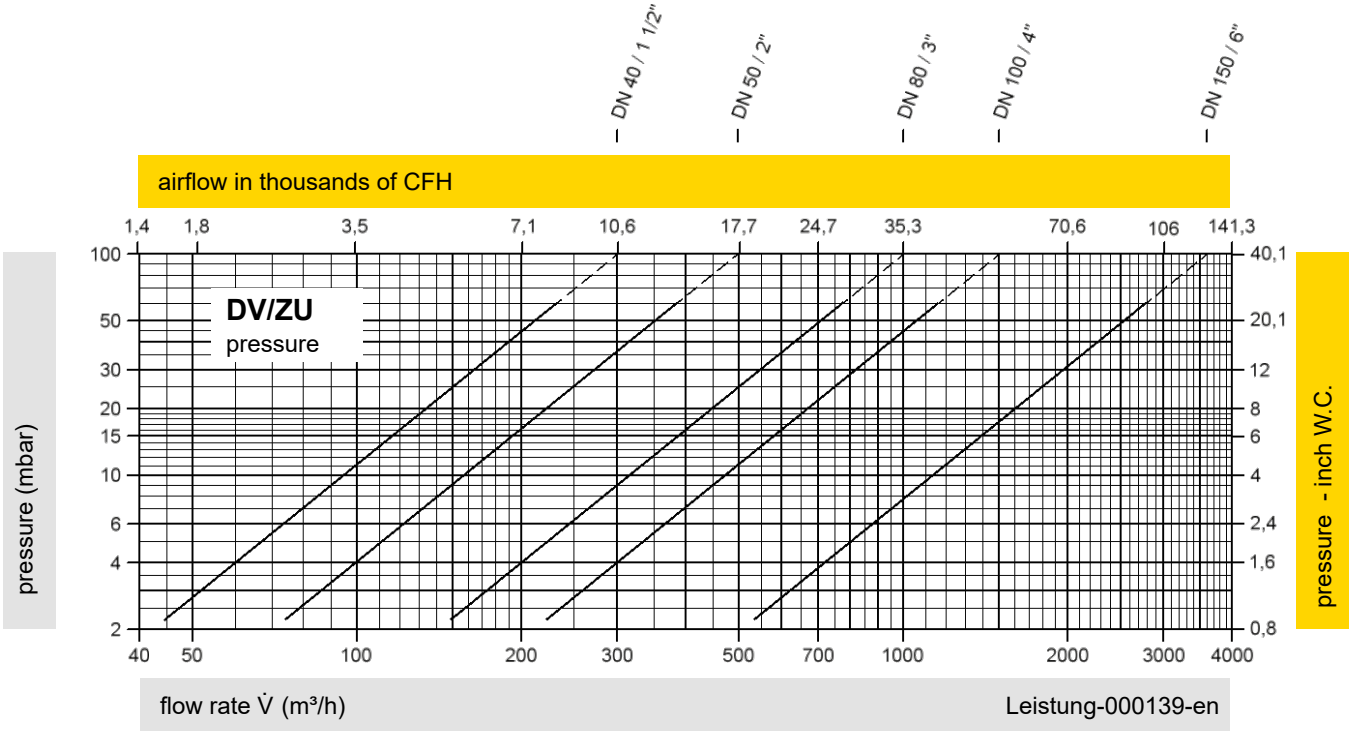
Other types upon request.

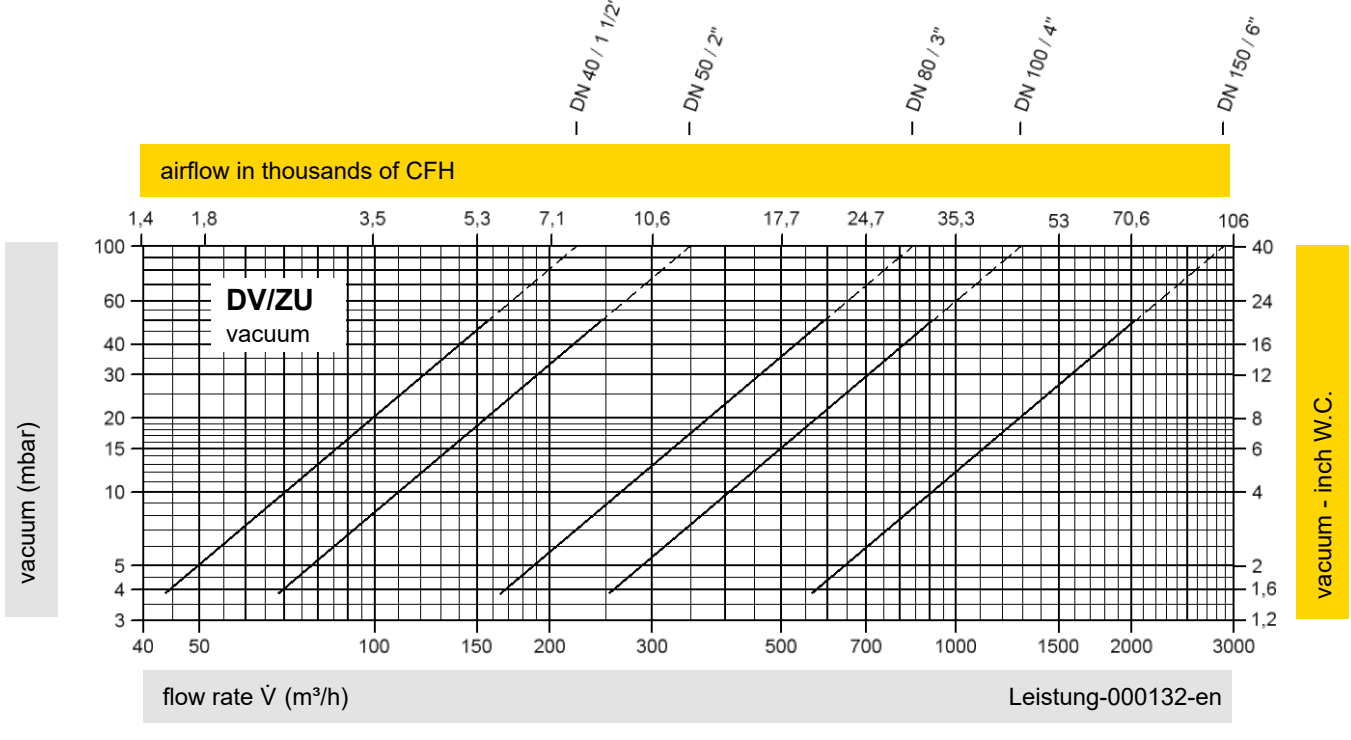


Pressure and Vacuum Relief Valve, In-Line

Flow Capacity Charts

PROTEGO® DV/ZU



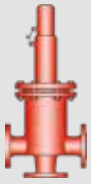


The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig.

Volume flow V̇ 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.”

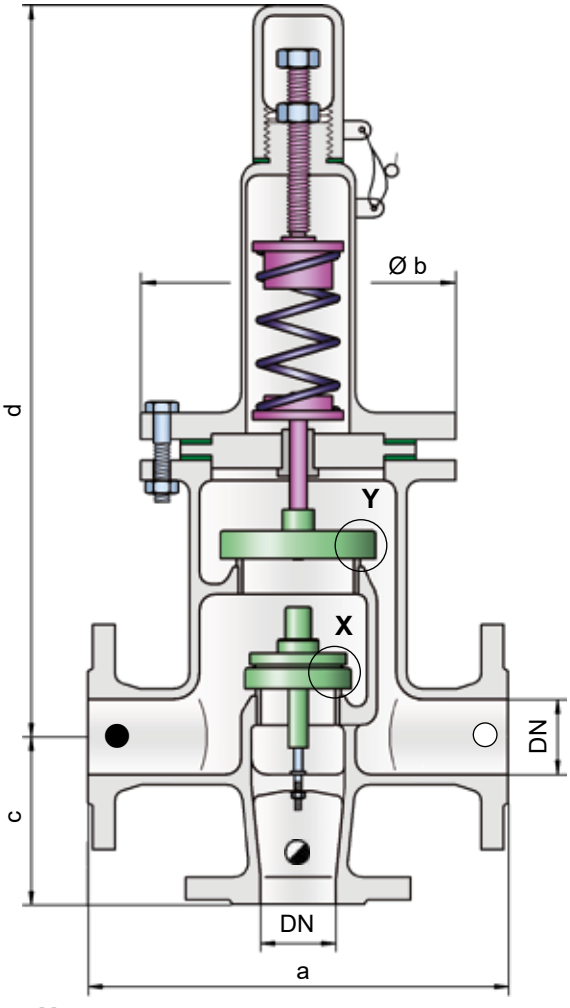
All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Notes:

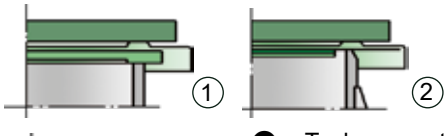


Pressure and Vacuum Relief Valve, In-Line

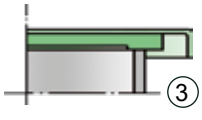
PROTEGO® DV/ZU-F



Detail **X**



Detail **Y**



● = Tank connection
◒ = In-breathing
○ = Out-breathing

Settings:

Pressure: +60 mbar up to +500 mbar
+24 inch W.C. up to +200 inch W.C.

Vacuum: -3.5 mbar up to -50 mbar
-1.4 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.
by set pressure up to +150 mbar / +60 inch W.C.

For lower set pressure, refer to type DV/ZU.
Higher set pressure and lower set vacuum upon request.

Function and Description

The PROTEGO® in-line valve DV/ZU is a state-of-the-art pressure and vacuum relief valve with separate flange connections for pressure and vacuum breathing. 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 pressure and prevents air intake almost up to set vacuum. The valve is designed in a way that if the set pressure is exceeded, the vapors are released into an exhaust pipe (e.g., vent header). If the set vacuum is exceeded, atmospheric air is pulled into the system. For structural reasons, the vacuum valve pallet is one size smaller than the pressure valve pallet. Due to the spring-loaded design, higher set pressures can be achieved.

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 of the pressure and vacuum side is basically the same. However, the in-breathing will start as soon as the differential pressure between the connected in-breathing line and the tank is greater than the set pressure of the vacuum valve pallet. Due to our highly developed manufacturing technology, the tank pressure is maintained up to set pressure with a tightness that is far above the conventional standard. This feature is ensured by valve seats made of high quality stainless steel and with individually lapped valve pallets (1), (3), or with an air cushion seal (2), in conjunction with high quality FEP diaphragm and a sturdy housing design. 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 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
- based on 10% technology, set pressure is close to opening pressure for optimum pressure maintenance in the system as compared to conventional 40% or 100% technology
- high flow capacity reduces costs through the use of smaller valves
- separate connections for in-breathing and out-breathing pipes
- can be used in explosion hazardous areas
- sturdy housing design (PN 10)
- spring-loaded on overpressure side for higher set pressures
- maintenance-friendly design

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Vents - 10% Technology (Flyer pdf)

Leak Rate/10% Technology (Flyer pdf)

Coated Devices (Flyer pdf)

The optimized valve pallet (Flyer pdf)

Designs and Specifications

The pressure valve pallet is spring-loaded, and the vacuum valve pallet is weight-loaded. Lower set pressures for the pressure side are achieved through weight-loaded type DV/ZU.

Two different designs are available:

In-line pressure and vacuum relief valve, standard design **DV/ZU-F** [–]

In-line pressure and vacuum relief valve with heating jacket **DV/ZU-F -** [H]

Additional special devices available upon request.

Within piping systems, the influence of backpressure has to be considered when deciding the set pressure and opening characteristics. For special design solutions (e.g., partial load operation), the valve can be supplied with standard valve pallets (with proportional opening function).

Spring-loaded PV-Valves Maintenance-friendly design (Flyer pdf)

Table 1: Dimensions Dimensions in mm / inches

To select the nominal size (DN), please use the flow capacity charts on the following pages.

DN	40 / 1 ½"	50 / 2"	80 / 3"	100 / 4"	150 / 6"
a	280 / 11.02	280 / 11.02	340 / 13.39	390 / 15.35	520 / 20.47
b	210 / 8.27	210 / 8.27	280 / 11.02	310 / 12.20	390 / 15.35
c	165 / 6.50	165 / 6.50	200 / 7.87	240 / 9.45	300 / 11.81
d	565 / 22.24	565 / 22.24	675 / 26.57	805 / 31.69	1070 / 42.13

Larger sizes upon request.
Dimensions for pressure and vacuum relief valve with heating jacket upon request.

Table 2: Material selection for housing

Design	A	B
Housing Heating jacket (DV/ZU-F-H-...)	Steel Steel	Stainless Steel Stainless Steel
Valve seat	Stainless Steel	Stainless Steel
Gasket	PTFE	PTFE

The housings are also available with an ECTFE coating.
Special materials upon request.

Table 3: Material of pressure valve pallet

Design	A
Pressure range (mbar) (inch W.C.)	>+60 up to +500 >+24 up to +200
Valve pallet	Stainless Steel
Sealing	Metal to Metal
Pressure spring	Stainless Steel

Special materials upon request.
For lower set pressure, use type DV/ZU.
Higher set pressure and lower set vacuum upon request.

Table 4: Material selection for vacuum valve pallet

Design	A*	B*	C	D
Pressure 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	<-35 up to -50 <-14 up to -20
Valve pallet	Aluminum	Stainless Steel	Stainless Steel	Stainless Steel
Sealing	FEP	FEP	Metal to Metal	Metal to Metal

Special materials and lower set vacuum upon request.

* by set pressure up to +150 mbar / +60 inch W.C.

Table 5: Flange connection type

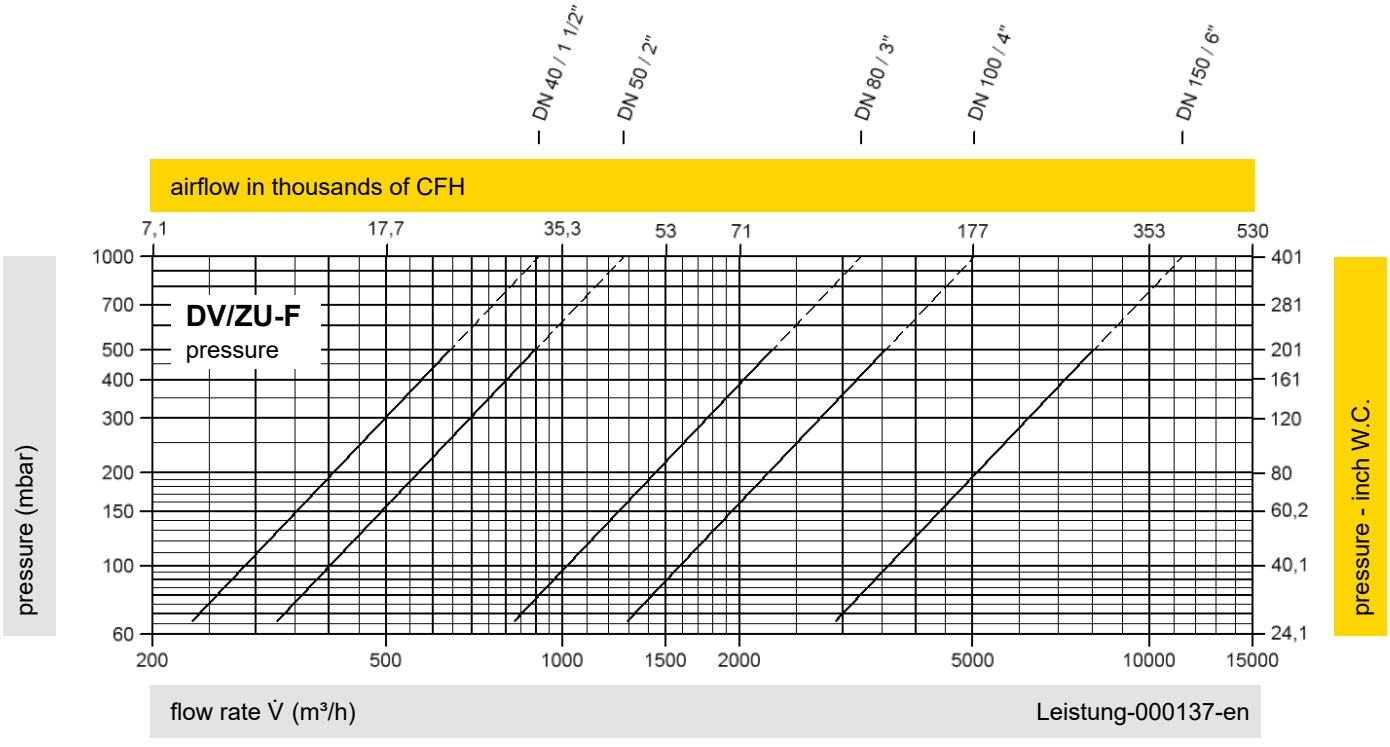
EN 1092-1; Form B1
ASME B16.5 CL 150 R.F.

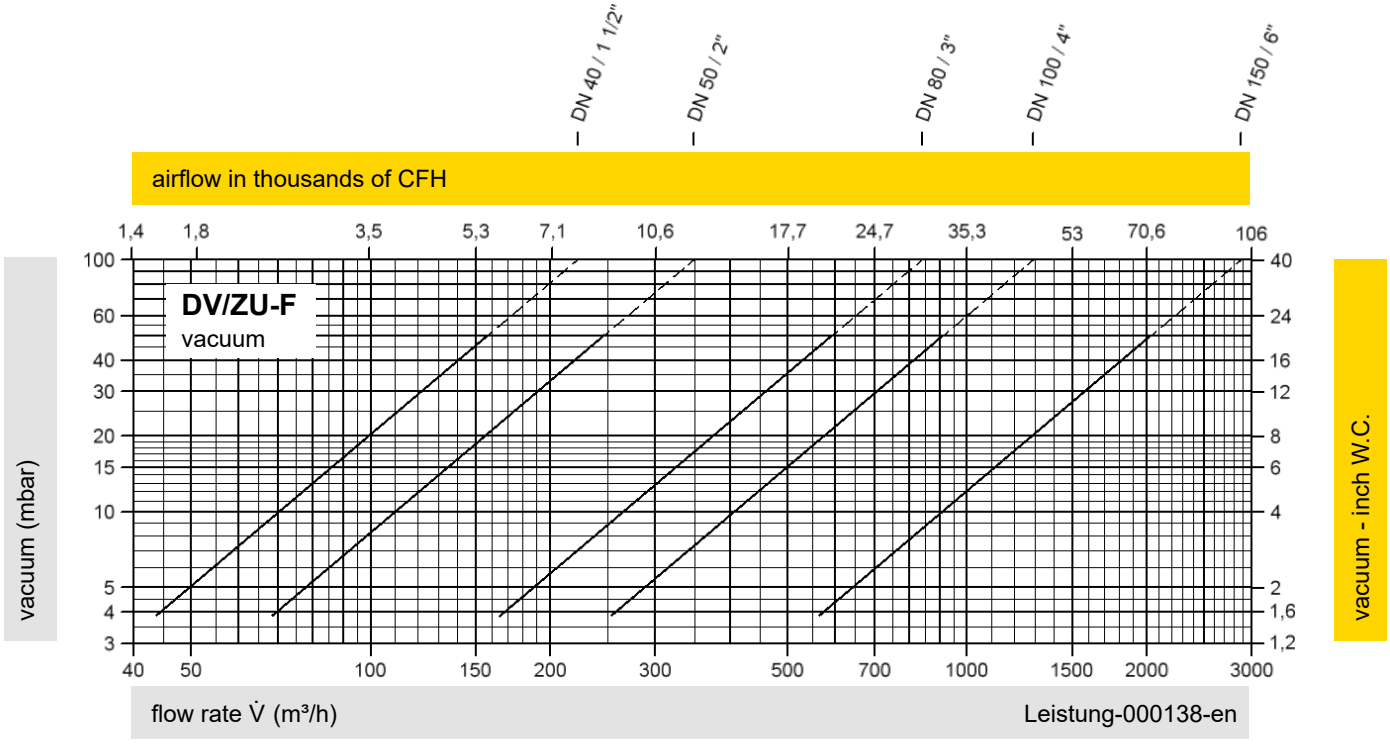
Other types upon request.

Pressure and Vacuum Relief Valve, In-Line

Flow Capacity Charts

PROTEGO® DV/ZU-F



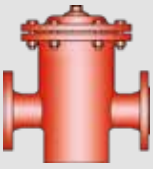


The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig.

Volume flow V̇ 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.”

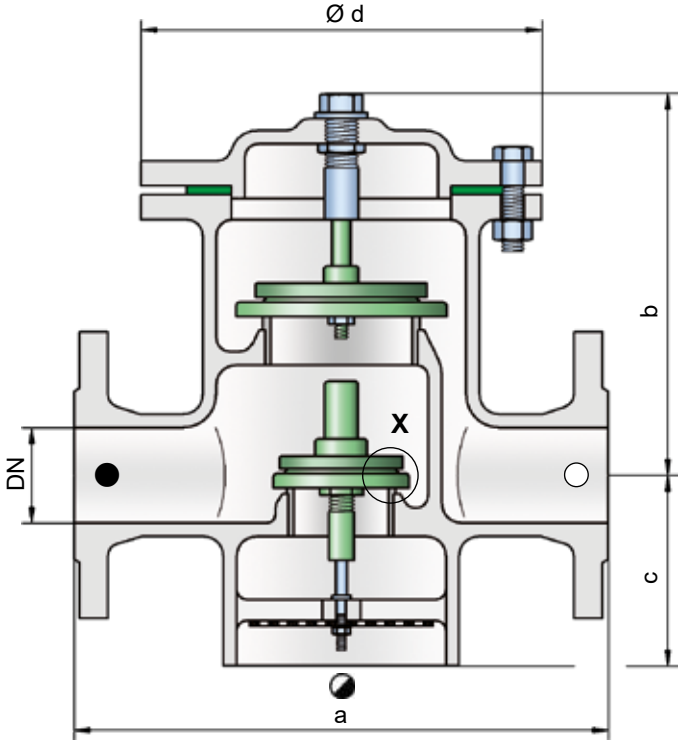
All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Notes:

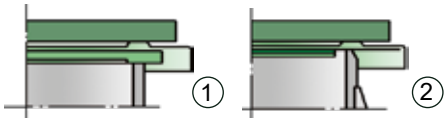


Pressure and Vacuum Relief Valve, In-Line

PROTEGO® DV/ZW



Detail **X**



● = Tank connection

◒ = In-breathing

○ = Out-breathing

Settings:

Pressure:	+2.0 mbar	up to +60 mbar
	+0.8 inch W.C.	up to +24 inch W.C.
Vacuum:	-3.5 mbar	up to -50 mbar
	-1.4 inch W.C.	up to -20 inch W.C.

For higher set pressure, refer to type DV/ZW-F.
Lower set vacuum upon request.

Function and Description

The PROTEGO® in-line valve DV/ZW is a state-of-the-art pressure and vacuum relief valve with separate flange connections for use in a vent line. 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 set vacuum. It is designed in a way that if the set pressure is exceeded, the vapors are released into an exhaust pipe (e.g., vent header). If the set vacuum is exceeded, atmospheric air is pulled into the system. For structural reasons, the vacuum valve pallet is one size smaller than the pressure valve pallet.

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 of the pressure and vacuum side is basically the same. However, the in-breathing will start as soon as the differential pressure between the atmospheric pressure and the tank is greater than the set pressure of the vacuum valve pallet. Due to our highly developed manufacturing technology, the tank pressure is maintained up to set pressure with a tightness that is far above the conventional standard. This feature is ensured by valve seats made of high quality stainless steel and with individually 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 fluids. After the over pressure 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 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
- based on 10% technology, set pressure is close to opening pressure for optimum pressure maintenance in the system as compared to conventional 40% or 100% technology
- high flow capacity reduces costs through the use of smaller valves
- connection for vent line
- can be used in explosion hazardous areas
- sturdy housing design (PN 10)
- maintenance-friendly design

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Vents - 10% Technology (Flyer pdf)

Leak Rate/10% Technology (Flyer pdf)

Coated Devices (Flyer pdf)

The optimized valve pallet (Flyer pdf)

Designs and Specifications

The valve pallets are weight-loaded. **Higher set pressures are achieved by using spring-loaded type DV/ZW-F.**

Two different designs are available:

In-line pressure and vacuum relief valve, standard design **DV/ZW - –**

In-line pressure and vacuum relief valve with heating jacket **DV/ZW - H**

Additional special devices available upon request.

Within piping systems, the influence of backpressure has to be considered when deciding the set pressure and opening characteristics. For special design solutions (e.g., partial load operation), the valve can be supplied with standard valve pallets (with proportional opening function).

Table 1: Dimensions Dimensions in mm / inches

To select the nominal size (DN), please use the flow capacity charts on the following pages.

DN	40 / 1 ½"	50 / 2"	80 / 3"	100 / 4"	150 / 6"
a	280 / 11.02	280 / 11.02	340 / 13.39	390 / 15.35	520 / 20.47
b	230 / 9.06	230 / 9.06	240 / 9.45	290 / 11.42	330 / 12.99
c	85 / 3.35	85 / 3.35	125 / 4.92	140 / 5.51	185 / 7.28
d	210 / 8.27	210 / 8.27	280 / 11.02	310 / 12.20	390 / 15.35

Larger sizes upon request.
Dimensions for pressure and vacuum relief valve with heating jacket upon request.

Table 2: Material selection for housing

Design	A	B
Housing Heating jacket (DV/ZW-H-...)	Steel Steel	Stainless Steel Stainless Steel
Valve seat	Stainless Steel	Stainless Steel
Gasket	PTFE	PTFE

The housings are also available with an ECTFE coating.

Special materials upon request.

Table 3: Material selection for pressure valve pallet

Design	A	B	C	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 +60 >+5.6 up to +24	>+14 up to +60 >+5.6 up to +24
Valve pallet	Aluminum	Stainless Steel	Stainless Steel	Stainless Steel
Sealing	FEP	FEP	Metal to Metal	PTFE

Special materials upon request.
For higher set pressures, refer to type DV/ZW-F.

Table 4: Material selection for vacuum valve pallet

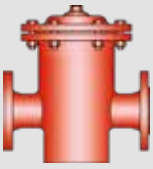
Design	A	B	C	D	E	F
Pressure range (mbar) (inch W.C.)	-3.5 up to -5.0 -1.4 up to -2.0	<-5.0 up to -14 <-2.0 up to -5.6	<-14 up to -35 <-5.6 up to -14	<-35 up to -50 <-14 up to -20	<-14 up to -35 <-5.6 up to -14	<-35 up to -50 <-14 up to -20
Valve pallet	Aluminum	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
Sealing	FEP	FEP	Metal to Metal	Metal to Metal	PTFE	PTFE

Special materials and lower set vacuum upon request.

Table 5: Flange connection type

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

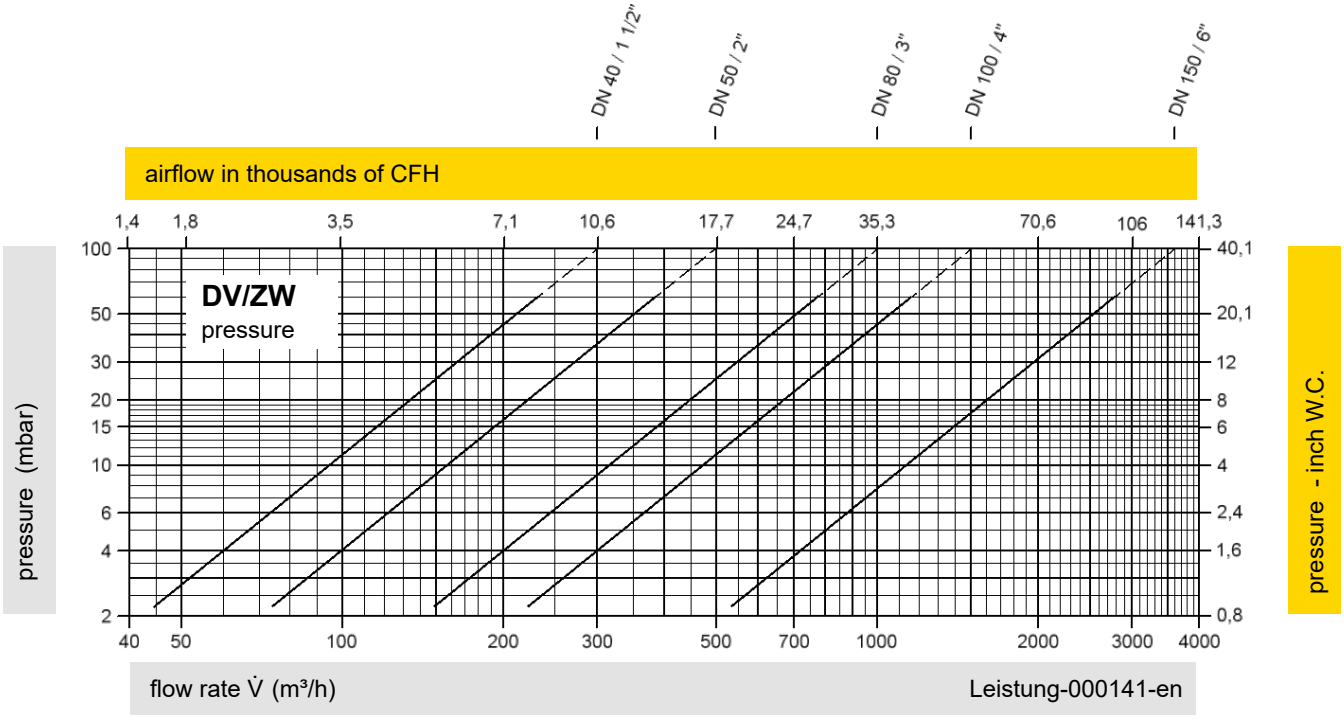
Other types upon request.

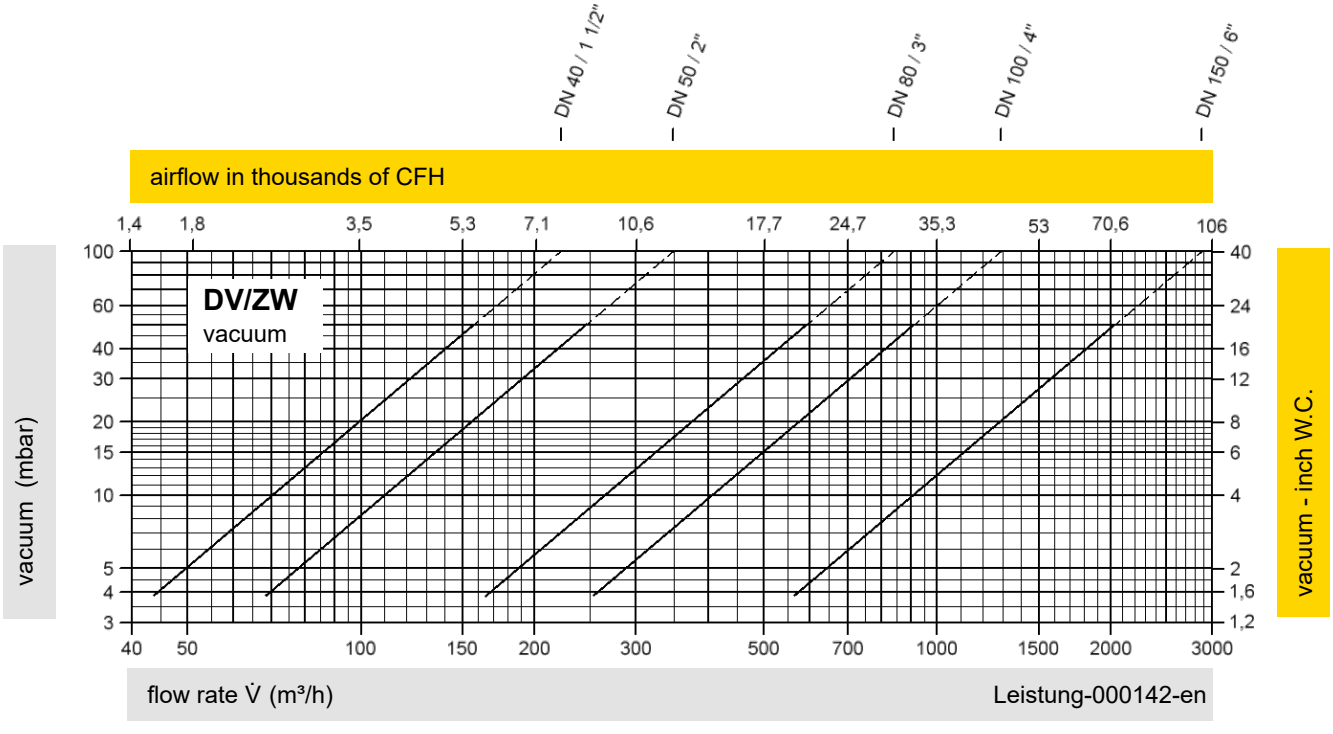


Pressure and Vacuum Relief Valve, In-Line

Flow Capacity Charts

PROTEGO® DV/ZW



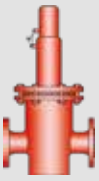


The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig.

Volume flow V̇ 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.”

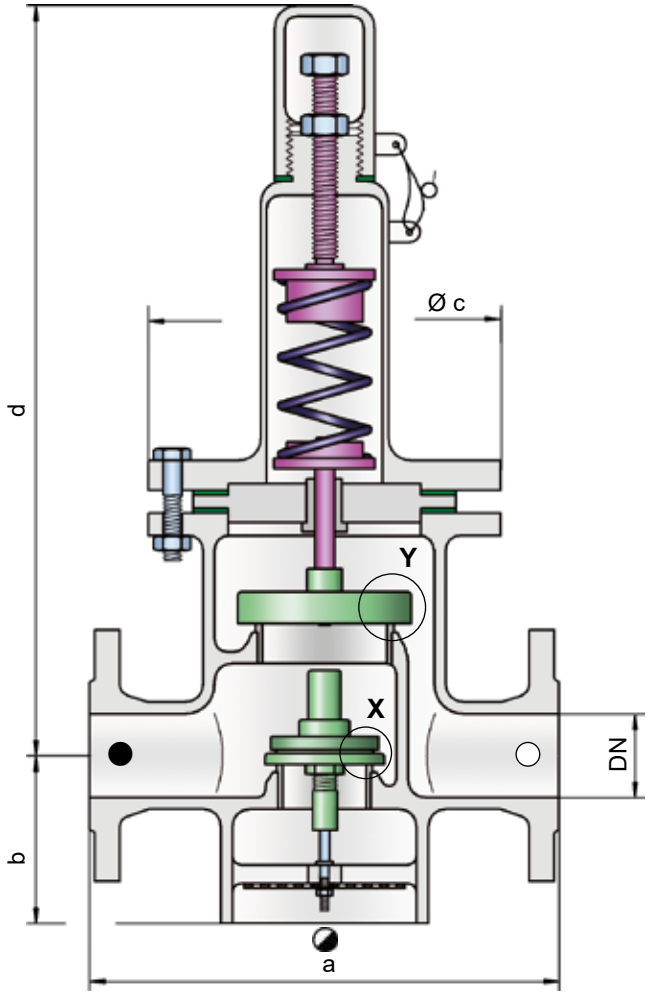
All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Notes:

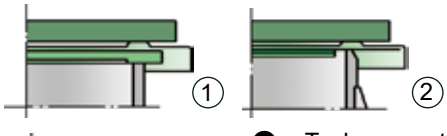


Pressure and Vacuum Relief Valve, In-Line

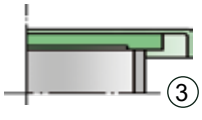
PROTEGO® DV/ZW-F



Detail **X**



Detail **Y**



● = Tank connection
◒ = In-breathing
○ = Out-breathing

Settings:

Pressure: +60 mbar up to +500 mbar
+24 inch W.C. up to +200 inch W.C.

Vacuum: -3.5 mbar up to -50 mbar
-1.4 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.
by set pressure up to +150 mbar / +60 inch W.C.

For lower set pressure, refer to type DV/ZW.
Higher set pressure and lower set vacuum upon request.

Function and Description

The PROTEGO® in-line valve DV/ZW-F is a state-of-the-art pressure and vacuum relief valve with flanged connections for use in a vent line. 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 pre- vents air intake almost up to set vacuum. It is designed in a way that if the set pressure is exceeded, the vapors are released into an exhaust pipe (e.g., vent header). If the set vacuum is exceeded, atmospheric air is pulled into the system. For structural reasons, the vacuum valve pallet is one size smaller than the pressure valve pallet. Due to the spring-loaded design, higher set pressures can be achieved.

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 in-breathing will start as soon as the differential pressure between the atmospheric pressure and the tank is greater than the set pressure of the vacuum valve pallet. The tank pressure is maintained up to set pressure with a tightness that is above the normal standards due to our highly developed manufacturing technology. This feature is ensured by valve seats made of high quality stainless steel and with individually lapped valve pallets (1), (3), or with an air cushion seal (2), in conjunction with a high quality FEP diaphragm and a sturdy housing design. 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 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
- based on 10% technology the set pressure is close to the opening pressure which results in best possible pressure management of the system compared to conventional 40%- or 100%- technology valves
- high flow capacity reduces costs through the use of smaller valves
- connection for vent line
- can be used in explosion hazardous areas
- sturdy housing design (PN 10)
- spring-loaded on overpressure side for higher set pressures
- maintenance-friendly design

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Vents - 10% Technology (Flyer pdf)

Leak Rate/10% Technology (Flyer pdf)

Coated Devices (Flyer pdf)

The optimized valve pallet (Flyer pdf)

Designs and Specifications

The pressure valve pallet is spring-loaded, and the vacuum valve pallet is weight-loaded. Lower set pressures for the pressure side are achieved through weight-loaded type DV/ZW.

Two different designs are available:

In-line pressure and vacuum relief valve, standard design **DV/ZW-F** [–]

In-line pressure and vacuum relief valve with heating jacket **DV/ZW-F -** [H]

Additional special devices available upon request.

Within piping systems, the influence of backpressure has to be considered when deciding the set pressure and opening characteristics. For special design solutions (e.g., partial load operation), the valve can be supplied with standard valve pallets (with proportional opening function).

Spring-loaded PV-Valves Maintenance-friendly design (Flyer pdf)

Table 1: Dimensions Dimensions in mm / inches

To select the nominal size (DN), please use the flow capacity charts on the following pages.

DN	40 / 1 ½"	50 / 2"	80 / 3"	100 / 4"	150 / 6"
a	280 / 11.02	280 / 11.02	340 / 13.39	390 / 15.35	520 / 20.47
b	85 / 3.35	85 / 3.35	125 / 4.92	140 / 5.51	185 / 7.28
c	210 / 8.27	210 / 8.27	280 / 11.02	310 / 12.20	390 / 15.35
d	565 / 22.24	565 / 22.24	675 / 26.57	805 / 31.69	1070 / 42.13

Larger sizes upon request.
Dimensions for pressure and vacuum relief valve with heating jacket upon request.

Table 2: Material selection for housing

Design	A	B
Housing Heating jacket (DV/ZW-F-H-...)	Steel Steel	Stainless Steel Stainless Steel
Valve seat	Stainless Steel	Stainless Steel
Gasket	PTFE	PTFE

The housings are also available with an ECTFE coating.
Special materials upon request.

Table 3: Material of pressure valve pallet

Design	A
Pressure range (mbar) (inch W.C.)	>+60 up to +500 >+24 up to +200
Valve pallet	Stainless Steel
Sealing	Metal to Metal
Pressure spring	Stainless Steel

Special materials upon request.
For lower set pressure, use type DV/ZW.
Higher set pressure and lower set vacuum upon request.

Table 4: Material selection for vacuum valve pallet

Design	A*	B*	C	D
Pressure 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	<-35 up to -50 <-14 up to -20
Valve pallet	Aluminum	Stainless Steel	Stainless Steel	Stainless Steel
Sealing	FEP	FEP	Metal to Metal	Metal to Metal

Special materials and lower set vacuum upon request.

* by set pressure up to +150 mbar / +60 inch W.C.

Table 5: Flange connection type

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

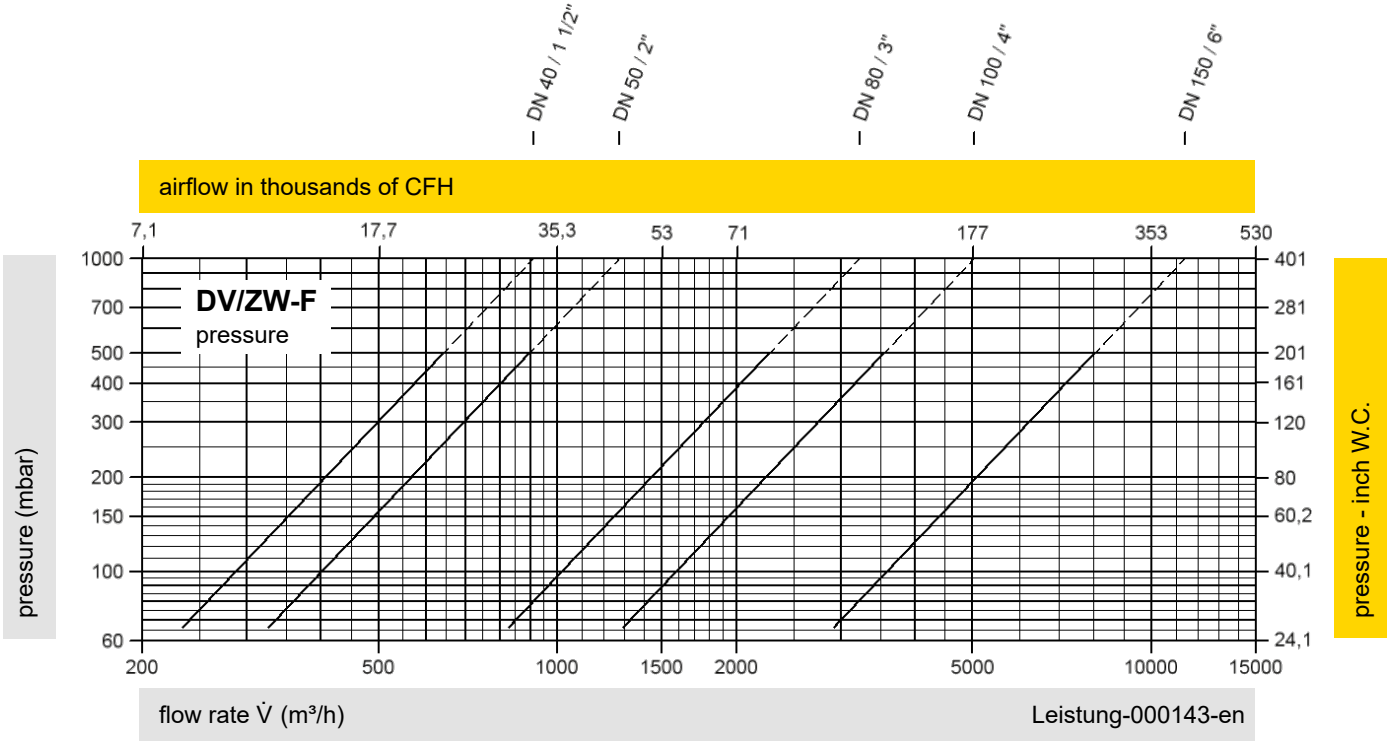
Other types upon request.

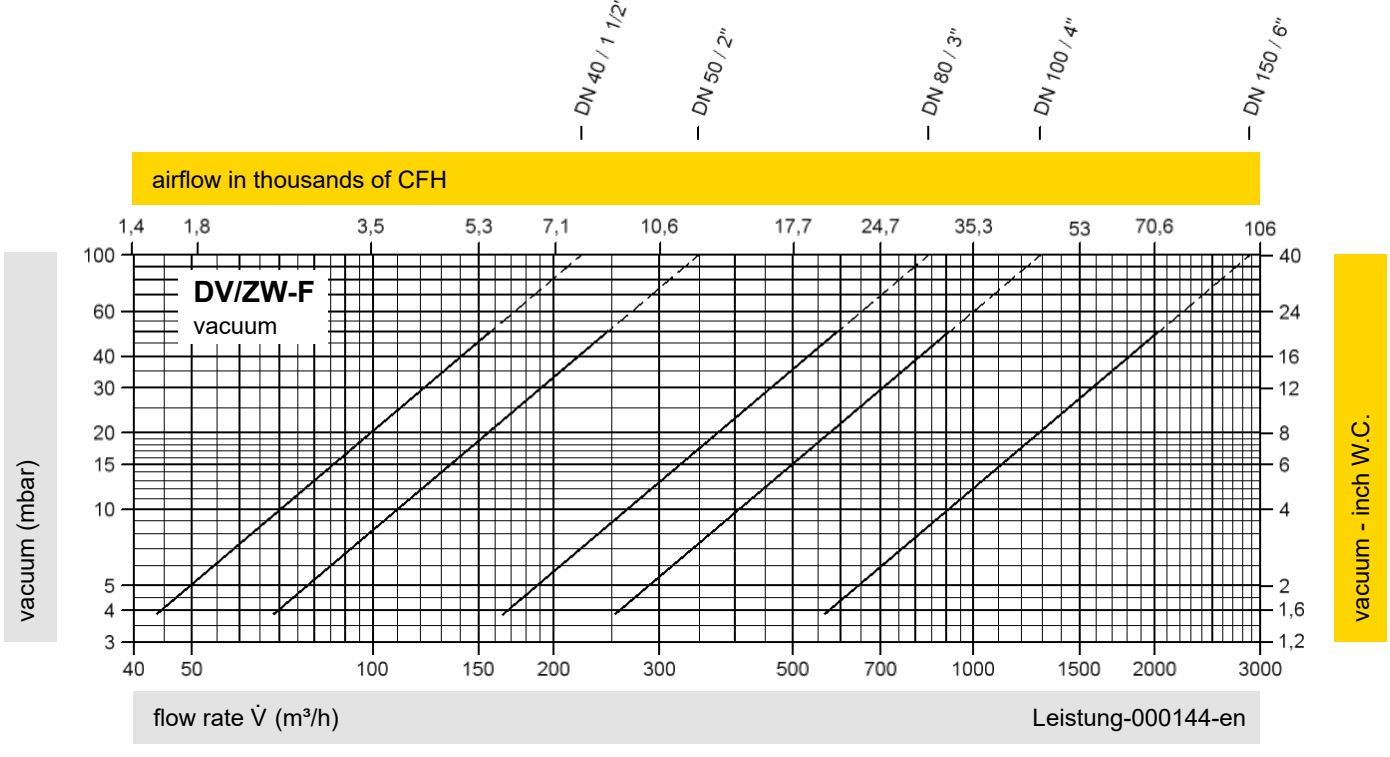
PROTEGO
for safety and environment

Pressure and Vacuum Relief Valve, In-Line

Flow Capacity Charts

PROTEGO® DV/ZW-F



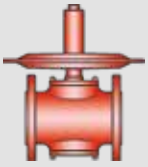


The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig.

Volume flow V̇ 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.”

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

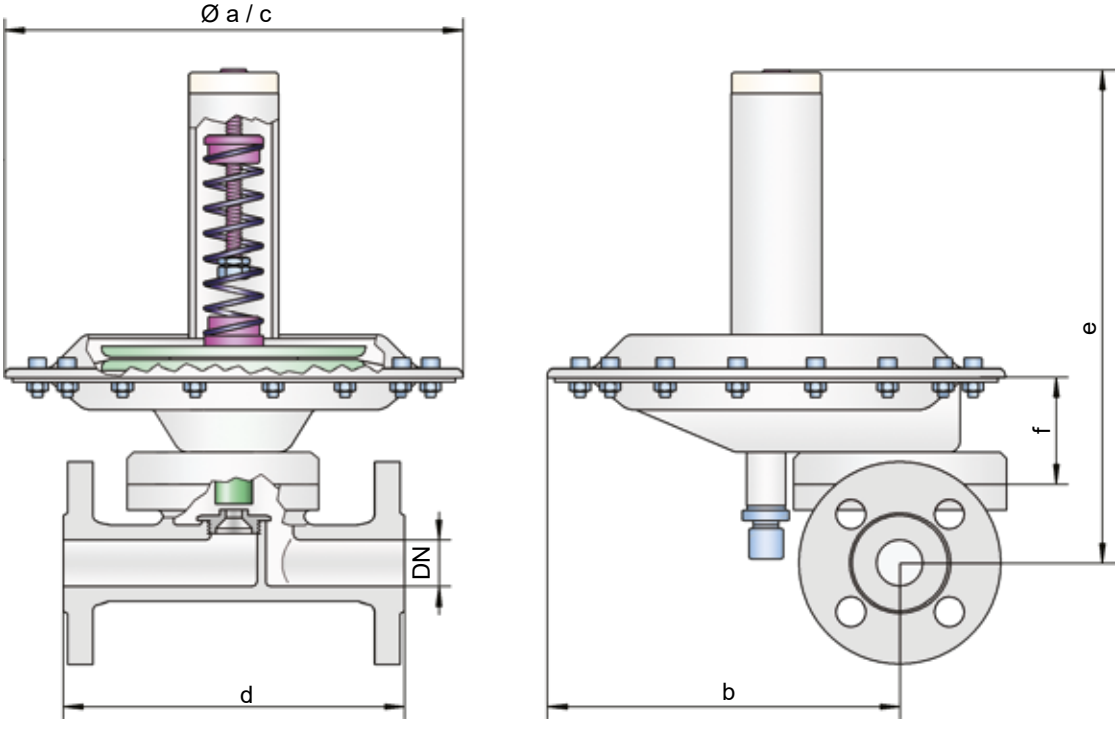
Notes:



Blanketing Valve

Low pressure reducing valve

ZM-R



Pressure range:
Supply pressure:
up to +16 bar /
+6424 inch W.C.

Set pressure for overpressure function:
up to +500 mbar /
+200 inch W.C.

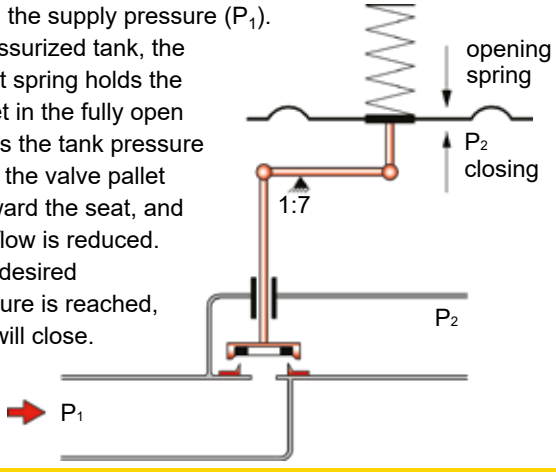
Set pressure for vacuum function:
up to -200 mbar /
-80 inch W.C.

Function and Description

The blanketing valve type ZM-R is a highly developed low pressure reducing valve. This valve is typically used to inert or blanket tanks, vessels, or other process systems with nitrogen or other blanketing gases by controlling the tank pressure to its desired value. High nitrogen or blanketing gas supply pressures up to 16 bar / 232 psi are safely reduced down to only a few mbar / inch W.C.

The ZM-R low pressure reducing valve is a direct acting, one stage pressure control device. It is designed as a diaphragm controlled, spring-loaded proportional acting valve. The valve controls the tank pressure by increasing flow as the tank pressure drops. This means that the mass flow through the valve depends on the pressure differential of the set pressure to the actual tank pressure. When the actual tank pressure reaches the set pressure, the control unit closes, and there is no flow.

At the control diaphragm, (which can be made from PTFE or Viton), the tank pressure (P_2) is balanced with the adjustment spring and the supply pressure (P_1).
In a depressurized tank, the adjustment spring holds the valve pallet in the fully open position. As the tank pressure increases, the valve pallet moves toward the seat, and the mass flow is reduced. When the desired tank pressure is reached, the valve will close.



If the tank pressure decreases, the valve will open. If the system is operated in a vacuum mode, vacuum pressures down to -200 mbar /-80 inch W.C. (relative pressure) can be achieved.

Special features and advantages

- single-stage pressure reduction possible within a high-pressure range
- large diaphragm area to increase the closing force
- all function-relevant and product-contacting parts are made of stainless steel or Hastelloy
- simple adjustment of set pressure (within the spring range)
- any mounting position (taking the set pressure into account)
- no external energy supply needed
- high flow capacity reduces costs through the use of smaller valves
- valve pallet is guided inside the housing to protect against harsh weather conditions, e.g., freezing of the valve pallet in extreme cold
- reduction within the vacuum range is possible
- high precision
- can be used in explosion hazardous areas
- sturdy housing design (PN 16)
- maintenance-friendly design

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

Design and Specification

Two different designs are available:

Blanketing valve for overpressure, standard design **ZM-R –**

Blanketing valve for vacuum, standard design **ZM-R / N**

Other special devices can be supplied on request.

Within piping systems, the influence of backpressure has to be considered when deciding the set pressure and opening characteristics

Table 1: Dimensions Dimensions in mm | Dimensions in inches

To select the nominal size (DN), please use the flow rates on the following pages.

DN	15 / ½"	25 / 1"	50 / 2"	100 / 4"	15 / ½"	25 / 1"	50 / 2"	100 / 4"
a	214	214	–	–	8.43	8.43	–	–
b	168	168	–	–	6.61	6.61	–	–
c*	–	–	214 / 360	360 / 600	–	–	8.43 / 14.17	14.17 / 23.62
d EN d ASME	150 180	160 160	150 150	250 / 250 250 / 250	5.91 7.09	6.3 6.3	5.91 5.91	9.84 / 9.84 9.84 / 9.84
e	214	214	230	275 / 310	8.43	8.43	9.06	10.83 / 12.2
f	87	87	103	148 / 155	3.43	3.43	4.06	5.83 / 6.10

* depends on size of diaphragm.

Table 2: Material selection for housing

Design	S	H	
Housing	Stainless Steel	Hastelloy	
Valve seat	Stainless Steel	Hastelloy	
Valve pallet	Stainless Steel	Hastelloy	
Valve seat sealing	FFKM	FFKM	
Gasket	PTFE	PTFE	
Diaphragm P	PTFE	PTFE	Marking P
Alternative: Diaphragm V	Viton	-	Marking V

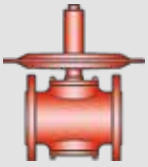
Housings can also be electropolished.

Special materials upon request.

Table 3: Selection for valve seat (depending on flow rate)

Size	Seat in mm / inches	Kvs	Number
25 / 1"	2,0 / 0.08	0,15	20
	4,5 / 0.18	0,60	45
	7,5 / 0.30	1,20	75
	10,0 / 0.39	1,70	100
	14,0 / 0.55	2,40	140
50 / 2"	14,0 / 0.55	3,00	140
	18,0 / 0.71	7,00	180
	26,0 / 1.02	15,00	260
100 / 4"	42,0 / 1.65	35,00	420
	55,0 / 2.17	70,00	550

* 1 Kvs = 0.86 Cv; 1 Cv = 1.17 Kvs



In-Line Pressure Reducing Valve

low pressure reducing valve

ZM-R

Table 4: Connection type			
FD	EN 1092-1; Form B1	EN	Other types upon request.
FA	ASME B16.5 CL 150 R.F.	ASME	
G	Thread	G or NPT	

Flow rates for P2 pressure range (Europe – metric units)

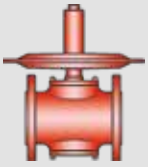
ZM-R 15 / ZM-R 25: flow rate (air, 0°C) at ΔP = P1 - P2 and valve fully open											
P1 (bar) overpressure / P2 (mbar)	0,15 [Nm³/h]	0,25 [Nm³/h]	0,40 [Nm³/h]	0,65 [Nm³/h]	1,00 [Nm³/h]	1,50 [Nm³/h]	2,50 [Nm³/h]	4,00 [Nm³/h]	6,00 [Nm³/h]	10,00 [Nm³/h]	Seat-Ø [mm]
10	6,2 12,4 17,5 24,8	8,1 16,2 23,0 32,5	10,3 20,7 29,3 41,4	13,2 26,5 37,6 53,1	16,5 33,0 46,7 66,0	20,6 41,2 58,4 82,4	28,8 57,6 81,6 115,2	41,1 82,2 116,5 164,5	57,5 115,0 163,0 230,1	90,3 180,7 256,0 361,4	Ø 4,5 Ø 7,5 Ø 10,0 Ø 14,0
20	6,0 12,0 17,0 24,0	7,9 15,9 22,6 31,9	10,2 20,5 29,1 41,1	13,2 26,4 37,5 52,9	16,5 33,0 46,7 66,0	20,6 41,2 58,4 82,4	28,8 57,6 81,6 115,2	41,1 82,2 116,5 164,5	57,5 115,0 163,0 230,1	90,3 180,7 256,0 361,4	Ø 4,5 Ø 7,5 Ø 10,0 Ø 14,0
100	3,8 7,7 10,9 15,4	6,7 13,4 18,9 26,8	9,4 18,9 26,8 37,9	12,8 25,6 36,3 51,3	16,4 32,8 46,5 65,6	20,6 41,2 58,4 82,4	28,8 57,6 81,6 115,2	41,1 82,2 116,5 164,5	57,5 115,0 163,0 230,1	90,3 180,7 256,0 361,4	Ø 4,5 Ø 7,5 Ø 10,0 Ø 14,0
200	- - - -	4,0 8,0 11,4 16,1	8,0 16,1 22,9 32,3	12,1 24,2 34,3 48,4	16,1 32,3 45,8 64,6	20,6 41,2 58,4 82,4	28,8 57,6 81,6 115,2	41,1 82,2 116,5 164,5	57,5 115,0 163,0 230,1	90,3 180,7 256,0 361,4	Ø 4,5 Ø 7,5 Ø 10,0 Ø 14,0
500	- - - -	- - - -	- - - -	7,8 15,6 22,1 31,2	14,2 28,5 40,4 57,0	20,1 40,3 57,1 80,7	28,8 57,6 81,6 115,2	41,1 82,2 116,5 164,5	57,5 115,0 163,0 230,1	90,3 180,7 256,0 361,4	Ø 4,5 Ø 7,5 Ø 10,0 Ø 14,0

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

ZM-R 50: flow rate (air, 0°C) at ΔP = P1 - P2 and valve fully open											
P1 (bar) overpressure / P2 (mbar)	0,15 [Nm³/h]	0,25 [Nm³/h]	0,40 [Nm³/h]	0,65 [Nm³/h]	1,00 [Nm³/h]	1,50 [Nm³/h]	2,50 [Nm³/h]	4,00 [Nm³/h]	6,00 [Nm³/h]	10,00 [Nm³/h]	Seat-Ø [mm]
10	28,9 70,3 150,0	37,9 92,1 196,5	48,3 117,4 250,4	61,9 150,4 320,8	77,0 187,1 399,1	96,2 233,6 498,3	134,5 326,6 696,5	191,9 466,1 994,0	268,5 652,1 1390	421,6 1024 2183	Ø 14,0 Ø 18,0 Ø 26,0
20	28,0 68,1 145,3	37,3 90,6 193,3	47,9 116,5 248,4	61,7 150,0 319,9	77,0 187,1 399,0	96,2 233,6 498,3	134,5 326,6 696,5	191,9 466,1 994,0	268,5 652,1 1390	421,6 1024 2183	Ø 14,0 Ø 18,0 Ø 26,0
100	18,0 43,8 93,5	31,2 75,9 162,0	44,2 107,4 229,1	59,9 145,5 310,2	76,6 186,1 396,9	96,2 233,6 498,3	134,5 326,6 696,5	191,9 466,1 994,0	268,5 652,1 1390	421,6 1024 2183	Ø 14,0 Ø 18,0 Ø 26,0
200	- - -	18,8 45,8 97,6	37,7 91,6 195,3	56,5 137,4 293,0	75,4 183,2 390,6	96,2 233,6 498,3	134,5 326,6 696,5	191,9 466,1 994,0	268,5 652,1 1390	421,6 1024 2183	Ø 14,0 Ø 18,0 Ø 26,0
500	- - -	- - -	- - -	36,4 88,6 188,9	66,6 161,7 344,9	94,1 228,7 487,8	134,5 326,6 696,5	191,9 466,1 994,0	268,5 652,1 1390	421,6 1024 2183	Ø 14,0 Ø 18,0 Ø 26,0

ZM-R 100: flow rate (air, 0°C) at ΔP = P1 - P2 and valve fully open											
P1 (bar) overpressure / P2 (mbar)	0,15 [Nm³/h]	0,25 [Nm³/h]	0,40 [Nm³/h]	0,65 [Nm³/h]	1,00 [Nm³/h]	1,50 [Nm³/h]	2,50 [Nm³/h]	4,00 [Nm³/h]	6,00 [Nm³/h]	10,00 [Nm³/h]	Seat-Ø [mm]
10	346 703	453 921	587 1174	741 1504	922 1871	1151 2336	1609 3266	2296 4661	3212 6512	5045 10241	Ø 42,0 Ø 55,0
20	335 681	446 906	574 1165	739 1500	921 1871	1151 2336	1609 3266	2296 4661	3212 6512	5045 10241	Ø 42,0 Ø 55,0
100	216 438	374 759	529 1074	716 1455	917 1861	1151 2336	1609 3266	2296 4661	3212 6512	5045 10241	Ø 42,0 Ø 55,0
200	- -	225 458	451 916	676 1374	902 1832	1151 2336	1609 3266	2296 4661	3212 6512	5045 10241	Ø 42,0 Ø 55,0
500	- -	- -	- -	436 886	796 1617	1127 2287	1609 3266	2296 4661	3212 6512	5045 10241	Ø 42,0 Ø 55,0

Flow rates for P2 vacuum range (Type ZM-R/N) upon request.



In-Line Pressure Reducing Valve

Flow rates for P2 pressure range (english/american units – non-metric)

ZM-R

ZM-R 15 / ZM-R 25: flow rate (air, 32°F) at ΔP = P1 - P2 and valve fully open											
P1 (psi) / overpressure / P2 ("wc)	2.18 [SCFH]	3.63 [SCFH]	5.80 [SCFH]	9.43 [SCFH]	14.50 [SCFH]	21.76 [SCFH]	36.26 [SCFH]	58.02 [SCFH]	87.02 [SCFH]	145.04 [SCFH]	Seat-Ø [inch]
3.94	219	287	366	469	583	728	1018	1453	2032	3191	Ø 0.18
	439	574	732	938	1166	1456	2036	2905	4064	6382	Ø 0.29
	621	814	1037	1329	1652	2063	2884	4116	5758	9042	Ø 0.39
	877	1149	1464	1876	2333	2913	4072	5810	8128	12764	Ø 0.55
7.87	212	282	363	468	583	728	1018	1453	2032	3191	Ø 0.18
	425	565	726	935	1166	1456	2036	2905	4064	6382	Ø 0.29
	602	800	1029	1325	1652	2063	2884	4116	5758	9042	Ø 0.39
	849	1130	1452	1870	2333	2913	4072	5810	8128	12764	Ø 0.55
39.4	137	237	335	453	580	728	1018	1453	2032	3191	Ø 0.18
	273	474	670	907	1166	1456	2036	2905	4064	6382	Ø 0.29
	387	671	949	1285	1643	2063	2884	4116	5758	9042	Ø 0.39
	547	947	1339	1814	2320	2913	4072	5810	8128	12764	Ø 0.55
78.7	-	143	285	428	571	728	1018	1453	2032	3191	Ø 0.18
	-	285	571	856	1142	1456	2036	2905	4064	6382	Ø 0.29
	-	404	809	1213	1617	2063	2884	4116	5758	9042	Ø 0.39
	-	571	1142	1713	2284	2913	4072	5810	8128	12764	Ø 0.55
196.9	-	-	-	276	504	713	1018	1453	2032	3191	Ø 0.18
	-	-	-	552	1108	1426	2036	2905	4064	6382	Ø 0.29
	-	-	-	782	1428	2020	2884	4116	5758	9042	Ø 0.39
	-	-	-	1104	2016	2851	4072	5810	8128	12764	Ø 0.55

ZM-R 50: flow rate (air, 32°F) at ΔP = P1 - P2 and valve fully open											
P1 (psi) / overpressure / P2 ("wc)	2.18 [SCFH]	3.63 [SCFH]	5.80 [SCFH]	9.43 [SCFH]	14.50 [SCFH]	21.76 [SCFH]	36.26 [SCFH]	58.02 [SCFH]	87.02 [SCFH]	145.04 [SCFH]	Seat-Ø [inch]
3.94	1023	1340	1708	2188	2722	3398	4750	6779	9483	14892	Ø 0.55
	2486	3254	4149	5314	6610	8253	11536	16462	23030	36166	Ø 0.71
	5300	6939	8846	11332	14094	17597	24600	35104	49109	77119	Ø 1.02
7.87	991	1318	1694	2182	2721	3398	4750	6779	9483	14892	Ø 0.55
	2407	3201	4115	5298	6608	8253	11536	16462	23030	36166	Ø 0.71
	5132	6827	8775	11298	14091	17597	24600	35104	49109	77119	Ø 1.02
39.4	638	1105	1563	2116	2707	3398	4750	6779	9483	14892	Ø 0.55
	1549	2684	3795	5139	6573	8253	11536	16462	23030	36166	Ø 0.71
	3304	5722	8093	10958	14017	17597	24600	35104	49109	77119	Ø 1.02
78.7	-	666	1332	1998	2664	3398	4750	6779	9483	14892	Ø 0.55
	-	1617	3235	4852	6470	8253	11536	16462	23030	36166	Ø 0.71
	-	3449	6898	10347	13796	17597	24600	35104	49109	77119	Ø 1.02
196.9	-	-	-	1288	2352	3327	4750	6779	9483	14892	Ø 0.55
	-	-	-	3129	5713	8079	11536	16462	23030	36166	Ø 0.71
	-	-	-	6672	12181	17227	24600	35104	49109	77119	Ø 1.02

All rights and modifications reserved in acc. with ISO 16016 - Current data sheet at **www.protego.com**

ZM-R 100: flow rate (air, 32°F) at ΔP = P1 - P2 and valve fully open											
overpressure P1 (psi) P2 ("wc)	2.18 [SCFH]	3.63 [SCFH]	5.80 [SCFH]	9.43 [SCFH]	14.50 [SCFH]	21.76 [SCFH]	36.26 [SCFH]	58.02 [SCFH]	87.02 [SCFH]	145.04 [SCFH]	Seat-Ø [inch]
3.94	12245 24856	16033 32544	20438 41485	26181 53144	32562 66097	40656 82525	56834 115365	81101 164624	113458 230303	178171 361660	Ø 1.65 Ø 2.17
7.87	11857 24068	15772 32014	20272 41150	26102 52984	32555 66082	40656 82525	56834 115365	81101 164624	113458 230303	178171 361660	Ø 1.65 Ø 2.17
39.4	7633 15494	13221 26836	18697 37952	25316 51387	32384 65735	40656 82525	56834 115365	81101 164624	113458 230303	178171 361660	Ø 1.65 Ø 2.17
78.7	- -	7968 16175	15937 32350	23905 48525	31874 64699	40656 82525	56834 115365	81101 164624	113458 230303	178171 361660	Ø 1.65 Ø 2.17
196.9	- -	- -	- -	15414 31289	28142 57125	39800 80788	56834 115365	81101 164624	113458 230303	178171 361660	Ø 1.65 Ø 2.17

Flow rates for P2 vacuum range (Type ZM-R/N) upon request.