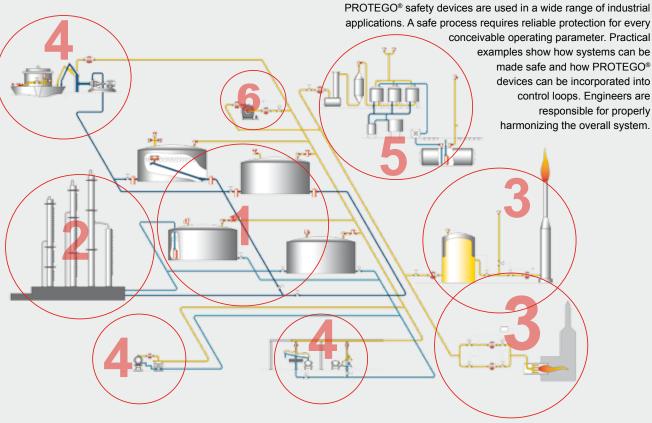
## **PROTEGO®** Product Overview

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





#### 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

Valves \_\_\_\_\_\_ page 2 - 5
Flame Arresters \_\_\_\_\_ page 6 - 7
Tank Accessories \_\_\_\_\_ page 8 - 9
Special Solutions \_\_\_\_\_ page 10 - 11



#### **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



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).

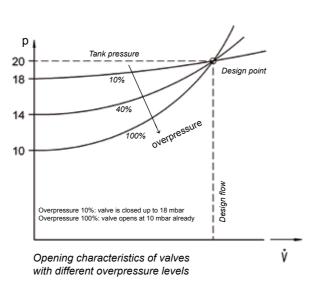
#### **Pilot operated Valves**

#### **Special Features and Advantages**

- → in accordance with API 2000 recommendations
- → increased set pressure up to 1034 mbar (15psig)
- → blow down < 7%</p>
- → 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.	O = X =
Pressure or	Vacuum R	elief Valves		
Î	DZ/E	25 - 300 1" - 12"	±2.0 up to ±60 ±0.8 up to ±24	0
	DZ/E-F	25 - 300 1" - 12"	±60 up to ±500 ±24 up to ±200	x
	DZ/EA	50 - 150 2" - 6"	±5 up to ±50 ±2 up to ±20	0
	DZ/EA-F	50 - 150 2" - 6"	±60 up to ±500 ±24 up to ±200	х
<b>FÎ</b>	DZ/T	25 - 300 1" - 12"	±2.0 up to ±60 ±0.8 up to ±24	0
	DZ/T-F	25 - 300 1" - 12"	±60 up to ±500 ±24 up to ±200	х
	R/KSM	50 - 200 2" - 8"	±5 up to ±100 ±2 up to ±40	0

	Туре	Size	positive	e setting negative setting range mbar / inch W.C.	O = X =
Pressure an	d Vacuum	Relief Val	/es		
Î	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
	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	х
Ĥ	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
	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
HÎH	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
	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				
	ZM-R	15 - 100 ½" - 4"	up to +500 up to +200	up to -200 up to -80	0

o: weight loaded x: spring loaded

2 3

# PROTEGO® Pressure/Vacuum Relief Valves end-of-line

			pressure	setting				
	Туре	Size	positive setting range mbar / inch W.C.	negative setting range mbar / inch W.C.				
Pressure Relief Valves, weight pallet type								
Î	P/EL	50 - 80 2" - 3"	+3.5 up to +210/ +1.4 up to +84					
Î	P/ELR	80 - 100 3" - 4"	+3.5 up to +210/ +1.4 up to +84					
	SD/BS-H	80-200 3" - 8"	+5 up to +210/ +2 up to +84					
W	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					
I	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					
Part.	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, weigh	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				

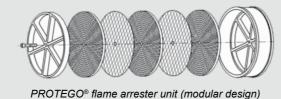
			pressure	catting
	Туре	Size	positive setting range mbar / inch W.C.	negative setting range mbar / inch W.C.
Pressure	e and Vacuu	um Relief	Valves, weight pall	et type
H	PV/EL	50 - 80 2" - 3"	+2.0 up to +210/ +0.8 up to +84	-3.5 up to -35 / -1.4 up to -14
I	PV/ELR	80 - 100 3" - 4"	+2.0 up to +210/ +0.8 up to +84	-3.5 up to -50 / -1.4 up to -20
	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
	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
ВÖ	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
	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 \	Valves, pilot-opera	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	

			Pressur	e setting		Expl	osion	Ø
	Туре	Size	positive setting range mbar / inch W.C.	negative setting range mbar / inch W.C.	O = X =		oup	Approvals
Pressur	e Relief \	/alves, P	allet Type					
Ť	P/EB	50 - 80 2" - 3"	+3.5 up to +210/ +1.4 up to +84		0 / X	IIA	D	ATEX
Ť	P/EB-E	50 - 80 2" - 3"	+3.5 up to +210/ +1.4 up to +84		0 / X	IIB1	_	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
Ť	P/EBR-E	80 - 100 3" - 4"	+3.5 up to +210/ +1.4 up to +84		0 / X	IIB1	-	ATEX
Ī	D-SVL-EB	200 10"	+2.0 up to +60/ +0.8 up to +24		0 / X	IIA	D	ATEX
·	BE/HR-D	150 -200 6" - 8"	+2.0 up to +35/ +0.8 up to +14		0 / X	IIA	D	ATEX
/acuum	n Relief Va	alves, Pa	allet Type					
	SV/E	50 - 300 2" - 12"		-2.0 up to -60/ -0.8 up to -24	X	IIB3	С	ATEX IMO
ressur	e/Vacuun	n Relief \	√alves, Pa	llet Type				
Î	PV/EB	50 - 80 2" - 3"	+2.0 up to +210/ +0.8 up to +84	-35/	0 / X	IIA	D	ATEX
Ì	PV/EB-E	50 - 80 2" - 3"	+2.0 up to +210/ +0.8 up to +84	-3.5 up to -35/ -1.4 up to -14	0 / X	IIB1	-	ATEX
Ť	PV/EBR	80 - 100 3" - 4"		-50/	0 / X	IIA, IIB3	D	ATEX
Î	PV/EBR-E	80 - 100 3" - 4"	+2.0 up to +210/ +0.8 up to +84	FO!	0 / X	IIB1	-	ATEX

			Pressur	e setting		Expl	osion	
	Туре	Size	positive setting range mbar / inch W.C.	negative setting range mbar / inch W.C	O = X =	gro	NEC	Approvals
Pressu	re/Vacuun	n Relief \	√alves, Pa	llet Type (	Cont	inua	tion)	
	VD/SV-AD and VD/SV- ADL	80 - 150 3" - 6"		-2.0 up to -35/ -0.8 up to -14	Х	IIB3	С	ATEX
Î	VD/SV-HR	80 - 100 3" - 4"	+3.5 up to +35/ +1.4 up to +14	-35/	0/X	IIA, IIB3	D, C	ATEX
Ŷ.	VD/SV- HRL	100-150 4" - 6"	+3.5 up to +35/ +1.4 up to +14	-2.0 up to -35/ -0.8 up to -14	0/X	IIA	D	ATEX
I	VD-SV-EB	200 10"	+2.0 up to +60/ +0.8 up to +24	-2.0 up to -60/ -0.8 up to -24	0/X	IIA	D	ATEX
À	VD/TS	50 - 300 2" - 12"		-2.0 up to -25/ -0.8 up to -10	Х	IIB3	С	ATEX FM
Pressu	re/Vacuun	n Relief \	Valves, Dia	aphragm \	/alve	S		
	UB/SF	80 - 150 3" - 6"	+140/	-3.5 up to -35/ -1.4 up to -16	0/X	IIB3	С	ATEX
	UB/DF	80 - 150 3" - 6"	+3.5 up to +140/ +1.4 up to +56		0/X	IIB3	С	ATEX
	UB/VF	80 - 150 3" - 6"		-3.5 up to -35/ -1.4 up to -16	Х	IIB3	С	ATEX
Pressure Relief Valves, High Velocity Valve								
	DE/S	80 - 150 3" - 6"	+100 up to +500/ +40 up to +200		0/X	IIB3	С	ATEX
$\prod$	DE/S-MK VI	80 - 150 3" - 6"	+60 up to +350/ +24 up to +140		0/X	IIB3, IIC	C, B	ATEX IMO

O = endurance burning proof X = prevent flashback in case of atmospheric deflagrations

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# 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**

							_
	Туре	Size DN	Design cc = concentric ec = eccentric	Explosion	ngroup	Approvals	
for stable	detonation						
	DA-G	G ½ - G 2	straigth through, cc	IIA, IIB3, IIC	D, C, B	ATEX	
•	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	
<u>O</u> H	DR/ES	25-200 1" - 8"	90-degree	IIA, IIB3	D, C	ATEX	į
V	DR/ES series 2	50-100 2" - 4"	90-degree	IIA, IIB3	D, C	ATEX	
<b>Q</b> <sup>‡</sup>	DR/ES-V	40-200 1 ½" - 8"	90-degree	IIA, IIB3	D, C	ATEX	
<b>T</b>	DR/ES-PTFE	40-150 1 ½" - 6"	90-degree	IIA	D	ATEX	
HOH	DR/SBW	50-400 2" - 16"	straight through, cc	IIA, IIB3	D, C	ATEX	
	BR/TS	80 3"	90-degree	IIB3	С	CE	

	Туре	Size DN	Design cc = concentric ec = eccentric	Explosion ATEX		Approvals
for stable	for stable detonation / for liquid detonation					
11	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
Ī	LDA	25-250 1" - 10"	vertical	IIA, IIB3	D, C	ATEX
Ü	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 unstab	le detona	ation				
	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
<u>Ť</u>	DR/EU	25-150 1" - 6"	90-degree	IIA, IIB2, IIB3	D, C, C	ATEX

	Туре	Size DN	Explosion	group NEC	Approvals
Deflagration	on flame arre	ster, end-o		NEC	
	BE/AD	15 - 50 ½" - 2"	IIB3, IIC	C B	ATEX
	LH/AD	50 - 800 2" - 32"	IIB3, IIC	C B	ATEX FM
Deflagration	on flame arre	ster, short	time burr	ning proc	of,
	LH/AD-T	50 - 800 2" - 32"	IIB3, IIC	C B	ATEX FM
Deflagration	on flame arre	ster, endur	ance bur	ning pro	of,
	EB	25 - 800 1" - 32"	IIA, IIB	D B	ATEX
	EB-DN/DN2	20 - 700 <sup>3</sup> ⁄ <sub>4</sub> " - 28"	IIA, IIB	D B	ATEX
	BE/HZ	15 - 32 ½" - 1¼"	IIA	D	ATEX
Ť	BE/HK	20 - 80 <sup>3</sup> ⁄ <sub>4</sub> " - 3" 20 - 32 <sup>3</sup> ⁄ <sub>4</sub> " - 11⁄ <sub>4</sub> "	IIA, IIB3	D C	ATEX FM
Ť	BE/HK-E	20 - 80 3⁄4" - 3"	IIB1	_	ATEX
	BE/HR	80 - 100 3" - 4"	IIA, IIB3	D C	ATEX FM
	BE/HR-E	80 - 100 3" - 4"	IIB1	-	ATEX
•	BE/HR 400	150 - 200 6" - 8"	IIA	D	ATEX
•	LH/EB	150 - 400 6" - 16"	IIA1 (I)	-	ATEX
Vent caps,	end-of-line,	without flar	me arrest	ter unit	
	EH/0	20 - 80 ¾" - 3"			
<b>*</b>	EH/0S	100 - 600 4" - 24"			
	E/KS	50 - 200 2" - 8"			

	Туре	Size DN	Design cc = concentric ec = eccentric	Explosio	ongroup	Approvals
In-line det	flagration	flame arres	ter			∢
	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
	FA-CN	40 - 300 1½" - 12"	straight through, cc	IIA1 (I)	-	ATEX
	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
H	FA-I	50 - 1000 2" - 40"	straight through, cc	IIA, IIB3	D, C	ATEX
	FAIPTFE	50 - 150 2" - 6"	straight through, cc	IIA	D	ATEX

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#### **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**

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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

	Туре	Size	Description					
Floating Suction Unit								
7	SA/S		Floating Suction Unit					
29	SA/DA		Floating Skimmer System					
Floating F	Roof Tank E	quipment						
<u>_</u>	SE/K	80 - 100 3" - 4"	Floating Roof Drainage System with Metal Hose Joint					
$\leq$	SE/CK	80 - 150 3" - 6"	Floating Roof Drainage System with Swivel Joints					
	D/SR D/SR-W	80 - 150 3" - 6"	Roof Drain Valves					
	AL/DK AL 200	200 8"	Vent Valve, Lift-actuated					
Gauging a	and Sampli	ng Equipme	ent					
	PF/K PF/TK PS/KF	100 - 200 4" - 8"	Gauge Hatch with flange					
	PS/K PS/TK	100 - 200 4" - 8"	Gauge Hatch with welded nozzle					
	PU-IIA	25 - 50 1" - 2"	Gauging Pipe, deflagration proof					
	PR/0	25 - 150 1" - 6"	Gauging and Sampling Pipe, verifiable					
Ţ.	VP/HK with PS/E und PG/H	100 - 150 4" - 6"	Gauging and Sampling Device with accessories					

	Туре	Size	Description				
Deflagration proof Special Valves							
	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	Devices						
	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"	Fast Action Bottom Drain Valve with pneumatic actuator				
H	SI/F	50 - 200 2" - 8"	Internal Safety Valve				
	SI/DP	150 - 300 6" - 12"	Internal Safety Valve				
4	WV/T	80 - 250 3" - 10"	Change-Over Valve				

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## PROTEGO® Special Solutions

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

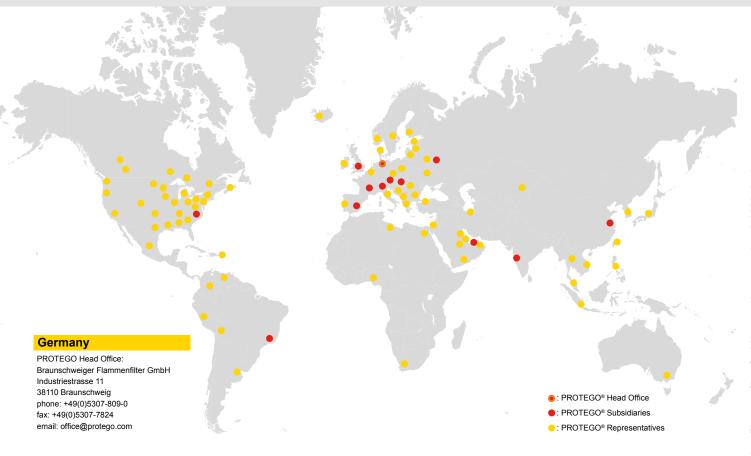


DMT Applications: Superheated Valves and Flame Arresters



Acrylate Applications: PROTEGO® UB/SF





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