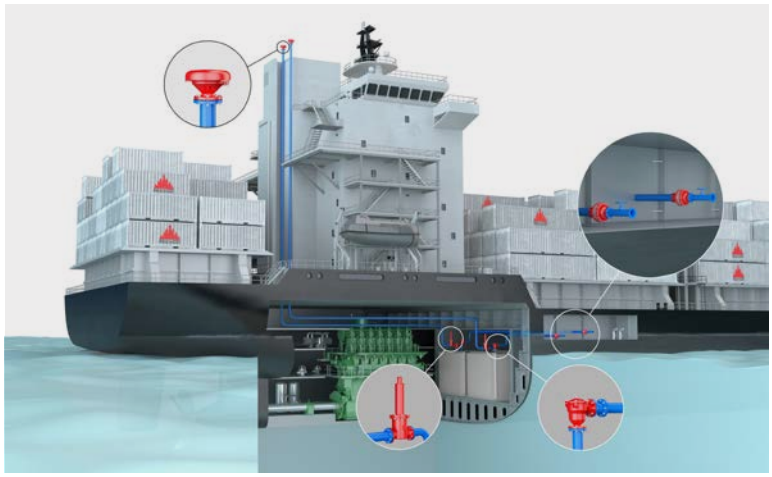
PROTEGO® – Explosion-Proof Venting for the Maritime Industry

- Explosion protection for methyl/ethyl alcohol as fuel according to IMO MSC.1/Circ.1621
- The vapor-return-line to the bunkering station is protected with a Detonation Flame Arrester PROTEGO® DA-SB
- Type approvals as per classification authority upon request

SCHEME A: P/ V - VALVE ON THE TANK IN COMBINATION WITH FLAME ARRESTER ON THE VENT MAST



- Protection of the fuel tank with in-line Pressure and Vacuum Relief Valve PROTEGO® DV/ZT-F-S in combination with an end-of-line Flame Arrester BE/HR-E on the vent mast
- PROTEGO® Flame Arresters are type approved as per EN ISO 16852 and conform to ISO/IEC 80079-49 respectively to prevent against the impact of atmospheric deflagration and endurance burning
- PROTEGO® Flame Arresters are type approved for endurance burning with alcohols as required by the operating conditions

PROTEGO® DV/ZT-F-S (Pressure and Vacuum Relief Valve)

PROTEGO® BE/HR-E-IIB1 (Atmospheric deflagration and endurance-burning proof Flame Arrester)

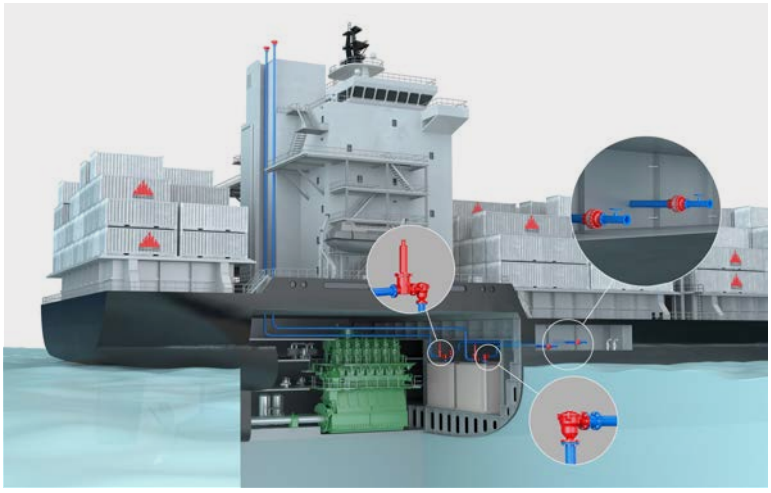
PROTEGO® DR/ES (Detonation Flame Arrester)

PROTEGO® DA-SB (Detonation Flame Arrester)

PROTEGO® – Explosion protection for methyl/ethyl alcohol as fuel according to IMO MSC.1/Circ.1621

SCHEME B: P/ V - VALVE IN COMBINATION WITH DETONATION ARRESTER ON THE TANK

- Protection of the fuel tank with in-line Pressure and Vacuum Relief Valve PROTEGO® DV/ZT-F-S in combination with a detonation-proof Flame Arrester PROTEGO® DR/ES
- PROTEGO® Flame Arresters are type approved as per EN ISO 16852 and conform to ISO/IEC 80079-49 respectively for explosion group IIA for methanol and IIB1 or higher for ethanol
- PROTEGO® Flame Arresters are type approved and tested for elevated pressures and temperatures as required by the operating conditions



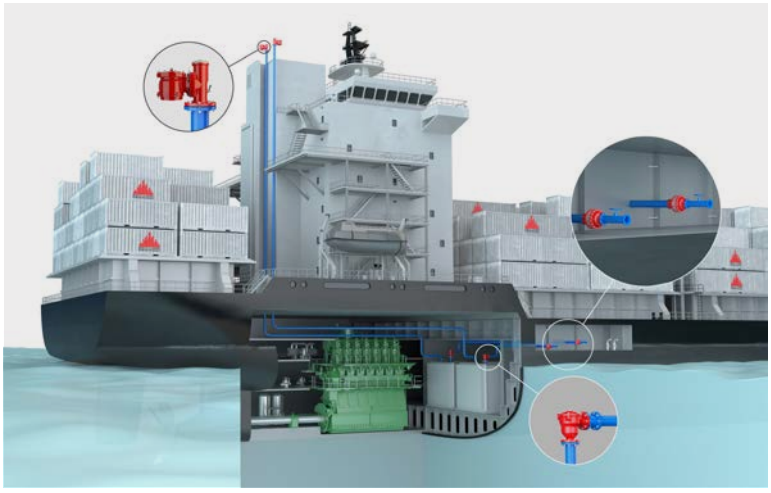
PROTEGO® DV/ZT-F-S (Pressure and Vacuum Relief Valve)

PROTEGO® DR/ES (Detonation Flame Arrester)

PROTEGO® DA-SB (Detonation Flame Arrester)

SCHEME C: JET-VALVE IN COMBINATION WITH VACUUM RELIEF VALVE

- Protection of the fuel tank with a high-velocity Pressure Relief Valve PROTEGO® DE/S in combination with Vacuum Relief Valve PROTEGO® SV/E-S at the vent mast
- PROTEGO® Valves are type approved as per EN ISO 16852 and conform to ISO/IEC 80079-49 respectively and ISO 15364

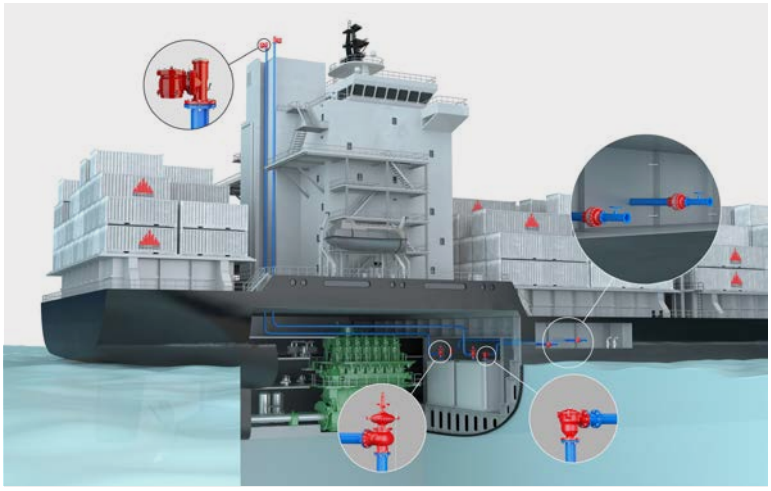


PROTEGO® DE/S (High Velocity Pressure Relief Valve) and PROTEGO® SV/E-S (Vacuum Relief Valve)

PROTEGO® DR/ES (Detonation Flame Arrester)

PROTEGO® DA-SB (Detonation Flame Arrester)

SCHEME D:
JET-VALVE WITH VACUUM RELIEF VALVE IN COMBINATION WITH PILOT-OPERATED PRESSURE/VACUUM RELIEF VALVE



- Protection of the fuel tank with a redundant in-line combination of pilot-operated Pressure / Vacuum Relief Valve PROTEGO® VN-A-PCPF-S and a high-velocity Pressure Relief Valve PROTEGO® DE/S in combination with Vacuum Relief Valve PROTEGO® SV/E-S at the vent mast
- PROTEGO® Valves are type approved as per EN ISO 16852 and conform to ISO/IEC 80079-49 respectively and ISO 15364

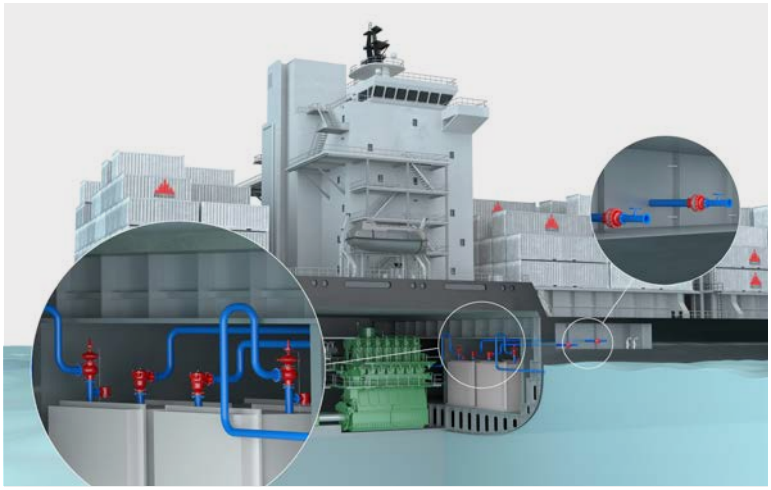
PROTEGO® DE/S (High Velocity Pressure Relief Valve) and PROTEGO® SV/E-S (Vacuum Relief Valve)

PROTEGO® VN-A-PCPF-S (Pilot-operated Pressure/ Vacuum Relief Valve)

PROTEGO® DR/ES (Detonation Flame Arrester)

PROTEGO® DA-SB (Detonation Flame Arrester)

SCHEME E:
PILOT-OPERATED PRESSURE/VACUUM RELIEF VALVE WITH ADDITIONAL VACUUM RELIEF VALVE - VAPOR DISCHARGE THROUGH OUTLETS UNDERWATER



- Protection of the fuel tank with a pilot-operated Pressure / Vacuum Relief Valve PROTEGO® VN-A-PCPF-S and a Vacuum Relief Valve PROTEGO® SV/E-S
- PROTEGO® Valves are type approved as per EN ISO 16852 and conform to ISO/IEC 80079-49 respectively

PROTEGO® VN-A-PCPF-S (Pilot-operated Pressure/ Vacuum Relief Valve)

PROTEGO® SV/E-S

PROTEGO® DR/ES (Detonation Flame Arrester)

PROTEGO® DA-SB (Detonation Flame Arrester)

PROTEGO® Technology Center – Testing under Extreme Conditions for the Maritime Industry

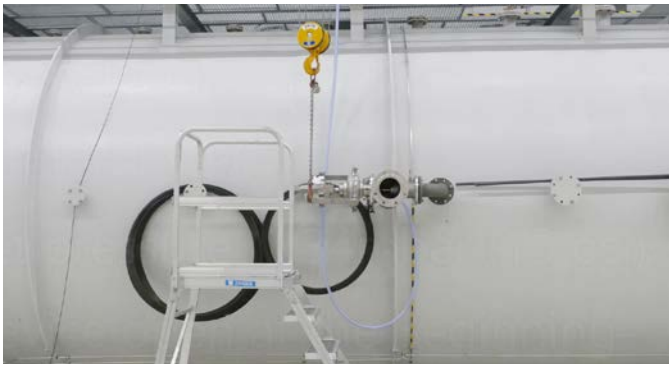
At the PROTEGO® Technology Center, the testing facilities, including the world's largest flow test facility of its kind, rigorously test PROTEGO® Valves and Flame Arresters to ensure safe and reliable operation in real-world conditions.

Our products are tested under extreme conditions to meet the highest safety and performance requirements.

For the solution of various marine customer requirements, we utilize state-of-the-art testing facilities, such as:

- Low pressure flow test facilities,
- Climate chamber,
- Salt spray chamber,
- Cryogenic test bench.

Low pressure flow test facilities



Testing the functionality of Pilot Valve when angled by 90 degrees

Test pilot-operated P/V-Relief Valve PROTEGO® VN-A-PCPF-S and a high-velocity Pressure Relief Valve PROTEGO® DE/S in combination with Vacuum Relief Valve PROTEGO® SV/E-S

Angled installation of PROTEGO® DE/S

Tests of PROTEGO® DA-SB in the salt spray chamber

Functional test of PROTEGO® VN-A-PCPF at the Cryogenic test bench

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