Leading The Way in Rail Equipment Innovation Worldwide

Dual Valve Systems for Chlorine Transportation

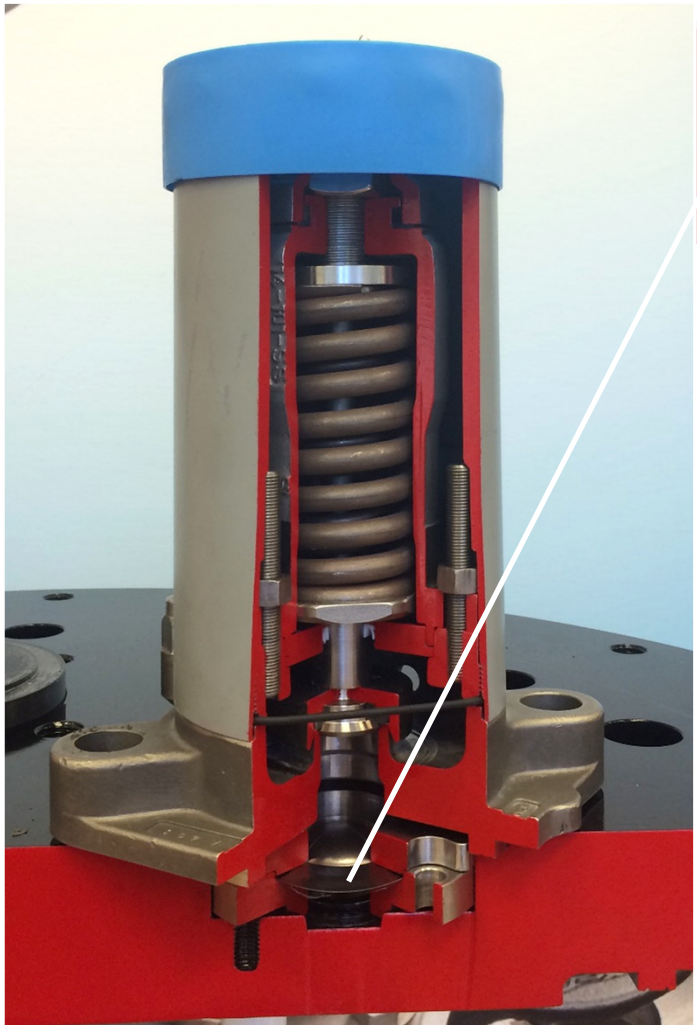
Design – Performance History - Improvements

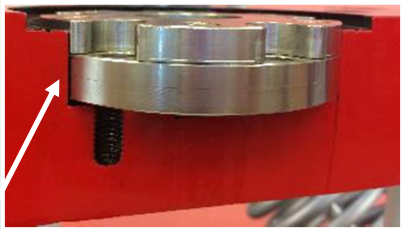
MIDLAND

PART OF OPW A DOVER COMPANY

Chlorine Dual Valve Enhanced Fittings Package

Dual Valve System Overview



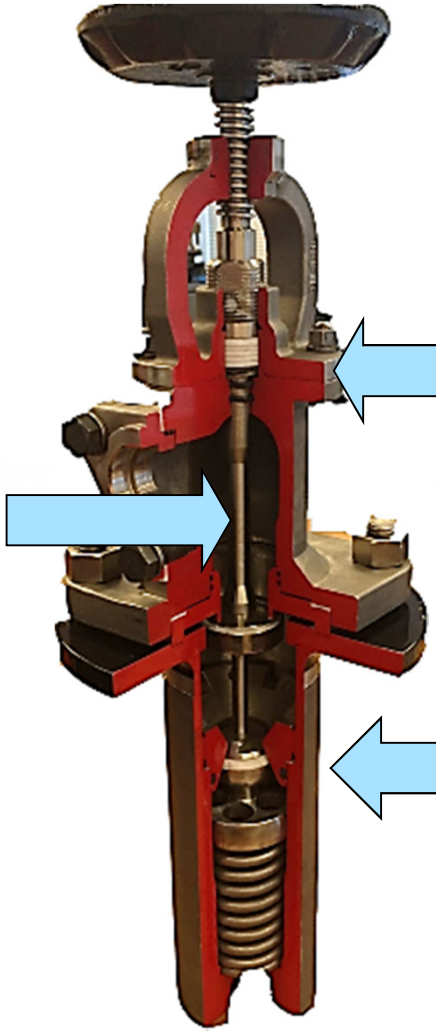


- PRV rupture disc is mounted in the pressure plate
  - Rupture disc mounting is separate from the PRV
- Check valve is mechanically operated by the angle valve
  - Check valve spring maintains a positive seal on the valve until pushed open by the angle valve stem
- Primary seals are below the pressure plate surface for added shear off protection

Combination Chlorine Angle & Check Valve

New angle valve operates in conjunction with check valve

Stem turns with the handwheel. When opening the angle valve, the spring compresses, opening the check valve

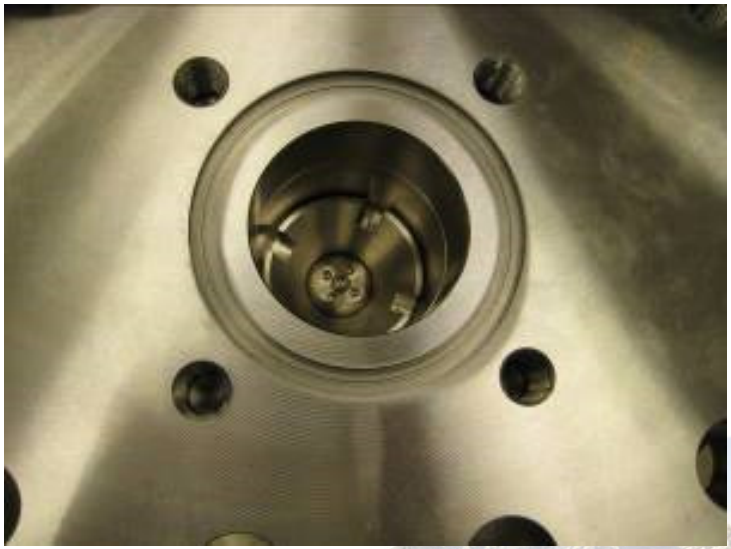


Angle Valve
A-718B-ML

Check Valve
A-180-ML-H01

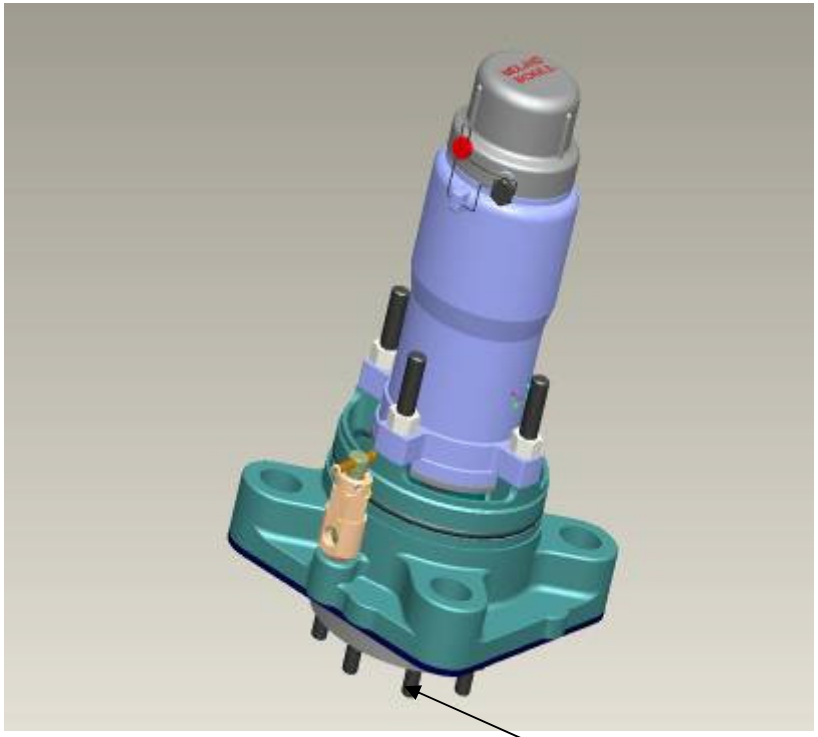
A-180-ML-H01 Check Valves Welded onto Pressure Plate

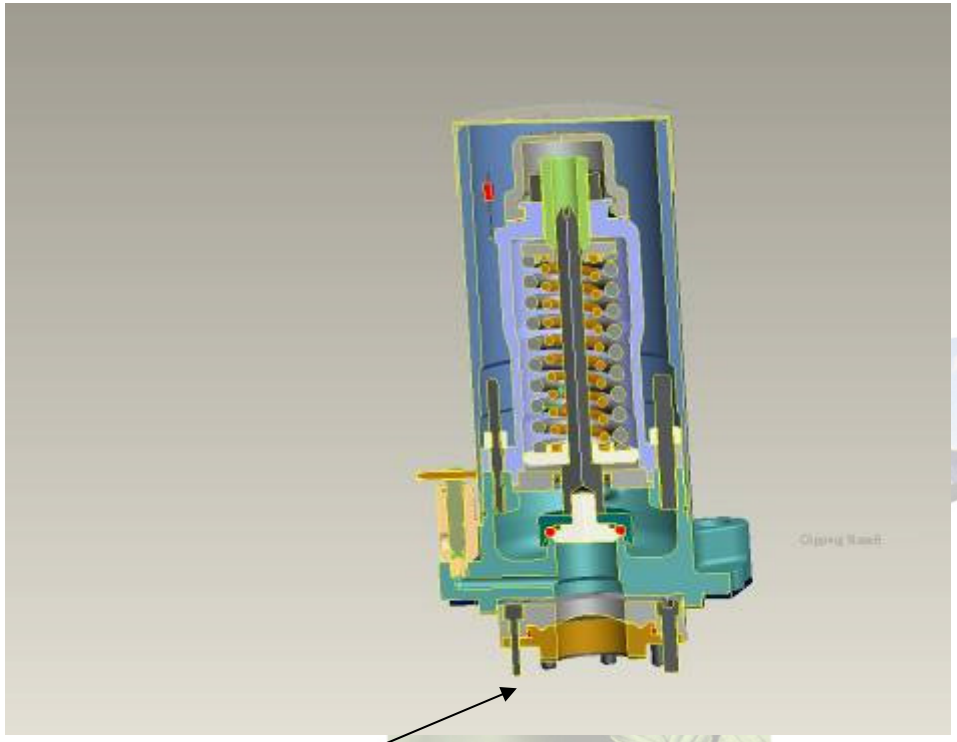
Bottom View



Top View

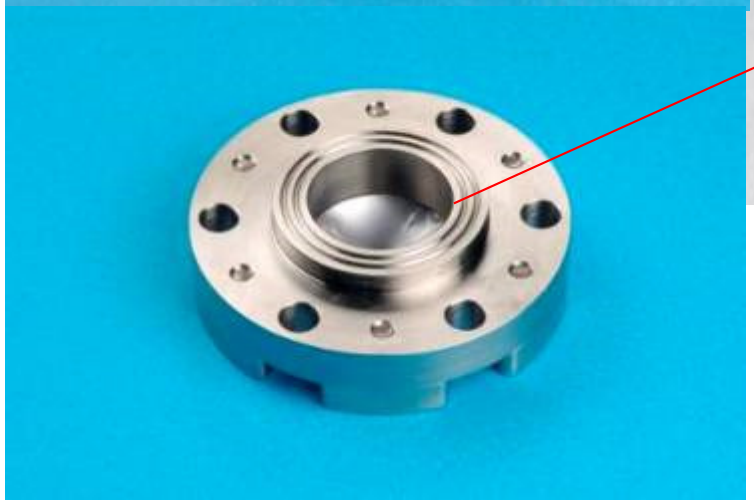
A-14378-ML Pressure Relief Valve

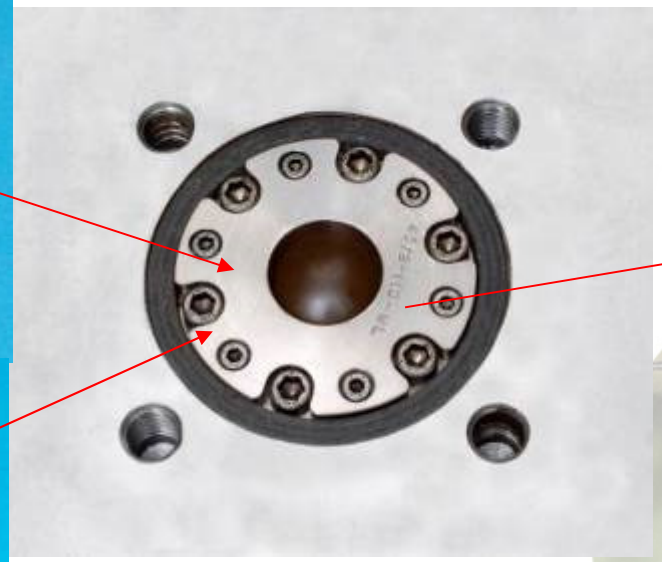


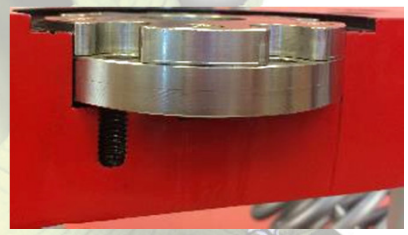


Independent Rupture Disc Design

A-14378-ML Pressure Relief Valve







Design & Installation

- Designed for retrofit and new car installations
  - 4 Valves on 18” or 20” manway
- Emergency Response
  - C Kit or Midland ERK Kit can be used
  - Protective housings required modification for C-Kit use
- Installation
  - New pressure plates required
  - Check valves welded to pressure plate

Dual Valve System Features and Benefits

- Meets new FRA regulations for top fittings protection- 9 MPH impact requirement
- Locates all primary seals below the shear plane of the pressure plate
- PRV mounting separated from rupture disk assembly
- Unloading/loading flow rates increased over existing systems without the worry of the check valve checking in over pressure situations during unloading

Dual Valve Systems

PERFORMANCE HISTORY - LESSONS LEARNED

INSTALLATIONS – PERFORMANCE HISTORY

- Midland systems in operation since 2008
  - Estimate over 12,000 trips with Midland dual valve package
- Over 260 cars in service in North America with Midland package
  - Chlorine
  - AHCL
  - Ethylene Oxide
- System involved in one derailment since 2008 and system performed as expected.
  - No damage to valves during incident
  - Car was easy to transload after accident and transloading operation was faster than with typical valve systems.

INDUSTRY FEEDBACK SUMMARY – DUAL VALVE SYSTEMS

- Design preferences
  - 4 valve system on 18” manway for both new and retrofit applications
- Check valve welding concerns
  - Pressure plate and check valve dimensional tolerances critical and difficult to hold
  - Improper welding could damage seals and threads in check valves
- Emergency Response
  - Industry preferred using traditional capping cans for angle valves
- Loading Flow Rates & Cavitation
  - Industry prefers faster loading rates which created concerns of flashing and cavitation on check valve performance
- Maintenance & Re-Qualification
  - Welded check valves are difficult to maintain and test for mandatory re-qualification events

Dual Valve Systems

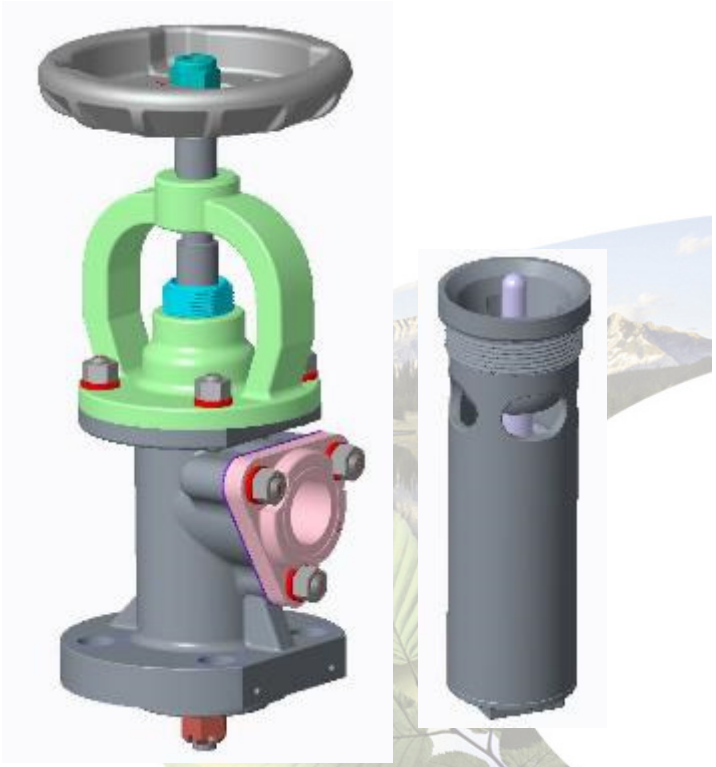
UPCOMING DESIGN IMPROVEMENTS

Chlorine Dual Valve Redesign

Midland is improving the new shear-off dual valve system for Chlorine service to increase safety and satisfy customer requests.

Dual Valve Redesign Goals

- Eliminate check valve welding to ease installation and maintenance
- Reduce/eliminate risk of flashing on/near the spring
- Maintain or exceed current product flow rates
- Mount in four angle valve configuration
- Fit under standard Emergency Response Kit
- Support retrofit



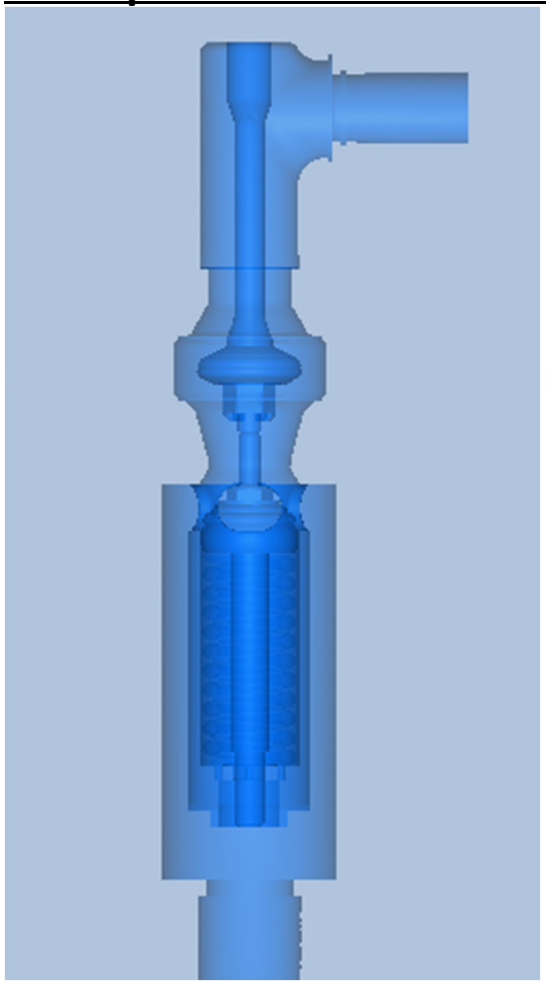
Current Concept Package

Chlorine Dual Valve Concept Design

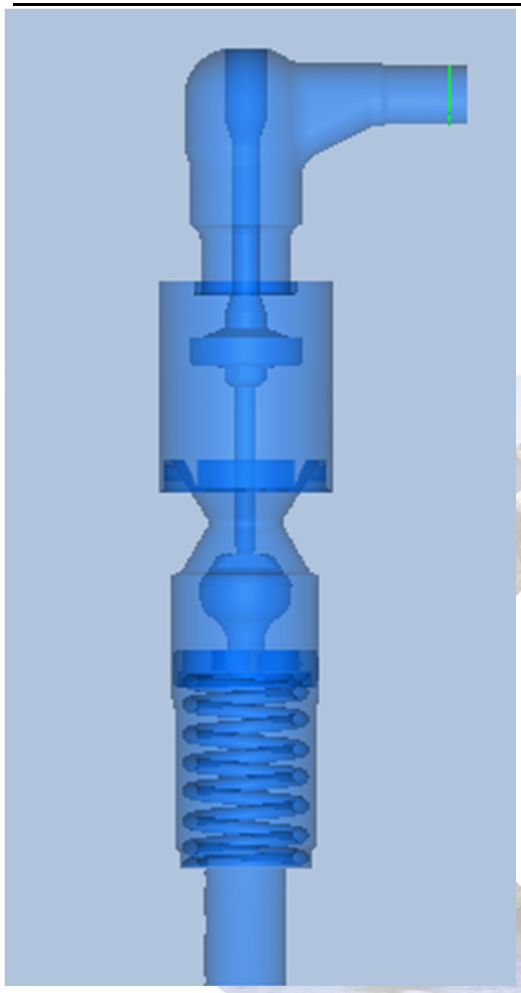
Concept Design Features

- ✓ Spring isolated from flow path to eliminate risk of flashing damage
- ✓ Flow coefficient: Cv approximately 25

Concept Flow Path - Loading



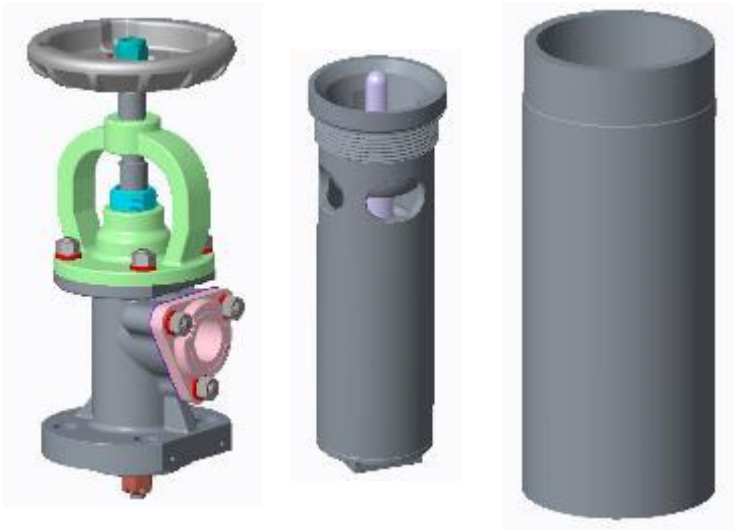
Current Dual Valve Flow Path

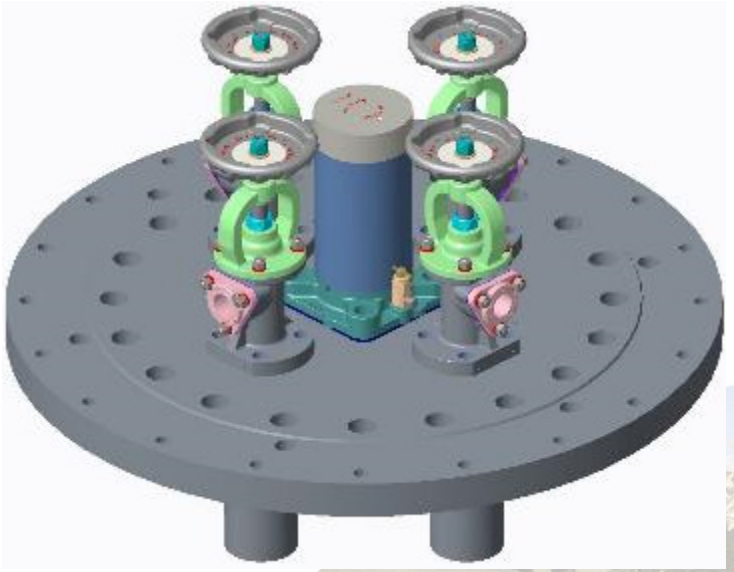


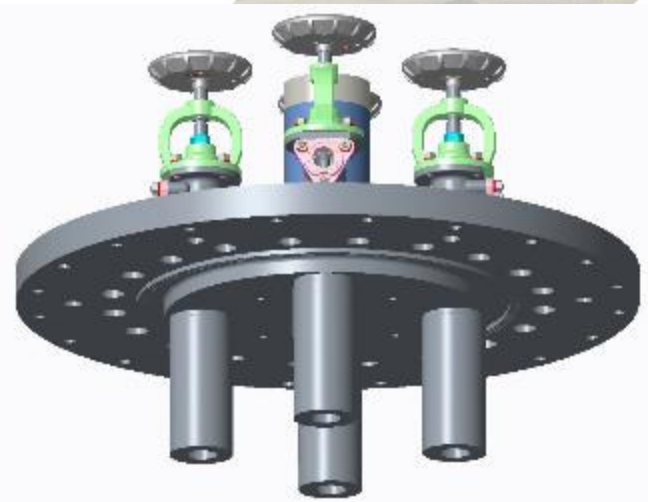
Chlorine Dual Valve Concept Design

Concept Design Features

- ✓ Externally mounted, threaded check valve
- ✓ Four angle-valve configuration
- ✓ 18” manway cover compatible
- ✓ Fits under the 6A hood







Thank You!