PROTEGO® Product Overview

For more product information please visit our website: www.protego.com

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PROTEGO® devices offer safety and environmental protection

- 1 In Storage Tank Farms for Refineries and Chemical Plants
- 2 In Processing Systems for Chemical and Pharmaceutical Industries
- 3 In Vapour Combustion Systems and Flares
- 4 In Ship Building and Loading Systems
- 5 In Vapour Recovery Units
- 6 As integrated Component of Equipment, Machines and Vessels





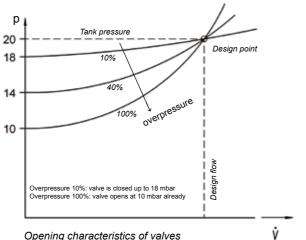
PROTEGO® Valves

with and without integrated flame arrester unit

Pressure / Vacuum Relief Valves

Advantages of PROTEGO® 10% technology

- → Pressure conservation very close to the maximum allowable tank pressure
- → Minimization of product losses
- Reduction of vapour emissions \rightarrow



Opening characteristics of valves with different overpressure levels

Diaphragm Valves

Due to the flexible diaphragm, these valves are used in weather-related low temperatures and in sticky, polymerizing media.

PROTEGO® diaphragm valves are the only valves worldwide which are frostproof down to temperatures of -40°C (-40°F) (e.g. PROTEGO® UB/ ... series).

Pilot operated Valves

Special Features and Advantages

- → in accordance with API 2000 recommendations
- → increased set pressure up to 1034 mbar (15psig)
- blow down < 7% \rightarrow
- → optimised flow performance

Emergency Relief Valves

- → used where the overpressure relief valves designed for normal operation fail to satisfy suddenly occurring venting requirements
- → used as an emergency pressure relief valve on storage tanks, vessels, silos, and process engineering equipment in the event of a fire

	Туре	Size	Pressure setting positive or negative setting range mbar / inch W.C.	0 = X =		Туре	Size	positive	e setting negative setting range mbar / inch W.C.	0 = X =
Pressure or	Vacuum R	elief Valves			Pressure an	nd Vacuum	Relief Val	ves		
Ê	DZ/E	25 - 300 1" - 12"	±2.0 up to ±60 ±0.8 up to ±24	0	<u>Î</u>	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	0
	DZ/E-F	25 - 300 1" - 12"	±60 up to ±500 ±24 up to ±200	x		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
Ē	DZ/EA	50 - 150 2" - 6"	±5 up to ±50 ±2 up to ±20	0	<u>Î</u>	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	0
	DZ/EA-F	50 - 150 2" - 6"	±60 up to ±500 ±24 up to ±200	x		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
Ĥ	DZ/T	25 - 300 1" - 12"	±2.0 up to ±60 ±0.8 up to ±24	0	Ĥ	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	0
	DZ/T-F	25 - 300 1" - 12"	±60 up to ±500 ±24 up to ±200	x		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
					Blanketing	/alve				
Ē	R/KSM	50 - 200 2" - 8"	±5 up to ±100 ±2 up to ±40	0	-	ZM-R	15 - 100 ½" - 4"	up to +500 up to +200	up to -200 up to -80	0

PROTEGO[®] Pressure/Vacuum Relief Valves in-line

o: weight loaded x: spring loaded

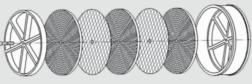
	Туре	Size	pressure positive setting range mbar / inch W.C.	setting negative setting range mbar / inch W.C.
Pressure	e Relief Va	alves, weig	ht pallet type	
Ī	P/EL	50 - 80 2" - 3"	+3.5 up to +210/ +1.4 up to +84	
Ť	P/ELR	80 - 100 3" - 4"	+3.5 up to +210/ +1.4 up to +84	
÷ الله	SD/BS-H	80-200 3" - 8"	+5 up to +210/ +2 up to +84	
H	D/SVL	50-300 2" - 12"	+2.0 up to +60/ +0.8 up to +24	
	ER-V-LP	200-700 8" - 28"	+3.4 up to +15/ +1.36 up to +6	
Ŧ	ER/V	200-700 8" - 28"	DN 200-350: +5 up to +40/ +2 up to +16 DN 400-700: +5 up to +25/ +2 up to +10	
T.	ER/VH	200-700 8" - 28"	DN 200-350: >+40 up to +60/ >+16 up to +24 DN 400-700: >+25 up to +60/ >+10 up to +24	
	ER/V-F	200-700 8" - 28"	>+60 up to +500/ >+24 up to +200	
	D/KSM	50-200 2" - 8"	+5.0 up to +100/ +2.0 up to +40	
Vacuum	Relief Val	ves, weigl	nt pallet type	
	SV/E-1-0	50 - 300 2" - 12"		-2.0 up to -60 / -0.8 up to -24
₽	SV/T-0-H	80 - 250 3" - 10"		-7.0 up to -50 / -2.8 up to -20
	V/KSM	50-200 2" - 8"		-5.0 up to -100 / -2.0 up to -40

			pressure	setting					
	Туре	Size	positive setting range mbar / inch W.C.	negative setting range mbar / inch W.C.					
Pressure	Pressure and Vacuum Relief Valves, weight pallet type								
Ĵ	PV/EL	50 - 80 2" - 3"	+2.0 up to +210/ +0.8 up to +84	-3.5 up to -35 / -1.4 up to -14					
Ĩ	PV/ELR	80 - 100 3" - 4"	+2.0 up to +210/ +0.8 up to +84	-3.5 up to -50 / -1.4 up to -20					
Ţ.	VD/SV	40 - 300 1½" - 12"	+2.0 up to +60 / +0.8 up to +24	-2.0 up to -60 / -0.8 up to -24					
j.	VD/SV-PA(L)	50 - 300 2" - 12"	+2.0 up to +60 / +0.8 up to +24	-2.0 up to -60 / -0.8 up to -24					
ВĴ	VD/KSM	50 - 200 2" - 8"	+5.0 up to +100 / +2.0 up to +40	-5.0 up to -100 / -2.0 up to -40					
ВŖ	VD/KSM-PA	50 - 200 2" - 8"	+5.0 up to +100 / +2.0 up to +40	-5.0 up to -100 / -2.0 up to -40					
Pressure	e and Vacuu	um Relief V	Valves, pilot-operat	ted					
	PM/(D)S	80 - 300 3" - 12"	+10 up to +300 / +4.0 up to +120	-3.0 up to -7 / -1.2 up to -2.8					
	PM-HF	80 - 300 3" - 12"	+10 up to +1034 / +4.0 up to +413.6						
	PM/F	replace	d by PM-HF						

			Pressure	e setting		Expl	osion	S				Pressur	e setting		Expl	osion	(A)
	Туре	Size	positive setting range mbar / inch W.C.	negative range mbar / inch W.C.	0 = X =	gro ATEX	NEC	Approvals		Туре	Size	positive setting range mbar / inch W.C.	negative setting range mbar / inch W.C	0 = X =	gro ATEX	NEC	Approvals
Pressu	re Relief \	Valves, P	allet Type						Pressu	re/Vacuur	n Relief	Valves, Pa	llet Type (Cont	inuat	ion)	
Ť	P/EB	50 - 80 2" - 3"	+3.5 up to +210/ +1.4 up to +84		0/X	IIA	D	ATEX	al al a	VD/SV-AD and VD/SV- ADL	80 - 150 3" - 6"		-2.0 up to -35/ -0.8 up to -14	x	IIB3	С	ATEX
Ì	P/EB-E	50 - 80 2" - 3"	+3.5 up to +210/ +1.4 up to +84		0/X	IIB1	_	ATEX	Ŷ	VD/SV-HR	80 - 100 3" - 4"	+3.5 up to +35/ +1.4 up to +14	-2.0 up to -35/ -0.8 up to -14	0/X	IIA, IIB3	D, C	ATEX
Ť	P/EBR	80 - 100 3" - 4"	+3.5 up to +210/ +1.4 up to +84		0/X	IIA, IIB3	D, C	ATEX	A.	VD/SV- HRL	100-150 4" - 6"		25/	0/X	IIA	D	ATEX
Ť	P/EBR-E	80 - 100 3" - 4"	+3.5 up to +210/ +1.4 up to +84		0/X	IIB1	_	ATEX	Î	VD-SV-EB	200 10"	+2.0 up to +60/ +0.8 up to +24	60/	0/X	IIA	D	ATEX
Ŷ	D-SVL-EB	200 10"	+2.0 up to +60/ +0.8 up to +24		0/X	IIA	D	ATEX	Â	VD/TS	50 - 300 2" - 12"	+3.5 up to +50/ +1.4 up to +20	-25/	х	IIB3	С	ATEX
		450.000	+2.0 up to						Pressu	re/Vacuur	n Relief V	Valves, Dia	aphragm \	/alve	s		
Vacuun	BE/HR-D	0-0	+0.8 up to +14		0/X	IIA	D	ATEX		UB/SF	80 - 150 3" - 6"	. 4 4 0 /	-3.5 up to -35/ -1.4 up to -16	0/X	IIB3	с	ATEX
<u>I</u>	SV/E	50 - 300 2" - 12"		-2.0 up to -60/ -0.8 up to -24	x	IIB3, IIB	C B	ATEX IMO	ļ.	UB/DF	80 - 150 3" - 6"	+3.5 up to +140/ +1.4 up to +56		0/X	IIB3	С	ATEX
Pressu	re/Vacuur	n Relief \	Valves, Pa	llet Type							80 - 150		-3.5 up to				
Ĵ	PV/EB	50 - 80 2" - 3"	+2.0 up to +210/ +0.8 up to +84	to -35/	0/X	IIA	D	ATEX	A.	UB/VF	3" - 6"	ligh Veloci	-35/ -1.4 up to -16	Х	IIB3	С	ATEX
Ĵ	PV/EB-E	50 - 80 2" - 3"	+2.0 up to +210/ +0.8 up to +84	-3.5 up to -35/	0/X	IIB1	_	ATEX	Ĥ	DE/S		+100 up to +500/ +40 up to +200	y valve	0/X	IIB3, IIB	C B	ATEX
Î	PV/EBR	80 - 100 3" - 4"	+2.0 up to +210/ +0.8 up to +84	to -50/	0/X	IIA, IIB3	D, C	ATEX	Į	DE/S-MK VI	80 - 150 3" - 6"	+60 up to +350/ +24 up to +140		0/X	IIB3, IIC	C, B	ATEX IMO
Ì	PV/EBR-E	80 - 100 3" - 4"	+2.0 up to +210/ +0.8 up to +84	to -50/	0/X	IIB1	-	ATEX	X = prev	urance buri ent flashba ospheric de	ick in case	e of					

PROTEGO[®] Pressure/Vacuum Relief Valves with Flame Arrester, end-of-line

PROTEGO® Flame Arresters



PROTEGO® flame arrester unit (modular design)

PROTEGO® Deflagration Flame Arresters, and Vent Caps, end-of-line

Special features and advantages of PROTEGO[®] Flame Arresters:

- → modular flame arrester unit enables each individual FLAMEFILTER[®] discs to be replaced and cleaned
- → service-friendly design
- → minimum pressure loss and associated low operating and life-cycle cost

Depending on the location of installation, the flame arresters must fulfill various protective tasks:

At the opening of a system part to the atmosphere → End-of-line flame arrester

At the opening of an equipment onto a connecting pipe → Pre-volume flame arrester

In the pipe

→ In-line flame arrester

PROTEGO® Detonation Flame Arresters

				Explosio group	n-	
	Туре	Size DN	Design cc = concentric ec = eccentric	ATEX	NEC	Approvals
for stable	detonation					
	DA-G	G ½ - G 2	straigth through, cc	IIA, IIB3, IIC	D, C, B	ATEX
\bullet	DR/SV	G ½ - G ¾	straight through, cc	IIA	D	ATEX
	DA-E	25-300 1" - 12"	straight through, ec	IIA, IIB3	D, C	ATEX
	DA-SB	50-600 2" - 24"	straight through, cc	IIA, IIB3, IIC	D, C, B	ATEX
	DA-SB-PTFE	50-100 2" - 4"	straight through, cc	IIA	D	ATEX
T	DR/ES	G ¼ -G ¾	90-degree	IIA, IIB3, IIC	D, C, B	ATEX
₽ [#]	DR/ES	25-200 1" - 8"	90-degree	IIA, IIB3	D, C	ATEX
V F	DR/ES series 2	50-100 2" - 4"	90-degree	IIA, IIB3	D, C	ATEX
¶.	DR/ES-V	40-200 1 ½" - 8"	90-degree	IIA, IIB3	D, C	ATEX
Ů.	DR/ES-PTFE	40-150 1 ½" - 6"	90-degree	IIA	D	ATEX
H)H	DR/SBW	50-400 2" - 16"	straight through, cc	IIA, IIB3	D, C	ATEX
	BR/TS	80 3"	90-degree	IIB3, IIB	C B	ATEX

	Type Si			Explor group		
			Design cc = concentri ec = eccentric		NEC	Approvals
for stable	e detonat	ion / for	liquid detonat	ion		
1	LDA-W	25-300 1" - 12"	straight through	IIA, IIB3	D, C	ATEX
	LDA- WF(W)	25-250 1" - 10"	straight through	IIA, IIB3	D, C	ATEX
đ	LDA	25-250 1" - 10"	vertical	IIA, IIB3	D, C	ATEX
Ů	LDA-F	25-250 1" - 10"	vertical	IIA, IIB3	D, C	ATEX
	EF/V	25-250 1" - 10"	vertical	IIB3	С	ATEX
88888	TS/P TS/E TS/W		vertical	IIA, IIB3, IIC	D, C, B	ATEX
for unsta	ble deto	nation				
:	DA-UB	50-600 2" - 24"	straigth through, cc	IIA, IIB3	D, C	ATEX
¢	DA-CG	50-600 2" - 24"	straight through, cc	IIA, IIB3	D, C	USCG
Ŷ	DR/EU	25-150 1" - 6"	90-degree	IIA, IIB2, IIB3	D, C, C	ATEX

	Туре	Size DN	Explosion ATEX	ngroup NEC	Approvals		
	1 y p c	OIZO DIV		NEO			
Deflagratio	Deflagration flame arrester, end-of-line						
Ť	BE/AD	15 - 50 ½" - 2"	IIB3, IIC	C B	ATEX		
	LH/AD	50 - 800 2" - 32"	IIB3, IIC	C B	ATEX		
Deflagration	on flame arre	ster, short	time bur	ning pro	oof,		
	LH/AD-T	50 - 800 2" - 32"	IIB3, IIC	C B	ATEX		
Deflagration	on flame arre	ster, endur	ance bu	rning pi	roof,		
	EB	25 - 800 1" - 32"	IIA, IIB	D B	ATEX		
	EB-DN/DN2	20 - 700 ¾" - 28"	IIA, IIB	D B	ATEX		
1	BE/HZ	15 - 32 ½" - 1¼"	IIA	D	ATEX		
Ļ	BE/HK	20 - 80 ³ ⁄4" - 3"	IIA,	D	ATEX		
		20 - 32 ¾" - 1¼"	IIB3	С			
<u> </u>	BE/HK-E	20 - 80 ¾" - 3"	IIB1, IIB3	– C	ATEX		
Ś.	BE/HR	80 - 100 3" - 4"	IIA, IIB3	D C	ATEX		
Š	BE/HR-E	80 - 100 3" - 4"	IIB1, IIB3, IIB	– C B	ATEX IMO		
÷	BE/HR 400	150 - 200 6" - 8"	IIA	D	ATEX		
•	LH/EB	150 - 400 6" - 16"	IIA1 (I)	-	ATEX		
Vont cane	end-of-line	without flou	no orroo	tor unit			

Vent caps, end-of-line, without flame arrester unit

<u> </u>	EH/0	20 - 80 ¾" - 3"		
Ż	EH/0S	100 - 600 4" - 24"		
T	E/KS	50 - 200 2" - 8"		

PROTEGO® Deflagration Flame Arresters, in-line

	Туре	Size DN	Design cc = concentric ec = eccentric	Explosi group		Approvals
In-line de	flagration	flame arres	ster			
	FA-E	25 - 300 1" - 12"	straight through, ec	IIA1 (I)	-	ATEX
	FA-E	25 - 300 1" - 12"	straight through, ec	IIA, IIB3, IIC	D, C, B	ATEX
i	FA-CN	40 - 300 1½" - 12"	straight through, cc	llA1 (l)	-	ATEX
Ü	FA-CN	25 - 300 1" - 12"	straight through, cc	IIA, IIB3	D, C	ATEX
	FA-CN	40 - 300 1½" - 12"	straight through, cc	IIC	В	ATEX
\$	FA-G	G½-G2	straight through, cc	IIA, IIB3, IIC	D, C, B	ATEX
	FA-I	50 - 1000 2" - 40"	straight through, cc	IIA, IIB3	D, C	ATEX
١	FAIPTFE	50 - 150 2" - 6"	straight through, cc	IIA	D	ATEX

Tank Accessories and Special Equipment

Tanks in tank farms and large vessels not only need to be equipped with flame arresters or pressure and vacuum valves but: in addition they need special equipment, which similar meets high requirements to operate safely.

Special Valves with Safety Functions

For emergency shut-off or for extraordinary operating conditions it is necessary to provide internal safety valves so that product leakage can be prevented quickly after a pipe burst. Change-over valves facilitate trouble-free valve maintenance.

Gauging and Sampling Equipment

Gauge and sampling hatches allow the use of gauging and sampling devices in the tank. For horizontal tanks deflagration proof gauging pipes are available.

For sampling and local venting in tanks that store flammable liquids PROTEGO® has designed special sampling and air bleed valves with flame arrester elements.

Explosion-proof floor drains for heliports pass flammable liquids (such as Kerosene) into catch tanks and prevent ignition inside. If an outside ignition source ignites the explosive atmosphere there is no flame transmission.

Floating Suction Units and Skimming Systems

Floating Suction Units PROTEGO® SA/S are designed to ensure that product in a storage tank is drawn off just below the surface of the liquid where it is cleanest.

Fixed roof tanks that store liquids with different density, socalled slop tanks, are fitted with the Float-Operated Skimming System PROTEGO® SA/DA for separating the phases.

Together with the tank operator or tank contractor we develop the best way to ensure both economical and safe operation.

Floating Roof Tank Equipment

For floating roof tanks the drainage system for the floating roof must be designed very precisely. Every movement of the floating roof must be taken into account and the load on the joints must not affect the free moving space. In case of restricted movement the system will crack, the pipes will bend and the joints will be stuck. In order to prevent the water in the system from standing and freezing, ensure sufficient drain to the lateral tank nozzle. Many years of experience are incorporated in the supplied systems that

work without disruptions - starting from the roof drain valves to the systems with ball bearing joints or metal hose joints. With lowered floating roofs in maintenance positions the completely drained space below the floating roof must be vented through a lift-actuated vent valve. When storing flammable liquids in the tank venting is to be done through flame arresters

Special Equipment

Hygroscopic products must be vented with dry air when stored. Air-drying devices with drying pearls prevent the air from saturating with humidity.

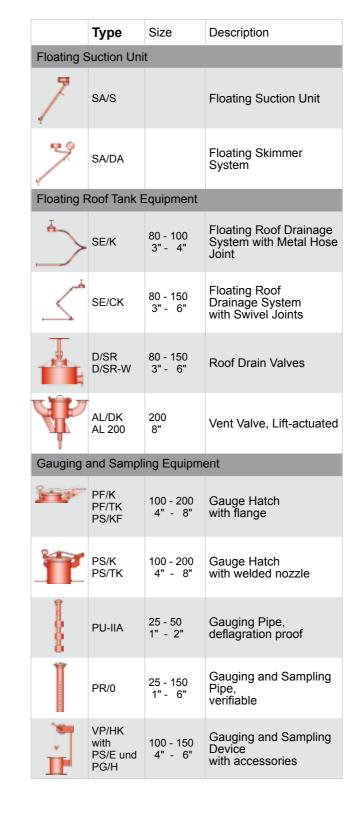
A special safety device is the hydraulic flame arrester. It is a collection device for large volume flows in pipelines collecting exhaust air from various plant areas, and it also functions as a backflow prevention device as it prevents the exchange of vapours. With extremely low pressure losses thanks to its relatively large drill holes in the sparge pipes the hydraulic flame arrester is insusceptible to clogging and therefore provides high plant availability. It can be used as flame arrester with substances of all explosion groups and provides protection against all types of combustion. The hydraulic flame arrester has to be monitored and controlled by instrumentation. Early involvement of our engineers in plant design is necessary to make the right selection.

Selection

The special valves, systems and devices are designed together with the operator, engineering company and tank contractor. PROTEGO® prepares a quotation based on the detailed system specifications.



Floating Suction Unit PROTEGO® SA/S



PROTEGO® Tank Accessories and Special Equipment

	Туре	Size	Description
Deflagrati	on proof S	pecial Valve	es
F	ZE/WU	15 - 25 G½" - G1"	Sampling and Air Bleed Valve, deflagration proof
-	ZE/TK	15 - 25 G½" - G1"	Condensate Drain Valve, deflagration proof
Air-Drying	g Devices		
0	LA	50 - 150 2" - 6"	Air-Drying Device
	LA/V	50 - 150 2" - 6"	Air-Drying Device with Check Valve
Special S	afety Valve	s	
	NB/AP	150 - 200 6" - 8"	In-Tank Valve
	SI/F	50 - 200 2" - 8"	In-Tank Valve
°~~~	SI/DP	150 - 300 6" - 12"	In-Tank Valve
لې کې	WV/T	80 - 250 3" - 10"	Change-Over Valve

Whatever complex and extreme your application, we will find a solution for you. We are specialists, not only specializing in what we have already developed, but also in developing the dedicated solutions you may require.

Tailored valves and devices are our day-to-day business. We will see to that, you can be sure:

- → Venting of pipelines
- → Internal safety valve
- → Super-heated PROTEGO[®] valves and devices
- → Applications for acetylene
- → Applications for ethylene oxide
- → Applications for alcohols
- → Applications for polymers (e.g. acrylates and styrene)



Pipeline Venting: PROTEGO® BE/SRL - Gas Liquid Separator



Acetylene Applications: PROTEGO® DA-SB-AC



Internal Safety Valve PROTEGO[®] SI/DP



Ethylene Oxide Applications: PROTEGO® DA-SB-EO

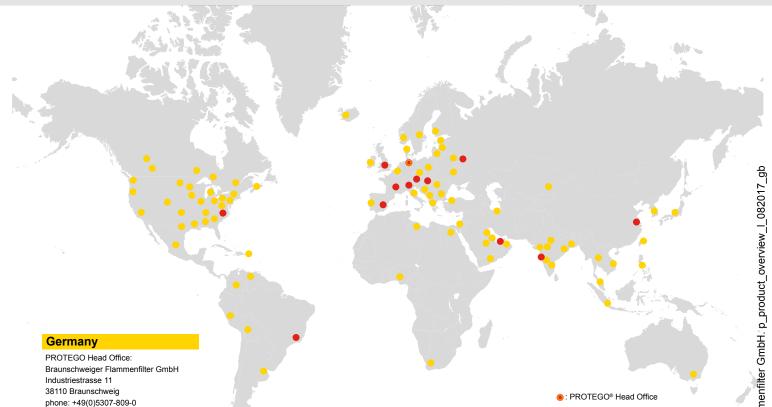




DMT Applications: Superheated Valves and Flame Arresters



Acrylate Applications: PROTEGO® UB/SF



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for safety and environment