



# **SECTION A: PRE-COMMISSIONING, START-UP, COMMISSIONING & OPERATION PROCEDURE**

# **1.0 SCOPE OF SUPPLY (INCLUDED)**

## 1.0 SCOPE OF SUPPLY

This system comprises the following:-

1. 2 x 2900 Liters Transportable Tank (566VL001 & 566VL002).
2. 1 X Pump Unit.
3. 1 X Dispenser Unit.
4. 1 X Laydown Skid to cater for 2 Unit of Transportable Tanks & Pump Unit

The system will be delivered together with:-

1. ABS Class Certification
2. Start-Up/ Commissioning Spare Parts.
3. Final Documentation.
4. One Year Normal Operation Spare Parts.
5. Two Year Normal Operation Spare Parts.

# **2.0 SCOPE OF SUPPLY (EXCLUDED)**

## **2.0 SCOPE OF SUPPLY (EXCLUDED)**

This system does not included the following:-

Power supply, interconnecting piping, tubing, and electric cable exceeded scope limit as shown on P&ID to be supplied by others.

# **3.0 PRECOMMISSIONING INSPECTION**

### 3.0 PRE-COMMISSIONING INSPECTION

Pre-start-up & commissioning inspection shall be done to ensure completeness of system prior to commissioning test.

PRE-START-UP/ COMMISSIONING PROCEDURE			
ITEM	INSPECTION ACTIVITIES	ACCEPTANCE CRITERIA	RESULTS
A	Skid installation. (Aviation Fuel Skid)	Skid has been installed as per client's installation plan. Aviation Fuel Skid shall welded to client platform.	
B	Skid installation. (Dispensing Skid)	Dispensing Skid has been installed as per client's installation plan by bolt & nut to client structural. Proper earth bonding cables were connected from Skid earth bosses to platform earth bosses.	
C	Equipment Marking/ Tagging check.	As per AS-BUILT P&ID.	
D	Interconnecting & Interface piping.	Interconnecting piping between skids have been installed, routed and tested as per client's new piping layout. All skid's skid drain points have been connected to the client approved drainage connections.	
E	Completed check for major mechanical equipment.	As per AS-BUILT P&ID.	
F	Completed check for instrument equipment.	As per AS-BUILT P&ID. Validity of calibration date.	
G	Check earth continuity through equipment and interconnecting piping.	Resistance should not more than 0.5 ohm. Flange come with proper earth jumper cable.	
H	Completed check for instrument cable/ tubing/ hose.	As per AS-BUILT P&ID.	
I	Check the condition of the system before commissioning.	The system should be in a fully shut down condition, full depressed condition and all isolated valve are in closed position.	
J	Check fuel level in the duty tanks.	Minimum 1000 liters is required for circulation & testing.	
K	Check available of fuel test kid.	As per Start-Up & Commissioning Spares List.	
L	Check Electrical Power & Instrument Air Supply.	As per AS-BUILT P&ID.	

# **4.0 START-UP/ COMMISSIONING TEST**



## 4.0 START-UP/ COMMISSIONING TEST

The system shall be start-up/ commissioning before allowed to use in normal refueling operation. The following procedures should be followed in the commissioning test.

START-UP/ COMMISSIONING PROCEDURE		
ITEM	ACTIVITY	NOTE/ RESULTS
1	Have a transportable tank with fuel on the aviation fuel laydown skid & an empty drum.	
2	Ensure sufficient fuel (~1000 Liters) is contained in the transportable tank. Check release note for the correct grade.	
3	Sample Check from the tank drain point.	
4	Ensure all isolation valves are closed and the system is in fully depressurized condition.	
	Unwind the ground earth unit and connected the earth clamp to empty steel drum.	
	Unwind the refueling hose and insert the nozzle into the steel drum. Connect the earth unit on the refueling nozzle to the steel drum. Trigger the refueling nozzle in open condition.	
5	Connect suction hose coupling & air hose coupling to the transportable tank discharge valve.	
6	Select the pump/ motor A & open all related inlet & outlet isolation valves.	
7	On Local Control Panel (LCP) <ul style="list-style-type: none"> <li>- On power supply at the local control panel.</li> <li>- Select "Local".</li> <li>- Select Pump/ Motor A.</li> </ul>	
8	Kick over the pump motor by pressing start push button at LCP. Check direction of rotation.	
9	Briefly start/stop the pump a few seconds to allow priming the fuel lines to the transfer pump unit and dispenser unit and replace air in the filter separator and water monitor. Check fuel lines and equipment for leakage.	



10	Start the pump and flush through approximated 50-100 litres of fuel into the steel drum.	
11	Take fuel sample from the sample points at filter separator, water monitor and nozzle end. Further sample to be taken until a clean and dry sample are obtained.	
12	Stop the pump & transfer the refueling nozzle to service tank's inspection hatch. (Close Loop System)	
13	Check & re-set pump's built-in relief valve set pressure if necessary.	
14	Carry out function test on the Local Control Panel as below.	
	Select LCP  Select Pump A	- Pump A Duty Pilot Light (Green) on RCP "ON".  - Pump A, Pump B stop Pilot Light (Green) "ON".
	Select LCP  Select Pump B	- Pump B Duty Pilot Light (Green) on RCP "ON".  - Pump A, Pump B stop Pilot Light (Green) "ON".
	Select Pump A Push Start Button	- Pump A "RUN" - Pump A run Pilot Light (Red) "ON". - Pump A stop Pilot Light (Green) "OFF". - Pump B stop Pilot Light (Green) "ON". - Dispenser Unit Run Indicating Light "ON".
	Select Pump A Push Stop Button	- Pump A "STOP" - Pump A run Pilot Light (Red) "OFF". - Pump A stop Pilot Light (Green) "ON". - Pump B stop Pilot Light (Green) "ON". - Dispenser Unit Run Indicating Light "OFF".
	Select Pump B Push Start Button	- Pump B "RUN". - Pump B run Pilot Light (Red) "ON". - Pump B stop Pilot Light (Green) "OFF". - Pump A stop Pilot Light (Green) "ON". - Dispenser Unit Run Indicating Light "ON".
	Select Pump B	- Pump B "STOP" - Pump B run Pilot Light (Red) "OFF".



	Push Stop Button	<ul style="list-style-type: none"> <li>- Pump B stop Pilot Light (Green) "ON".</li> <li>- Pump A stop Pilot Light (Green) "ON".</li> <li>- Dispenser Unit Run Indicating Light "OFF".</li> </ul>
	Push Emergency Stop Device (ESD) Button	<ul style="list-style-type: none"> <li>- Full system shutdown.</li> <li>- ESD Light (Red) "ON".</li> <li>- Main Incoming Supply "ON".</li> </ul>
15	<b>Function Test Remove Control Panel</b>	
	Select "Remote" control. On LCP Select Pump A.	<ul style="list-style-type: none"> <li>- Pump A Duty Pilot Light (Green) on RCP "ON".</li> <li>- Pump A, Pump B stop Pilot Light (Green) "ON".</li> </ul>
	Select "Remote" control. On LCP Select Pump B.	<ul style="list-style-type: none"> <li>- Pump B Duty Pilot Light (Green) on RCP "ON".</li> <li>- Pump A, Pump B stop Pilot Light (Green) "ON".</li> </ul>
	Select "Remote" control. On LCP Select Pump A. Push Start Button.	<ul style="list-style-type: none"> <li>- Pump A "RUN"</li> <li>- Pump A run Pilot Light (Red) "ON".</li> <li>- Pump A stop Pilot Light (Green) "OFF".</li> <li>- Pump B stop Pilot Light (Green) "ON".</li> <li>- Dispenser Unit Run Indicating Light "ON".</li> </ul>
	Select "Remote" control. On LCP Select Pump A. Push Stop Button.	<ul style="list-style-type: none"> <li>- Pump A "STOP"</li> <li>- Pump A run Pilot Light (Red) "OFF".</li> <li>- Pump A stop Pilot Light (Green) "ON".</li> <li>- Pump B stop Pilot Light (Green) "ON".</li> <li>- Dispenser Unit Run Indicating Light "OFF".</li> </ul>
	Select "Remote" control. On LCP Select Pump B. Push Start Button.	<ul style="list-style-type: none"> <li>- Pump B "RUN".</li> <li>- Pump B run Pilot Light (Red) "ON".</li> <li>- Pump B stop Pilot Light (Green) "OFF".</li> <li>- Pump A stop Pilot Light (Green) "ON".</li> <li>- Dispenser Unit Run Indicating Light "ON".</li> </ul>
	Select "Remote" control. On LCP Select Pump B. Push Stop Button.	<ul style="list-style-type: none"> <li>- Pump B "STOP"</li> <li>- Pump B run Pilot Light (Red) "OFF".</li> <li>- Pump B stop Pilot Light (Green) "ON".</li> </ul>



		<ul style="list-style-type: none"><li>- Pump A stop Pilot Light (Green) "ON".</li><li>- Dispenser Unit Run Indicating Light "OFF".</li></ul>
	Push Emergency Stop Device (ESD) Button	Full system shutdown. ESD Light (Red) "ON".
16	<b>Function Test On Signal Emergency Stop Device (ESD)</b>	
	1.1. Simulate Client ESD.	<ul style="list-style-type: none"><li>- Whole system will shut down immediately.</li><li>- Incoming Power Supply Light "ON"</li></ul>
17	<b>Function Test For Output Signal Terminal</b>	
	<ul style="list-style-type: none"><li>- Common Shut Down</li><li>- Common Stop</li><li>- Common Run</li><li>- Common Trip</li></ul>	- Dry contact. Resistant Test (NO/NC)
18	Swop to Pump B. Repeat the same step as above.	

<b>OPERATION PERFORMANCE RESULTS / SUMMARY</b>			
	DESIGN SPECIFICATION	ACTUAL READING (PUMP A)	ACTUAL READING (PUMP B)
Flow Rate @ LPM	225		
Pump's Internal Relief Valve Set Pressure @ kPaG (Close Head)	700		
Pump's Discharge Pressure @ kPaG (While Pump Running)	Measure at Test		
Diff Pressure – Filter Separator @ Psi	< 100 kPaG		
Diff Pressure – Water Monitor @ Psi	< 100 kPaG		
Hose Reel's Inlet Pressure @ Psi	Measure at Test		
Instrument Air Supply @ kPaG	500-800		
Noise Level @ dBA	< 85		
Leak Test	None		
Current Load @ A	Measure at Test		
Voltage @ VAC	380 VAC		
<b>FUEL SAMPLE CHECK</b>			
Filter Separator	Satisfactory		
Water Monitor	Satisfactory		
Refuelling Nozzle End	Satisfactory		

# **5.0 REFUELING TEAM/ CRASH TEAM**

## 5.0 REFUELING TEAM/ CRASH TEAM

It is strongly recommended to have three (3) trained operators to carry out refueling operation.

1. **Fuel Master** – Responsible for fuel quality checks, coordinates with pilot and attendant 1 & 2.
2. **Attendant No.1**- Under instruction of Fuel Master or co-pilot, places refueling hose to aircraft and man the refueling nozzle. Commences and ceases refueling operation on instructions. Attendant No. 1 shall be visible to Fuel Master or co-pilot from helideck.
3. **Attendant No.2** – To man system Start/Stop panel from dispenser unit. He shall be visible to Fuel Master or co-pilot from helideck.

- **Fire/Crash Team**

The refueling team shall always be covered by Fire/Crash Team who is to be positioned in ready to deploy firefighting and crash equipment at all times while the aircraft is on helideck.

- **Aviation Fuel Requirements**

Information regarding the fuel requirement of the aircraft is to be passed over the radio during the aircraft's approach to the destined helideck.

- **Deployment Of Refueling Team**

When refuel is required, the refueling team is positioned themselves for prompt deployment of the earth bonding assembly and deliver hose to the aircraft.

**Note:** All fuel contamination checks are to be carried out by this stage.



# **6.0 REFUELING OPERATION PROCEDURE**



## 6.0 REFUELING OPERATION PROCEDURE

- **Arrival Of Aircraft – Start of Refueling Operation**

On arrival of aircraft, the Fuel Master approaches the aircraft when signaled to do so, whereupon, a nozzle fuel sample is taken for fuel contamination check in the presence of pilot. If the fuel quality is accepted, the Fuel Master would sign the attendants to proceed, and remain in a position where he can see the captain of the aircraft.

- **Refueling**

Attendants shall position the earth bonding assembly onto the aircraft and followed by the refueling nozzle, never vice-versa. Jack Plug & Nozzle's bonding clip shall attached to the aircraft follow the instruction from Pilot.

Leaving Attendant No.1 to man the refueling nozzle and the other Attendant No.2 is repositioned himself to the Control Panel at dispenser unit. Both within the sight of the Fuel Master/ Pilot.

The Fuel Master on instruction from pilot, he would give signals to start and finish of the refueling cycle to both his attendants. This is to prevent a situation whereby the delivery pump runs with closed refueling nozzle.

- **Completion Of Refueling**

After refueling, fuel sample is taken for fuel contamination check from nozzle in the presence of pilot.

Upon completion of refueling, the Fuel Master would supervise the stowage of the refueling equipment. Then gives signal when "All Clear" to the flight crews.

Fuel samples taken from nozzle end before & after refueling to helicopter shall be disposed or kept for number of day if required by Helicopter Company.

- **Documentation**

Fill out **Helicopter Fuelling Log** & **Fuel Quantity Log** in QC Documentation File.

Record the differential pressure in **Differential Pressure Log Sheet** in QC Documentation File.

# **7.0 FUEL QUALITY CHECKING PROCEDURE**

## 7.0 FUEL QUALITY CHECKING PROCEDURE

When taking fuel samples, the fuel shall be drawn into a clean and dry glass sample jar in 4 Liters capacity. The fuel sample shall be examined visually to ensure that it is clear and bright, and that there is no evidence of foreign matters either in solid or liquid.

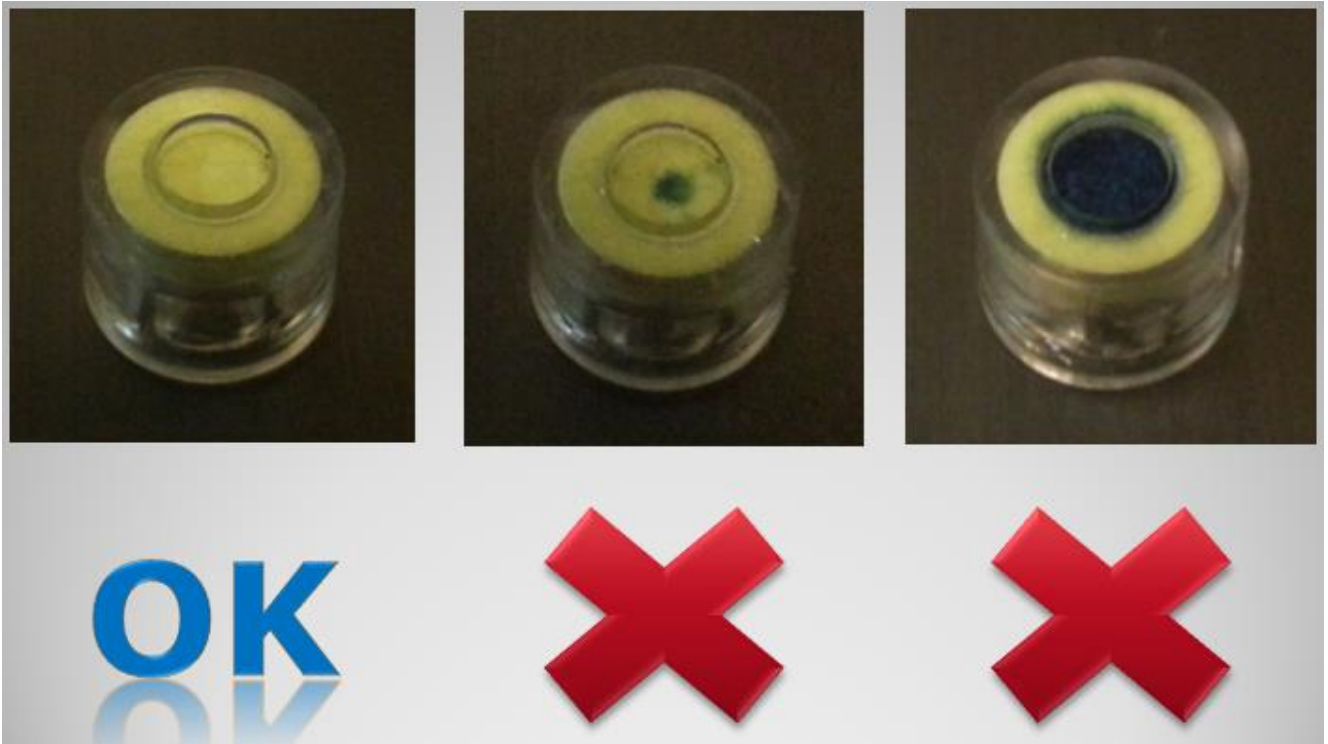
Solid contamination is easily detected. However, liquid contaminants are not easily detected. Liquid contaminants, water being the most common form, occur in two forms:-

- Dissolved water - Dissolved water is not a problem as such, but may change to free water if the ambient temperature drops.
- Free water - Free water occurs in two forms; firstly it can take the form of beads and is easily seen visually. The second form is more difficult to detect, that is when the water is in suspension with fuel. The water suspension turns the fuel cloudy, but a more positive means of ascertaining if the fuel does contain water is to use the “ Shell Water Detector Kit “ as follows :-



- Examine capsule. Confirm expired date.
- Confirm uniform yellow paper color.
- Fit detector capsule to syringe.
- Immerse capsule and approximately half of syringe in sample.
- Draw 5 ml through capsule.
- Examine capsule for colour difference.
- A distinction or mottled green colour gives positive indication of water contamination. The capsule is able to detect water level down to 10 ppm.

**Results:**



# **SECTION B: MAINTENANCE PROCEDURE**



# **1.0 DAILY INSPECTION CHECK LIST**

## 1.0 DAILY INSPECTION CHECK LIST:-

NO	ITEM	ACTIVITY	REMARKS
1	All Tanks	Fuel sample check. (Drain the fuel until it is clear & perform quality check by Shell Water Detector)	
2	Filter Separator	Fuel sample check. (Drain the fuel until it is clear & perform quality check by Shell Water Detector)	
3	Water Monitor	Fuel sample check. (Drain the fuel until it is clear & perform quality check by Shell Water Detector)	
4	Refueling Nozzle	Fuel sample check. (Drain the fuel until it is clear & perform quality check by Shell Water Detector)	

Note: Fuel used for testing shall record in the Helicopter Fuelling Log & Overall Fuel Log.

# **2.0 WEEKLY INSPECTION CHECK LI**



## 2.0 WEEKLY INSPECTION CHECK LIST:-

NO	ITEM	ACTION	REMARKS
1	Differential Pressure Gauge	Record differential pressure on Filter Separator and Water Monitor during refueling operation & record in the "Differential Pressure Log".	
2	Refueling Nozzle	Inspect & clean refueling nozzle strainer. Check the condition of seal for serviceability. Check condition of jack plug, wire & clip. Maximum acceptable continuity 0.5 ohms.	
3	Refueling Hose	Inspect refueling hose for splits, bulges and soft areas. Check whilst hose subjected to system pump pressure. Record result in "Hose Inspection and Test Journal".	
4	Earth Bonding Reel	Check earth bonding general condition & conductivity. (<0.5 ohm). Check quick release connection.	
5	Entire System	Check entire system for leaks	
6	Dry-Break Quick Disconnect	Visual check & ensure dust caps are in place.	
7	All Tanks	Check Tank top fitting to see all are in place, clean and watertight. Check entire tank connection for leaks.	
8	Test Kit	Check available of Fuel Test kit & record in the (SPIR).	

# **3.0 MONTHLY INSPECTION CHECK**

### 3.0 MONTHLY INSPECTION CHECK LIST:-

NO	ITEM	ACTION	REMARKS
1	Pressure Gauge & Differential Pressure Gauge	Check for correct operation. (Valid calibration & return to Zero when in rest condition)	
2	PSV (Filter Separator)	Check correct operation of PSV. (Valid calibration & set pressure clear display)	
3	Flow Meter	Check correct operation of flow meter. (Valid calibration)	
4	Hose Reel	Check correct operation of hose reel. (Not Leaking)	
5	PVRV (Tanks)	Check correct operation of PVRV on tank unit. (Valid calibration)	
6	Air Regulator	Check correct operation of air regulator. (Check Correct Set pressure)	
7	Entire System	Ensure Regulation Jet A1, no smoking & flammable liquid marking are visible & clearly applied.	
8	Test Kit	Check available of Fuel Test kit & record in the (SPIR).	

# **4.0 3 MONTHLY INSPECTION CHECK LI**

## 4.0 3 MONTHLY INSPECTION CHECK LIST:-

A three monthly check is the major inspection of the system, when performing three monthly inspection, inspector shall read together with all previous check records.

NO	ITEM	ACTION	REMARKS
1	Filter Separator & Water Monitor	Sample check from filter separator & water monitor drain. Check external condition. Clean as necessary. Check & record last cartridges change out date.	
2	Entire system earth bonding	Earth Bonding check. Carry out continuity test throughout the system.	
3	Suction Hose	Check correct operation of suction hose. (Hose in free & relax condition. Not folded, damage & leakage).	
4	Dry Break Quick Disconnect	Visual check on dry-break quick disconnect for tank & hose unit. Check condition of seals, cams and dust cap. No leakage when connect to each other. Lubricate the rotating parts if necessary (Non fuel contact parts).	
5	Pump Unit	Check correct built-in PSV set pressure & no leakage.	
6	Y-Strainer (Pump's Inlet)	Check & clean Y-Strainer at pump inlet.	
7	Hose Reel	Hose Reel. Ensure reel mechanism operates correctly and grease rewind gears.	
8	Air Eliminator	Automatic air eliminator. Prime and check for correct operation.	
9	Refueling Hose	Inspect refueling hose for splits, bulges and soft areas. Check whilst hose subjected to system pump pressure. Record result in "Hose Inspection and Test Journal".	
10	Flow Meter	Check & clean Strainer for Flow Meter. Check for any leakage.	
11	Earth Bonding Reel.	Check correct operation of the rewind mechanism.	



		Visual check of bonding cable & terminal connection. Check condition of earth clamp & quick disconnect. Continuity Check. (<0.5 ohms)	
12	Delivery coupling/ nozzle	Check operation to ensure correct lock off & no leakage. Remove, clean and visually check cone strainer, replace as necessary. Check earth bonding wire assemblies and bonding clip and pins. Renew if required. Ensure dust cap are present and are secured. <b>Note: No lubricant except petroleum jelly should be applied to any of the coupling or nozzle parts.</b>	
13	Entire System	Check condition and operation for all valves & pipe work. (In good condition, no leakage & no corrosion).	

# **5.0 6 MONTHLY MAINTENANCE CHECK LIST**

## 5.0 6 MONTHLY INSPECTION CHECK LIST:-

NO	ITEM	ACTION	REMARKS
1	Filter Separator & Water Monitor	Sample check from filter separator & water monitor drain. Check external condition. Clean as necessary. Check & record last cartridges change out date. Check correct fuel grade identification.	
2	Entire system earth bonding	Earth Bonding check. Carry out continuity test throughout the system.	
3	Suction Hose	Check correct operation of suction hose. (Hose in free & relax condition. Not folded, damage & leakage).	
4	Dry Break Quick Disconnect	Visual check on dry-break quick disconnect for tank & hose unit. Check condition of seals, cams and dust cap. No leakage when connect to each other. Lubricate the rotating parts if necessary (Non fuel contact parts).	
5	Pump Unit	Check correct built-in PSV set pressure & no leakage.	
6	Y-Strainer (Pump's Inlet)	Check & clean Y-Strainer at pump inlet.	
7	Hose Reel	Hose Reel. Ensure reel mechanism operates correctly and grease rewind gears. Check tension if applicable. Lubricate bearing.	
8	Air Eliminators	Automatic air eliminator. Prime and check for correct operation for all air eliminator.	
9	Refueling Hose	Inspect refueling hose for splits, bulges and soft areas. Check whilst hose subjected to system pump pressure. Record result in "Hose Inspection and Test Journal". Check correct coupling the condition.	
10	Flow Meter	Check & clean Strainer for Flow Meter. Check for any leakage.	
11	Earth Bonding Reel.	Check correct operation of the rewind mechanism.	



		<p>Visual check of bonding cable &amp; terminal connection.</p> <p>Check condition of earth clamp &amp; quick disconnect.</p> <p>Continuity Check. (&lt;0.5 ohms)</p>	
12	Delivery coupling/ nozzle	<p>Check operation to ensure correct lock off &amp; no leakage.</p> <p>Remove, clean and visually check cone strainer, replace as necessary.</p> <p>Check earth bonding wire assemblies and bonding clip and pins. Renew if required.</p> <p>Ensure dust cap are present and are secured.</p> <p><b>Note: No lubricant except petroleum jelly should be applied to any of the coupling or nozzle parts.</b></p>	
13	Entire System	<p>Check condition and operation for all valves &amp; pipe work. (In good condition, no leakage &amp; no corrosion).</p>	
14	Air driven pump unit	<p>Check air motor bearings. Lubricate if necessary.</p> <p>Check pump bearing. Lubricate if necessary.</p> <p>Check for free rotating by hand on coupling. Apply Grease on rotating parts.</p> <p>Visual Check for sign of misalignment.</p> <p>Holding bolts &amp; nuts tightness.</p> <p>(Refer to manufacturer schedule for additional items)</p>	
15	Electrical Pump Unit	<p>Check electrical circuit/ cabling by qualified electrician.</p> <p>Check gear reducer (if applicable) for lubricant oil level.</p> <p>Check pump bearing. Lubricate if necessary.</p> <p>Check coupling for wear &amp; tear.</p> <p>Visual Check for sign of misalignment.</p> <p>(Refer to manufacturer schedule for additional items)</p>	

# **6.0 ROUTINE INSPECTION SCHEDULE**

## 6.0 ROUTINE INSPECTION SCHEDULE:-

### DAILY LOG

Month/Year		
Date	PERFORMED BY	ACTION / REMARKS
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### WEEKLY LOG

Month/Year		
Date	PERFORMED BY	ACTION / REMARKS

### MONTHLY LOG

Year		
Date	PERFORMED BY	ACTION / REMARKS

### 3 MONTHLY LOG

Year		
Date	PERFORMED BY	ACTION / REMARKS

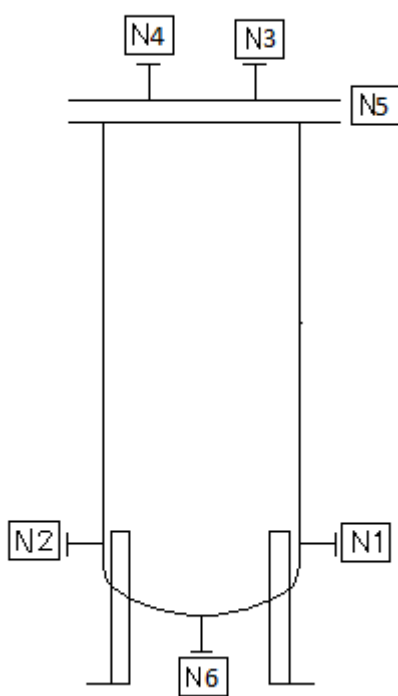
### 6 MONTHLY LOG

Year		
Date	PERFORMED BY	ACTION / REMARKS

# **SECTION C: TECHNICAL DATA SHEET**

# **1.0 FILTER SEPARATOR DATA SHEET**

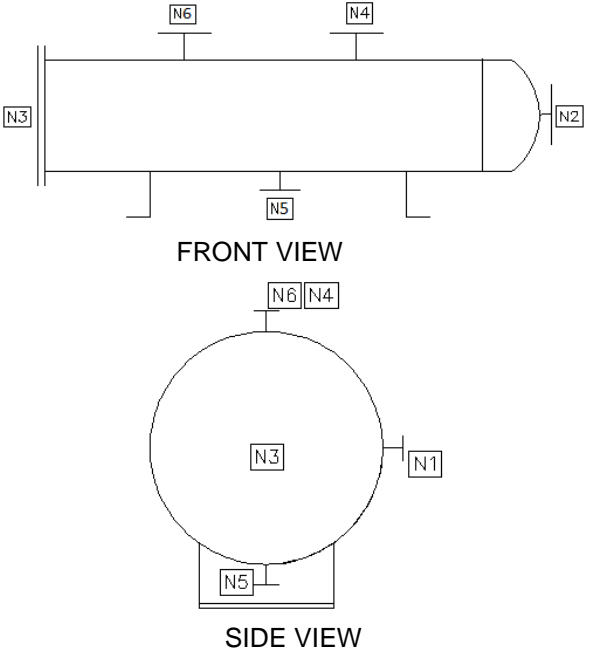
## a) FILTER SEPARATOR

ITEM	FILTER SEPARATOR			
TAG NO.	-			
 <p style="text-align: center;">VERTICAL MODEL</p>	<b>POSITION</b>	VERTICAL		
	<b>DESIGN CODE</b>	ASME VIII DIV.1 2013 ED		
	<b>DESIGN PRESSURE</b>	10.5 BARG		
	<b>MAX. ALLOWABLE WORKING PRESSURE</b>	11 BARG		
	<b>DESIGN TEMPERATURE</b>	0/ 66°C		
	<b>CORROSION ALLOWANCE</b>	0		
	<b>NDT (VESSEL)</b>	100% DPI / SPOT RT		
	<b>JOINT EFFICIENCY</b>	0.85		
	<b>TEST PRESSURE</b>	14.3 BAR (1.3 X MAWP)		
	<b>INSULATION</b>	NONE		
	<b>CAPACITY (LITER)</b>	80 L		
	<b>WEIGHT (EMPTY)</b>	151 KGS		
	<b>WEIGHT (FULL)</b>	215 KGS		
	<b>OPERATING PRESSURE</b>	7.0 BARG (MAX)		
	<b>DESIGN FLOW RATE</b>	80 USGPM		
	<b>OPERATING FLOW RATE</b>	60 USGPM		
	<b>FLUID TYPE</b>	JET A1		
	<b>FLUID S.G.</b>	0.8		
	<b>FLUID VISCOSITY</b>	1.5 cst		
	<b>OPERATION dP</b>	2 PSIG (CLEAN)		
		15 PSIG (DIRTY)		
	<b>MATERIAL</b>	ASTM A240-316L		
	<b>SOLID REMOVAL</b>	≤ 1 MICRONS		
	<b>WATER REMOVAL</b>	<15 PPM FREE WATER		
		<b>NO.</b>	<b>SIZE</b>	<b>QYT</b>
		N1	2"	1
	N2	2"	1	
	N3	3/4"	1	
	N4	1"	1	
	N5	12"	1	
	N6	3/4"	1	
	<b>DESCRIPTION</b>			
	INLET- ANSI 150# RF			
	OUTLET- ANSI 150# RF			
	PSV- ANSI 150# RF			
	AIR VENT - ANSI 150#			
	MAIN OPENING – ANSI 150#			
	SAMPLE/ DRAIN - NPTF			
	<b>Note:</b>			

# **2.0 WATER MONITOR DATA SHEET**




## (B) WATER MONITOR

ITEM	WATER MONITOR			
TAG NO.	-			
 <p>FRONT VIEW</p> <p>SIDE VIEW</p>	<b>DESIGN CODE</b>		ASME VIII DIV.1 2013 ED	
	<b>DESIGN PRESSURE</b>		10.5 BARG	
	<b>MAX. ALLOWABLE WORKING PRESSURE</b>		11.0 BARG	
	<b>DESIGN TEMPERATURE</b>		0/ 66°C	
	<b>CORROSION ALLOWANCE</b>		0	
	<b>NDT (VESSEL)</b>		100% DPI/ SPOT RT	
	<b>JOINT EFFICIENCY</b>		0.85	
	<b>TEST PRESSURE</b>		14.3 BARG	
	<b>INSULATION</b>		NONE	
	<b>CAPACITY (LITER)</b>		14.0 L	
	<b>WEIGHT (EMPTY)</b>		58 KGS	
	<b>WEIGHT (FULL)</b>		71 KGS	
	<b>OPERATING PRESSURE</b>		7.0 BARG (MAX)	
	<b>DESIGN FLOW RATE</b>		80 USGPM	
	<b>OPERATING FLOW RATE</b>		60 USGPM	
	<b>FLUID TYPE</b>		JET A1	
	<b>FLUID S.G.</b>		0.8	
	<b>FLUID VISCOSITY</b>		1.5 cst	
	<b>OPERATION dP</b>		2 PSIG (CLEAN)	
			15 PSIG (DIRTY)	
	<b>MATERIAL</b>		ASTM A240-316L	
	<b>FILTRATION EFFICIENCY</b>		≤ 15 ppm	
	<b>NO.</b>	<b>SIZE</b>	<b>QYT</b>	<b>DESCRIPTION</b>
	N1	2"	1	FUEL INLET- ANSI 150# RF
N2	2"	1	FUEL OUTLET- ANSI 150# RF	
N3	6"	1	FRONT OPENING- ANSI 150# RF	
N4	3/4"	1	SPARE ANSI- 150# RF	
N5	3/4"	1	SAMPLE/DRAIN	
N6	1"	1	AIR VENT- ANSI 150# RF	
<b>Note:</b>				



# **3.0 PRESSURE GAUGE DATA SHEET**

<p>HELICOPTER REFUELING SYSTEM 11-1118 (JSPL)</p> 	PRESSURE GAUGES			SHEET 1 OF 1
	NO	BY	DATE	REVISION
	1	LKS	24-Jan	A
				SPEC. NO. _____
				REV. 0
				DATE Mar-15
				REQ. - P.O. _____
		BY LKS	CHK'D ST	APPR. ST


<p>1. Type: Direct Rdg <input checked="" type="checkbox"/> 3-15 lb Receiver <input type="checkbox"/> Other _____</p> <p>2. Mounting: Surface <input type="checkbox"/> Local <input checked="" type="checkbox"/> Flush <input type="checkbox"/></p> <p>3. Dial: Diameter 4" Dial Size _____ Color Black/White _____</p> <p>4. Case: Cast Iron <input type="checkbox"/> Aluminum <input type="checkbox"/> Phenol <input type="checkbox"/> Other <u>Stainless Steel</u></p> <p>5. Ring: Screwed <input type="checkbox"/> Hinged <input type="checkbox"/> Slip <input type="checkbox"/> Std <input checked="" type="checkbox"/> Other _____</p> <p>6. Blow-Out Protection: None <input type="checkbox"/> Back <input checked="" type="checkbox"/> Disc <input type="checkbox"/> Solid Front <input checked="" type="checkbox"/> Other _____</p> <p>7. Lens: Glass <input checked="" type="checkbox"/> Plastic <input type="checkbox"/></p> <p>8. Options: Syphon Material <input type="checkbox"/> _____  Snubber <input type="checkbox"/> _____  Pressure Limit Valve <input type="checkbox"/> _____  Movement Damping <input type="checkbox"/> _____</p> <p>9. Nominal Accuracy Required _____</p>	<p>10. Mfr. &amp; Model No. <u>WIKA 232.50.100</u></p> <p>11. Press. Element: Bourdon <input checked="" type="checkbox"/> Bellows <input type="checkbox"/> Other _____</p> <p>12. Element Mtl: Bronze <input type="checkbox"/> Steel <input type="checkbox"/> <u>316</u> _____ SS Other _____</p> <p>13. Socket Mtl: Bronze <input type="checkbox"/> Steel <input type="checkbox"/> <u>316</u> _____ SS Other _____</p> <p>14. Connection-NPT 1/4 in. <input type="checkbox"/> 1/2 in. <input checked="" type="checkbox"/> Other _____  Bottom <input checked="" type="checkbox"/> Back <input type="checkbox"/></p> <p>15. Movement: Bronze <input type="checkbox"/> SS <input checked="" type="checkbox"/> Nylon <input type="checkbox"/> Other _____</p> <p>16. Diaphragm Seal:  Mfg. _____ Type _____  Wetted Part Mtl. _____ Other Mtl. _____  Fill Fluid _____  Process Conn. _____ Gage Conn. _____</p>
--	--

Rev.	Quan.	Tag Number	Range	Operating Pressure	Service
A	1	TBA	0-200 psig	50 PSIG	Pump A Discharge
A	1	TBA	0-200 psig	50 PSIG	Pump B Discharge
A	1	TBA	0-200 psig	50 PSIG	Dispenser Hose Reel Inlet

NOTES:




# **4.0 DIFFERENTIAL PRESSURE GAUGE DATA SHEET**

HELICOPTER REFUELING SYSTEM 11-1118 (JSPL)		DIFFERENTIAL PRESSURE INSTRUMENTS				SHEET 1 OF 1					
		NO	BY	DATE	REVISION	SPEC. NO.	REV. 0				
		1	LKS	Jan-15	A		DATE Mar-15				
							REQ. - P.O.				
						BY LKS	CHK'D ST	APPR. ST			
		1 Tag Number <u>TBA</u>		Service <u>Filter Separator</u>							
GENERAL	2	Function	Record <input type="checkbox"/>	Indicate <input checked="" type="checkbox"/>	Control <input type="checkbox"/>	Blind <input type="checkbox"/>	Transmit <input type="checkbox"/>	Integ <input type="checkbox"/>	Other _____		
	3	Case	Mfr Std <input checked="" type="checkbox"/>	Nom Size _____	Color: Mfr Std <input checked="" type="checkbox"/>	Other _____					
	4	Mounting	Flush <input type="checkbox"/>	Surface <input checked="" type="checkbox"/>	Yoke <input type="checkbox"/>	Other _____					
	5	Enclosure Class	General Purpose <input type="checkbox"/>	Weather Proof <input checked="" type="checkbox"/>	Explosion Proof <input type="checkbox"/>	Class _____					
	For Use in Intrinsically Safe System <input type="checkbox"/> Other _____										
	6	Power Supply	117V 60Hz <input type="checkbox"/>	Other ac _____	dc <input type="checkbox"/>	Volts _____					
	7	Chart	12 in. Circ. <input type="checkbox"/>	Other _____	Range _____	No. _____					
	8	Chart Drive	24 hr. <input type="checkbox"/>	Other _____	Elec. <input type="checkbox"/>	Spring <input type="checkbox"/>	Other _____				
	9	Scale	Type <u>Linear</u>	Range: 1 <u>0-30 psig</u>		2 _____	3 _____				
XMTR	10	Transmitter Output	4-20 mA <input type="checkbox"/>	10-50 mA <input type="checkbox"/>	21-103 kPa (3-15 psig) <input type="checkbox"/>	Other _____					
	For Receiver, See Spec Sheet _____										
CONTROLLER	11	Control Modes	P = Prop (Gain), I = Integral (Auto Reset), D = Derivative (Rate), Sub: s = Slow, f = Fast								
			P <input type="checkbox"/>	PI <input type="checkbox"/>	PD <input type="checkbox"/>	PID <input type="checkbox"/>	I <sub>f</sub> <input type="checkbox"/>	D <sub>f</sub> <input type="checkbox"/>	I <sub>s</sub> <input type="checkbox"/>	D <sub>s</sub> <input type="checkbox"/>	
	Other _____										
	12	Action	On Meas. Increase Output:		Increases <input type="checkbox"/>	Decreases <input type="checkbox"/>					
	13	Auto-Man Switch	None <input type="checkbox"/>	Mfr Std <input type="checkbox"/>	Other _____						
	14	Set Point Adj.	Manual <input type="checkbox"/>	External <input type="checkbox"/>	Remote <input type="checkbox"/>	Other _____					
15	Manual Reg.	None <input type="checkbox"/>	Mfr Std <input type="checkbox"/>	Other _____							
16	Output	4-20 mA <input type="checkbox"/>	10-50 mA <input type="checkbox"/>	21-103 kPa (3-15 psig) <input type="checkbox"/>	Other _____						
UNIT	17	Service	Flow <input type="checkbox"/>	Level <input type="checkbox"/>	Diff. Pressure <input checked="" type="checkbox"/>	Other _____					
	18	Element Type	Diaphragm <input type="checkbox"/>	Bellows <input type="checkbox"/>	Mercury <input type="checkbox"/>	Other <u>Piston</u>					
	19	Material	Body <u>Anodised Aluminium</u>			Element <u>316 SS</u>					
	20	Rating	Overrange <u>300 psig</u>			Body Rating <u>300</u> psig					
	21	Diff. Range	Fixed <input checked="" type="checkbox"/>	Adj. Range _____	Set At _____						
	22			Elevation _____	Suppression _____						
	23	Process Data	Fluid <u>Jet A1/Liquid</u>		Max Temp. <u>Ambient</u>		Max Press. _____				
	24	Process Conn.	1/2 in. NPT <input type="checkbox"/>	Other <u>1/4" NPTF</u>							
25	Alarm Switches	Quantity _____	Form _____		Rating _____						
26	Function	Meas. Var. <input type="checkbox"/>	Deviation <input type="checkbox"/>	Contacts To _____ on Inc. Meas.							
27	Options	Pressure Element <input type="checkbox"/>		Range _____	Material _____						
		Temp. Element <input type="checkbox"/>		Range _____	Type _____						
		Filt-Reg <input type="checkbox"/> Sup. Gage <input type="checkbox"/> Output Gage <input type="checkbox"/> _____ Charts									
		Valve Manifold _____									
		Cond. Pots <input type="checkbox"/>		Adj. Damp <input type="checkbox"/>	Integral Sq. Rt. Ext. <input type="checkbox"/>						
		Integrator _____									
28	Mfr & Model No.	<u>Schultz/SC-5150-30</u>									
NOTES:											




# **5.0 PRESSURE VACUUM RELIEF VALVE DATA SHEET**

HELICOPTER REFUELING SYSTEM 11-1118 (JSPL)			PRESSURE RELIEF VALVES				SHEET 1 OF 1			
			NO	BY	DATE	REVISION	SPEC. NO.	REV. A		
			1	LKS	24-Jan	A		DATE Jan-15		
			REQ. - P.O.						BY LKS	CHK'D ST
									APPR. ST	
GENERAL	1	Tag Number	TBA							
	2	Service	Aviation Fuel Transportable tank #1 & #2							
	3	Line Number / Vessel Number	TBA							
	4	Full Nozzle/Semi Nozzle	Full							
	5	Safety or Relief	Safety							
	6	Conv., Bellows, Pilot Op.	Conv.							
	7	Bonnet Type	Open							
CONN.	8	Size: Inlet	Size: Outlet	2"	Vent To Atmosphere					
	9	Flange Rating or Screwed		Screwed						
	10	Type of Facing		RF						
MATERIALS	11	Body and Bonnet		316 SS						
	12	Seat and Disc		316 SS						
	13	Resilient Seat Seal		Viton						
	14	Guide and Rings		316 SS						
	15	Spring		316 SS						
	16	Bellows		N/A						
OPTIONS	17									
	18	Cap: Screwed or Bolted								
	19	Lever: Plain or Packed								
	20	Test Gage								
	21									
	22									
BASIS	23									
	24	Code		IMDG CODE						
	25	Fire		Yes						
	26									
FLUID DATA	27									
	28	Fluid and State		Jet A1/Vapour						
	29	Required Capacity		2,115 SCFM						
	30	Mol. Wt.	Oper. Sp. Gr.	171	0.8					
	31	Oper. Press.	Set. Press.	ATM	31.5 psig					
	32	Oper. Temp.	Rel. Temp.	Ambient	60 Deg.C					
	33	Back Pressure: Constant		None						
	34	Back Pressure: Variable		None						
	35	Back Pressure: Total		None						
	36	% Allowable Overpressure		21%						
	37	Overpressure Factor		1.21						
	38	Compressibility Factor		-						
	39	Latent Heat of Vaporization		50 BTU/lb						
	40	Ratio of Specific Heats		1.01						
	41	Operating Viscosity		2.2 cst						
	42	Barometric Pressure		-						
	43									
44										
	45	Calc. Area sq. in.		5.56						
	46	Selected Area		7.45						
	47	Orifice Designation		-						
	48	Manufacturer		Perolo						
	49	Model No.		Superventix						
NOTES:										




# **6.0 PRESSURE SAFETY VALVE DATA SHEET**



HELICOPTER REFUELING SYSTEM Project : 11-1118 (JSPL)			THERMAL RELIEF VALVES				SHEET 1 OF 1		
			NO	BY	DATE	REVISION	SPEC. NO.	REV. A	
			1	LKS	21/10/2014	A		DATE 21/10/2013	
			P.O. : OS15011712CT						
							BY LKS	CHK'D TSY	APPR. ST
GENERAL	1	Tag Number	TBA						
	2	Service	Filter Separator						
	3	Line Number / Vessel Number	TBA						
	4	Full Nozzle/Semi Nozzle	Full						
	5	Safety or Relief	Safety-Relief						
	6	Conv., Bellows, Pilot Op.	Conv.						
	7	Bonnet Type	Close						
CONN.	8	Size: Inlet	Size: Outlet	3/4" 1"					
	9	Flange Rating or Screwed	ANSI 150#		ANSI 150#				
	10	Type of Facing	RF		N/A				
MATERIALS	11	Body and Bonnet	316 SS						
	12	Seat and Disc	316 SS						
	13	Resilient Seat Seal	N/A						
	14	Guide and Rings	316 SS						
	15	Spring	316 SS						
	16	Bellows	N/A						
	17								
OPTIONS	18	Cap: Screwed or Bolted	SCREWED						
	19	Lever: Plain or Packed	CAP						
	20	Test Gage	N/A						
	21								
	22								
BASIS	24	Code	ASME VIII & API 520/521						
	25	Fire	Yes						
	26	Sizing Basis	THERMAL RELIEF						
	27								
FLUID DATA	28	Fluid and State	Jet A1/Vapour						
	29	Required Capacity	N/A						
	30	Mol. Wt.	Oper. Sp. Gr.	171				0.8	
	31	Oper. Press.	Set. Press.	344kPa		1050kPa			
	32	Oper. Temp.	Rel. Temp.	Ambient		35.9 DEG C			
	33	Back Pressure: Constant	None						
	34	Back Pressure: Variable	None						
	35	Back Pressure: Total	None						
	36	% Allowable Overpressure	10%						
	37	Overpressure Factor	1.1						
	38	Compressibility Factor	1						
	39	Latent Heat of Vaporization	50 BTU/lb						
	40	Ratio of Specific Heats	N/A						
	41	Operating Viscosity	2.2 cP						
	42	Barometric Pressure	-						
	43								
	44								
	45	Calc. Area sq. in.	0.001						
	46	Selected Area	0.122						
	47	Orifice Designation	D						
	48	Manufacturer	LESER or Equivalent						
	49	Model No.	437 or Equivalent						
NOTES:									



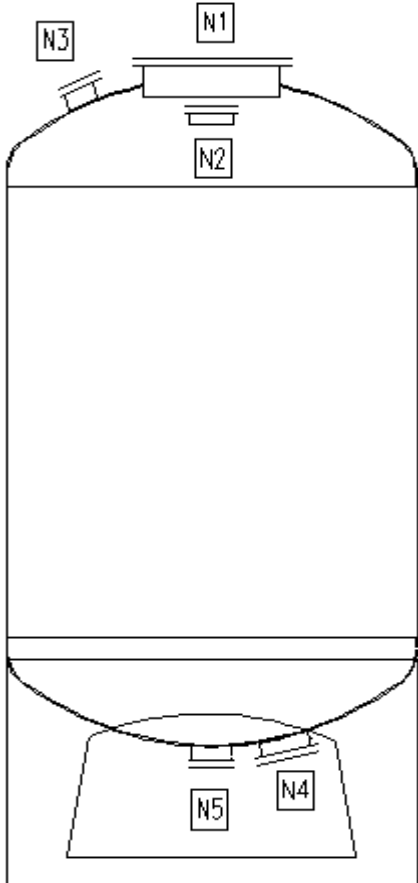
# **7.0 PD FLOW METER DATA SHEET**

HELICOPTER REFUELING SYSTEM 11-1118 (JSPL)		POSITIVE DISPLACEMENT METERS				SHEET 1 OF 1		
		NO	BY	DATE	REVISION	SPEC. NO.	REV. A	
 <b>PETRICO ENGINEERING</b> <b>PTE LTD</b>		1	LKS	Jan-15	A		DATE Jan-15	
		REQ. - P.O.				BY LKS	CHK'D ST	APPR. ST
METER	1	Tag Number	TBA					
	2	Service	Helifuel Dispenser Unit					
	3	Line Number/Vessel Number	TBA					
	4	Type of Element	Rotary Vane					
	5	Size	2"					
	6	End Connections	Proprietary					
	7	Temp. & Press. Rating	70 DegC & 150 Psig					
	8	Flow Rate Range	100 USGPM					
	9	Totalized Units	Liter					
	10	Enclosure Class	Weatherproof					
	11	Power Supply	-					
	12	Materials: Outer Housing	Cast Iron					
	13	Materials: Main Body Cover	Cast Iron					
	14	Materials: Rotating Element	Mfr Std					
	15	Materials: Shaft	Mfr Std					
	16	Materials: Blades	Mfr Std					
	17	Bearings: Type & Material	Carbon					
	18	Packing	- Viton					
	19	Type of Coupling	Mfr Std					
	20							
COUNTER	21	Register Type	Horizontal					
	22	Totalizer	8 digits					
	23	Reset	None					
	24	Capacity	99,999,999					
	25	Set-Stop	None					
	26							
FLUID DATA	27	Fluid	Jet A1/Liquid					
	28	Flow Rate: Min.	Flow Rate: Max.					
	29	Normal Flow	60 USGPM					
	30	Oper. Press.	Oper. Temp.	Ambient				
	31	Oper. Specific Gravity	0.8					
	32	Oper. Viscosity	2.2 cst					
	33	Coef. of Expansion	-					
OPTIONS	34	Flow Units	-					
	35	Shut-Off Valve	-					
	36	Switch: Single or 2-Stage	-					
	37	Temp. Compensator	-					
	38	Transmitter Type	-					
	39	Transmitter Output	-					
	40	Air Eliminator	Yes					
	41	Strainer: Size & Mesh	Yes. 100 Mesh					
	42							
	43							
	45	Manufacturer	TCS					
	46	Model Number						
NOTES:								



# **8.0 2900L TOTE TANK DATA SHEET**

## (L) 2900L TRANSPORTABLE TANK DATA SHEET


ITEM	2900 LITERS TRANSPORTABLE TANK			
Tank Serial No.	TT-0007/15 / TT-0008/15			
 <p style="text-align: center;">FRONT VIEW</p>	DESIGN CODE	ASME VIII DIV.1 2013 ED		
	DESIGN PRESSURE	2.17BARG (INT)/ 0.21BARG (EXT)		
	MAX. ALLOWABLE WORKING PRESSURE	2.203BARG (INT)/ 0.21BARG (EXT)		
	DESIGN TEMPERATURE	-20°C / 60°C		
	CORROSION ALLOWANCE	0		
	NDT (VESSEL)	100% DPI / 0% RT / 100% MPI		
	JOINT EFFICIENCY	0.85		
	TEST PRESSURE	2.86 BARG		
	INSULATION	NONE		
	CAPACITY (LITER)	2270 L		
	WEIGHT (EMPTY)	1200 KGS		
	WEIGHT (FULL)	3020 KGS		
	MAX. PAYLOAD	1820 KGS		
	MATERIAL	ASTM A240-316L		
	HEAD TYPE	TORISPHERICAL		
	ID	1534 MM		
	THICKNESS	6MM (SHELL), 6MM (HEAD)		
	SHELL LENGTH	1219 MM		
	TANGENT-TANGENT	1279 MM		
	BASE SUPPORT	SUPPORT SKI		
	PROTECTIVE FRAME	YES (Design to DNV 2.7-1)		
	MATERIAL (FRAME)	ASTM A500 GR. B		
	NDT (FRAME)	100% MPI (MAJOR Joint)		
	NO.	SIZE	QYT	DESCRIPTION
	N1	20" ND	1	MANWAY PROPRIETARY
	N2	6" ND	1	INSPN. HATCH PROPRIETARY
	N3	2.5" ND	1	PVRV
	N4	3" ND	1	DISCHARGE OUTLET
	N6	1 1/2" ND	1	DRAIN/SAMPLE PROPRIETARY
DIMENSION (MM)	2488 (L) X 1850 (W) X 1850			



# **SECTION D: Operation & MAINTENANCE DOCUMENTS**




# **1.0 BILL OF MATERIAL (B.O.M.)**

Equipment Vendor	Petrico Engineering Pte Ltd	Date	15/08/2015	 <b>P</b> PETRICO ENGINEERING PTE LTD
Equipment	Helicopter Refueling System	Revision	A	
Petrico Document No.	PE-0003	Client	CSOC	
Client Document No.	N/A	Project	HY4001/ HY4002/ HY4003	
Document Title	Bill of Material (BOM)			

ITEM	Quantity	DESCRIPTION	MATERIAL	MANUFACTURER
1	2	2900 Liters Transportable Tank	316/316L SS	PETRICO
2	2	Flame Proof Cowl	316L SS	PEROLO
3	2	Pressure/Vacuum Relief Valve Set @ 217 KpaG / -21 Kpag	316 SS	PEROLO
4	2	3" Pneumatic Operated Foot Valve (Discharge)	316 SS	PEROLO/ FORTVALE
5	2	1.5" Foot Valve (Drain/sample)	316L SS	PEROLO/ FORTVALE
6	-	-	-	-
7	2	2.5" Dry-Break Quick Disconnect Male Adaptor (Tank Unit)	Gun Metal	MANNTEK
8	1	2.5" Dry-Break Quick Disconnect Female Coupler (Hose Unit)	Gun Metal	MANNTEK
9	2	½" NPTF Ball Valve	316 SS	ARITA
10	4	¼" NPTF Ball Valve	316 SS	ARITA
11	4	¾" NPTF Ball Valve	316 SS	ARITA
12	1	2" x 20' Long Suction Hose c/w SS Stainless Steel Braiding	SS	FLYTECH
13	1	¼" x 20' Heavy Duty Air Hose	Reinforced Rubber	PARKER
14	1 LOT	Deluge Piping & Nozzles	316 SS/ Brass	BETE
15	-	-	-	-
16	-	-	-	-
17	7	2" ANSI 150# RF Full Bore Floating Ball Fire Safe Anti-Static	316 SS	NEWAY
18	2	40 Mesh Y-Strainer	316 SS	ARITA
19	2	PD Rotary Vane Pump c/w Built-in Relief Valve	Ductile Cast Iron	BLACKMER
20	2	Electric Motor c/w space heater, Exd IP56	Cast Iron	CEMP
21	3	Block & Bleed Needle Valve	316 SS	ALCO
22	3	4" Dial Size Pressure Gauge	316 SS	WIKA
23	2	Wafer Check Valve	316 SS	ARITA
24	1	PD Flow Meter c/w LNC 5 Digit Resettable 8 Digit Non-Resettable	Cast Iron	TCS
25	1	Vertical Filter Separator to API 1581 Type S Category C	316 SS	PETRICO/ FACET
26	3	Auto Air Eliminator	316 SS	ARMSTRONG




Equipment Vendor	Petrico Engineering Pte Ltd	Date	15/08/2015	
Equipment	Helicopter Refueling System	Revision	A	
Petrico Document No.	PE-0003	Client	CSOC	
Client Document No.	N/A	Project	HY4001/ HY4002/ HY4003	
Document Title	Bill of Material (BOM)			

ITEM	Quantity	DESCRIPTION	MATERIAL	MANUFACTURER
27	-	-	-	-
28	1	Thermal Pressure Safety Relief Valve Set @ 1000 KPAG	316 SS	LESER
29	1	Vent Tank	A500 GrB	PETRICO
30	2	Piston Type Differential Pressure Gauge	316 SS Wetted Part	SCHULTZ
31	2	5-Way Manifold	316 SS	ALCO
32	1	Manual Hose Reel	316 SS Wetted Part	PETRICO
33	1	1-1/2" Refueling Hose c/w dry-break Quick Disconnect	Rubber	ELAFLEX
34	1	1-1/2" Overwing Refueling Nozzle c/w Quick Disconnect	Mrf Standard	OPW
35	1	Motor Starter Panel, Exd	Anodize Aluminium	ASP OR EQUI.
36	1	Water Monitor to API 1583 Standard	316 SS	PETRICO/ FACET
37	1	Run Indicating Light	Anodize Aluminum	ASP OR EQUI.
38	1	Interlock Self-retract bonding reel c/w auto breakaway	Mfr Standard	NEWSON GALE
39	1	Remote Control Panel, Exe	GRB	ASP OR EQUI.
40	1	Air Regulator c/w pressure gauge	Mfr Standard	NORGREN
41	1	3 Way NC Direct Acting Solenoid Valve	316 SS	ASCO




# **2.0 LUBRICATION SCHEDULE**

Equipment Vendor	Petrico Engineering Pte Ltd	Date	14/08/15	 <b>P</b> PETRICO ENGINEERING PTE LTD
Equipment	Helicopter Refueling System	Revision	A	
Petrico Document No.	PE-0019	Client	CSOC	
Client Document No.	N/A	Project	HY4001/ HY4002/ HY4003	
Document Title	Lubrication Schedule			

ITEM	SKID	QUANTITY	FIRST FILL QUANTITY (LITRES)	REPLENISHING PERIOD	LUBRICANT TYPE
Hose Reel	Aviation Fuel Dispensing Skid	1	Sufficient	Every 3 months	Mechanical Grease
Coupling (Between Pump & Motor)	Aviation Fuel Filling Pump Skid	2	Sufficient	Every 3 months	Mechanical Grease
Motor Gear Reducer	Aviation Fuel Filling Pump Skid	2	1.0 Liters	Every 6 months (As required)	Heavy Duty Hydraulic Oil




# **3.0 UTILITY REQUIREMENT FOR PACKAGE**

Equipment Vendor	Petrico Engineering Pte Ltd	Date	14/08/2015	
Equipment	Helicopter Refueling System	Revision	A	
Petrico Document No.	PE-0015	Client	CSOC	
Client Document No.	N/A	Project	HY4001/4002/4003	
Document Title	Utility Consumption List			

ITEM	EQUIPMENT	CONSUMPTION
1	Tanks's Pneumatic Activated Foot Valve	50 SCFM @ 85-95 Psig
2	Run Indicating Light	220 VAC/1ph/50 Hz (100 W)
3	Electric Motor	380VAC/50Hz/3ph (5.5 kW)
4	Space Heater	220VAC/50Hz/1ph (100W)
5	Solenoid Valve	24 VDC (3.6 W)
6	Remote Control Panel	220 VAC/1ph/50 Hz (100 W)



# **4.0 START-UP & COMMISSIONING SPARES**


Equipment Vendor	Petrico Engineering Pte Ltd	Date	14/08/2015	
Equipment	Helicopter Refueling System	Revision	A	
Petrico Document No.	PE-0016	Client	CSOC	
Client Document No.	N/A	Project	HY4001/4002/4003	
Document Title	Start-Up & Commissioning Spares			

ITEM	Quantity	DESCRIPTION	Part Number	Equipment
1	1	Coalescer Cartridges	PRS/SPARES/0001	Filter Separator
2	1	Separator Cartridges	PRS/SPARES/0002	Filter Separator
3	4	Water Monitor Cartridges	PRS/SPARES/0003	Water Monitor
4	1 Box	Shell Water Detector Capsule (Shelf Life – 6 months)	PRS/SPARES/0004	Fuel Test Kit
5	5	Sample Jar	PRS/SPARES/0005	Fuel Test Kit
6	5	Syringe	PRS/SPARES/0006	Fuel Test Kit



# **5.0 ONE/TWO YEARS NORMAL OPERATION SPARES**



Equipment Vendor	Petrico Engineering Pte Ltd	Date	14/08/2015	 <b>PETRICO ENGINEERING PTE LTD</b>
Equipment	Helicopter Refueling System	Revision	A	
Petrico Document No.	PE-0018	Client	CSOC	
Client Document No.	N/A	Project	HY4001/4002/4003	
Document Title	Two Years Normal Operation Spare Part List			

ITEM	Quantity	DESCRIPTION	PART NO.	Equipment
1	2	Coalescer Cartridges	PRS/SPARES/0001	Filter Separator
2	2	Separator Cartridges	PRS/SPARES/0002	Filter Separator
3	8	Water Monitor Cartridges	PRS/SPARES/0003	Water Monitor
4	1 Box	Shell Water Detector Capsule (Shelf Life – 6 months)	PRS/SPARES/0004	Fuel Test Kit
5	10	Sample Jar	PRS/SPARES/0005	Fuel Test Kit
6	10	Syringe	PRS/SPARES/0006	Fuel Test Kit
7	4	Tank Manway Gasket	PRS/SPARES/0007	Tank
8	4	Inspection Hatch Sealing Gasket	PRS/SPARES/0014	Tank
9	2	Filter Separator Sealing Gasket	PRS/SPARES/0008	Filter Separator
10	2	Water Monitor Sealing Gasket	PRS/SPARES/0009	Water Monitor

# **SECTION E: TECHNICAL LITERATURE**

# TX, TXD & TXSD Series

## Sliding Vane Pumps

### Reliability

Durable pumps for fast and quiet operation. Sliding-vane design provides sustained performance and trouble free operation.

### Unique Features

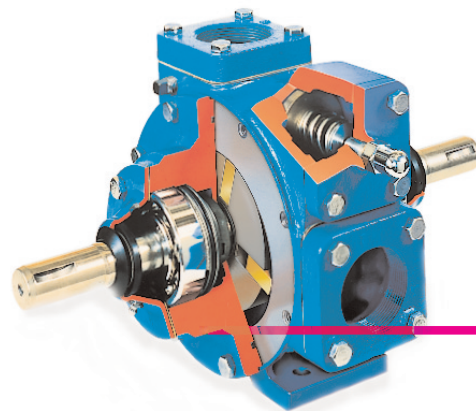
Adjustable relief valve protects pump from excessive pressure. Optional air operated diaphragm relief valve offers easy hose and nozzle handling. T-Type strainers are available to protect pumping systems from damage caused by welding slag and foreign matter in the piping and tanks.

### Sizing Options

Available in 1.5, 2, 2.5, 3, and 4 inch port sizes with flow rates from 10 to 500 U.S. gallons (2 to 113 m<sup>3</sup>/H) and pressures up to 125 PSI (8.6 bar).

### Applications

Fuel oil delivery truck, fleet refueling, lube oil, aviation refuelers, transports of petro chemical, gasoline, solvents, and many more.





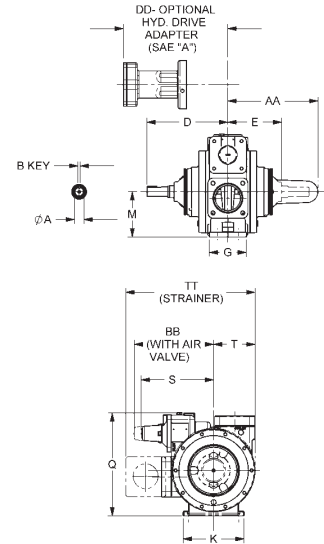
# TX, TXD & TXSD Series

## Sliding Vane Pumps

### Performance Data

Pump Model	TX1.5			TX(S)D2		TX(S)D2.5		TX(S)D3		TX4	
Rated Pump Speed (RPM)	780	600	400	640	520	640	520	640	520	500	400
GPM	52	40	25	72	58	120	98	263	211	505	405
LPM	197	151	95	273	220	454	371	995	799	1911	1533
M <sup>3</sup> /H	12	9	6	16	13	27	22	60	48	115	92
HP	5.9	4.5	3.2	3.0	2.5	5.0	3.8	9.5	7.8	17.5	15
KW	4.4	3.4	2.4	2.2	1.9	3.7	2.8	7.1	5.8	13.0	11.2

\* Approximate capacities and horsepower (HP) are based on a 100 SSU (22 Cp) fluid a 50 PSI (3.4 bar) differential pressure.  
Refer to Characteristic Curves for flow rates and torque requirements at other pressures and viscosities.



### Maximum Operating Limits

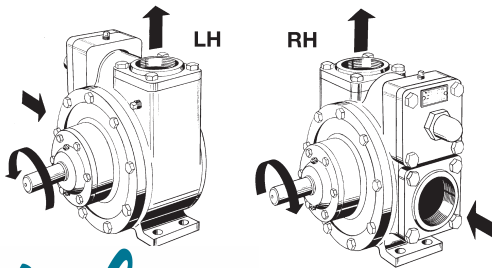
Pump Model	Nominal Flowrate		Pump Speed	Viscosity		Differential Pressure		Working Pressure		Temperature	
	GPM	LPM	RPM	SSU	Cp	PSI	BAR	PSI	BAR	°F	°C
TX1.5	56	212	780	20,000	4,250	125	8.6	175	12.1	300	149
TX(S)D2	87	329	780	20,000	4,250	125	8.6	175	12.1	300	149
TX(S)D2.5	157	594	780	20,000	4,250	125	8.6	175	12.1	300	149
TX(S)D3	270	1022	640	20,000	4,250	125	8.6	175	12.1	300	149
TX4	505	1,911	500	20,000	4,250	125	8.6	175	12.1	240	116

### Dimensions

Model		A	B	D	E	G	K	M	Q	S	T	AA	BB	DD	TT	Approx. WT.		
TX1.5	IN.	1 1/8	1/4	7 13/16	5 1/16	3 1/8	6 1/2	4	8 1/2	7	3 9/16	—	—	10 3/8	—	61	lbs	
	MM	-	-	198	129	79	165	102	216	178	90	—	—	264	—	28	kg	
TX(S)D2	IN.	1 1/8	1/4	8	5 1/4	3 1/2	6 1/2	4	8 11/16	6 1/8	3 7/8	8 3/4	8 5/16	10 7/8	10 9/16	12 1/8	70	lbs
	MM	-	-	203	133	89	165	102	221	156	98	222	211	276	268	308	32	kg
TX(S)D2.5	IN.	1 1/8	1/4	8 3/4	6	4 7/8	7	4	9 5/8	6 13/16	3 15/16	9 1/2	8 11/16	11 5/8	11 5/16	13 5/16	94	lbs
	MM	-	-	222	152	124	178	102	244	173	100	241	221	295	287	338	43	kg
TX(S)D3	IN.	1 1/8	1/4	9 5/8	6 7/16	4 3/8	7 1/4	5 3/8	12 13/16	8 9/16	4 15/16	10 11/16	9 7/16	12 3/8	15 3/8	152	lbs	
	MM	-	-	244	164	111	184	137	325	217	125	271	240	314	391	69	kg	
TX4	IN.	1 1/2	3/8	11	8 1/4	7	9 1/2	6 3/8	15 1/2	8 9/16	6 3/8	—	—	—	—	295	lbs	
	MM	-	-	279	210	178	241	162	394	217	162	—	—	—	—	134	kg	

### Pump Rotation

Blackmer TX(S)D models are equipped with a double-ended drive shaft for either clockwise (RH) or counterclockwise (LH) rotation. Standard rotation for the TX1.5 is counterclockwise (LH) when viewed from the drive shaft. Standard rotation for the TX4 model is clockwise (RH).



### Options

- Viton or Teflon O-rings
- Mechanical seals with stainless steel stationary seats
- Laminate vanes
- Pneumatic relief valve
- Hydraulic Motor Adapters
- Strainers
- DMX Air Elimination System

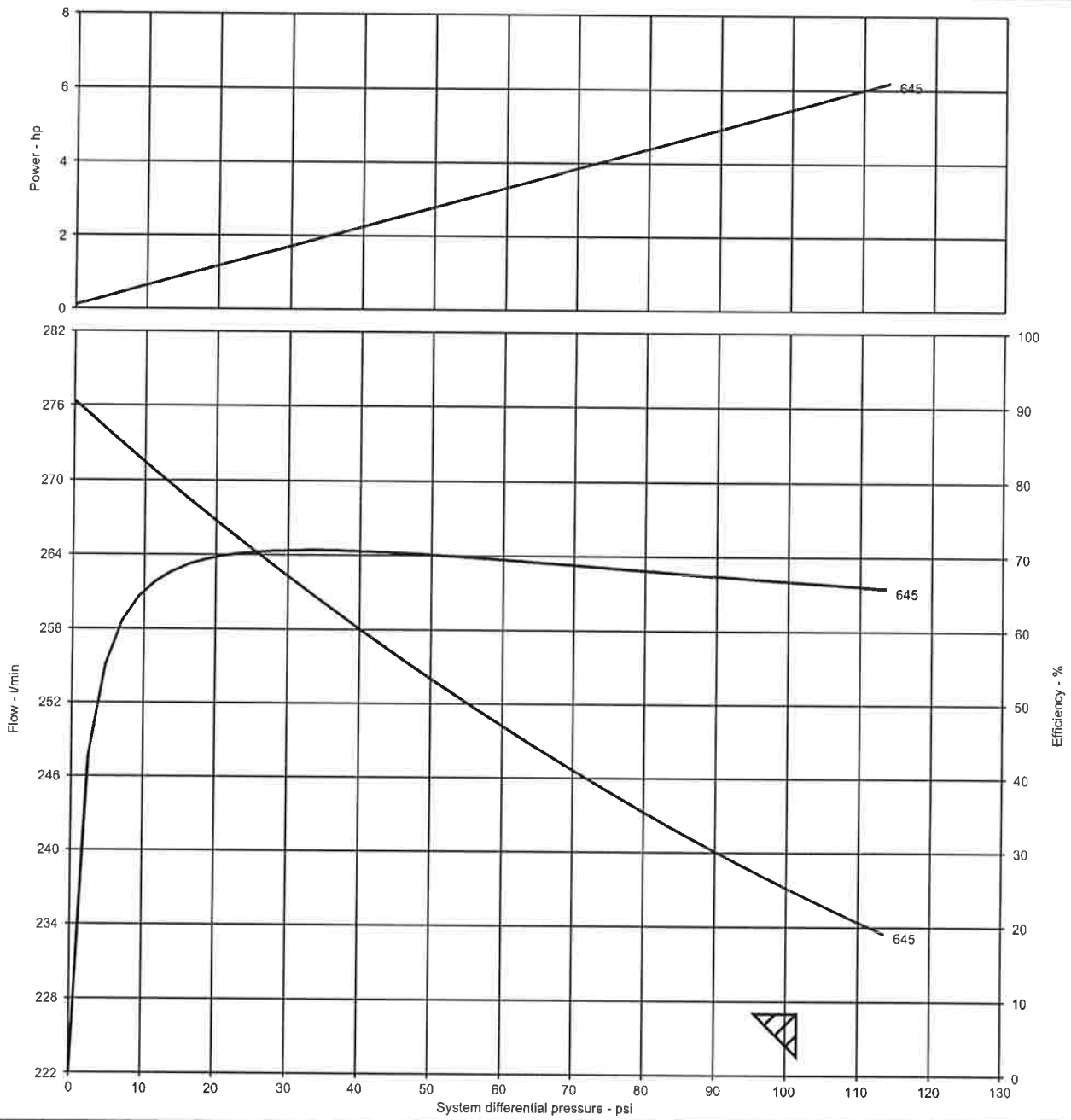
Distributed By:



1809 Century Avenue, Grand Rapids, MI 49503-1530 U.S.A. ♦ Telephone: 616.241.1611 ♦ Fax: 616.241.3752 ♦ www.blackmer.com  
ZI la Plaine des Iles, rue des Caillottes, 89000 Auxerre FRANCE ♦ Telephone: +33.3.86.49.86.30 ♦ Fax: +33.3.86.46.42.10 ♦



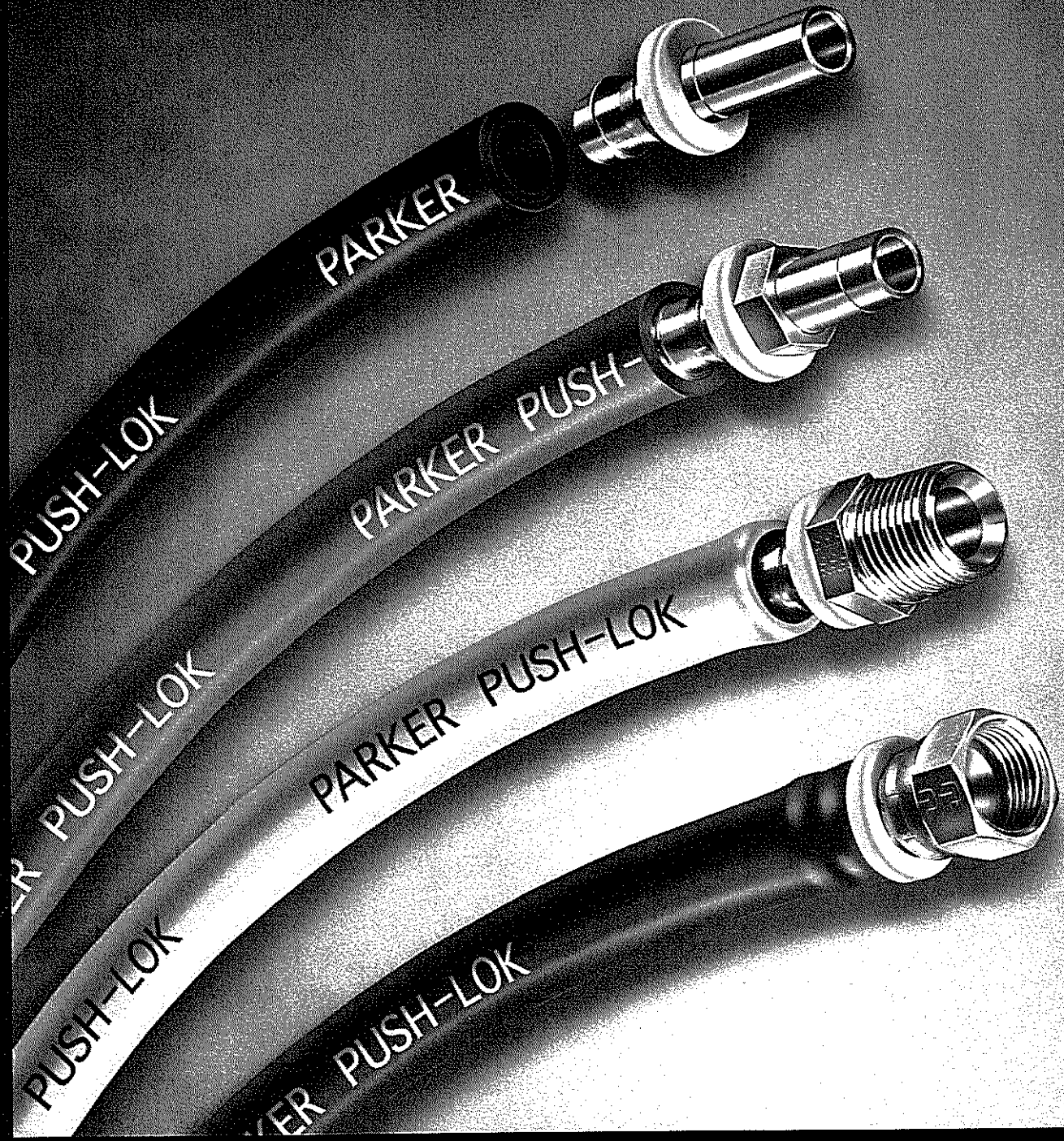
Multi-Speed Performance Curve



Customer	:		Size	:	X2B
Customer reference	:		Stages	:	-
Item number	:	021	Speed, rated	:	623 rpm
Service	:		Based on curve number	:	X2B-NM
Quantity	:	1	Efficiency	:	66.13 %
Quote number	:	157915	Power, rated	:	5.37 hp
Date last saved	:	22 Sep 2014 8:43 PM	NPSH required	:	8.05 ft
Flow, rated (user / actual)	:	227.0 / 227.0 l/min	Viscosity	:	1.40 cSt
Differential head / pressure, rated	:	7.00 bar	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	:	- / - / - / -
Fluid density, rated / max	:	0.850 / 0.850 SG			

# PARKER

## PUSH-LOK®



For All Your Instrumentation Needs

**Premium Products, Powerful Solutions.**

**Parker**  
FluidConnectors

# Premium Products,

## The Benefits of Parker PUSH-LOK®

**Premium products and powerful solutions are what you'll get with every Parker PUSH-LOK hose and fitting system. With the most complete line of high-quality, low-pressure hose and fittings, PUSH-LOK is the answer to all your instrumentation needs.**

### **Offering easy assembly and organization.**

Every PUSH-LOK system is easy to use. No clamps or special tools are required during installation. And with Parker's exclusive color code system, you can inventory, maintain and identify your hose needs easily and efficiently.

### **Providing exceptional value.**

Parker PUSH-LOK hoses assemble in seconds, saving valuable time and money. What's more, PUSH-LOK fittings are reusable. Just replace the hose at the job site without any special tools or clamps.

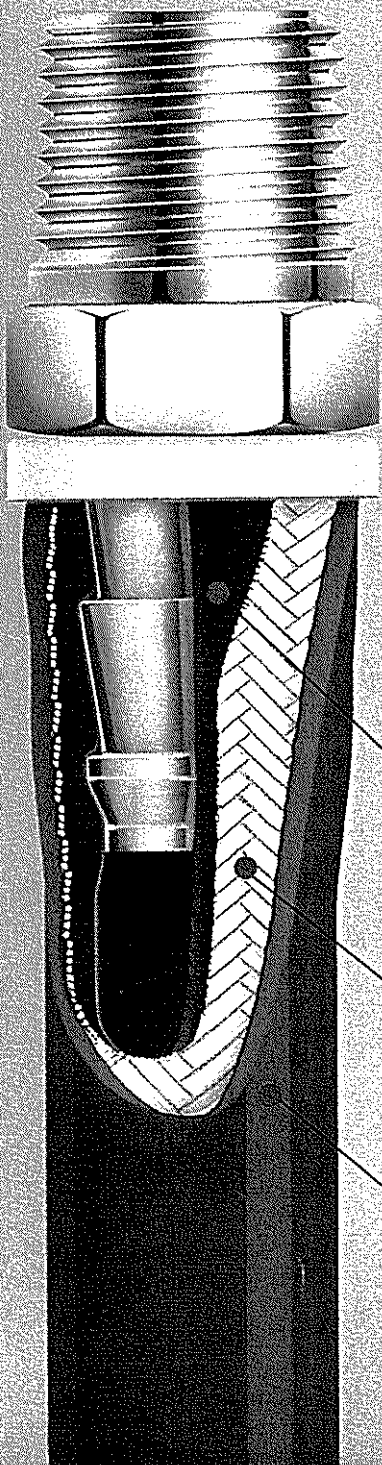
### **Meeting all your special needs.**

Helping you maintain a clean environment on the job is another important reason to use Parker's PUSH-LOK system. Its unique seal ensures reliability and durability for clean-environment use.

*Inner liner is an extruded, synthetic rubber, making it resistant to petroleum-base oil, air and water.*

*Fiber braid reinforcement layer is impregnated with synthetic rubber for added durability.*

*High-quality elastomer cover—lively feel, excellent flexibility and resistance to abrasion.*



# Powerful Solutions.

## Advantages of the PUSH-LOK Color Coding System:

### **For easier, faster line identification:**

In applications where a number of hose lines carry different media, PUSH-LOK colors reduce timely "tracing" of lines, preventing disconnection of the wrong line and costly down time that can result.

### **More efficient preventive maintenance:**

Using color-coded PUSH-LOK hose is an excellent way to keep track of scheduled replacement of low-pressure hose in your operations. Just assign a different color hose to each replacement period and eliminate the possibility of missing lines scheduled for replacement.

### **Help identify industrial drop lines:**

Use PUSH-LOK colors to identify drop line length and diameter for faster and easier replacement. When replacing by color, the right size and length are automatically set.

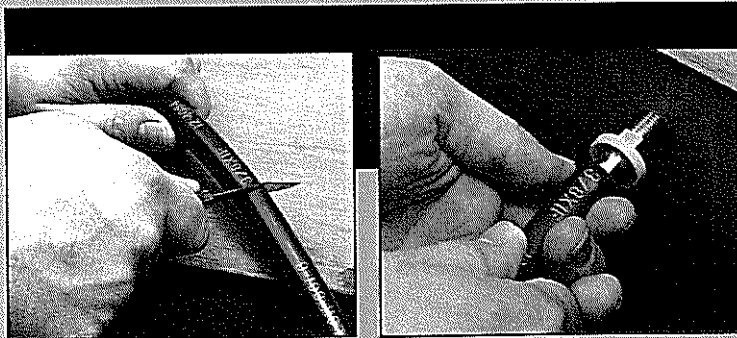
### **Enhance your products' appearance:**

For equipment manufacturers and their customers, using PUSH-LOK color hoses can vastly improve the visual and functional appeal of work equipment, on-line systems and the overall facility.

### **Create efficient inventory control:**

Assign a PUSH-LOK color to each department for its maintenance requirements. The color system helps assure that hoses are routed to their correct areas, resulting in better control over hose inventories.

## To Assemble PUSH-LOK



1. Cut hose cleanly and squarely with a sharp knife or a Parker PUSH-LOK cut-off tool.
2. Lubricate the PUSH-LOK fitting and/or hose I.D. with a light oil or soapy water only. Do not use heavy oil or grease.
3. Insert fitting into hose until the barb is in the hose.
4. Place end fitting against a flat object (bench or wall). Grip hose approximately one inch from end and push with steady force until the end of the hose bottoms on fitting and is covered by the yellow plastic cap.

## To Disassemble PUSH-LOK



1. Leave fitting in place and cut hose lengthwise from the yellow cap approximately one inch. **IMPORTANT!** Be careful not to nick barbs when cutting hose.
2. Grip hose and give a sharp downward tug to disengage the fitting.

**Caution:** PUSH-LOK fittings will properly grip PUSH-LOK hose only when pushed all the way in with the cut end of the hose completely concealed by the yellow plastic cap.

Sealing integrity may be damaged by using exterior clamps.



# Parker PUSH-LOK Hose

## 801 Hose

# Part Number	I.D.		O.D.		Working Pressure			Burst Pressure			Minimum Bend Radius		Weight		Ug	
	inch	mm	inch	mm	psi	MPa	Bar	psi	MPa	Bar	inch	mm	lbs/ft	kg/m	inches of Hg	kPa (abs)
801-4	1/4	6.3	0.50	12.7	250	1.7	17.2	1000	6.8	69	2-1/2	65	0.09	0.13	28	6
801-6	3/8	9.5	0.63	16	250	1.7	17.2	1000	6.8	69	3	75	0.11	0.16	28	6
801-8	1/2	12.7	0.78	19.8	250	1.7	17.2	1000	6.8	69	5	125	0.18	0.27	28	6
801-10	5/8	15.9	0.91	23	250	1.7	17.2	1000	6.8	69	6	150	0.19	0.28	15	51
801-12	3/4	19	1.03	26	250	1.7	17.2	1000	6.8	69	7	180	0.24	0.36	15	51

### Color Codes:



If no color is specified, 801 Gray will be supplied.

**Fittings:** PUSH-LOK 82 Series.

**Construction:** Synthetic rubber tube; one textile braid reinforcement; MSHA accepted synthetic rubber cover. Furnished in gray, red, yellow, blue, green or black.

### Application and Temperature Range:

Widely used for shop air systems and general industrial, maintenance and automotive applications.

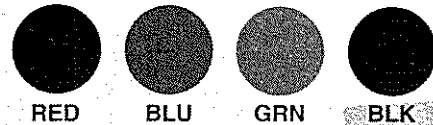
Low-pressure service hose for use with:

- Petroleum-based hydraulic fluids and lubricating oils within a temperature range of -40°F to +212°F (-40°C to +100°C).
- Water, water/oil emulsion, and water/glycol hydraulic fluids up to +185°F (+85°C).
- Air within a temperature range of -40°F to 158°F (-40°C to +70°C)

## 831 Hose

# Part Number	I.D.		O.D.		Working Pressure			Burst Pressure			Minimum Bend Radius		Weight		Ug	
	inch	mm	inch	mm	psi	MPa	Bar	psi	MPa	Bar	inch	mm	lbs/ft	kg/m	inches of Hg	kPa (abs)
831-4	1/4	6.3	0.50	12.7	350	2.4	24	1400	9.7	96.5	2-1/2	65	0.09	0.13	28	6
831-6	3/8	10	0.63	16	300	2.0	20.7	1200	8.3	82.7	3	75	0.11	0.16	28	6
831-8	1/2	12.7	0.78	19.8	300	2.0	20.7	1200	8.3	82.7	5	125	0.18	0.27	28	6
831-10	5/8	16	0.91	23	300	2.0	20.7	1200	8.3	82.7	6	150	0.19	0.28	15	50
831-12	3/4	19	1.03	26	300	2.0	20.7	1200	8.3	82.7	7	180	0.24	0.36	15	50

### Color Codes:



If no color is specified, 831 Black will be supplied.

**Fittings:** PUSH-LOK 82 Series.

**Construction:** Synthetic rubber tube; one textile braid reinforcement; MSHA accepted synthetic rubber cover. Furnished in red, blue, green, or black.

### Application and Temperature Range:

Widely used for shop air systems and general industrial, maintenance and automotive applications.

Low-pressure service hose for use with:

- Petroleum-based hydraulic fluids and lubricating oils within a temperature range of -40°F to +212°F (-40°C to +100°C).
- Water, water/oil emulsion, and water/glycol hydraulic fluids up to +185°F (+85°C).
- Air within a temperature range of -40°F to 158°F (-40°C to +70°C).

## 836 Hose

# Part Number	I.D.		O.D.		Working Pressure			Burst Pressure			Minimum Bend Radius		Weight		Ug	
	inch	mm	inch	mm	psi	MPa	Bar	psi	MPa	Bar	inch	mm	lbs/ft	kg/m	inches of Hg	kPa (abs)
836-4	1/4	6.3	0.50	13	250	1.7	17.2	1000	6.8	69	2-1/2	65	0.09	0.13	28	6
836-6	3/8	10	0.63	16	250	1.7	17.2	1000	6.8	69	3	75	0.11	0.16	28	6
836-8	1/2	12.5	0.78	20	250	1.7	17.2	1000	6.8	69	5	125	0.18	0.27	28	6
836-10	5/8	16	0.91	23	250	1.7	17.2	1000	6.8	69	6	150	0.19	0.28	15	50

### Color:



Note: PUSH-LOK hose is recommended for vacuum applications but not for cooling lines in air conditioners and heat pumps, or for hydraulic applications where extreme pulsations are encountered. PUSH-LOK is not recommended for any fuel.

**Fittings:** PUSH-LOK 82 series.

**Construction:** PKR<sup>®</sup> elastomer tube; one textile braid reinforcement; MSHA accepted blue synthetic rubber cover with embossed layline.

High-temperature service hose for use with:

- Petroleum based hydraulic fluids and lubricating oils within a temperature range of -55°F to +302°F (-48°C to +150°C).

- Water, water/oil emulsion, water/glycol, and hydraulic fluids up to +185°F (+85°C).

- Air within a temperature range of -40°F to +158°F (-40°C to +70°C).

**PARKER**  
**PUSH-LOK**

*Made of the highest-quality elastomeric compounds for a lively feel, excellent flexibility and long lasting service on the job.*

**PARKER PUSH-LOK 801**

**Color Coded**

*Produced to handle higher-pressure jobs with ease and dependability.*

**PARKER PUSH-LOK 831**

**Heavy Duty**

*Ideal for high-temperature applications.*

**PARKER PUSH-LOK 833**

**Hi-Temp  
Heat-Resistant**

**Inspection certificate**

(EN 10204 – 3.1)

Elaflex – Gummi Ehlers GmbH  
Frau Skock  
Schnackenburgallee 121  
  
22525 Hamburg

No.: 30000034556  
Date: 26/06/12  
Plant: Korbach  
Page: 1 of 2

**PURCHASER**

Order No: 1211012739  
Date:  
Part No:  
Part Name: Refuelling hose HD 38 C

Dimension: 38.0 x 6.5  
Material: Inner tube NBR, Cover CR  
Specification: EN 1361  
Drawing No:  
Hose marking: Production: 05/12 - 6527165

**MANUFACTURER**

Delivery No:  
Date:  
Part No: 3520698011  
1285/1024  
Quantity: 2 x 30.0 m  
Order-No: 6527165

Issue: October 2004

Issue:

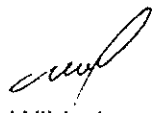
We hereby certify that the material described above complies with the terms of the order contract.

Korbach, 26/06/12

Quality Assurance  
Hose Technology  
Phone: 049/5631-581497



Wibbeke  
(Responsible for Inspection)

Inspection Certificate				Date 26/06/12			
		X	Dimension	X	Material	X	Function
<b>Manufacturer</b> ContiTech Schlauch GmbH Postfach 1120 D - 34481 Korbach				<b>Report No:</b> 30000034556		Page 2 of 2	
<b>Part No./Part Name</b> 1285/1024 Refuelling hose HD 38 C							
Pos.	Item	Specified	Manufacturer Results				
	Dimensions and technical data						
1	Inner tube		NBR				
2	Reinforcement		2 textile braids				
3	Cover		CR				
4	Inner diameter	38.0 ± 0.8	38.4 – 38.5	mm			
5	Outer diameter		51.4 – 51.8	mm			
6	Working pressure		20	bar			
7	Test pressure		40	bar			
8	Elongation at 20 bar	max. 7	0	%			
9	Torsion at 40 bar	max. 8	1	°/m			
10	Burst pressure	≥ 80	155	bar			
11	Electrical resistance	10 <sup>3</sup> - 10 <sup>6</sup>	1.5 x 10 <sup>3</sup>	Ohm/m			
12	Adhesion						
12.1	Cover/Reinforcement	≥ 3.0	3.2 – 3.8	N/mm			
12.2	Reinforcement/Reinforcement	≥ 3.0	3.5 – 4.7	N/mm			
12.3	Inner tube/Reinforcement	≥ 3.0	4.5 – 4.8	N/mm			
Remarks Manufacturer	The hoses were tested at 40 bar water pressure and no leakages or other						
	faults were ascertained. The processed material and the hoses comply with all						
	points specified in the EN ISO 1825, EN 1361, EN 12115, EN 1761, VG 95955, API 1529,						
	AS 2683 and TRbF 131/2.						
Remarks Purchaser							
Date		26/06/12		Responsible for Inspection:		 Wibbeke	



**GAMMON TECHNICAL PRODUCTS, INC.**  
P.O. BOX 400 - 2300 HWY 34  
MANASQUAN, N.J. 08736

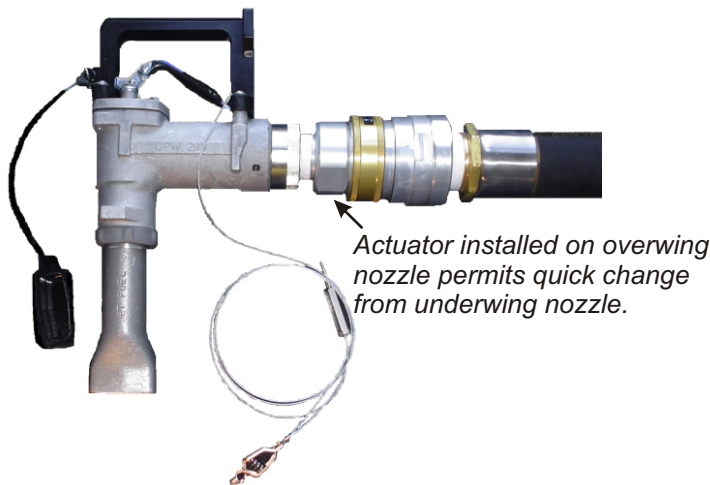
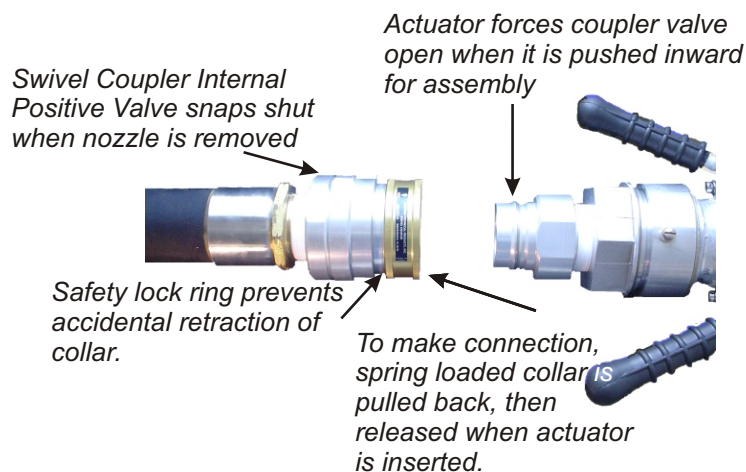
PHONE 732-223-4600  
FAX 732-223-5778  
EMAIL [gammontech@gammontech.com](mailto:gammontech@gammontech.com)

**DRY BREAK  
QUICK  
DISCONNECT**

**BULLETIN  
31  
(10-09)**

## **HEAVY DUTY DRY BREAK QUICK DISCONNECT** *With Stainless Steel Ball Race Ring to Resist Wear* Fast change from **OVERWING** to **UNDERWING** nozzle **NO SPILL FROM HOSE**

**FAST OPERATION.** Connect or disconnect in seconds, without tools. To connect, pull back sleeve, push connector into coupler and release sleeve. To disconnect, pull back the sleeve coupler and connector halves separate. Valve opens automatically when halves are connected.



All couplers and actuators are made of Aluminum, unless stated otherwise. **NOT** designed for suction service.

**DEPENDABLE OPERATION.** The ball-lock mechanism is the simplest, most reliable type in use, providing positive connection under constant or surge flow - even excessive shock. Ball bearing sleeve lock permits 360° swivel action, preventing build-up of hose torque. Hardened stainless steel balls give extra long service. Stainless steel ball race resists wear for longer life.

Molded U-Packer seal provides contact over several times the normal O-ring sealing area. Its design embodies a self-energizing feature that gives a positive seal at all pressures. This seal is capable of sealing under side loads and will tolerate small scratches and some dirt without leakage.

**TIGHT SEAL DISCONNECTED.** The poppet has a metal-to-metal stop to control compression on the valve o-ring seal. Seal is recessed and wedged in coupler body to keep it in place. The stop also prevents poppet blow-out.

### **LOW PRESSURE DROP DESIGN**

1 1/2" size: 2.6 psi @ 50 gpm  
2" size: 2.9 psi @ 100 gpm

# HOW TO ORDER

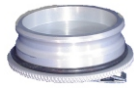
1 1/2"

## SWIVEL COUPLERS

2"



→ GTP-919-1  
GTP-919BSP



GTP-1768  
Dust Plug  
with Chain



GTP-917-1  
GTP-917BSP



TL-1652  
Dust Plug  
with Chain

## ACTUATORS FOR GTP-919-1



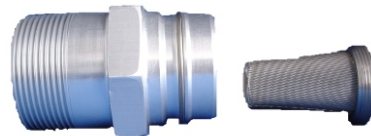
Female  
GTP-920-1 NPT  
GTP-920-4 BSP



GTP-1428  
Dust Cap  
with Chain



→ Male  
GTP-920-2 NPT  
GTP-920-3 BSP



GTP-1534 Optional Strainer for all 1 1/2" actuators, except GTP-920-3S 24 x 110 mesh stainless steel.  
If you want the strainer and actuator assembly, order GTP-1510



Male  
GTP-920-3S BSP  
Stainless Steel

## MALE ACTUATORS FOR GTP-917-1



GTP-918-1 1 1/2" NPT  
GTP-918-3 1 1/2" BSP



GTP-918-2 2" NPT  
GTP-918-4 2" BSP



GTP-1653  
Dust Cap  
with Chain



— MODEL —

**347GF**

# Cla-Val Refueling Nozzle



## Model 347GF

The use of all new, internal interlock technology results in a smaller, thinner, lighter Nozzle. The body of the Nozzle, adjacent to the connection head, has a very small outside diameter. This means that the Model 347GF Nozzle will easily connect to all aircraft, even the newer, smaller private jets and regional jets that are incorporating smaller and smaller refueling ports. Even with the compact size, the connection head features high strength, hardened, Stainless Steel components to assure superior durability to withstand the toughest, most abusive environments.



## Model 347GF Connection End View



- **Designed per SAE AS5877**
- **Connects to MS24484 Single Point Adapter**
- **Six Slot Connection Head**
- **Integrated Durable Swivel Joint**
- **Light Weight and Compact Size**
- **All Aluminum and Stainless Steel Construction**
- **Fuel Resistant Seals**

The Cla-Val 347GF Nozzle is designed per SAE AS5877 and is constructed entirely of aluminum and stainless steel, with fuel resistant Nitrile, Acetal and Polyurethane seals. All aluminum surfaces are anodized or coated to prevent corrosion. No copper, zinc, or alloys thereof are used in construction. The 347GF Nozzle connects to an aircraft “single point adapter” conforming to specification MS24484.

The Cla-Val 347GF Nozzle is designed to maximize safe refueling operations. An internal interlock system, fully contained within the nozzle, prevents it from being opened when not connected to an aircraft adapter. In addition, when connected to an aircraft adapter, the 347GF Nozzle cannot be removed until the operating lever is first rotated to the fully closed position.

The Cla-Val 347GF Nozzle is also designed to simplify refueling operations.

This lightweight design reduces the physical stresses involved in connecting the Nozzle to the aircraft. To provide greater refueling efficiency, the 347GF Nozzle features a six slot connection head, making it much easier to connect to a three-lug aircraft adapter.

Every effort has been made to reduce flow resistance through the nozzle and all related components and optional accessories to the lowest possible level, resulting in reduced refueling times.

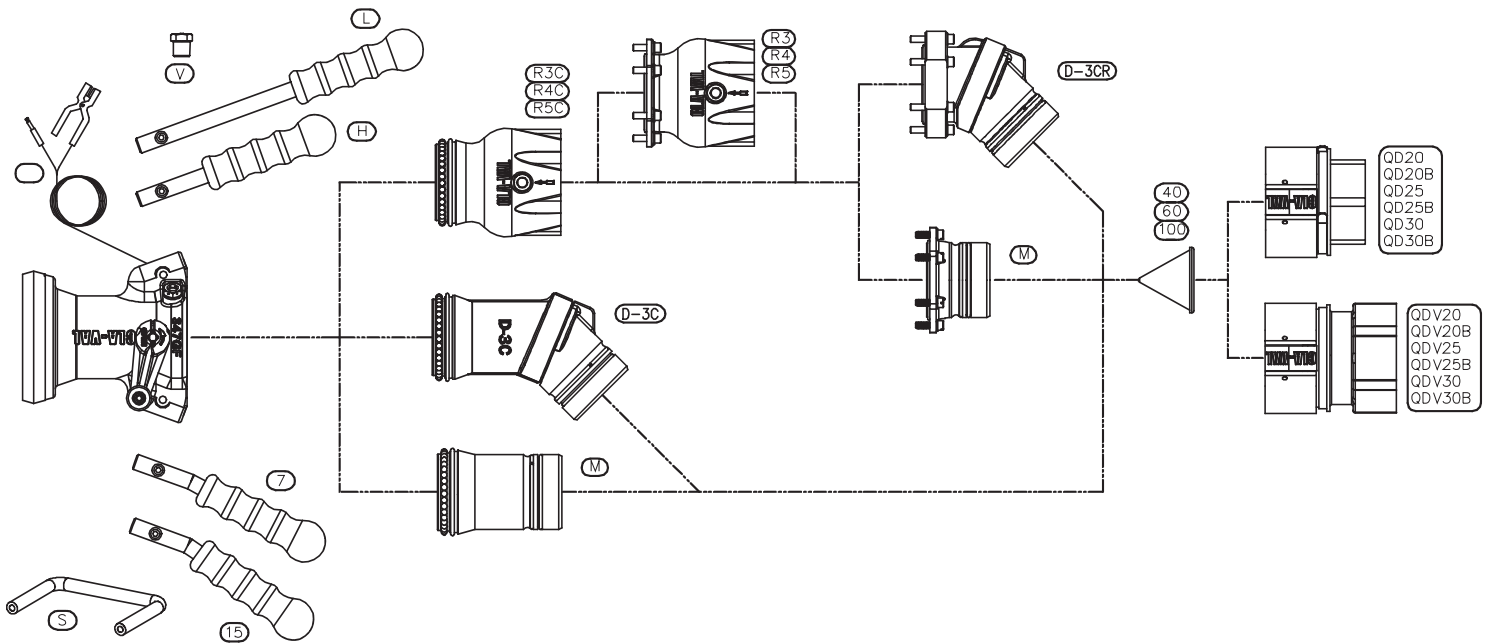
The Model 347GF Nozzle features a six slot connection head. The entire interlock mechanism is housed within the body of the Nozzle where it is protected from handling damage. Yet, pressure drop through the Nozzle remains very low.

The six slots in the connection interface allow for easier connection to the three-lug aircraft adapter. A spring loaded Safety Lock prevents the Nozzle from being connected to an aircraft adapter in an unsafe manner, continuing the high level of safety which is the hallmark of all Cla-Val aircraft refueling products.



# 347GF Nozzle Refueling Nozzle

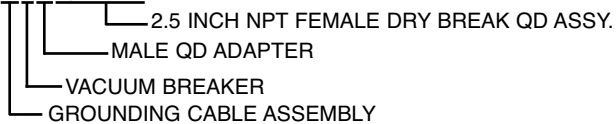
## Model Numbering Scheme



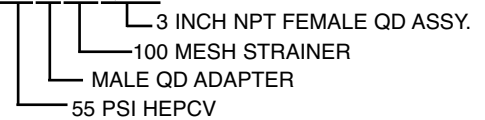
### Create Complete Model Numbers for Various Applications

It is easy to "customize" a 347GF to special requirements. Complete model numbers always begin with "347GF". Add your option selections to this base model number, following the flow chart above from left to right. See example below.

347GF-GVMQDV25



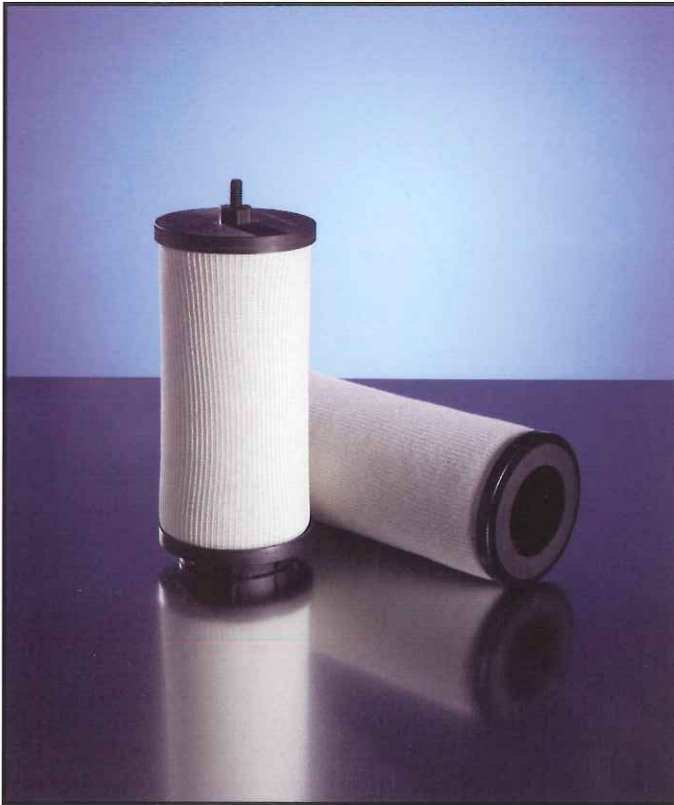
347GF-R5C M100QD30



### AVAILABLE OPTIONS ADDED TO Model 347GF

H	STANDARD HANDLES	40	40 MESH STRAINER
L	LONG HANDLES	60	60 MESH STRAINER
7	STANDARD HANDLES WITH 7° BEND	100	100 MESH STRAINER
15	STANDARD HANDLES WITH 15° BEND	QD20	STANDARD QUICK DISCONNECT WITH 2 INCH NPT THREADS
G	GROUNDING CABLE	QD20B	STANDARD QUICK DISCONNECT WITH 2 INCH BSPP THREADS
V	VACUUM BREAKER	QD25	STANDARD QUICK DISCONNECT WITH 2.5 INCH NPT THREADS
S	STOWAGE BAR	QD25B	STANDARD QUICK DISCONNECT WITH 2.5 INCH BSPP THREADS
R3C	35 PSIG HOSE END REGULATOR WITH SWIVEL CONNECTION	QD30	STANDARD QUICK DISCONNECT WITH 3 INCH NPT THREADS
R4C	45 PSIG HOSE END REGULATOR WITH SWIVEL CONNECTION	QD30B	STANDARD QUICK DISCONNECT WITH 3 INCH BSPP THREADS
R5C	55 PSIG HOSE END REGULATOR WITH SWIVEL CONNECTION	QDV20	DRY BREAK QUICK DISCONNECT WITH 2 INCH NPT THREADS
R3	35 PSIG HOSE END REGULATOR WITH FLANGED OUTLET	QDV20B	DRY BREAK QUICK DISCONNECT WITH 2 INCH BSPP THREADS
R4	45 PSIG HOSE END REGULATOR WITH FLANGED OUTLET	QDV25	DRY BREAK QUICK DISCONNECT WITH 2.5 INCH NPT THREADS
R5	55 PSIG HOSE END REGULATOR WITH FLANGED OUTLET	QDV25B	DRY BREAK QUICK DISCONNECT WITH 2.5 INCH BSPP THREADS
D-3C	D-3 MALE QD INLET WITH SWIVEL CONNECTION	QDV30	DRY BREAK QUICK DISCONNECT WITH 3 INCH NPT THREADS
D-3CR	D-3C MALE QD INLET WITH FLANGED CONNECTION	QDV30B	DRY BREAK QUICK DISCONNECT WITH 3 INCH BSPP THREADS
M	MALE QUICK DISCONNECT ADAPTER		





### FOR MAXIMUM WATER COALESCING EFFICIENCY AND SOLIDS HOLDING CAPACITY

Facet CAA Series 5 coalescer cartridges offer the finest performance available. This standard line of high flow coalescer cartridges removes ultra-fine solids and enhances separation of water from jet fuel.

The Facet coalescer separator housings equipped with CAA Series 5 coalescer and companion separator cartridges have been tested and fully qualified to meet the performance requirements of API Bulletin 1581, Fifth Edition, Category C, Type S. (Category C replaces the previous class A, B, and C of API-1581 3<sup>rd</sup> Edition.)

Built for balanced fluid flow-thru and structural strength, each CAA Series 5 coalescer cartridge is a single-piece construction of various combined media, precisely arranged in many layers and pleats, wrapped around a treated, perforated metal center tube—all encased in an outer sock material. All are 6" OD (152 mm) by 3½" ID (89 mm) and available in standard interchangeable nominal lengths in increments from 11¼" (290 mm) to 57¼" (1450 mm).

The CAA Series 5 coalescer cartridges are available in two cartridge mounting styles: self-centering rod mount and screw base. The rod mount style has treated metal end caps, while the screw base ends are injection molded, glass-filled nylon. This screw base material offers superior strength and ease of maintenance—uniform threads, no shrinkage, no galling and no gasket to recover.

A permanently affixed Buna-N gasket seals against the V-type knife edge mounting adaptor to provide a positive seal. It will not separate from the cartridge during installation or change out.

### STANDARD DESIGN FEATURES

- Tested and qualified to the Fifth Edition of API Bulletin 1581, Category C, Type S
- Multi-layered media for increased solids holding capacity
- Ultra-fine solids removal
- Maximum water coalescence
- Balanced cartridge flow characteristics
- Recommended maximum operating temperature: 240°F
- Withstands in excess of 75 psi differential pressure
- pH range from 5 to 9
- Screw base or open-end configuration

### MATERIALS

- All metal components are treated against corrosion
- Screw base ends are injection molded, glass-filled nylon with locked-in gaskets
- Buna-N gaskets—other materials are available on request

*Due to our continuing program of improvement, specifications are subject to change without notice.*

**DATA**

MODEL NUMBER	NOMINAL LENGTH (IN)	NOMINAL LENGTH (MM)	OUTSIDE DIAMETER OD (IN)	INSIDE DIAMETER ID (IN)	MOUNTING STYLE
CAA11-5	11¼	290	6	3½	Rod
CAA14-5	14½	370	6	3½	Rod
CAA14-5SB	15	380	6	3½	Screw Base
CAA22-5	22¼	560	6	3½	Rod
CAA22-5SB	23	580	6	3½	Screw Base
CAA28-5	28¾	730	6	3½	Rod
CAA28-5SB	29	740	6	3½	Screw Base
CAA33-5	33¼	840	6	3½	Rod
CAA33-5SB	34	860	6	3½	Screw Base
CAA38-5	38	960	6	3½	Rod
CAA38-5SB	39	990	6	3½	Screw Base
CAA43-5	43¼	1100	6	3½	Rod
CAA43-5SB	45	1140	6	3½	Screw Base
CAA56-5	56¼	1430	6	3½	Rod
CAA56-5SB	57	1450	6	3½	Screw Base

**NOTE:** The Facet screw base adaptor part number is 677453-AM.

*Due to our continuing program of improvement, specifications are subject to change without notice.*



**TEFLON SERIES**

Facet's **ST-5 Series** Teflon separator cartridges are cleanable and reusable separator cartridges of the highest quality in a variety of dimensional configurations. Teflon® coated screen is wrapped around a treated, perforated metal shell, lock-seam folded and secured by metal clips, then adhesive bonded to gasketed metal end caps. The screen is Teflon® coated for more effective water repelling characteristics assuring long, trouble-free service.

Facet's **SS-5 Series** synthetic separator cartridges feature a specially developed hydrophobic synthetic media which offers all the permanent features of Teflon® screen, with the ability to handle higher flow rates. Synthetic mesh is wrapped around a treated, perforated metal shell, then adhesive-bonded to gasketed metal end caps. The synthetic mesh is designed for more effective water repelling characteristics, assuring long, trouble-free service.

*Both* Facet **ST-5 and SS-5 Series** Separators have the distinctive Facet Velocigard which provides balanced flow of product (radially inward) throughout the cartridge. All metal components are treated to resist corrosion. Maximum recommended operating temperature is 240°F. For compatibility in extreme operating conditions, other gasket, adhesive and metal materials are available.

## STANDARD DESIGN FEATURES

- Cleanable and reusable
- Superior water barrier
- Recommended maximum operating temperature: 240°F
- pH range from 5 to 9
- Designed for balanced flow through cartridge
- Flow direction: Outside to inside

## MATERIALS

- Synthetic mesh OR Teflon® coated screen
- Treated metal components for corrosion protection
- Buna-N gaskets
- Other gasket, adhesive and metal materials are available on request



**SYNTHETIC SERIES**

*Due to our continuing program of improvement, specifications are subject to change without notice.*

### DIMENSIONAL INFORMATION

MODEL NUMBER TEFLON	MODEL NUMBER SYNTHETIC	OUTSIDE DIAMETER		NOMINAL LENGTH		INSIDE DIAMETER SEALING END		INSIDE DIAMETER MOUNTING END	
		in.	mm.	in.	mm.	in.	mm.	in.	mm.
ST318FA-5	SS318FA-5	3	76	18	460	BLIND	13	2	51
ST324FA-5	SS324FA-5	3	76	24	610	BLIND	13	2	51
ST412FC-5	SS412FC-5	4 $\frac{1}{8}$	105	11 $\frac{1}{2}$	290	1 $\frac{7}{8}$	48	1 $\frac{7}{8}$	48
ST415FB-5	SS415FB-5	4 $\frac{1}{2}$	114	15	380	BLIND	13	3 $\frac{1}{2}$	89
ST417FB-5	SS417FB-5	4 $\frac{1}{2}$	114	17	430	BLIND	13	3 $\frac{1}{2}$	89
ST422FC-5	SS422FC-5	4 $\frac{1}{8}$	105	22 $\frac{1}{2}$	570	1 $\frac{7}{8}$	48	1 $\frac{7}{8}$	48
ST424FB-5	SS424FB-5	4 $\frac{1}{2}$	114	24	610	BLIND	13	3 $\frac{1}{2}$	89
ST430FB-5	SS430FB-5	4 $\frac{1}{2}$	114	30	760	BLIND	13	3 $\frac{1}{2}$	89
ST432FC-5	SS432FC-5	4 $\frac{1}{8}$	105	31 $\frac{1}{2}$	800	1 $\frac{7}{8}$	48	1 $\frac{7}{8}$	48
ST436FB-5	SS436FB-5	4 $\frac{1}{2}$	114	36	910	BLIND	13	3 $\frac{1}{2}$	89
ST609FB-5	SS609FB-5	6	152	9	230	BLIND	13	3 $\frac{1}{2}$	89
ST609FF-5	SS609FF-5	6	152	9	230	BLIND	13	4 $\frac{1}{2}$	114
ST611FD-5	SS611FD-5	6	152	11 $\frac{1}{4}$	290	3 $\frac{1}{2}$	89	3 $\frac{1}{2}$	89
ST612FB-5	SS612FB-5	6	152	12 $\frac{1}{8}$	310	BLIND	13	3 $\frac{1}{2}$	89
ST614FD-5	SS614FD-5	6	152	14 $\frac{1}{2}$	370	3 $\frac{1}{2}$	89	3 $\frac{1}{2}$	89
ST616FD-5	SS616FD-5	6	152	16 $\frac{1}{4}$	410	3 $\frac{1}{2}$	89	3 $\frac{1}{2}$	89
ST618FB-5	SS618FB-5	6	152	18	460	BLIND	13	3 $\frac{1}{2}$	89
ST622FD-5	SS622FD-5	6	152	22 $\frac{1}{4}$	560	3 $\frac{1}{2}$	89	3 $\frac{1}{2}$	89
ST624FB-5	SS624FB-5	6	152	24	610	BLIND	13	3 $\frac{1}{2}$	89
ST624FE-5	SS624FE-5	6	152	24	610	BLIND	13	4 $\frac{1}{8}$	105
ST624FF-5	SS624FF-5	6	152	24	610	BLIND	13	4 $\frac{1}{2}$	114
ST629FD-5	SS629FD-5	6	152	28 $\frac{3}{4}$	730	3 $\frac{1}{2}$	89	3 $\frac{1}{2}$	89
ST630FB-5	SS630FB-5	6	152	30	760	BLIND	13	3 $\frac{1}{2}$	89
ST630FD-5	SS630FD-5	6	152	30	760	3 $\frac{1}{2}$	89	3 $\frac{1}{2}$	89
ST630FE-5	SS630FE-5	6	152	30	760	BLIND	13	4 $\frac{1}{8}$	105
ST630FF-5	SS630FF-5	6	152	30	760	BLIND	13	4 $\frac{1}{2}$	114
ST633FB-5	SS633FB-5	6	152	33 $\frac{1}{4}$	840	BLIND	13	3 $\frac{1}{2}$	89
ST633FD-5	SS633FD-5	6	152	33 $\frac{1}{4}$	840	3 $\frac{1}{2}$	89	3 $\frac{1}{2}$	89
ST636FB-5	SS636FB-5	6	152	36	910	BLIND	13	3 $\frac{1}{2}$	89
ST636FD-5	SS636FD-5	6	152	36	910	3 $\frac{1}{2}$	89	3 $\frac{1}{2}$	89
ST636FE-5	SS636FE-5	6	152	36	910	BLIND	13	4 $\frac{1}{8}$	105
ST636FF-5	SS636FF-5	6	152	36	910	BLIND	13	4 $\frac{1}{2}$	114
ST638FD-5	SS638FD-5	6	152	38	965	3 $\frac{1}{2}$	89	3 $\frac{1}{2}$	89
ST640FD-5	SS640FD-5	6	152	40	1020	3 $\frac{1}{2}$	89	3 $\frac{1}{2}$	89
ST640FE-5	SS640FE-5	6	152	40	1020	BLIND	13	4 $\frac{1}{8}$	105
ST640FF-5	SS640FF-5	6	152	40	1020	BLIND	13	4 $\frac{1}{2}$	114
ST643FB-5	SS643FB-5	6	152	43	1090	BLIND	13	3 $\frac{1}{2}$	89
ST643FD-5	SS643FD-5	6	152	43	1090	3 $\frac{1}{2}$	89	3 $\frac{1}{2}$	89
ST644FB-5	SS644FB-5	6	152	44	1120	BLIND	13	3 $\frac{1}{2}$	89
ST644FD-5	SS644FD-5	6	152	44	1120	3 $\frac{1}{2}$	89	3 $\frac{1}{2}$	89
ST644FE-5	SS644FE-5	6	152	44	1120	BLIND	13	4 $\frac{1}{8}$	105
ST644FF-5	SS644FF-5	6	152	44	1120	BLIND	13	4 $\frac{1}{2}$	114
ST648FD-5	SS648FD-5	6	152	48	1220	3 $\frac{1}{2}$	89	3 $\frac{1}{2}$	89
ST648FF-5	SS648FF-5	6	152	48	1220	BLIND	13	4 $\frac{1}{2}$	114
ST656FB-5	SS656FB-5	6	152	56	1420	BLIND	13	3 $\frac{1}{2}$	89
ST656FF-5	SS656FF-5	6	152	56	1420	BLIND	13	4 $\frac{1}{2}$	114

Due to our continuing program of improvement, specifications are subject to change without notice.



The Facet 2" (51 mm.) nominal outside diameter FG Series Fuel-Gard® monitor cartridges perform three jobs—they absorb free and emulsified water, remove ultra-fine solids and shut down system flow when hit with a localized slug of water, giving you clean, dry fuel. The FG Series Fuel-Gard® monitor cartridges are designed to flow from the outside to inside at a rate of 1 gallon (3.79 liters) per inch of length.

Fuel-Gard® monitor cartridges meet the 6th edition of EI 1583 Specifications and Qualification Procedures—Aviation Fuel Filter Monitors With Absorbent Type Elements.

The presence of water or solids in the incoming fuel will be indicated by an increase in the pressure differential or a decrease in the flow rate as the cartridges reach their maximum capacity for solids, water or a combination of both. When either happens, the cartridges should be replaced.

Each FG Series Fuel-Gard® monitor cartridge is constructed of various water absorbent media, plus fine filtration layers wrapped around a molded center tube for balanced flow and structural strength—all encased in a protective outer sock material. The end cap material is of injection molded, glass-filled nylon which provides superior strength and ease of maintenance. This material gives excellent support for the o-ring on the mounting/adaptor end.

### STANDARD DESIGN FEATURES

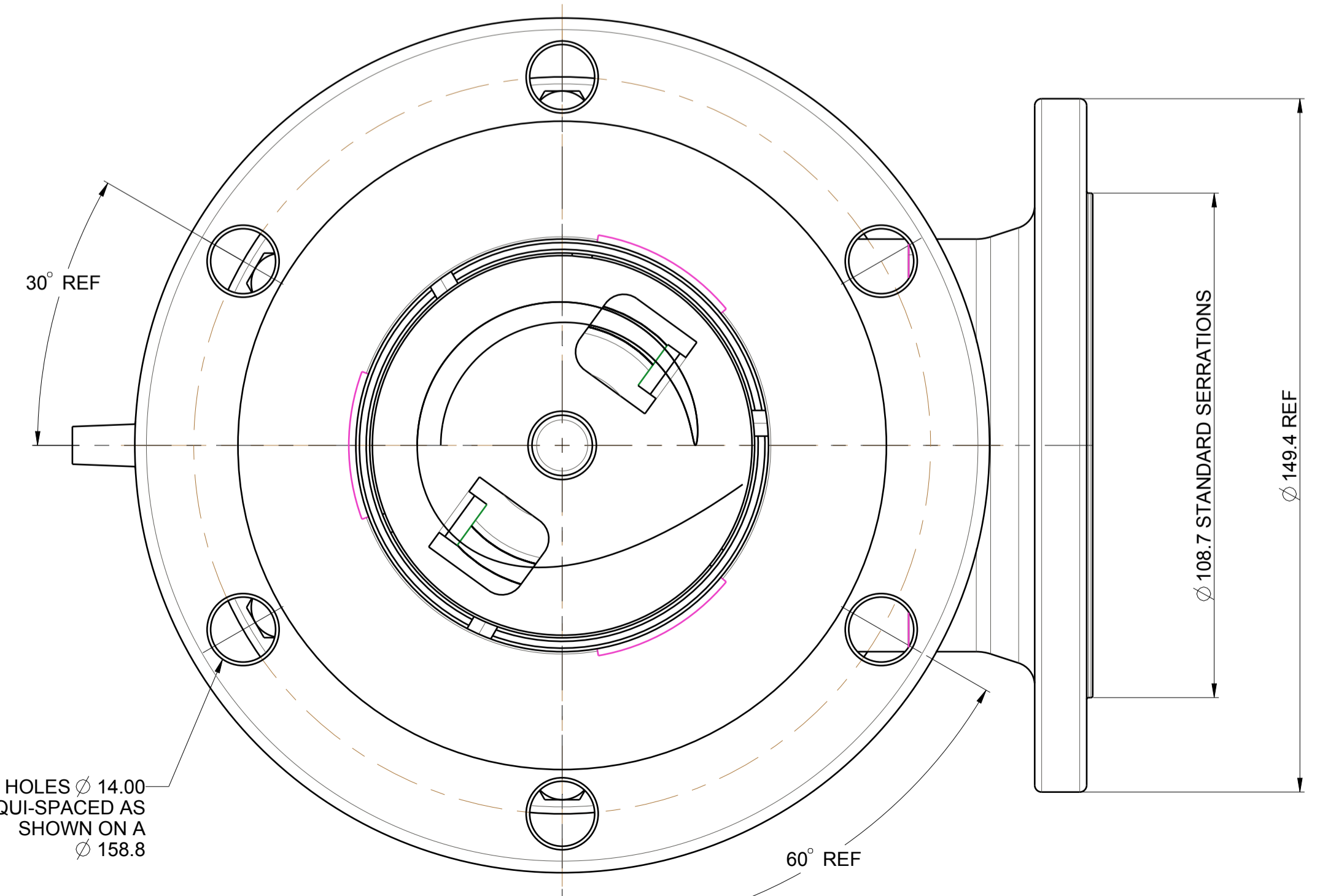
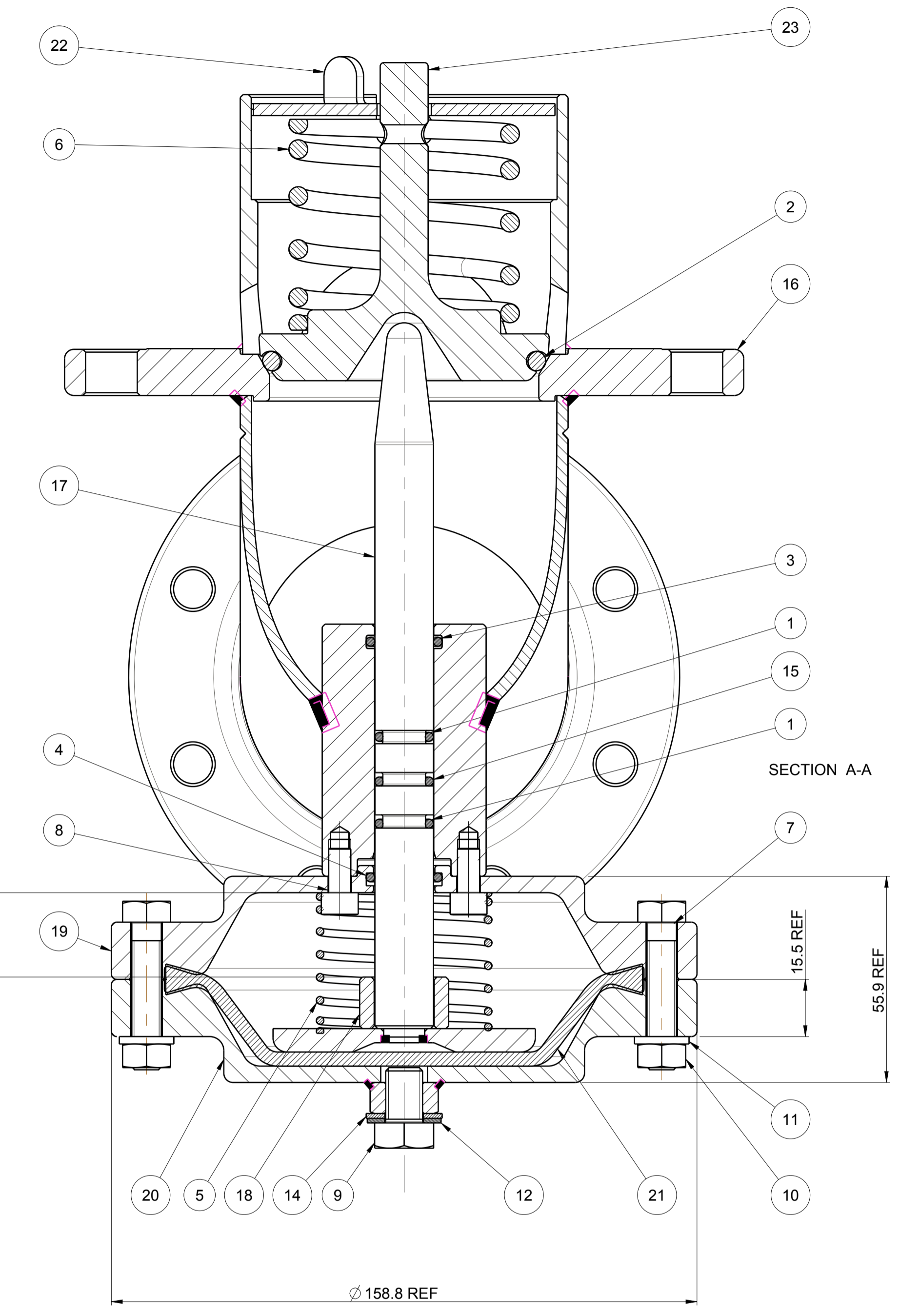
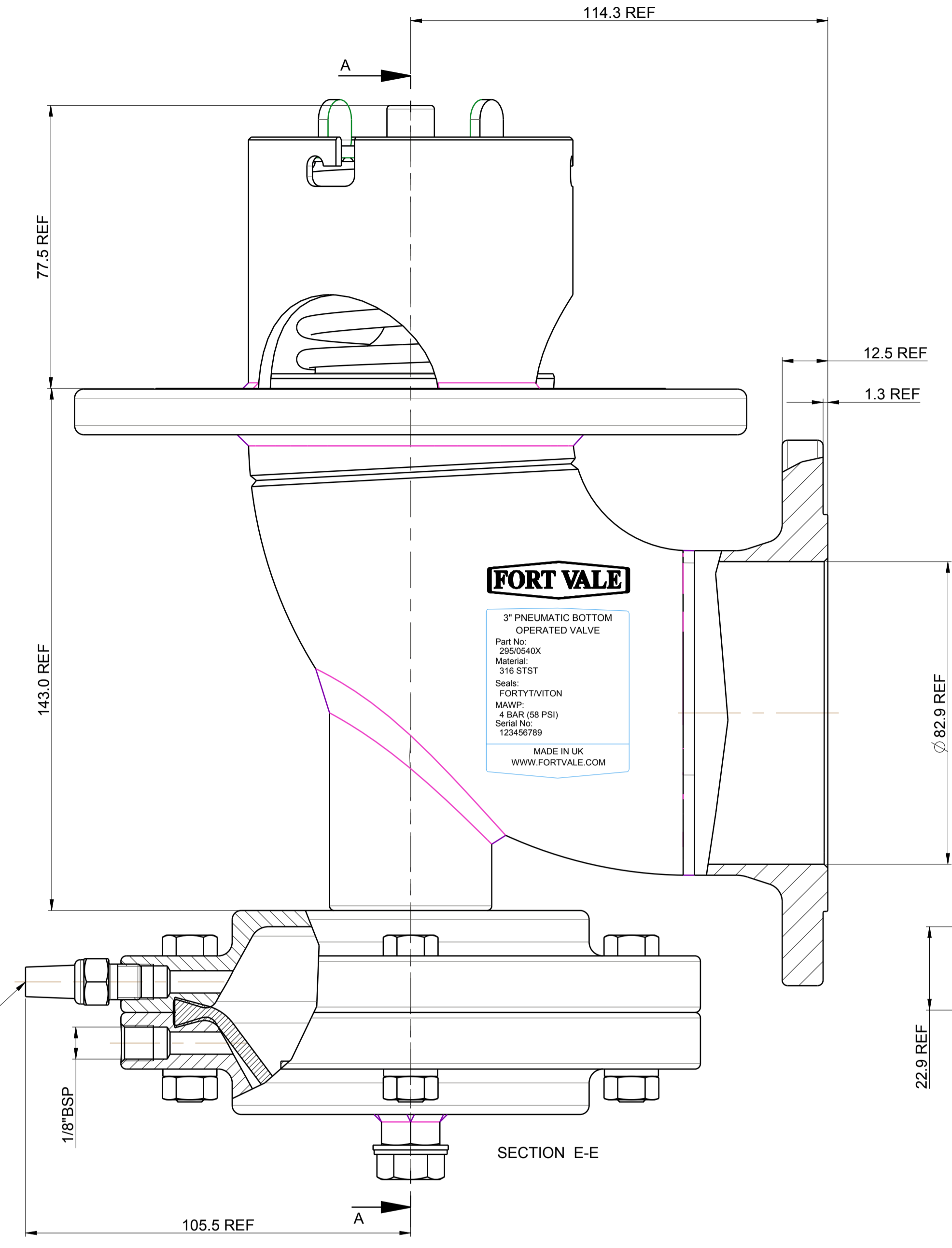
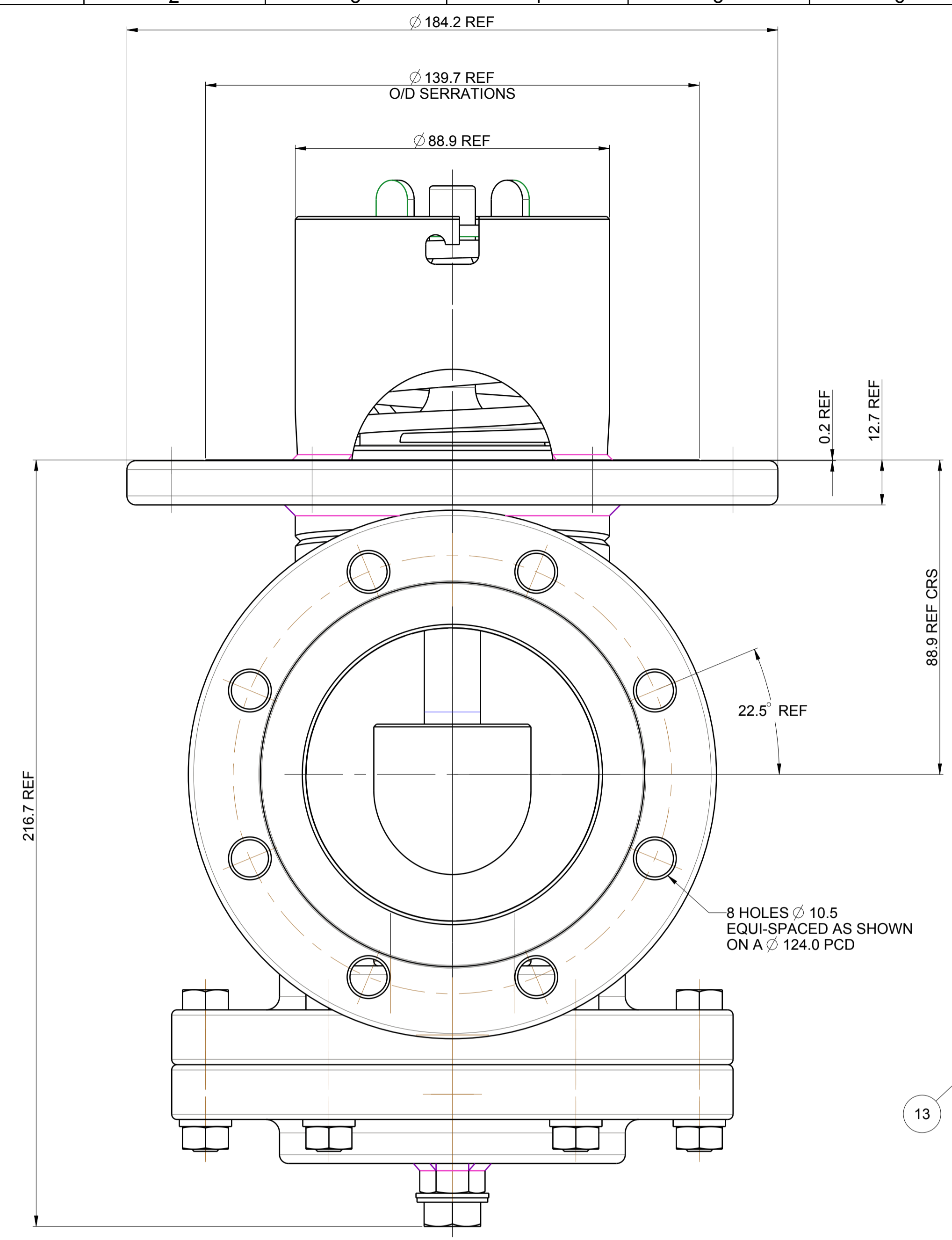
- Tested and qualified to meet the 6th Edition of EI 1583 Specifications and Qualification Procedures—Aviation Fuel Filter Monitors With Absorbent Type Elements
- Multi-layered media for increased solids holding, water removal and shutdown protection
- New conductive end caps with anti-static properties which greatly reduce the possibility of static discharge during the fueling process
- Structurally withstands a minimum of 174 psid
- Not adversely affected by exposure to temperatures varying from -65°F to 160°F

### DATA

MODEL NUMBER	NOMINAL LENGTH		OUTSIDE DIAMETER		INSIDE DIAMETER	
	in.	mm.	in.	mm.	in.	mm.
FG-205-6	5 <sup>7</sup> / <sub>8</sub>	150	1 <sup>3</sup> / <sub>4</sub>	45	7 <sup>7</sup> / <sub>8</sub>	23
FG-207-6	7 <sup>1</sup> / <sub>16</sub>	195	1 <sup>3</sup> / <sub>4</sub>	45	7 <sup>7</sup> / <sub>8</sub>	23
FG-210-6	10 <sup>7</sup> / <sub>8</sub>	227	1 <sup>3</sup> / <sub>4</sub>	45	7 <sup>7</sup> / <sub>8</sub>	23
FG-215-6	15 <sup>7</sup> / <sub>8</sub>	404	1 <sup>3</sup> / <sub>4</sub>	45	7 <sup>7</sup> / <sub>8</sub>	23
FG-217-6	17 <sup>7</sup> / <sub>8</sub>	454	1 <sup>3</sup> / <sub>4</sub>	45	7 <sup>7</sup> / <sub>8</sub>	23
FG-220-6	20 <sup>7</sup> / <sub>8</sub>	531	1 <sup>3</sup> / <sub>4</sub>	45	7 <sup>7</sup> / <sub>8</sub>	23
FG-225-6	25 <sup>7</sup> / <sub>8</sub>	658	1 <sup>3</sup> / <sub>4</sub>	45	7 <sup>7</sup> / <sub>8</sub>	23
FG-230-6	30 <sup>7</sup> / <sub>8</sub>	785	1 <sup>3</sup> / <sub>4</sub>	45	7 <sup>7</sup> / <sub>8</sub>	23

**WARNING: MONITOR CARTRIDGES SHOULD NEVER BE USED WITH FUELS CONTAINING ANTHCING ADDITIVES SUCH AS FSII, PRIST AND DIGME. THIS INCLUDES PRE-MIXED AND MILITARY FUELS CONTAINING THESE ADDITIVES. THE USE OF MONITOR CARTRIDGES WITH FUELS CONTAINING ANTHCING ADDITIVES MAY RESULT IN (1) A FAILURE OF THE MONITOR CARTRIDGE AND/OR (2) MIGRATION OF FILTRATION MEDIA INTO THE FUEL STREAM, EITHER OF WHICH COULD POTENTIALLY CAUSE DAMAGE TO OR SUDDEN FAILURE OF THE CORRESPONDING ENGINE. THE SUPPLIER SHALL NOT BE LIABLE IN ANY RESPECT FOR ANY DAMAGE OR LOSS THAT ARISES FROM THE USE OF MONITOR CARTRIDGES WITH FUELS CONTAINING ANTHCING ADDITIVES. SUCH USE IS ENTIRELY AT THE USER'S RISK.**

MOD	REVISION	SIG & DATE
01	DRAWING WAS IMPERIAL AND PICTORIALY UPDATED TO SHOW HUBBED OUTLET FLANGE.	PB 09/12/11
02	5111-034 WAS 5111-015	IA 17/04/2012



**FORT VALE**  
 3" PNEUMATIC BOTTOM OPERATED VALVE  
 Part No: 295/0540X  
 Material: 316 STST  
 Seats: FORTYTY/TITON  
 MAMP: 4 BAR (58 PSI)  
 Serial No: 123456789  
 MADE IN UK  
 WWW.FORTVALE.COM

**DESIGN PRESSURE (MAWP) : 4BAR (58 PSI)**  
**DESIGN TEMPERATURE : 200° C (392° F)**  
**TEST PRESSURE : 6BAR (87 PSI)**

295/0540V	VITON	5005-102
295/0540F	FORTYTY	5005-220
<b>ASSEMBLY PART No.</b>	<b>MAIN SEAL MATERIAL</b>	<b>MAIN SEAL PART No.</b>

Index	Part Number	Description	Material	Quantity
23	336/0010	SOLID POPPET	316 STST	1
22	336/0005	BAYONET CAP	316 STST	1
21	295/0529	SIZE 9 DIAPHRAGM SEAL	RUBBER	1
20	295/0528	DIAPHRAGM CYLINDER BASE	304 STST	1
19	295/0526	DIAPHRAGM CYLINDER BODY HALF	304 STST	1
18	295/0509	CYLINDER STOP	304 STST	1
17	295/0506	PUSH STEM WELD ASSY	316 STST	1
16	295/0100	3" 90 DEG FOOTVALVE BODY	316 STST	1
15	10133V	BS 111 'O' RING VITON	VITON	1
14	5623-002	M10 FIBRE WASHER	C.N.A.F.	1
13	5128-065	1/8" BSP SILENCER	BRASS	1
12	5113-009	M10 PLAIN WASHER A4 ST ST	316 STST	1
11	5113-003	M8 SPRING WASHER	304 STST	6
10	5112-001	M8 FULL NUT	304 STST	6
9	5111-082	M10 X 15mm HEX BOLT	304 STST	1
8	5111-034	M6 X 12MM CAP SCREW	316 STST	4
7	5111-011	M8 X 40mm HEX BOLT	304 STST	6
6	5104-970	CLOSURE SPRING	316 STST	1
5	5104-847	2.0" UNIACT SPRING	302 STST	1
4	5005-296	BS 114 'O' RING VITON	VITON	1
3	5005-135PER	BS 114 'O' RING PERFLUOROELASTOMER	PERFLUOROELASTOMER	1
2	5005-XXX	MAIN SEAL (SEE TABLE)	VARIOUS (SEE TABLE)	1
1	5005-008	BS111 PTFE 'O' RING	PTFE	2

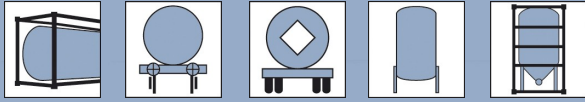
Assembly BOM

**FORT VALE** SALES@FORTVALE.COM WWW.FORTVALE.COM  
 ENGLAND, USA, CHINA  
 NETHERLANDS, SINGAPORE

© FORT VALE ENGINEERING LTD 2012. DO NOT SCALE- IF IN DOUBT ASK

UNLESS OTHERWISE STATED	FIRST ANGLE PROJECTION	MATERIAL: 316 STST
X.X ±0.5 SURFACE FINISH 3.2um MAX	BSI REGISTERED NUMBER FM 20165	SCALE: NTS MASS: 11.39 kg
X.XX ±0.25 CORNER RADII 0.8		CHECKED DVN: 22556
X.XXX ±0.125 CORNER CHAMFER 1.0 X 45°		SHEET 1 OF 1
ANGLES ±0.5° REMOVE ALL BURRS AND SHARP EDGES	DESCRIPTION	DATE: 20-MAR-06
	3" PNEUMATIC BOTTOM OPERATED VALVE	DRG. NO.
	3" PNEUMATIC EMERGENCY VALVE	<b>295/0540X</b>

A1 UNITS mm



## 2 1/2" BSP MEGA SUPERVENTIX™

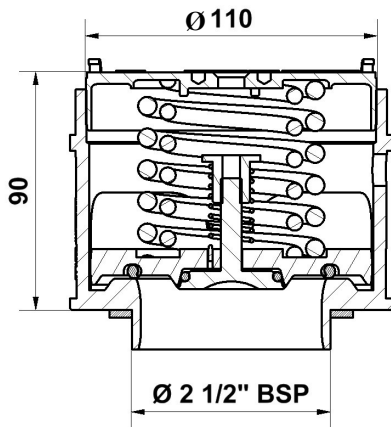
Series MX65F Pressure & Vacuum Safety relief valve

The PEROLO 2 1/2" BSP MEGA SUPERVENTIX™ safety relief valve is designed to protect tanks against accidental overpressure and excessive vacuum. With a smart compact design, the 2 1/2" BSP MEGA SUPERVENTIX™ SRV has a high flow performance.

Made of 316L/1.4404 stainless steel, this product is suitable for ISO tank containers, IBC's, rail tank cars, road tankers and static tanks dedicated to the transport and storage of chemicals and liquid foodstuff.



### Specifications



- Nominal diameter: 65mm (2 1/2 ")
- Maximum weight : 2,8 kg
- Connection: 2 1/2 " BSP
- Standard pressure settings: 2.18, 3.75, 4.40, 7.33 Bar.
- Standard vacuum setting: 0.21 bar  
*Other pressure & vacuum settings available on request*
- Certified Flow rate
- Design temperature: -40°C +190°C

### Flow rate

Set Pressure			Measured flow rate at 120 % without gauze		Certified flow rate with the federal Register coefficient 90% without gauze	
Bar	KPa	PSIG	Sm <sup>3</sup> /s	Scfm	Sm <sup>3</sup> /s	Scfm
+/- 0.14	+/- 14	+/- 2				
2,18	218	31,6	2,560	5425	2,304	4883
3,75	375	54,4	3,918	8301	3,526	7471
4,40	440	63,8	4,480	9492	4,032	8544
7,33	733	107,3	6,987	14803	6,288	13324

- Flow measurement conditions : 101.3 kPa, 15°C.

### Features

- Full 316L/1.4404 stainless steel construction
- Compact design
- Supplied with/without vacuum
- FEP seals
- High flow rates performance

### Approval & Certifications

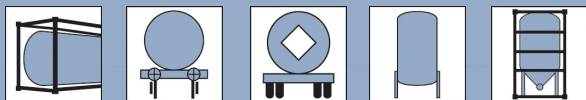
- Comply with IMDG 2008 & ADR 2009
- Certified and approved by Lloyd's Register

### Options

- Flame proof gauze
- Option PED CE 97/23/EC ⇨ Series MP65
- Spring Halar coated
- Vacuum test button
- Composite or Perbunan setting gasket

### Accessories

- Weld in flange. Part# 12 91 14 00 00.
- Recess flange. Part# 12 92 14 00 00.
- Bursting disc
- Bursting disc adaptor flange. Part# 11 91 15 00 00.
- Pressure gauge. Part# 70 21 02 00 22.



## Codification

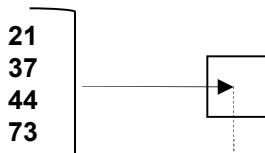
1. Base code of your Mega-SUPERVENTIX™



2. Set Pressure

- 2.18 Bar
- 3.75 Bar
- 4.40 Bar
- 7.33 Bar

Other on request



3. Seal type pressure/vacuum

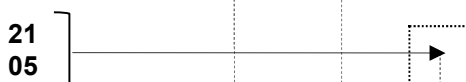
- FEP



4. Vacuum (Optional)

- 0.21 Bar
- 0.05 Bar

Other on request



5. Flame proof gauze

- With
- Without



6. Setting gasket type

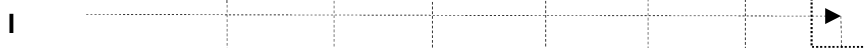
- Composite/ PTFE
- Rubber/PTFE



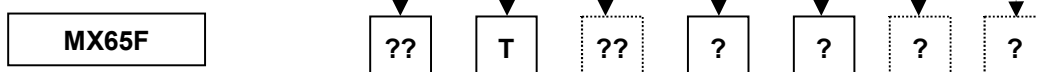
7. Vacuum test button (Optional)



8. Halar coating (Optional)



Final code of your Mega-SUPERVENTIX




STANDARD PART#



For any specific requests, please feel free to contact our sales department at [sales@perolo.com](mailto:sales@perolo.com)




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Sizing - Medium			
1000	Designation	Air	
1004	Formula		
1001	Molar mass	M	29 kg/kmol
1002	Ratio of specific heats	k	1.400
1003	Compressibility factor	Z	1.000

Sizing - Firecase			
1050	Calculation type		Unwetted
1051	Type of vessel		Horizontal
1052	Vessel head design		Flat head
1054	Vessel diameter	D	
1055	Vessel length	L	
1070	Exposed surface area of the vessel, calculated	A'	
1071	Exposed surface area of the vessel, manual	A'	
1063	Vessel wall temperature	Tw	
1064	Normal operating gas pressure	Pn	
1065	Normal operating gas temperature	Tn	
1068	Coefficient of discharge	Kd	0.975
1069	Minimum value of factor F'	F'min	0.010
1072	Minimum required mass flow	W	
1073	Minimum required effective discharge area	A	

Sizing - Service condition			
1009	Case for blow off		Firecase
1100	Maximum allowable working pressure		
1101	Set pressure	p	152.29 psi-g
1102	Superimposed back pressure	paf	0 psi-g
1103	Built up back pressure	pae	
1104	Backpressure		0 psi-g
1105	Overpressure	dp	21.00 %
1106	Environmental pressure	pu	14.696 psi
1107	Temperature	T	545.67 °R
1108	Required massflow	qm,ab	
1109	Volume flow to be discharged (working condition)	qvb,ab	
1110	Volume flow to be discharged (std condition) [T=60 °F P=14.7 psi]	qvn,ab	
1120	Rupture disc correction factor	Kc	1.000

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Sizing - Calculation				
1200	Certified massflow	qm,zu	3,121.392	lb/h
1201	Certified volumeflow (operating condition)	qvb,zu	3,167.785	ft³/h
1203	Certified volumeflow (standard condition)	qvn,zu	1,156.274	m³/h
1204	Maximum mass flow	qm,max	3,468.214	lb/h
1205	Maximum volume flow (working condition)	qvb,max	3,519.762	ft³/h
1206	Maximum volume flow (standard condition)	qvn,max	1,284.749	m³/h
1207	Capacity exceed			


Valve - General				
1500	Article number			5264.0242
1512	Reseller article number			
1513	Quantity of safety valve			1
1501	Certified coefficient of discharge for steam and gases	K,DG		0.801
1502	Certified coefficient of discharge for liquid	K,F		0.579
1453	Orifice			E
1505	Bonnet / Lifting device			Cap H2
1506	Body-/ Inlet base material			1.4408 / SA 351 CF8M
1511	Bonnet			Closed Bonnet
1514	Order code		5264.0242-152.29 psi_g- H64H79H03H01-3.1	

Inlet connection				
1303	Connection standard			acc. to ASME B16.5
1304	DN / NPS			1"
1305	PN / PR			#150
1306	Flange facing			RF

Outlet connection				
1353	Connection standard			acc. to ASME B16.5
1354	DN / NPS			2"
1355	PN / PR			#150
1356	Flange facing			RF

Valve - Dimensions				
1400	Discharge area	Ao	0.239	in²
1401	Discharge diameter	do	0.551	inch
1402	Centre to Face dimensions	a	4.134	inch
1403	Centre to Face dimensions	b	4.488	inch
1405	Height	H	17.323	inch
1406	Weight	M	38.14	lb
1411	Inlet flange thickness incl. raised face	S1	1.181	inch

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Lift			
1507	Standard		0.154 inch

Valve - Calculation			
1200	Certified massflow	qm,zu	3,121.392 lb/h
1201	Certified volume flow (operating condition)	qvb,zu	3,167.785 ft <sup>3</sup> /h
1203	Certified volume flow (standard condition)	qvn,zu	1,156.274 m <sup>3</sup> /h
1204	Maximum mass flow	qm,max	3,468.214 lb/h
1205	Maximum volume flow (working condition)	qvb,max	3,519.762 ft <sup>3</sup> /h
1206	Maximum volume flow (standard condition)	qvn,max	1,284.749 m <sup>3</sup> /h
1207	Capacity exceed		
1600	Required actual discharge area	Ao, req	
1601	Required discharge diameter	do,req	
1617	Back pressure correction factor	Kb	1.000
1618	Cold differential test pressure	CDTP	152.29 psi-g
1620	Cold differential test pressure, manually	CDTP	

Valve - Inspections	
H03	LESER CGA: Inspection certificate 3.1 acc. to DIN EN 10204, Declaration of conformity acc. to PED 97/23/EC

Valve - Material certificates	
H01	Material test certificate for body acc. to DIN EN 10204-3.1

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Valve - Part list					
	PosNo	Denomination	Q	Material ASME	Material DIN
12010	1	Body	1	SA 351 CF8M	1.4408
12050	5	Full nozzle	1	CF8M or 316L	1.4408 or 1.4404
12060	6	Adjusting ring	1	CF8M	1.4408
12070	7	Disc	1	316L stellited	1.4404 stellitiert
12080	8	Guide	1	316L	1.4404
12090	9	Bonnet	1	SA 479 316L	1.4404
12120	12	Spindle	1	420	1.4021
12140	14	Split ring	2	316L	1.4404
12160	16	Spring plate	1	316L	1.4404
12170	17	Spring plate	1	316L	1.4404
12180	18	Adjusting screw	1	316L tenifer	1.4404 tenifer
12190	19	Lock nut	1	316L	1.4404
12220	22	Lift stopper	1	316L	1.4404
12400	40	Cap H2	1	Steel	1.0718
12540	54	Spring	1	Stainless steel	1.4310
12550	55	Bolt	4	B8M	1.4401
12560	56	Nut	4	8M	1.4401
12570	57	Ball	15	316	1.4401
12600	60	Gasket	1	Graphite / 316	Graphit / 1.4401
12610	61	Ball washer	1	316	1.4401
12660	66	Hex. nut	1	B8M	1.4401
12690	69	Thrust needle bearing	1	316L	1.4404
12730	73	Locking screw	1	8M	1.4404

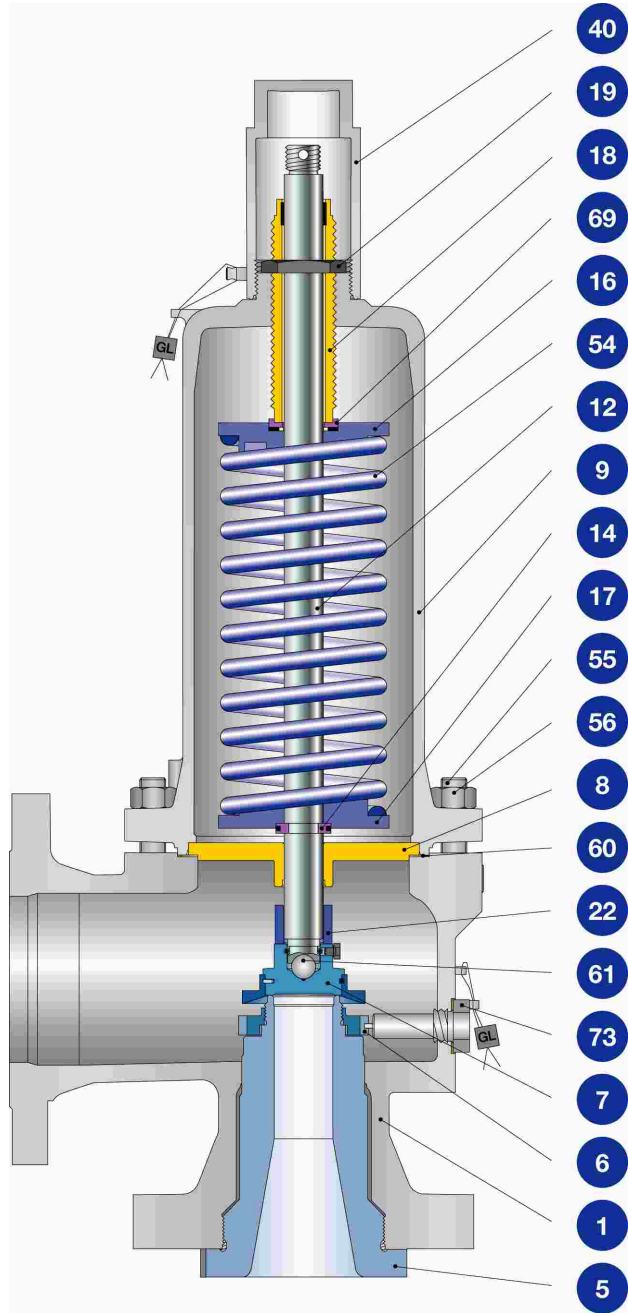
LESER is free to upgrade materials without further notice.

Spare parts						
Part number	PosNo	Denomination	Startup	2 year oper.	5 year oper.	
207.2049.9000	5	Full nozzle 526 NPS 1 E CL 150-600	0	0	1	
242.7339.0000	12	Spindle 16x 267.8	0	0	1	
510.0604.0000	57	Ball D 3	3	6	15	
500.0807.0000	60	Gasket V32	1	1	2	
510.0204.0000	61	Ball D 9	1	1	1	

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**Drawing**

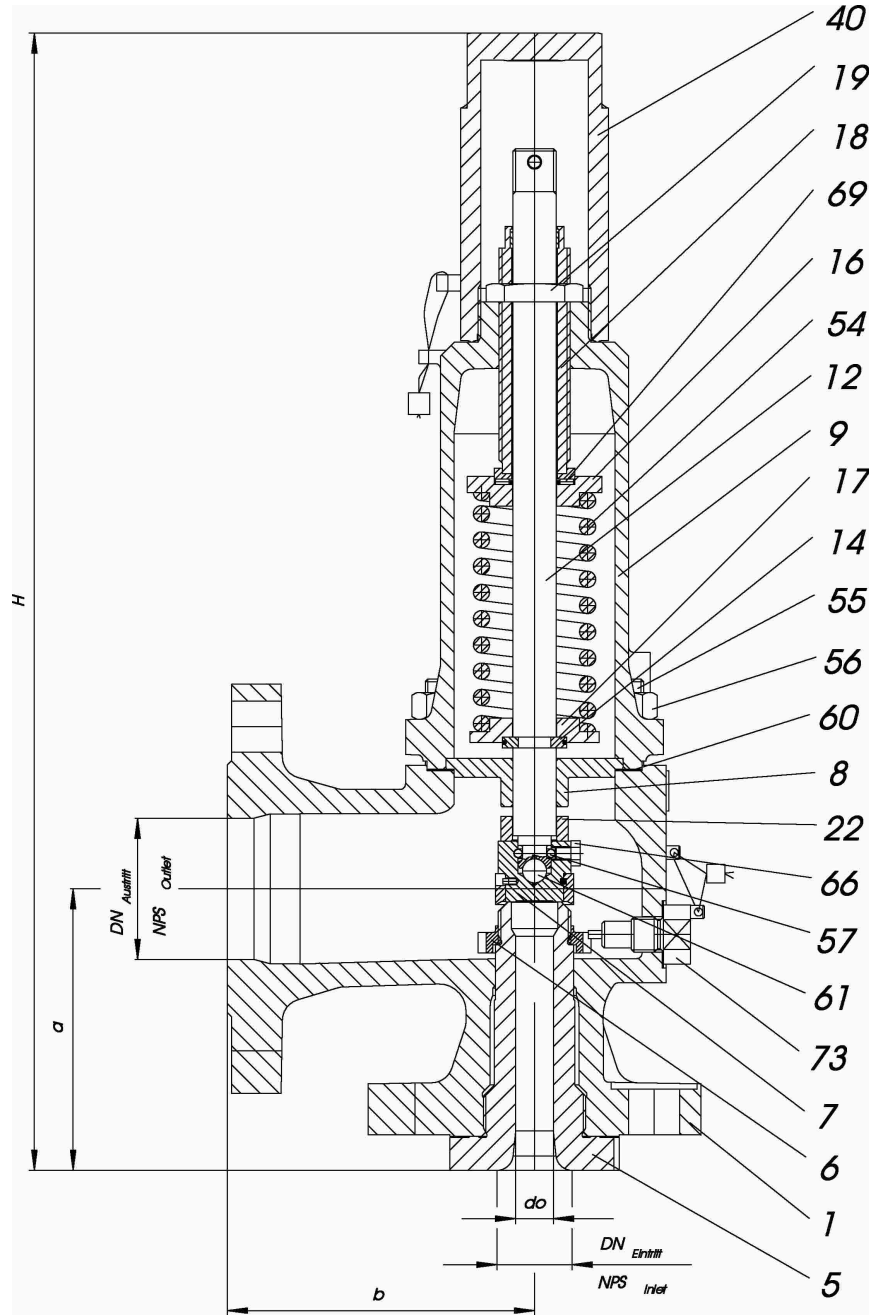


Drawing is a view; the effective geometry could deviate from this view.

Name	Default user				
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**Drawing**






Drawing is a view; the effective geometry could deviate from this view.





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**ASME nameplate**


**TYPE 5264.0242**  
 NPS 1"X2"    657 SCFM  
 CDTP 152.29 ps set-p    152.29 psig  
 back-p 0 psig  
  
 0045

**DIN nameplate**

 5264.0242  
   
 04-1082  
 D0 14.0 D/G 0.801 F 0.58     152.29 psig  
 0045




**World nameplate**

 Tag PSV-01  
 Type 5264.0242    Size 1"    Serial no.  
 Flow area 154 mm<sup>2</sup>    d<sub>0</sub> 14.0 mm    Seat  


	Set p.	Back p.	CDTP	Temp.
bar	10.5	0	10.5	30.00 °C
psig	152.29	0	152.29	86.00 °F

TÜV-SV	Lift 3.90 mm ISO 4126-1	ASME-Cap.
04-1082	Steam 0.80	1793 lbs/hr
Date	Gas 0.80	657 SCFM
	Liquid 0.58	68 GPM

5264.0242-152.29 psi\_g-H64H79H03H01-3.1

 0045  
 cc2408  


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Sizing - Medium			
1000	Designation	Air	
1004	Formula		
1001	Molar mass	M	29 kg/kmol
1002	Ratio of specific heats	k	1.400
1003	Compressibility factor	Z	1.000

Sizing - Firecase			
1050	Calculation type		Unwetted
1051	Type of vessel		Horizontal
1052	Vessel head design		Flat head
1054	Vessel diameter	D	
1055	Vessel length	L	
1070	Exposed surface area of the vessel, calculated	A'	
1071	Exposed surface area of the vessel, manual	A'	
1063	Vessel wall temperature	Tw	
1064	Normal operating gas pressure	Pn	
1065	Normal operating gas temperature	Tn	
1068	Coefficient of discharge	Kd	0.975
1069	Minimum value of factor F'	F'min	0.010
1072	Minimum required mass flow	W	
1073	Minimum required effective discharge area	A	

Sizing - Service condition			
1009	Case for blow off		Firecase
1100	Maximum allowable working pressure		
1101	Set pressure	p	152.29 psi-g
1102	Superimposed back pressure	paf	0 psi-g
1103	Built up back pressure	paе	
1104	Backpressure		0 psi-g
1105	Overpressure	dp	21.00 %
1106	Environmental pressure	pu	14.696 psi
1107	Temperature	T	545.67 °R
1108	Required massflow	qm,ab	
1109	Volume flow to be discharged (working condition)	qvb,ab	
1110	Volume flow to be discharged (std condition) [T=60 °F P=14.7 psi]	qvn,ab	
1120	Rupture disc correction factor	Kc	1.000

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Sizing - Calculation				
1200	Certified massflow	qm,zu	910.595	lb/h
1201	Certified volume flow (operating condition)	qvb,zu	924.129	ft <sup>3</sup> /h
1203	Certified volume flow (standard condition)	qvn,zu	337.316	m <sup>3</sup> /h
1204	Maximum mass flow	qm,max	1,011.772	lb/h
1205	Maximum volume flow (working condition)	qvb,max	1,026.81	ft <sup>3</sup> /h
1206	Maximum volume flow (standard condition)	qvn,max	374.796	m <sup>3</sup> /h
1207	Capacity exceed			

Valve - General				
1500	Article number			4374.3142
1512	Reseller article number			
1513	Quantity of safety valve			1
1501	Certified coefficient of discharge for steam and gases	K,DG		0.458
1502	Certified coefficient of discharge for liquid	K,F		0.333
1453	Orifice			0.52xD
1505	Bonnet / Lifting device			Cap H2
1506	Body-/ Inlet base material			1.4404 / 316L
1511	Bonnet			Closed Bonnet
1514	Order code	4374.3142-152.29 psi_g- V62V71H03H01-3.1		


Inlet connection		
1307	Thread standard	NPT - Male thread acc. to ANSI/ASME B1.20.1
1308	DN	NPT 3/4"

Outlet connection		
1357	Thread standard	NPT - Female thread acc. to ANSI/ASME B1.20.1
1358	DN	NPT 1"

Valve - Dimensions				
1400	Discharge area	Ao	0.122	in <sup>2</sup>
1401	Discharge diameter	do	0.394	inch
1402	Centre to Face dimensions	a	1.299	inch
1403	Centre to Face dimensions	b	1.457	inch
1405	Height	H	8.583	inch
1406	Weight	M	2.646	lb
1413	Thread length	C	0.866	inch

Lift				
1507	Standard		0.055	inch

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 The-Safety-Valve.com	<b>Sizing acc. to          API 520 for Gas          VALVESTAR® - v.7.2.3.1205</b>	Page:	3 of 7
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		Project:	New project
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Valve - Calculation				
1200	Certified massflow	qm,zu	910.595	lb/h
1201	Certified volume flow (operating condition)	qvb,zu	924.129	ft <sup>3</sup> /h
1203	Certified volume flow (standard condition)	qvn,zu	337.316	m <sup>3</sup> /h
1204	Maximum mass flow	qm,max	1,011.772	lb/h
1205	Maximum volume flow (working condition)	qvb,max	1,026.81	ft <sup>3</sup> /h
1206	Maximum volume flow (standard condition)	qvn,max	374.796	m <sup>3</sup> /h
1207	Capacity exceed			
1600	Required actual discharge area	Ao, req		
1601	Required discharge diameter	do,req		
1617	Back pressure correction factor	Kb	1.000	
1618	Cold differential test pressure	CDTP	152.29	psi-g
1620	Cold differential test pressure, manually	CDTP		

Valve - Inspections	
H03	LESER CGA: Inspection certificate 3.1 acc. to DIN EN 10204, Declaration of conformity acc. to PED 97/23/EC

Valve - Material certificates	
H01	Material test certificate for body acc. to DIN EN 10204-3.1

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Valve - Part list					
	PosNo	Denomination	Q	Material ASME	Material DIN
12010	1	Inlet body	1	316L	1.4404
12020	2	Outlet body	1	316L	1.4404
12070	7	Disc incl. detachable lifting aid	1	316L	1.4404
12120	12	Spindle	1	316L	1.4404
12160	16	Spring plate	1	316L	1.4404
12170	17	Spring plate	1	316L	1.4404
12180	18	Adjusting screw	1	316L	1.4404
12190	19	Lock nut	1	316L	1.4404
12400	40	Lever cover H4	1	316L	1.4404
12540	54	Spring	1	Stainless steel	1.4310
12570	57	Pin	1	Stainless steel	1.4310
12610	61	Ball washer	1	Hardened Stainless steel/316	1.3541/1.4401

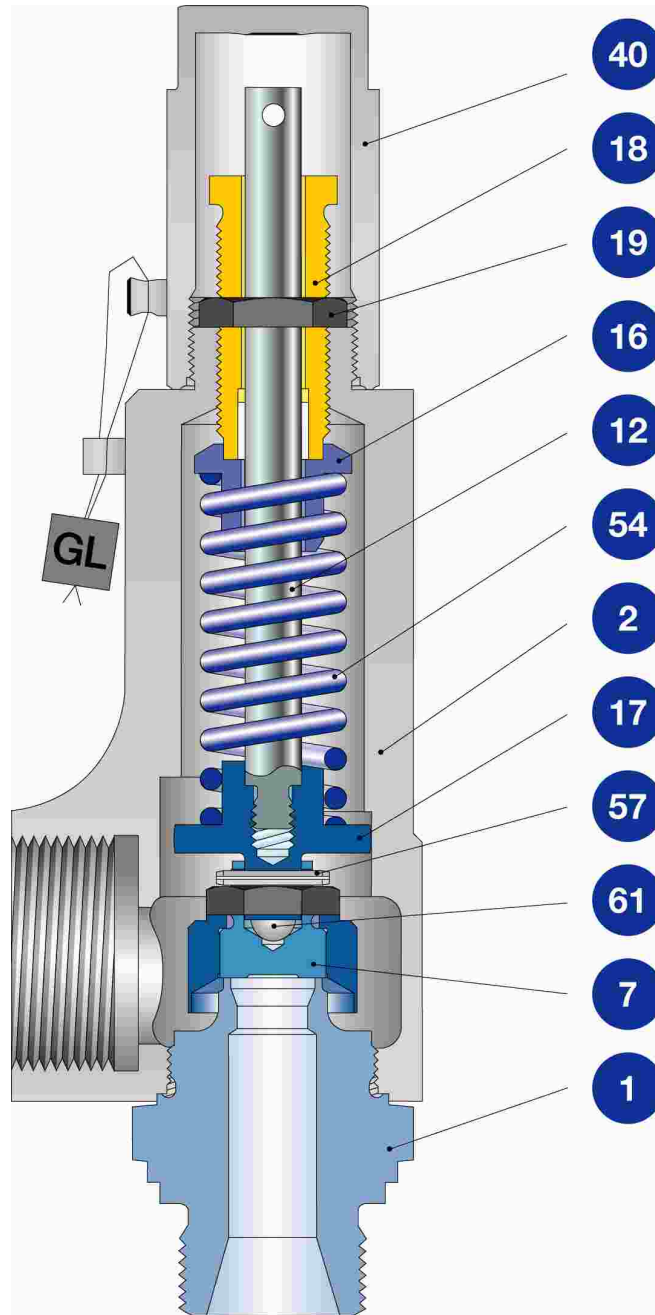
LESER is free to upgrade materials without further notice.

Spare parts					
Part number	PosNo	Denomination	Startup	2 year oper.	5 year oper.
205.3349.9000	7	Disc kompl. D0 10	1	1	1
242.5849.0000	12	Spindle 8x105	0	0	1
480.2405.0000	57	pin 3x24	1	1	1
510.0104.0000	61	Ball D 6	1	1	1

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**Drawing**

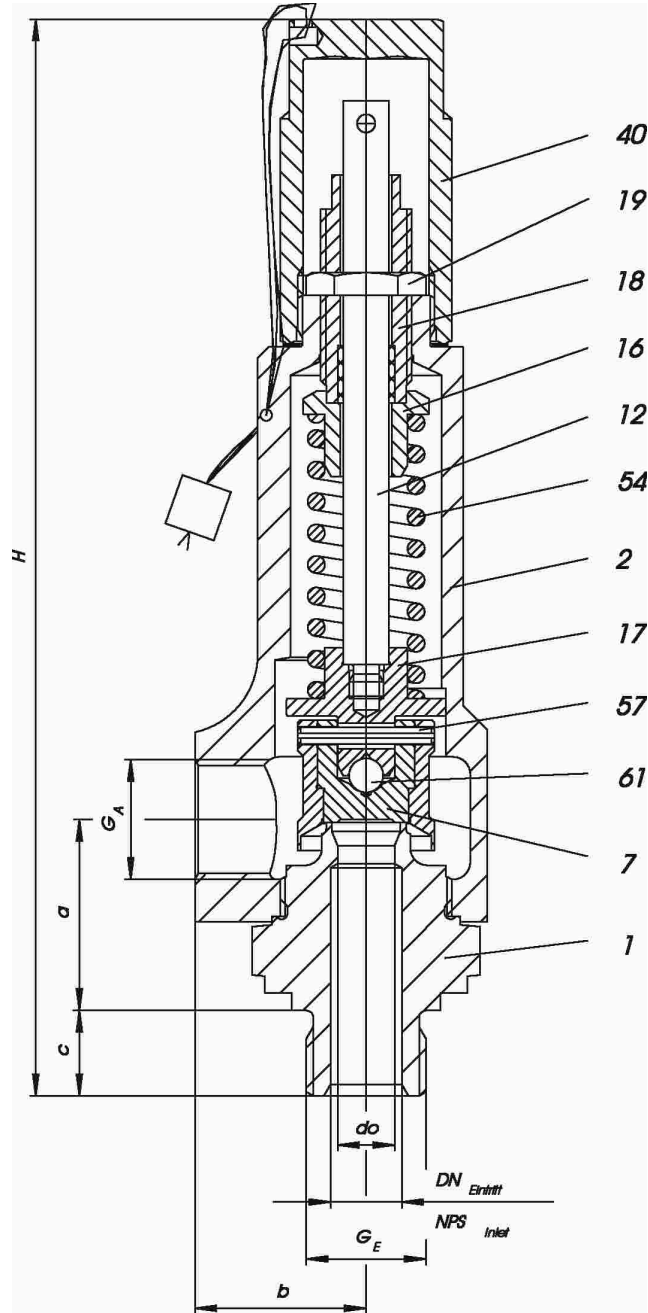


Drawing is a view; the effective geometry could deviate from this view.

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**Drawing**






Drawing is a view; the effective geometry could deviate from this view.

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**ASME nameplate**


**TYPE 4374.3142**  
 NPS NPT 3/4" 192 SCFM  
 CDTP 152.29 ps set-p 152.29 psig  
 back-p 0 psig


  
 0045

**DIN nameplate**


 4374.3142

 TUEV-SV  
 04-980

DO 10.0 D/G 0.458 F 0.33

 152.29 psig  
 0045

**World nameplate**


 Tag PSV-02




Type 4374.3142 Size NPT 3/ Serial no.

Flow area 79 mm<sup>2</sup> d<sub>0</sub> 10.0 mm Seat

	Set p.	Back p.	CDTP	Temp.
bar	10.5	0	10.5	30.00 °C
psig	152.29	0	152.29	86.00 °F

TÜV-SV	Lift 1.40	mm ISO 4126-1	ASME-Cap.
04-980	Steam	0.46	523 lbs/hr
Date	Gas	0.46	192 SCFM
	Liquid	0.33	20 GPM

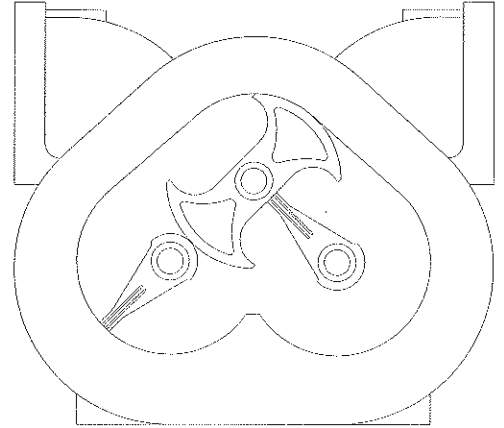
 4374.3142-152.29 psi\_g-V62V71H03H01-3.1

 0045  
 cc2408  


Name	Default user			
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Rev.No	1			

## Meter Overview

The TCS Model 700 series flow meter is a simple and efficient design. The meter consists of a single fluid chamber that contains a single blocking rotor and two displacement rotors whose rotation is synchronized with mating gears. As the fluid enters the fluid chamber, the blocking rotor is forced to rotate. The displacement rotors, also rotating in conjunction with the blocking rotor help direct the fluid flow through the chamber and to the outlet. The linear flow of the fluid is thus translated into rotary motion in the meter. The output of the meter is picked up from the rotation of the blocking rotor and transmitted to a register or pulse transmitter.



The rotors in the meter are designed to operate at close tolerances to one another and the wall of the fluid chamber. There are slight clearances between the rotors and the chamber wall. Because of this, it is important that the meter be properly applied for the flow rate and operating pressure of the system.

Because the fluid flowing through the meter is redirected only slightly from its natural flow, there is very little pressure drop across the meter, unlike other meters that use multiple measuring chambers.

The meter design uses high performance materials for the rotor bearings and journals. Since there is no contact between the rotors and the fluid chamber wall, these critical components have a long life expectancy.

Calibration of the meter involves adjusting the rotation of the output shaft relative to the rotation of the internal rotors of the meter. This is accomplished by changing the settings on an adjuster device. Calibration of the meter is discussed in detail in the section Meter Calibration.

### FLOW ILLUSTRATION



## Meter Specifications

Flange Connection:	2" NPT Flange Connection, 1-1/2" NPT Flange. Optional BSPT, Slip Weld or ANSI flanges available upon request.
Flow Rate:	700-20 up to 100 GPM (380 LPM) 700-25 up to 150 GPM (567 LPM); only for fluids under 225 SSU
Maximum Pressure:	150 PSI (10.5 BAR)
Working Temperature:	-20 F to 160 F (-28.9 C to 71 C)

## Meter Types

### SP - Standard Petroleum

For metering refined petroleum products such as Leaded and Unleaded Gasoline, Fuel Oils, Diesel, Bio-Diesel, Kerosene, Jet Fuels, Vegetable Oils, Motor Oils, Ethylene Glycol (Antifreeze), etc.

### SPA - Standard Petroleum (Aviation)

For metering refined petroleum products such as Aviation Gasoline, Fuel Oils, Jet Fuels, Gasoline, Diesel, Bio-Diesel, Kerosene, etc.

### SPD - Standard Petroleum (Ductile Iron)

For metering refined petroleum products such as Aviation Gasoline, Ethanol Blends, Methanol Blends, Gasoline, Fuels Oils, Diesel, Bio-Diesel, Kerosene, etc.

### IC - Industrial Products (Carbon Bearings)

For metering Industrial Chemicals, General Solvents, Water and other Non-lubricating Liquids, such as Alcohol, Acetones, Ethanol, Naptha, Xylene, MEK, Toluene, Deionized Water, Demineralized Water, Potable Water, etc.

### IP - Industrial Products

For metering Industrial Chemicals, General Solvents and many other liquids; such as Liquid Sugars, Corn Syrup, Soy Bean Oil, Shortenings, Latex Products, Adhesives, etc.

### AF - All Ferrous

For metering Pesticides, Nitrogen Solutions, Fertilizer, Chlorinated Solvents, Paints, Inks, Alcohols, Adhesives, Motor Oils, Molasses, Corn Syrup, Liquid Sugars, etc.

### SS - Stainless Steel

For metering the same liquids as the SP, SPA, SPD, IP, IC and AF flow meters, but includes food processing and special handling fluids such as Nitric, Phosphorus and Glacial Acetic Acids, Anti-Icing Fluids, Vinegar, Fruit Juices, etc.

### SSD - Stainless Steel (DEF)

For metering Diesel Exhaust Fluid (DEF), Ad-Blue, ARLA and AUS32.



## Material of Construction

Description	SP	SPA	SPD	IP	IC	AF	SS	SSD
Housing	Hardcoat Anodized Aluminum	Hardcoat Anodized Aluminum	Ductile Iron	Hardcoat Anodized Aluminum	Hardcoat Anodized Aluminum	Ductile Iron	Stainless Steel	Stainless Steel
Rotors	Hardcoat Anodized Aluminum	Hardcoat Anodized Aluminum	Ni-Resist	Hardcoat Anodized Aluminum	Hardcoat Anodized Aluminum	Ni-Resist	Stainless Steel	Stainless Steel
Rotor Journals	Plated SS	Plated SS	Plated SS	Plated SS	Plated SS	Plated SS	Plated SS	Plated SS
Bearing Plates	Ni-Resist	Ni-Resist	Ni-Resist	Ni-Resist	Ni-Resist	Ni-Resist	Stainless Steel	Ryton
Bearing Sleeves	Ni-Resist	Carbon Graphite	Carbon Graphite	Ni-Resist	Carbon Graphite	Carbon Graphite	Carbon Graphite	Ryton
Timing Gears	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
Packing Seal	Viton®	Viton®	Simriz®	Simriz®	Simriz®	Simriz®	Simriz®	EPDM
Body O-rings	FKM	FKM	PTFE	PTFE	PTFE	PTFE	PTFE	EPDM

Simriz® is a registered trademark of Freudenberg-NOK.

## System Recommendations



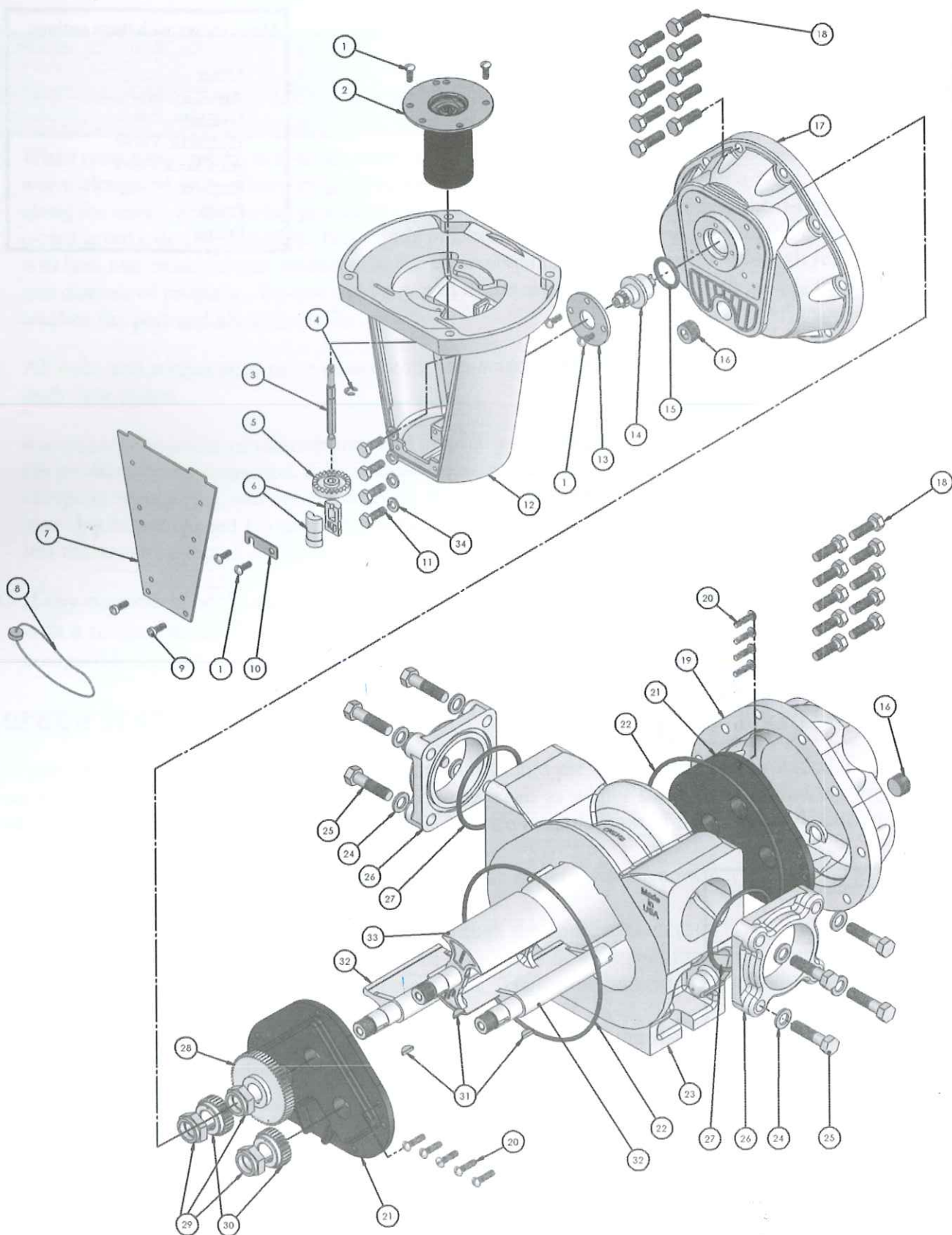
### Meter Selection

The flow meter must be carefully chosen from the Meter Selection factors in the Engineering Manual. The meter must be selected based on the operating system and product characteristics. System variables include flow rate, temperature and pressure. The product characteristics include the material compatibility, lubricity, viscosity, suspensions, pH, and whether the product can congeal, crystallize or leave a dry film. Failure to select the correct flow meter may result in system failure or serious injury.

### Air Elimination

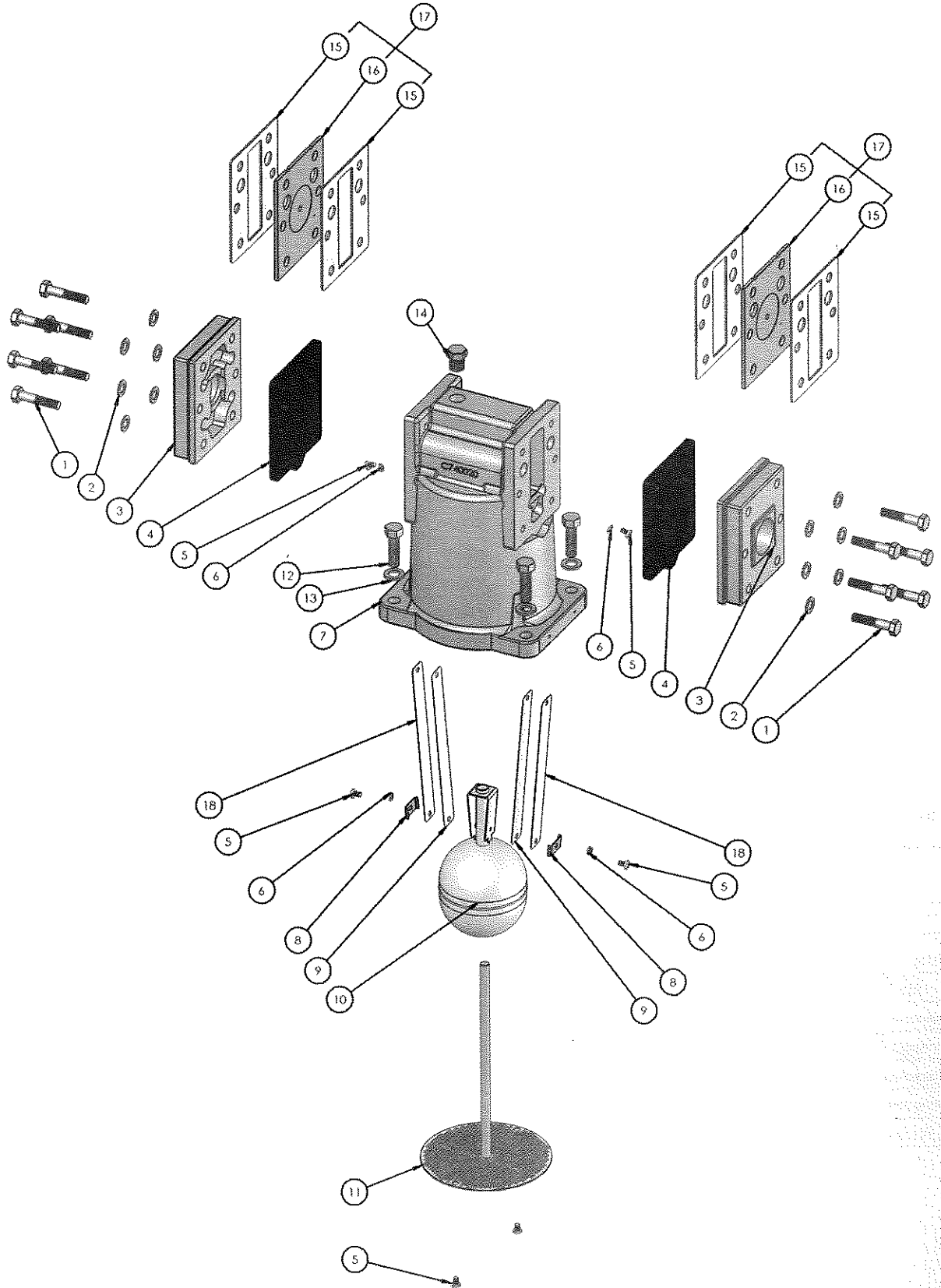
In any system that the tank may be completely drained or multiple products manifold into one metering system, the possibility of air being present increases. The solution is an air or vapor eliminator located before the flow meter to vent the air or vapor from the system before it can be measured. Air or vapor elimination is required for all weights and measures regulatory approvals in custody transfer applications.

# 700-20 / 700-25 Meter Assembly





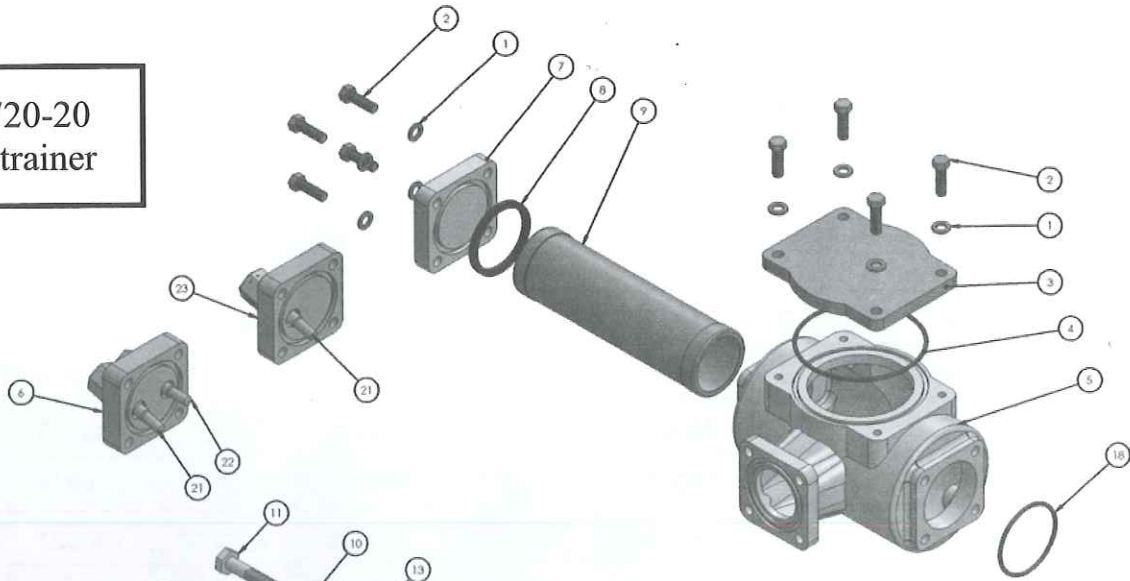
# 730-20 Air Eliminator Assembly



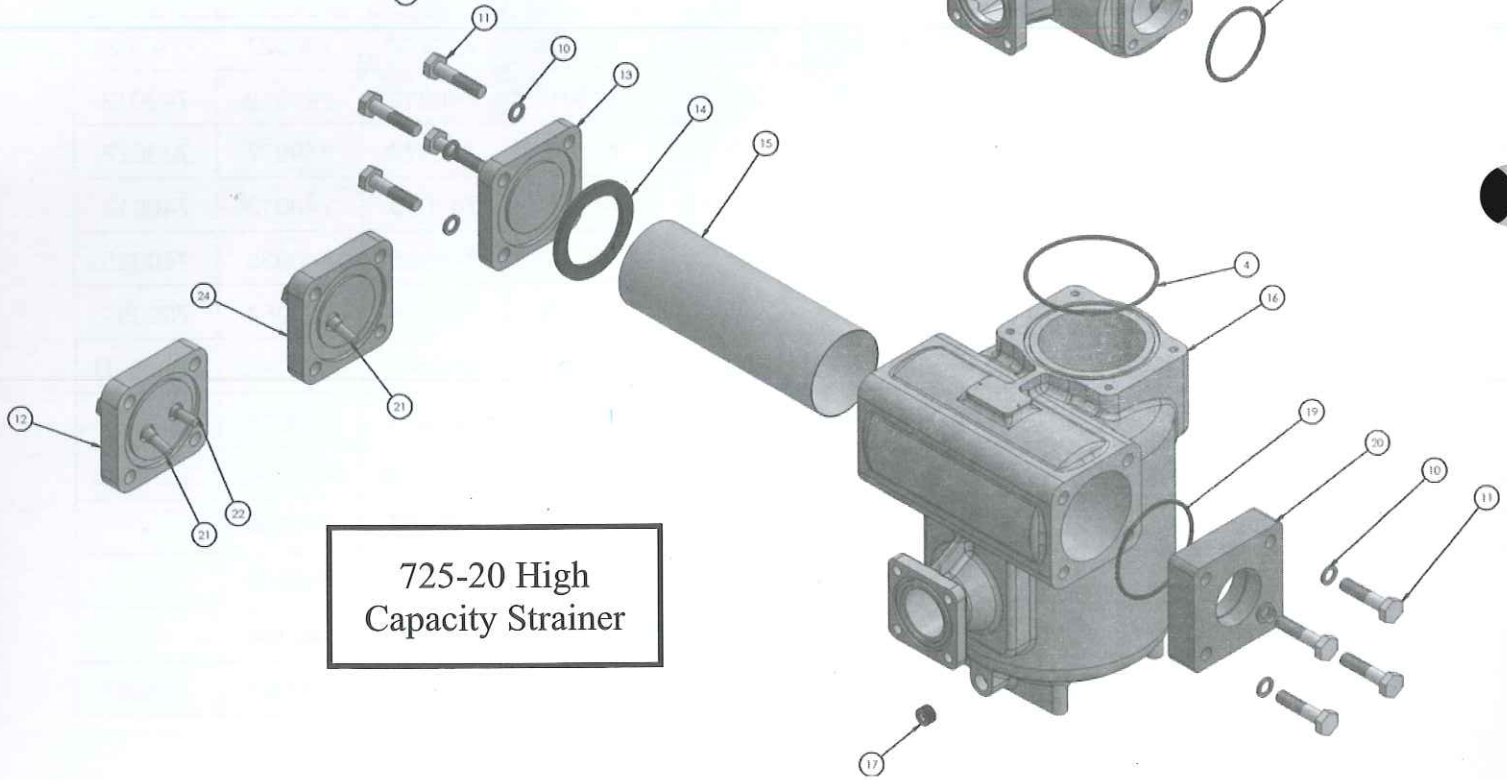


# 720-20 Strainer / 725-20 High Capacity Strainer Assembly

720-20  
Strainer

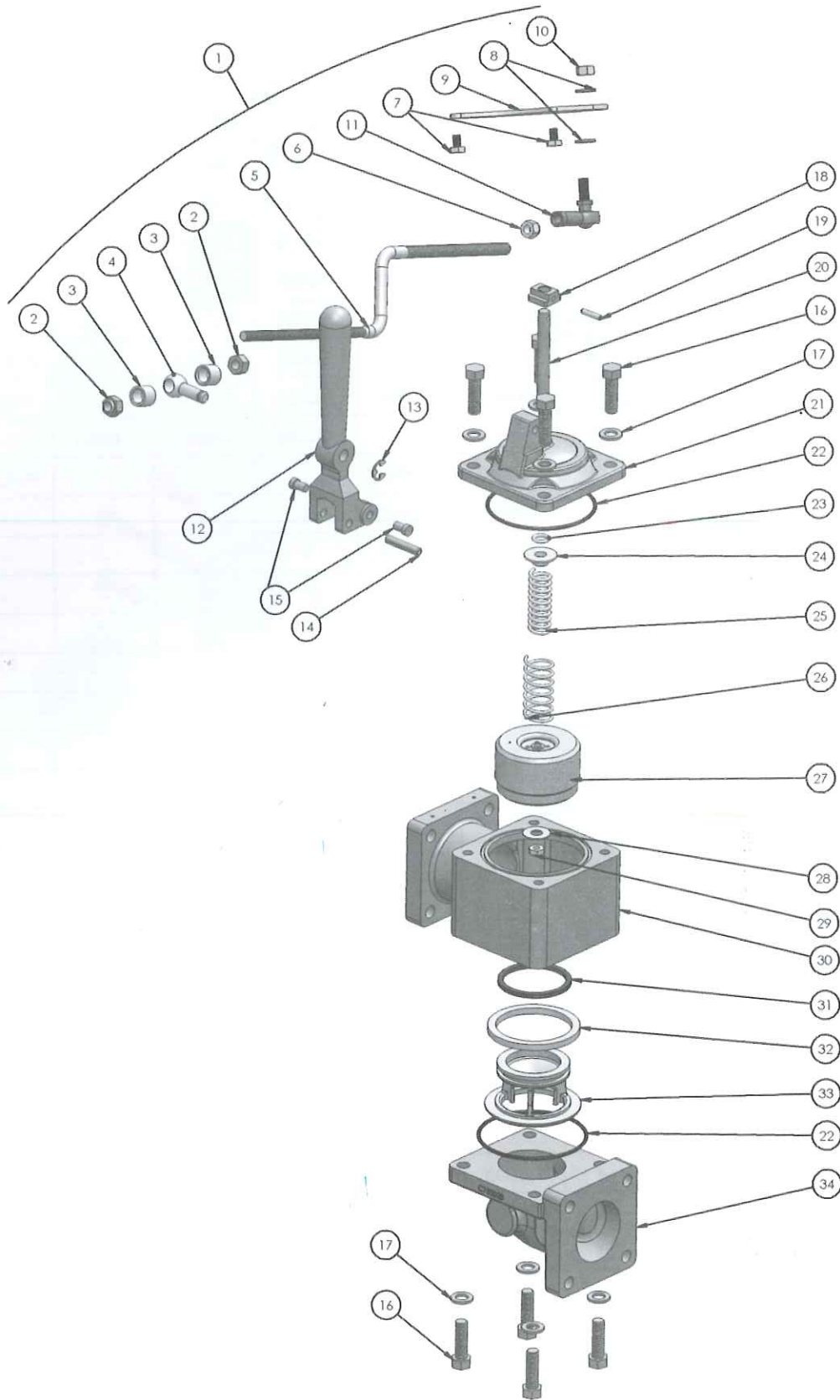


725-20 High  
Capacity Strainer





# 750-20 Hydraulic Preset Valve Assembly

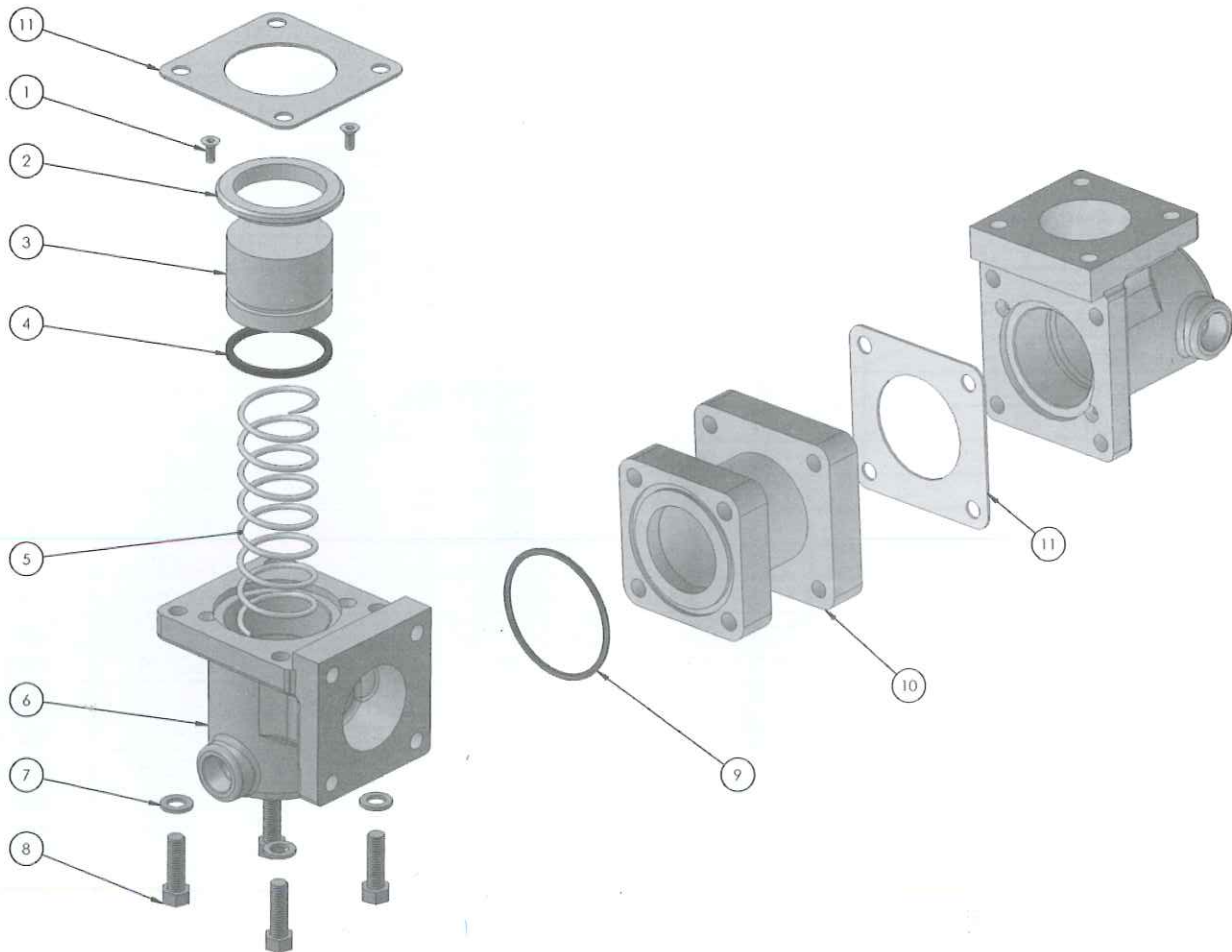




## 750-20 Hydraulic Preset Valve Assembly

Item	Description	Qty	750-20				
			SP	IP	AF	SS	SSD
1	Linkage Assembly Kit	1	752002KT	752002KT	752002KT	752002KT	752002KT
2	Linkage Lock Nut	2	750001	750001	750001	750001	750001
3	Linkage Sleeve	2	750002	750002	750002	750002	750002
4	Linkage Spherical Pivot	1	750003	750003	750003	750003	750003
5	Linkage Arm	1	752001	752001	752001	752001	752001
6	Hex Nut	1	750010	750010	750010	750010	750010
7	Linkage Screw	2	750011	750011	750011	750011	750011
8	Flat Washer	2	68001	68001	68001	68001	68001
9	Preset Bracket	1	752099	752099	752099	752099	752099
10	Locking Nut	1	750012	750012	750012	750012	750012
11	Ball & Stud	1	753053	753053	753053	753053	753053
12	Operating Lever	1	752010	752010	752010	752010	752010
13	Linkage E-Ring	1	750004	750004	750004	750004	750004
14	Roll Pin	1	752004	752004	752004	752004	752004
15	Step Pin	2	752005	752005	752005	752005	752005
16A	Cap Screw	4	700054	700054	700054	700054	700054
16B	Drilled Cap Screw	4	700054D	700054D	700054D	700054D	700054D
17	Flat Washer	8	702018	702018	702018	702018	702018
18	Bushing	1	752006	752006	752006	752006	752006
19	Roll Pin	1	752007	752007	752007	752007	752007
20	Valve Shaft	1	752008	752008	752008	752008	752008
21	Valve Cap	1	752015	752015	752017	752018	752018
22	Body O-ring	2	752044	752045	752045	752045	752045
23	O-ring	1	752011	752012	752012	752012	752012
24	O-ring Retainer	1	752013	752013	752013	752013	752013
25	Internal Spring	1	752019	752019	752019	752019	752019
26	External Spring	1	752014	752014	752014	752014	752014
27	Piston	1	752020	752020	752022	752022	752022
28	Washer	1	752023	752023	752023	752023	752023
29	Lock Nut	1	752024	752024	752024	752024	752024
30	Valve Body	1	752040	752040	752042	752043	752043
31	Upper Seal	1	752035	752036	752036	752036	752036
32	Lower Seal	1	752033	752034	752034	752034	752034
33	Piston Guide	1	752030	752031	752032	752032	752032
34	Elbow	1	752041	752041	752027	752028	752028

## 760-20SP / 765-20SP Air Check Valve Assembly



Item	Description	Quantity	760-20	765-20
			SP	SP
1	Screw	2	792004	792004
2	Ring	1	792003	792003
3	Poppet	1	792002	792002
4	Gasket	1	792005	792005
5	Compression Spring	1	792001	792001
6A	Housing; 1/2" NPT	1	792011	792011
6B	Housing, 1/2" BSPT	1	792711	792711
7	Flat Washer	4	702018	702018
8A	Cap Screw	2	792015	792015
8B	Drilled Cap Screw	2	792015D	792015D
9	Adapter O-ring; 765 Air Check	1	-	702012
10	Adaptor; 765 Air Check	1	-	702665
11	Valve Gasket	1	752039	752039

## Torque Specifications

### 700-20/25 METER ASSEMBLY

Part Number & Description	Tool	Bolt/Nut Size	Foot Lbs.		Newton Meter	
			Unlubricated	Lubricated	Unlubricated	Lubricated
TCS 700026 Cover Screws	1/2" hex wrench/socket	5/16-18 UNC 2B	11	6.6	14.9	8.9
TCS 700040 Counter Support	7/16" hex wrench/socket	1/4-20 UNC 2B	6.3	3.8	8.5	5.2
TCS 702014 Bearing Plate	slotted screwdriver	10-24 UNC 2B	1.9	1.1	2.6	1.5
TCS 1-128279 Dust Cover	slotted screwdriver	10-24 UNC-2B	1.9	1.1	2.6	1.5
TCS 702010 Rotor Gear	15/16" hex wrench/socket	5/8-18	40	28	54	38

### 740-20 AIR ELIMINATOR/STRAINER ASSEMBLY

Part Number & Description	Tool	Bolt/Nut Size	Foot Lbs.		Newton Meter	
			Unlubricated	Lubricated	Unlubricated	Lubricated
TCS 740050 Cover Plate	1/2" hex screw wrench/socket	5/16-18 UNC 2B	11	6.6	14.9	8.9
TCS 701017 Cap Screws	9/16" hex screw wrench/socket	3/8-16 UNC 2B	19.7	11.8	26.7	16.0
TCS 740030 Reed & Diffuser	slotted screwdriver	8-32 UNC 2B	1.65	1.0	2.2	1.4

### 750-20 HYDRAULIC PRESET VALVE ASSEMBLY

Part Number & Description	Tool	Bolt/Nut Size	Foot Lbs.		Newton Meter	
			Unlubricated	Lubricated	Unlubricated	Lubricated
TCS 701017 Cover & Elbow	9/16" hex screw wrench/socket	3/8-16 UNC 2B	19.7	11.8	26.7	16.0
TCS 752024 Piston Lock	7/16" hex nut Wrench/socket	1/4-20 UNF 3B	6.3	3.8	8.5	5.2

This Torque Chart is for 18-8 Stainless Steel Bolts

\*\*Values can be +/- 10% of value listed\*\*

**MW NEWAY**

# Floating Ball Valve

*Complete Solutions for Engineered Valves*



**NEWAY VALVE**

Cat.no.:E-FBV-2012

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## Complete Solutions for Engineered Valves

As one of the leading valve manufacturers in the world, NEWAY specializes in the development of innovative designs through intensive R&D programs and a commitment to excellence, engineering and manufacturing valve solutions for all industries.

NEWAY's main product lines include Gate, Globe, Check, Butterfly and Ball valves with quality innovative designs, recognized by many global users and EPC's. These products have been installed throughout the world in Gas, Oil, Refining, Chemical, Marine, Power Generation and Pipeline Transmission industrial applications.

## NEWAY'S Facilities

NEWAY's facilities are among one of the most advanced in valve manufacturing in the world today. NEWAY has developed and implemented a group management system based on multi-plant manufacturing. Valves are manufactured in six specialized production facilities that are linked by an intranet system of over 600 computers, connecting engineering to the CNC machining centers, and the bar-coded warehouse system. NEWAY has implemented an Enterprise Resource Planning (ERP) manufacturing management system. In-house testing capabilities include fire-safe, cryogenic, high pressure gas and fugitive emission testing.

## Quality Assurance

NEWAY's quality assurance is dedicated to the pursuit of zero defect valves to customers. We perform active Six Sigma quality management to continually enhance process control management based on advanced data statistical analysis. NEWAY's industrial certificates include ISO 9001, CE/PED, TA-Luft, API 6A, API 6D, ABS, and Fire Safe approvals.

## Introduction

In this catalogue, you will find the latest developed NEWAY Ball Valves, which include 4 different designs:

- BA series 1PC uni-body floating type
- B series 2PC cast steel floating type
- BB series 2PC forged steel floating type
- BC series 3PC forged steel floating type

All Ball Valves conform to BS5351 and API 6D, and are Fire-Safe tested and certified, API 6FA and API 607.

# Quality Commitment

ISO 9001

API 6D



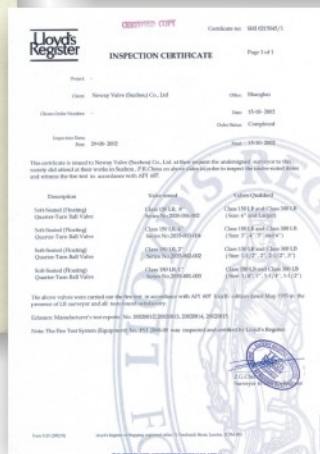
API 6A



TA Luft



API 591



Fire Safe Test

Neway recognizes the importance of valve quality for the safety and protection of personnel health and property. It is our quality commitment to focus our resources to provide our customers with first class products at a competitive price, designed, manufactured, inspected and tested in accordance with our customers CE/PED specifications and complying with all international standards.

Current industrial standards do not always take into consideration the likelihood and consequences of possible deterioration in service, related to specific service fluids or the external environments in which they operate. Therefore we request that our customers communicate with our engineering department. Our valve optimization program continuously strives to provide valves that withstand deterioration in service, and ensure safety over the valves expected lifetime.

# Standard and Product Range

## Reference Standard:

<b>Pressure-Temperature Ratings</b>		ASME B16.34
<b>Shell Wall Thickness</b>		ASME B16.34; ISO 17292 (BS 5351)
<b>Face to face Dimensions</b>	<b>Flange Connections</b>	ASME B16.10;
	<b>Socketed Welding &amp; NPT</b>	Neway Standard
<b>End Connection Dimensions</b>	<b>Raised Flange</b>	ASME B16.5;
	<b>Butt-Weld</b>	ASME B16.25
	<b>Socketed Weld</b>	ASME B16.11
	<b>NPT</b>	ASME B1.20.1
<b>Pressure Test</b>		API 598 and ISO 14313 (API 6D)
<b>Fire Safe</b>		API 607 and API 6FA
<b>Marking Standard</b>		MSS-SP 25
<b>Surface Quality Visual Method</b>		MSS-SP 55
<b>Sour Service</b>		NACE Std. MR 0175 or MR 0103
<b>Low Fugitive Emission</b>		ISO 15848; TA-Luft

## Product Range:

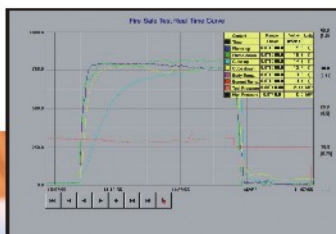
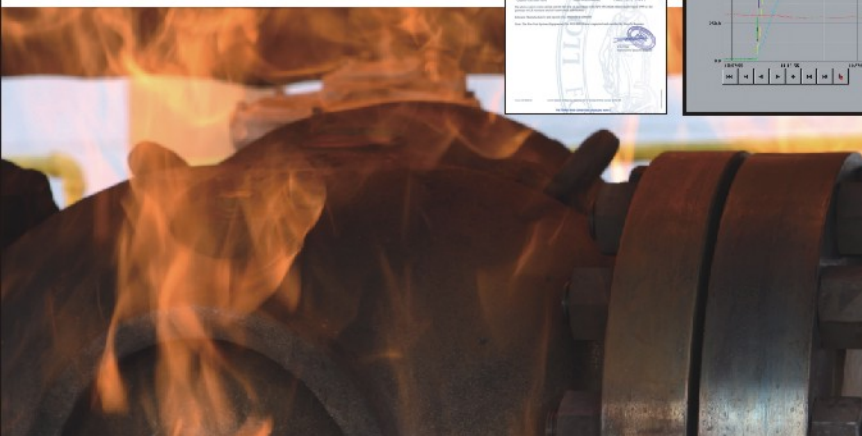
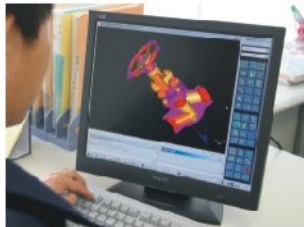
		Valve Size	1/2"	3/4"	1"	1-1/2"	2"	2-1/2"	3"	4"	6"	8"	10"	
<b>BSS5351 Floating Ball Valve</b>	<b>1PC</b>	150	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
		300	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
	<b>2PC</b>	150	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
		300	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
		600	◆	◆	◆	◆	◆							
		900	◆	◆	◆	◆	◆							
		1500	◆	◆	◆	◆	◆							
		2500	◆	◆	◆									
	<b>3PC</b>	150	◆	◆	◆	◆	◆							
		300	◆	◆	◆	◆	◆							
		600	◆	◆	◆	◆	◆							
		900	◆	◆	◆	◆	◆							
		1500	◆	◆	◆	◆	◆							
		2500	◆	◆	◆	◆	◆							

# Technical Innovation

NEWAY's technical research center utilizes the most advanced computer technology to improve existing product lines and develop new ones. A comprehensive internal computer network links the highly trained engineering team to manufacturing and administration so everyone can be updated instantly.

NEWAY's mission is to engineer safe, cost-effective valves. The latest AutoCAD® and I-DEAS® software are used by the product design and research team. The advanced finite element analysis feature enables virtual verification of new product designs prior to production. Besides dramatically reducing new product development time, this feature ensures quality and cost control. All designs are then rigorously tested in NEWAY's state-of-the-art flow loop to confirm and validate designs. The end result is a final product that meets and exceeds international quality and safety standards, yet is easy on the budget.

NEWAY's technical personnel stand ready to support its customers, whether distributor, agent or end user, with on-line and/or on-site technical support and training.



Fire safe certification is standard for all NEWAY ball valves. The soft seated ball valves are witnessed and certified by Lloyd's Register. NEWAY's computer controlled fire testing lab is the facility capable of testing and certifying floating and trunnion mounted ball valves per API 6FA and API 607 standards.



# NEWAY Owned Foundries



NEWAY understands that consistently producing high quality castings and forgings is the single most important factor in maintaining valve integrity and assuring long, trouble-free service life. Valve casting quality is of utmost importance for pressure containing equipment in process control pipelines with personnel and environmental safety at stake. NEWAY's valve castings have been certified by many end users as part of their Quality Assurance program, prior to vendor approval.

Whereas most other valve manufacturers outsource this operation, NEWAY has invested millions developing two state-of-the-art foundries to maintain tight quality standards. One foundry specializes in large size sand castings using the organic ester water glass casting process; and, the other one produces small sized investment castings using the lost wax casting method. Each foundry is equipped with a wide range of quality inspection equipment and instruments, including a spectrum analyzer, non-destructive testing equipment and mechanical property testing equipment. NEWAY maintains tight quality control throughout the whole valve foundry process to ensure that stringent quality standards are maintained and delivery commitments are met at a competitive price. This extraordinary level of commitment to quality has made NEWAY the supplier of choice for many world class customers.



## Supply Range & capacity :

Plant Name	Dafeng Foundry	Suzhou Foundry
Process Technology	Lost wax investment casting	Organic ester water glass sand casting
Size Range(In)	1/2" ~10"	2" ~64"
Pressure Rating	ANSI Class 150~600	ANSI Class 150~2500
Weight(Kg)	1~150	100~11000
Material	WCB, WCC, LCB, LCC, WC6, WC9, C5, C12, C12A, CF8, CF8M, CF3, CF3M, CN7M, Monel, Inconel, Duplex Steel, 4A,5A	
Monthly Capacity(Ton)	1500	1800
Quality Certificate	ISO9001,CE/PED, AD W0	ISO9001,CE/PED, Norsok

# Advanced Manufacturing

The latest computer technologies are also widely applied at NEWAY in its manufacturing facilities, including a large number of computer numeric controlled (CNC) machining centers, horizontal and vertical lathes and drilling machines. These machines directly tie into NEWAY's ERP management system, resulting in significantly improved machining quality and timely order processing. NEWAY internally machines all of the parts for its valves through the 60" ball valve size, insuring consistent quality and just-in-time (JIT) deliveries.



# Quality Control



NEWAY houses its own extensive and advanced inspection and testing department, equipped with the latest equipment and instruments. Here, highly trained and certified technicians perform radiographic, ultrasonic, dye-penetrant, magnetic particle, PMI, impact, hardness, and tensile testing.

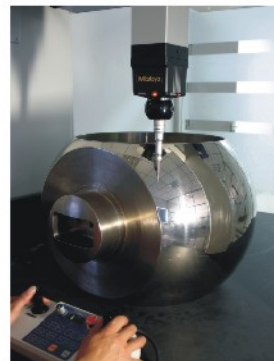


NEWAY also maintains its own state-of-the-art cryogenic, vacuum, fugitive emission, and fire testing facilities as well as hydro-testing facilities to ensure the highest product quality and performance.



Six Sigma, zero defect policies and continuous improvement processes have allowed NEWAY to obtain numerous certifications, such as ISO 9001 (issued by DNV), API 6-D, CE/PED, ABS, API6A, TA-Luft, API591 and GOST.

In fact, today, due to its extensive product portfolio, high quality focus, competitive delivery lead times and value pricing, NEWAY has earned as many end user customer approvals as its major competitors, and is viewed by many customers as a world-class manufacturer.



Neway offers four series of floating ball valves:

- BA Series, one piece, uni-body design
- B Series, two piece, split body design
- BB Series, two piece, forged steel split body design
- BC Series, three piece, forged steel design

All floating ball valves are designed to conform to BS 5351 and ASME B16.34 are certified to industry standards such as BS 6755, API 6FA and API 607. A wide range of body and trim material is available to service working temperature from -196 to 200°C (-320 to 392°F). Valve Size: 1/2" to 12". Pressure Rating: ASME Class 150 - 2500. NACE MR0175 is also available upon request for sour service.



3PC Floating Ball Valve



Pneumatic Actuator Ball valve



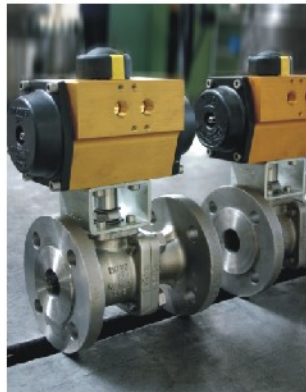
2PC Forged Steel Design



Extended Bonnet Temperature Service



Hastelloy Ball Valve



Pneumatic Actuator Ball valve



1PC Cast Steel Design



2PC Cast Steel Design



Stainless Steel

# How to order

## Example:



Newway part numbers are designed to cover essential features. When ordering, please show the part numbers and a detailed description to avoid misunderstanding of your requirements.

## Following descriptions provide a basic guideline in valve specification:

### ① Valve Sizes

#### Full bore:

In	3/8	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	3-1/2	4	5	6	8	10	12
mm	10	15	20	25	32	40	50	65	80	90	100	125	150	200	250	300

#### Reduced bore:

in	3/8*1/4	1/2*3/8	3/4*1/2	1*3/4	1-1/2*1	2*1-1/2	2-1/2*2	3*2	4*3	6*4	8*6	10*8	12*10
mm	10*6.4	15*10	20*15	25*20	40*25	50*40	65*60	80*50	100*80	150*100	200*150	250*200	300*250

### ② Valve Types

Symbol	Valve Type	Symbol	Valve Type
BA	Uni-body Floating ball valve - cast	BBA	Uni-body Floating ball valve - forged
B	2-pcs Floating ball valve - cast	BB	2-pcs floating ball valve - forged
BC	3-pcs floating ball valve - forged	BCC	3-pcs floating ball valve - cast

### ③ ASME Class

Code	1	3	4	6	8	9	15	25
Class (LB)	150	300	400	600	800	900	1500	2500

### ④ End Connections

Symbol	End	Symbol	End
R	Raised face flanged end	S	Socket weld end
J	RTJ flanged end	N	Screwed end
B	Butt-weld end	SN	Socket Weld/Screwed End
F	Flat Face Flanged End	NC	55° Taper Screwed End

### ⑤ Operator

Symbol	Description	Symbol	Description
	Lever	BS	Bare shaft
G	Gear operator	H	Hydraulic actuator
M	Electric actuator	L	Gas over oil actuator
P	Pneumatic actuator	C	Gear operator (Operation force ≤ 350N)

## ⑥ Body Materials

<b>Material</b>	A105	LF2	F316	F304	F316L	F304L	Alloy 20	F51
<b>ASTM Ref</b>	A106N	A350 LF2	A182 F316	A182 F304	A182 F316L	A182 F304L	Alloy 20	A182 F51
<b>Material</b>	WCB	LCB	CF8M	CF8	CF3M	CF3	CN7M	4A
<b>ASTM Ref</b>	A216 WCB	A352 LCB	A351 CF8M	A351 CF8	A351 CF3M	A351 CF3	A351 CN7M	A890 4A

## ⑦ Trim Codes

Seat		O-ring		Stem		Ball		Packing	
Code	Material	Code	Material	Code	Material	Code	Material	Code	Material
1	PTFE	1	NBR	1	AISI 410	1	AISI 410	1	PTFE
2	NYLON1010	2	VITON	2	F304	2	F304	2	Graphite
3	PEEK	3	VITON AED	3	A105/ENP	3	A105/ENP	8	Garlock(low emission)
7	NYLON 12	4	VITON B	4	17-4PH	4	17-4PH		
8	PCTFE	5	HNBR-70	5	AISI 4140/ENP	5	AISI 4140/ENP		
G	FILLED PTFE	8	VITON GLT	6	F316	6	F316		
F	TFM1700	9	BUNA-N	9	LF2/ENP	9	LF2/ENP		
		N	None O-Ring	A	F51	A	F51		

Note: Other materials upon request.

# Design Features

## Blow-out Proof Stem

The stem is made separately from the ball. The lower end of the stem is designed with an integral collar to be blowout-proof, assuring sealing at all pressures. (Fig.1)

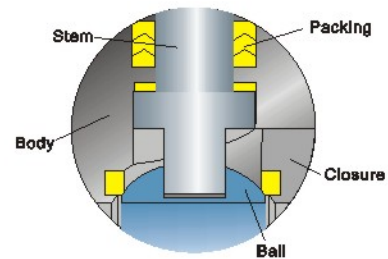


Fig.1

## Anti-Static Device

The Anti-static device is a standard feature of NEWAY ball valves. A spring-loaded pin assures the electrical continuity between the ball, stem and body, to avoid sparking during the turning of the stem to open and close the valve. (Fig.2)

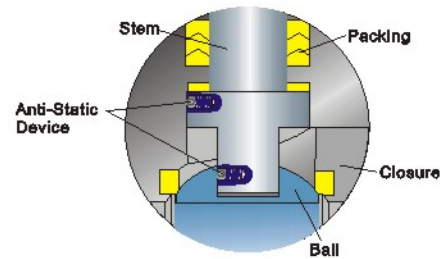
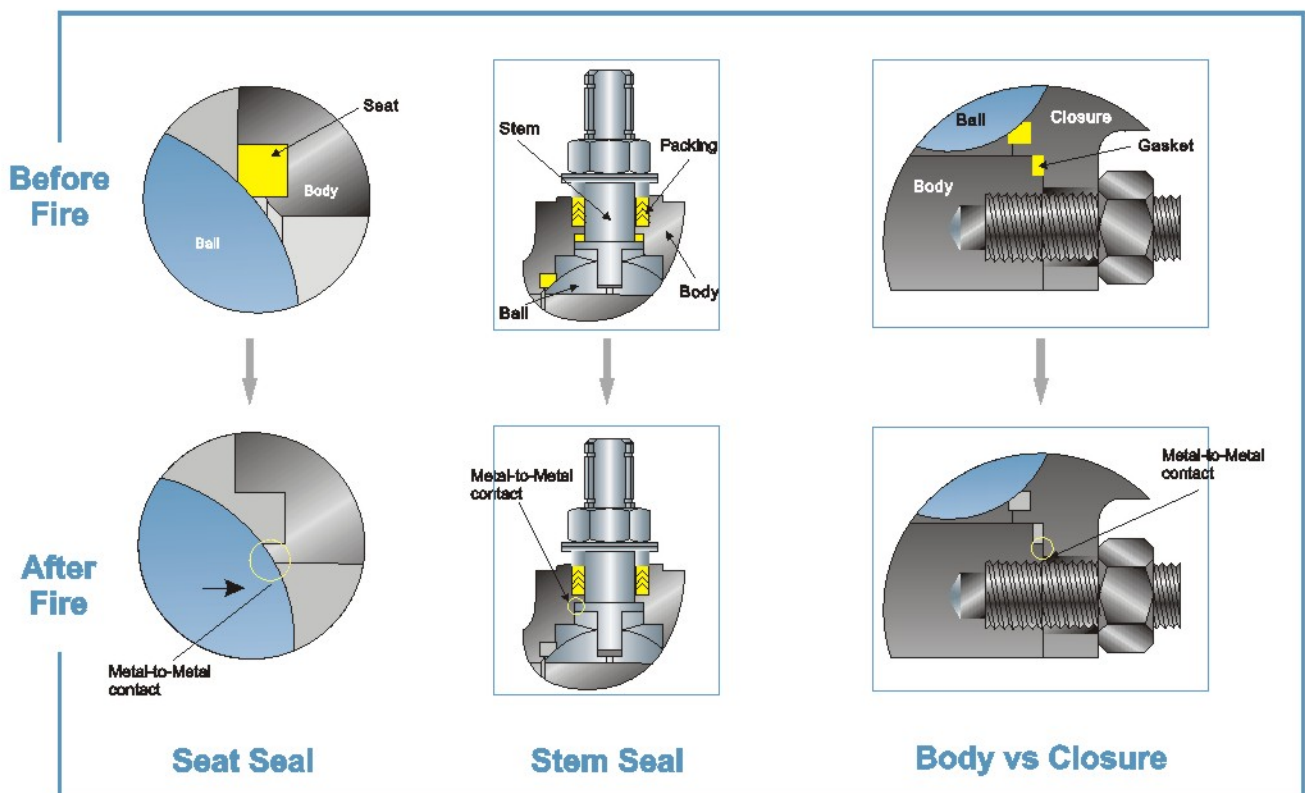


Fig.2

## Fire Safe - Metal to Metal Sealing

When soft seats are decomposed or deteriorated by fire, the edge of the metal seat comes into contact with the ball to shut off the process media and minimize internal leakage through the valve bore.

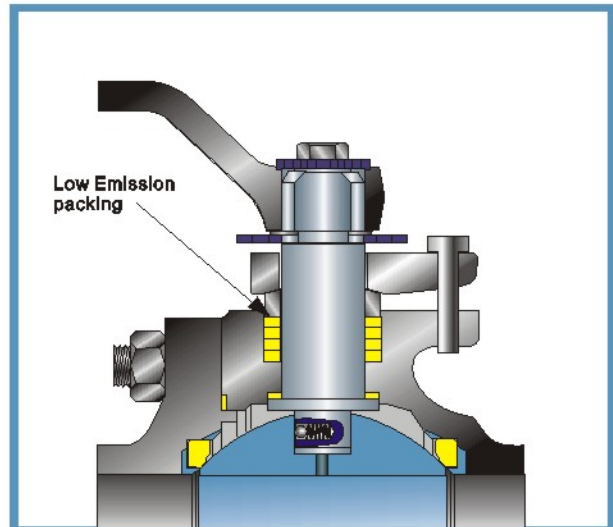
Additionally, the fire safe metal seat can prevent the line pressure erosion on soft seat and minimize soft seat creep deformation. All NEWAY floating valves are designed to be fire safe and are tested and certified in accordance with API 607.



Emission control features are standard on all NEWAY BA, B and BB series flanged floating ball valves with emission control packing to eliminate the leakage of fugitive emissions. These valves have been designed and tested to meet the 100 PPM maximum allowed emissions per the Shell ISO15848 test.

## Eliminate Stem Leakage

NEWAY controls the finish of the stem's surface to be between Ra0.4 and Ra0.8 which ensures that the graphite packing will migrate into any stem micro scratches, functioning as a lubricant to reduce stem torque. The surface of the stuffing box is controlled to be no more than Ra3.2. This rougher finish holds the packing ring in place, resulting in better sealing performance.



## Low Emission Packing

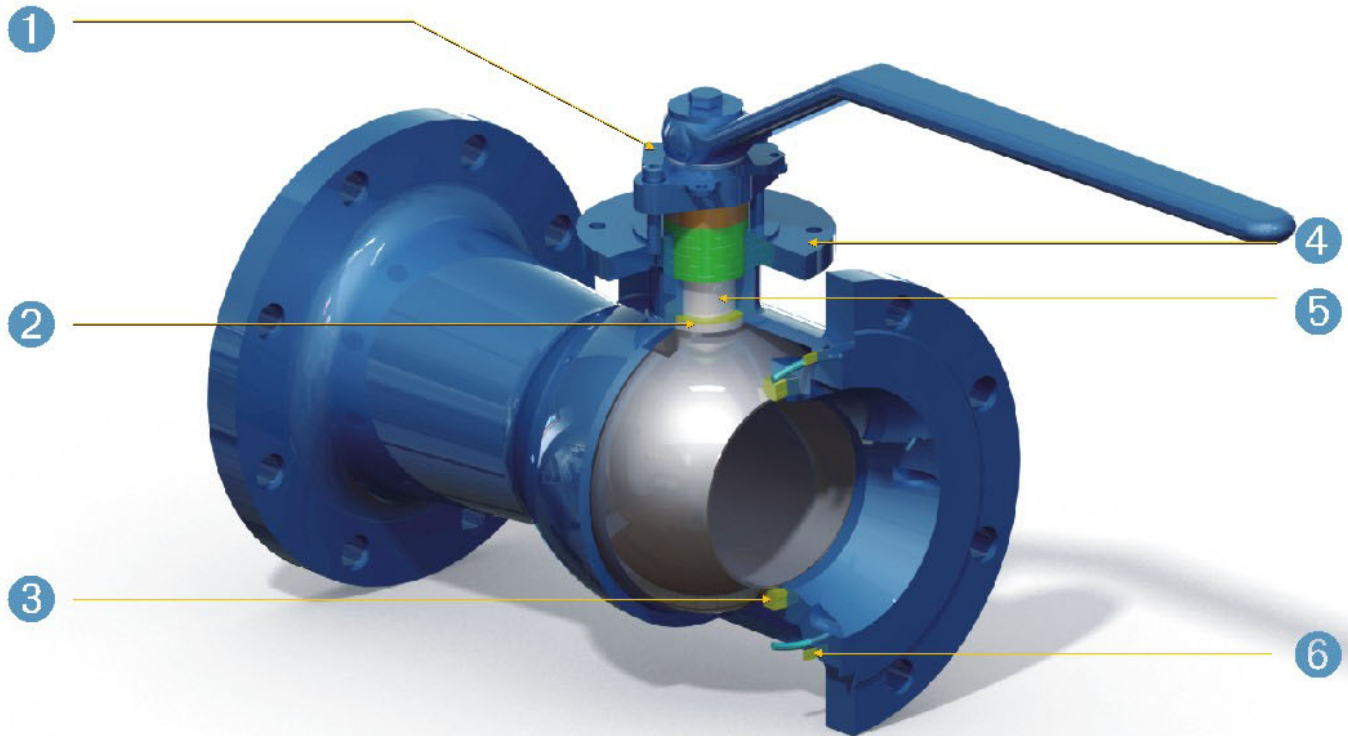
The low emission pack set combines a parallel and vertical layer of sealing elements made of graphite. These die-formed graphite rings feature heat resistance, low creep and less relaxation from stress. This structure means low friction on rotary and rising stems, providing stabilized seal performance and long cycle life for the valve.

For medium and low temperature service, the standard V shape PTFE packing rings are installed for low emission control.



Low Emission Test



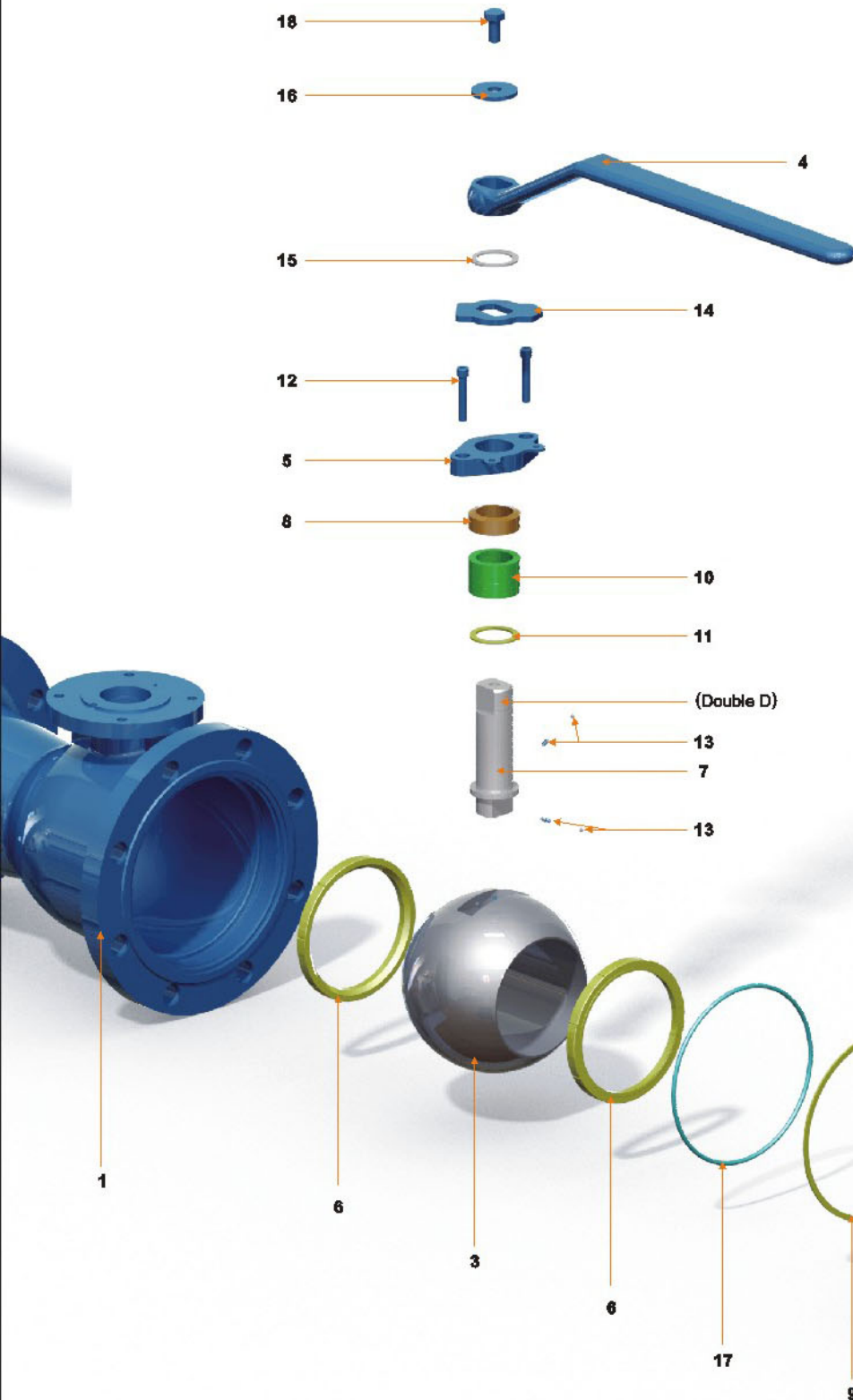


- ① **Secure Line Flow Locking Device:** Valve is equipped with an integral locking device to secure line flow.
- ② **Blow-out Proof Stem:** The lower end of the separate stem is T-shaped to create an integral collar making the stem blowout-proof.
- ③ **Fire Safe Design:** Metal to metal sealing shuts off valve flow when soft sealing materials are destroyed by fire.
- ④ **ISO 5211 Mount Pad:** Simplifies the installation of actuators with standardized connections.
- ⑤ **Double "D" Stem Head:** Insures handle lever will always be mounted correctly, parallel to the media flow, indicating valve open and closed positions.
- ⑥ **Emission-free Gasket:** The primary gasket is emission free graphite to eliminate leakage.

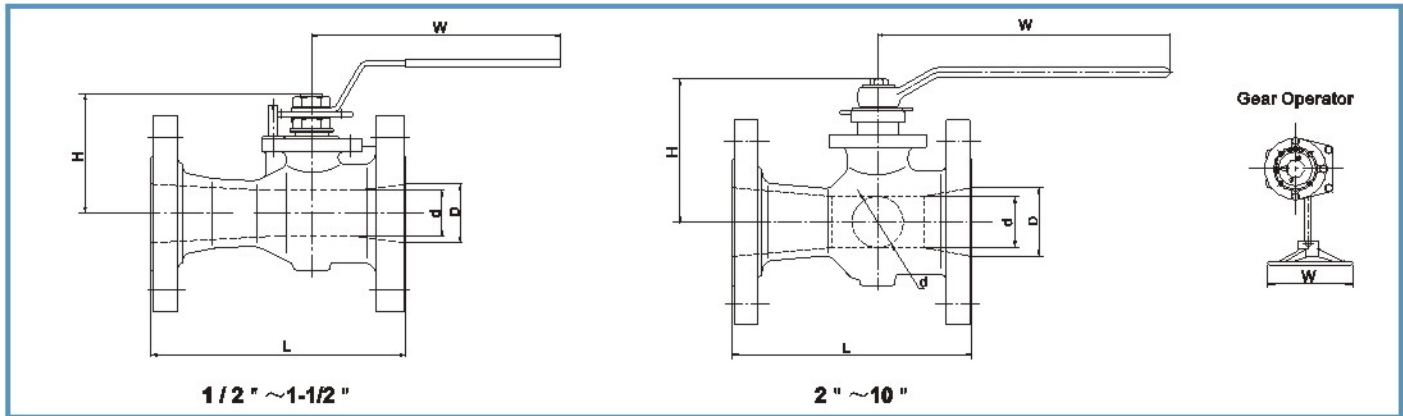
## APPLICATIONS

- Refinery
- Petrochemical
- Paper
- Chemical
- Pharmaceutical
- Food and Beverage

Index no	Part
1	Body
2	Bonnet
3	Ball
4	Lever
5	Gland Flange
6	Seat Ring
7	Stem
8	Gland
9	Gasket
10	Packing Set
11	Thrust Washer
12	Bolt
13	Anti-Static Device
14	Stop Plate
15	Retainer
16	Washer
17	O-Ring
18	Bolt



No	Part	Standard	Stainless Steel	Sour Service	Low Temperature Service
1	Body	ASTMA216-WCB	ASTMA351-CF8M	ASTMA216-WCB	ASTMA352-LCB
2	Bonnet	ASTMA216-WCB	ASTMA351-CF8M	ASTMA216-WCB	ASTMA352-LCB
3	Ball	ASTMA105N/ENP	ASTMA182-F316	ASTMA105N/ENP	ASTMA182-F316
4	Lever	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel
5	Gland Flange	ASTMA216-WCB	ASTMA351-CF8	ASTMA216-WCB	ASTMA352-LCB
6	Seat Ring	PTFE	PTFE	PTFE	PTFE
7	Stem	ASTMA182-F6a	ASTMA182-F316	ASTMA182-F6a	ASTMA182-F316
8	Gland	ASTMA276-420	ASTMA276-316	ASTMA276-420	ASTMA276-316
9	Gasket	316 S.S.+Graphite	316 S.S.+Graphite	316 S.S.+Graphite	316 S.S.+Graphite
10	Packing Set	Graphite	Graphite	Graphite	Graphite
11	Thrust Washer	PTFE	PTFE	PTFE	PTFE
12	Bolt	ASTMA193-B7	ASTMA193-B8	ASTMA193-B7M	ASTMA320-L7M
13	Anti-Static Device	S.S.	S.S.	S.S.	S.S.
14	Stop Plate	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel
15	Retainer	Carbon Steel	S.S.	Carbon Steel	S.S.
16	Washer	Carbon Steel	S.S.	Carbon Steel	S.S.
17	O-Ring	Viton A	Viton A	Viton A	HNBR
18	Bolt	Carbon Steel	S.S.	Carbon Steel	S.S.



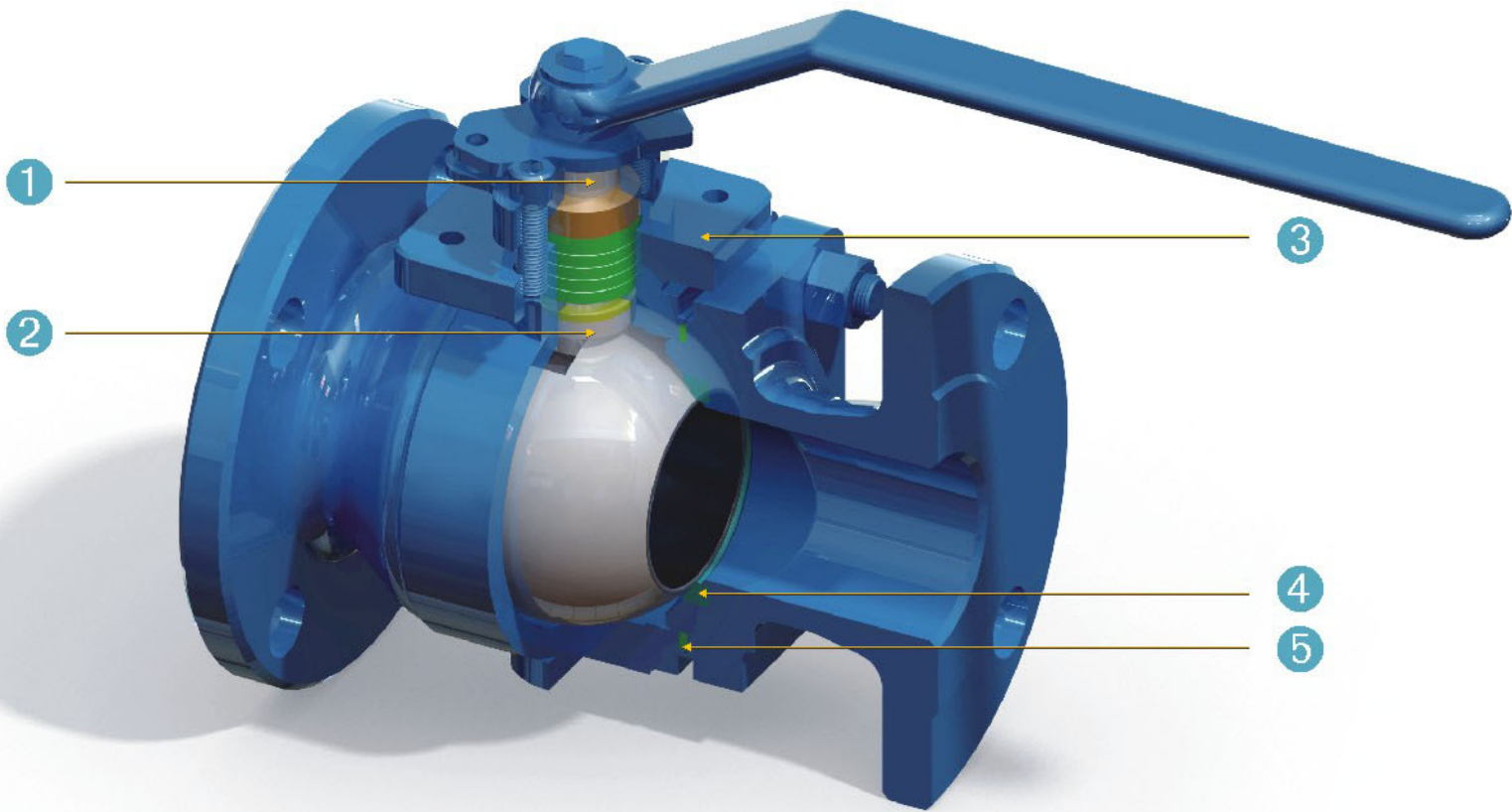
## 150 LB Dimensions

Size		d		D		L		H		W		Weight	
In	mm	In	mm	In	mm	In	mm	In	mm	In	mm	lb	KG
1/2	15	0.37	10	0.60	13	4.26	108	2.13	54	4.72	120	3.3	1.5
3/4	20	0.50	13	0.75	19	4.81	117	2.32	59	5.51	140	6.5	2.5
1	25	0.75	19	1.00	26	5.00	127	2.52	64	5.51	140	6.6	3.0
1-1/2	40	1.18	30	1.50	38	6.50	165	3.54	90	6.30	160	11.0	5.0
2	50	1.50	38	2.00	51	7.01	178	4.02	102	10.43	265	19.2	8.7
2-1/2	65	2.00	51	2.50	64	7.52	191	4.41	112	10.43	265	27.3	12.4
3	80	2.50	64	3.00	76	7.99	203	4.76	121	10.43	265	36.8	16.7
4	100	3.00	76	4.00	102	9.02	229	6.54	166	11.81	300	53.8	24.4
6	150	4.50	114	6.00	152	10.51	267	8.19	208	15.75	400	110.2	50.0
8	200	6.00	152	8.00	203	11.50	292	9.69	246	11.81	*300	222.7	101.0
10	250	7.36	187	10.00	254	12.99	330	11.93	303	18	*400	330.7	150.0

## 300 LB Dimensions

Size		d		D		L		H		W		Weight	
In	mm	In	mm	In	mm	In	mm	In	mm	In	mm	lb	KG
1/2	15	0.37	10	0.50	13	5.51	140	2.13	54	4.72	120	6.2	2.8
3/4	20	0.50	13	0.75	19	5.98	162	2.32	59	5.51	140	7.9	3.6
1	25	0.75	19	1.00	26	6.60	166	2.52	64	5.51	140	10.6	4.8
1-1/2	40	1.18	30	1.50	38	7.48	190	3.54	90	6.30	160	21.2	9.6
2	50	1.50	38	2.00	51	8.50	216	4.02	102	10.43	265	24.3	11.0
2-1/2	65	2.00	51	2.50	64	9.49	241	4.41	112	10.43	265	33.3	15.1
3	80	2.50	64	3.00	76	11.14	283	4.76	121	10.43	265	49.6	22.5
4	100	3.00	76	4.00	102	12.01	305	6.54	166	11.81	300	81.6	37.0
6	150	4.50	114	6.00	152	15.87	403	8.19	208	11.81	*300	159.8	72.5
8	200	5.67	144	8.00	203	16.50	419	9.69	246	15.75	*400	275.6	125.0
10	250	7.36	187	10.00	254	17.99	457	11.93	303	15.75	*400	451.9	205.0

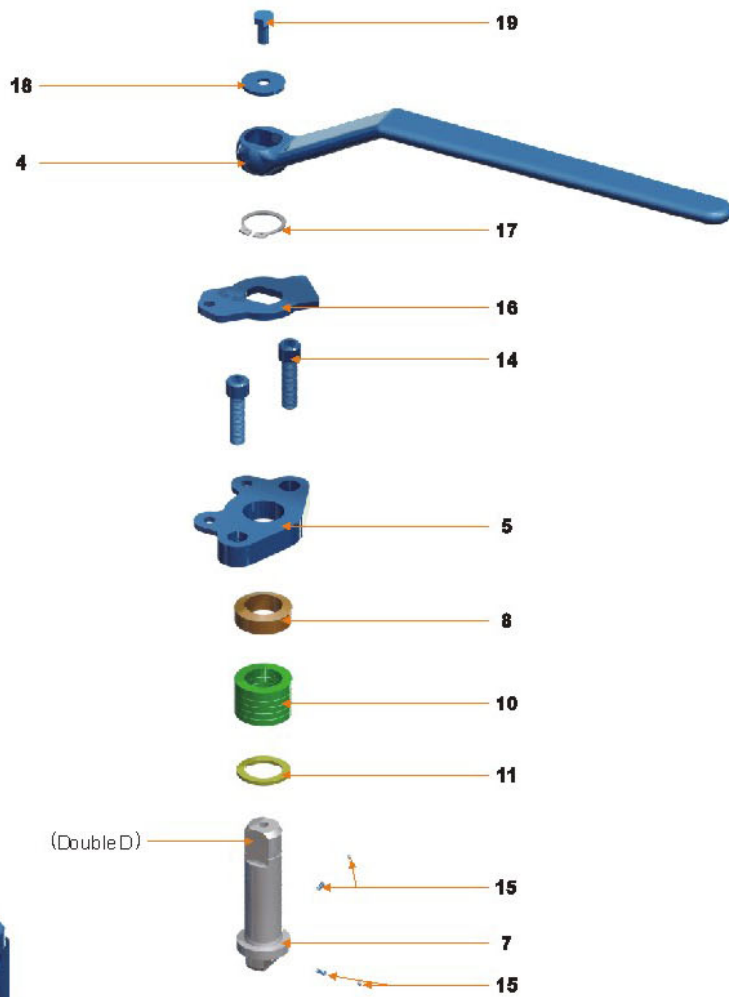
\*Gear Operator



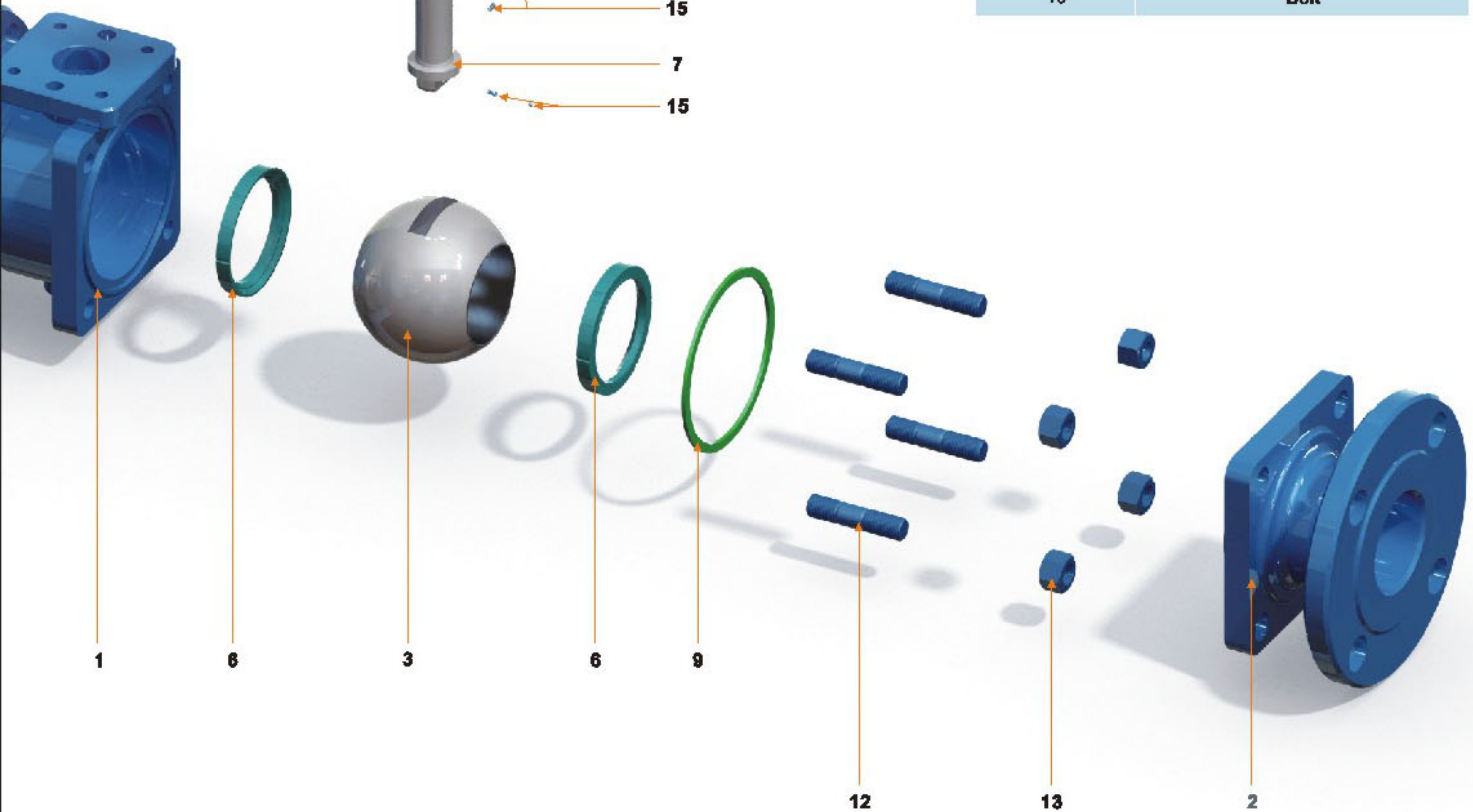
- ① **Double "D" Stem Head:** Insures handle lever will always be mounted correctly, parallel to the media flow, indicating valve open and closed positions.
- ② **Blow-out Proof Stem:** The lower end of the separate stem is T-shaped to create an integral collar making the stem blowout-proof.
- ③ **ISO 5211 Mount Pad:** Simplifies the installation of actuation devices with standardized connections.
- ④ **Fire Safe Design:** Metal to metal sealing shuts off valve flow when soft sealing materials are destroyed by fire.
- ⑤ **Emission-free Gasket:** The primary gasket is emission free graphite to eliminate leakage.

## APPLICATIONS

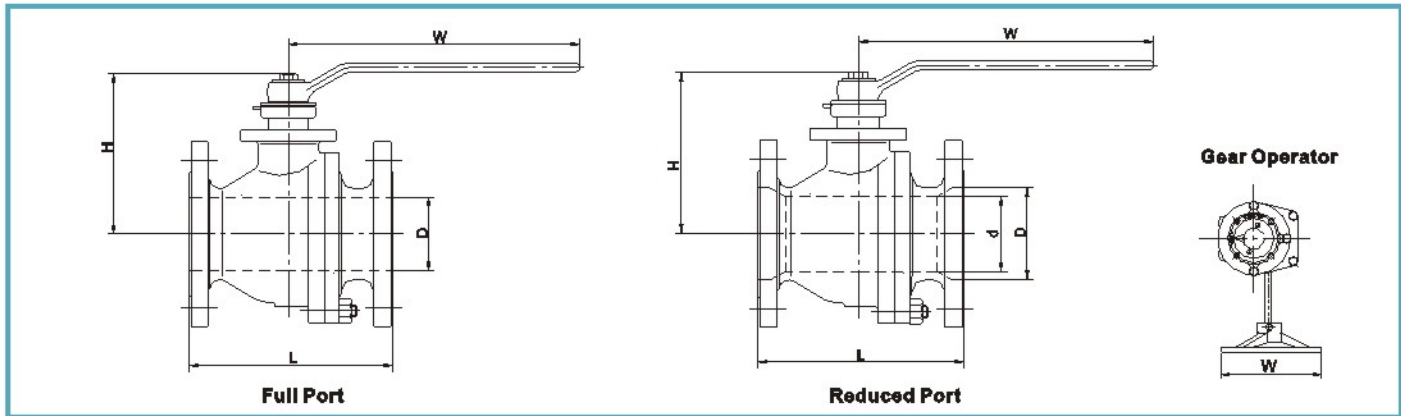
- Refinery
- Petrochemical
- Power
- Chemical
- Pharmaceutical



Index no	Part
1	Body
2	Bonnet
3	Ball
4	Lever
5	Gland Flange
6	Seat Ring
7	Stem
8	Gland
9	Gasket
10	Packing Set
11	Thrust Washer
12	Stud
13	Nut
14	Bolt
15	Anti-Static Device
16	Stop Plate
17	Retainer
18	Washer
19	Bolt



No	Part	Standard	Stainless Steel	Sour Service	Low Temperature Service
1	Body	ASTMA216-WCB	ASTMA351-CF8M	ASTMA216-WCB	ASTMA352-LCB
2	Bonnet	ASTMA216-WCB	ASTMA351-CF8M	ASTMA216-WCB	ASTMA352-LCB
3	Ball	ASTMA105N/ENP	ASTMA182-F316	ASTMA105N/ENP	ASTMA182-F316
4	Lever	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel
5	Gland Flange	ASTMA216-WCB	ASTMA351-CF8	ASTMA216-WCB	ASTMA352-LCB
6	Seat Ring	PTFE	PTFE	PTFE	PTFE
7	Stem	ASTMA182-F6a	ASTMA182-F316	ASTMA182-F6a	ASTMA182-F316
8	Gland	ASTMA276-420	ASTMA276-316	ASTMA276-420	ASTMA276-316
9	Gasket	316 S.S.+Graphite	316 S.S.+Graphite	316 S.S.+Graphite	316 S.S.+Graphite
10	Packing Set	Graphite	Graphite	Graphite	Graphite
11	Thrust Washer	PTFE	PTFE	PTFE	PTFE
12	Stud	ASTMA193-B7	ASTMA193-B8	ASTMA193-B7M	ASTMA320-L7M
13	Nut	ASTMA194-2H	ASTMA194-8	ASTMA194-2HM	ASTMA194-7M
14	Bolt	ASTMA193-B7	ASTMA193-B8	ASTMA193-B7M	ASTMA320-L7M
15	Anti-Static Device	S.S.	S.S.	S.S.	S.S.
16	Stop Plate	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel
17	Retainer	Carbon Steel	S.S.	Carbon Steel	S.S.
18	Washer	Carbon Steel	S.S.	Carbon Steel	S.S.
19	Bolt	Carbon Steel	S.S.	Carbon Steel	S.S.



## 150 LB Dimensions

Full Port

Size		D		L		H		W		Weight	
In	mm	In	mm	In	mm	In	mm	In	mm	lb	kg
1/2	15	0.50	13	4.25	108	2.32	59	5.12	130	4.0	1.8
3/4	20	0.75	19	4.61	117	2.48	63	5.12	130	4.4	2.0
1	25	1.00	25	5.00	127	2.99	76	6.30	160	7.9	3.6
1-1/2	40	1.50	38	6.50	165	3.82	97	9.06	230	15.9	7.2
2	50	2.00	51	7.01	178	4.21	107	9.06	230	24.5	11.1
2-1/2	65	2.50	64	7.48	190	5.59	142	15.75	400	30.9	14.0
3	80	3.00	76	7.99	203	5.98	152	15.75	400	48.5	22.0
4	100	4.00	102	9.02	229	7.01	178	27.58	700	116.8	53.0
5	125	5.00	127	14.02	368	9.92	252	43.31	1100	127.9	58.0
6	150	6.00	162	16.51	394	10.71	272	11.81	*300	236.1	108.0
8	200	7.99	203	17.99	467	13.48	342	11.81	*300	429.9	195.0
10	250	10.00	264	20.98	533	13.68	345	15.75	*400	687.8	312.0
12	300	12.00	305	24.02	610	18.88	479	23.82	*600	762.8	346.0

Reduced Port

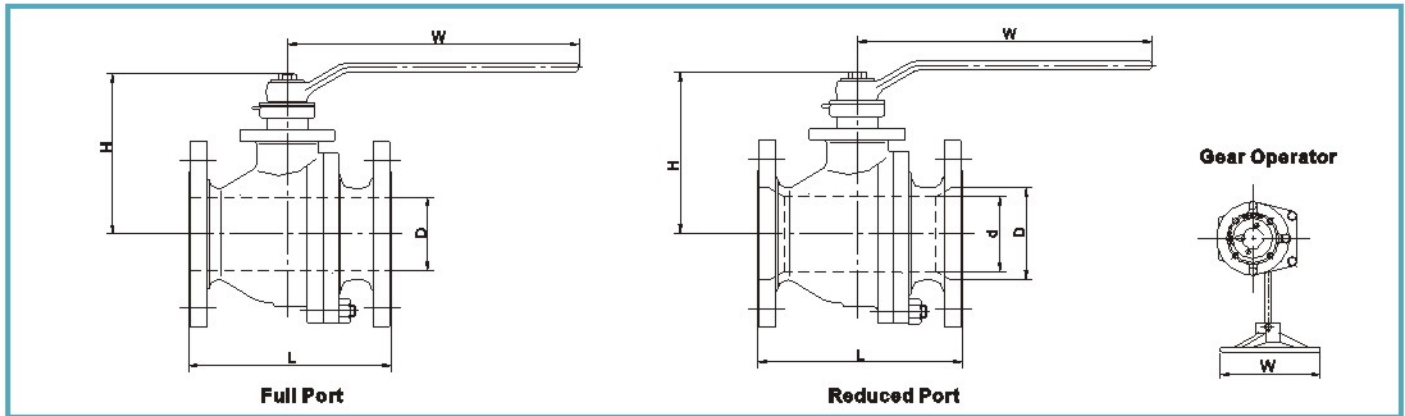
Size		d		D		L		H		W		Weight	
In	mm	In	mm	In	mm	In	mm	In	mm	In	mm	lb	kg
3/4*1/2	20*15	0.60	13	0.75	19	4.63	118	3.23	82	6.12	130	6.6	3.0
1*3/4	25*20	0.75	19	1.00	25	5.00	127	3.35	85	5.12	130	9.9	4.5
1-1/2*1	40*25	1.00	25	1.50	38	6.50	165	3.94	100	6.30	160	15.4	7.0
2*1-1/2	50*40	1.50	38	2.00	51	7.01	178	4.53	115	9.06	230	19.8	9.0
2-1/2*2	65*50	2.00	51	2.50	64	7.48	190	4.72	120	9.06	230	33.1	15.0
3*2	80*50	2.00	51	3.00	76	7.99	203	6.02	153	15.75	400	35.3	16.0
4*3	100*80	3.00	76	4.00	102	9.02	229	6.38	162	15.75	400	65.0	29.5
6*4	150*100	4.00	102	6.00	162	16.51	394	7.62	191	18.11	480	105.8	48.0
8*6	200*150	6.00	152	8.00	203	17.99	467	11.42	290	11.81	*300	271.2	123.0
10*8	250*200	8.00	203	10.00	264	20.98	533	13.39	340	11.81	*300	480.6	218.0
12*10	300*250	10.00	254	12.00	306	24.02	610	17.40	442	15.75	*400	507.1	230.0

\*Gear Operator



# B Series Ball Valve

Two-piece, split body, cast steel, side entry design

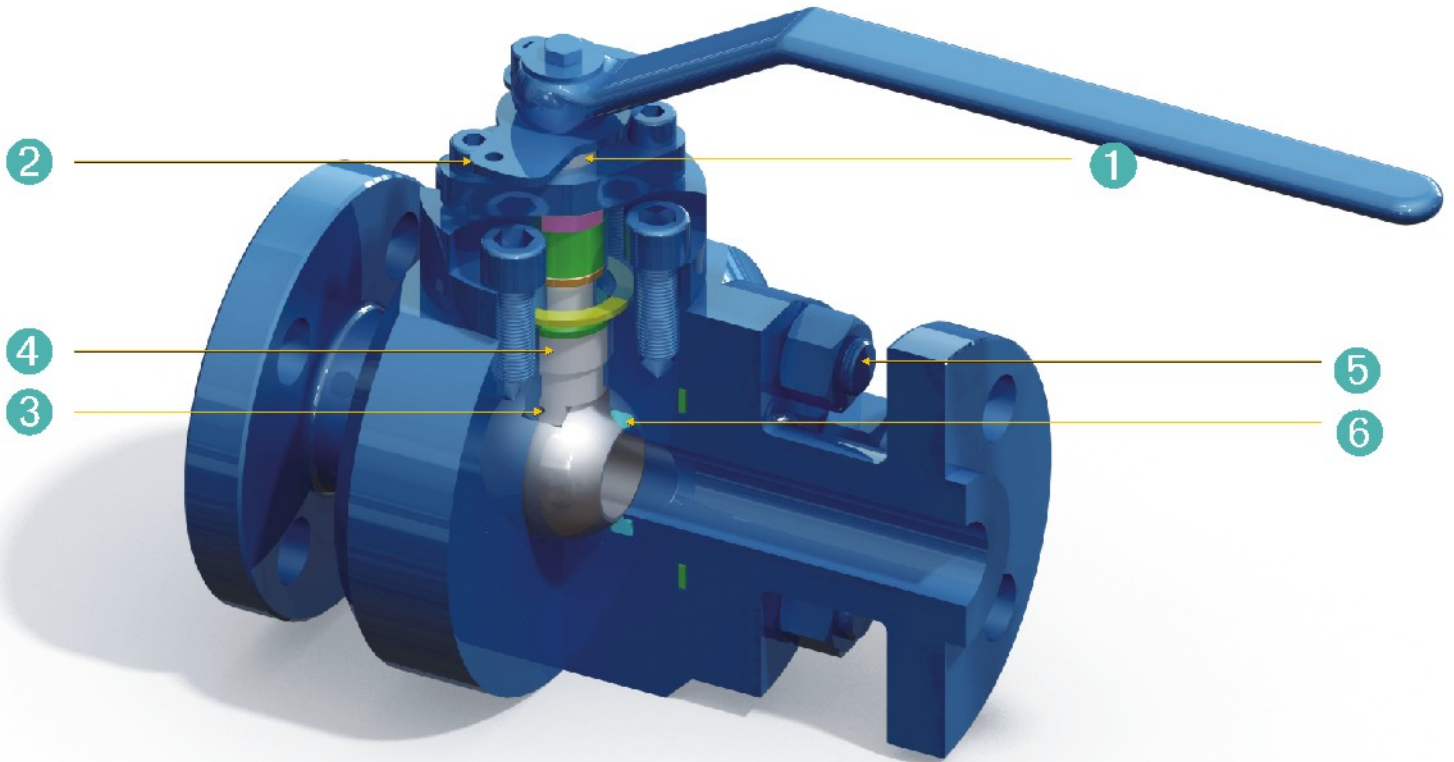


## 300 LB Dimensions

Full Port											
Size		D		L		H		W		Weight	
In	mm	In	mm	In	mm	In	mm	In	mm	lb	kg
1/2	15	0.50	13	5.51	140	2.32	59	5.12	130	5.1	2.3
3/4	20	0.75	19	5.98	152	2.48	63	5.12	130	7.9	3.6
1	25	1.00	25	6.50	165	2.95	75	6.30	160	11.2	5.1
1-1/2	40	1.50	38	7.48	190	3.82	97	9.06	230	22.0	10.0
2	50	2.00	51	8.50	216	4.21	107	9.06	230	30.9	14.0
2-1/2	65	2.50	64	9.49	241	5.59	142	15.75	400	50.7	23.0
3	80	3.00	76	11.14	263	5.96	152	15.75	400	67.5	30.6
4	100	4.00	102	12.01	305	7.01	178	27.56	700	110.2	50.0
5	125	5.00	127	15.00	381	9.92	252	43.31	1100	205.0	93.0
6	150	6.00	152	15.87	403	10.71	272	11.81	*300	255.7	116.0
8	200	8.00	203	19.76	502	13.46	342	15.75	*400	517.0	234.5
10	250	10.00	254	22.36	568	13.58	345	15.75	*400	1086.9	493.0

Reduced Port													
Size		d		D		L		H		W		Weight	
In	mm	In	mm	In	mm	In	mm	In	mm	In	mm	lb	kg
3/4*1/2	20*15	0.50	13	0.75	19	5.98	152	3.23	82	5.12	130	7.7	3.5
1*3/4	25*20	0.75	19	1.00	25	6.50	165	3.35	85	5.12	130	12.1	5.5
1-1/2*1	40*25	1.00	25	1.50	38	7.48	190	3.94	100	6.30	160	22.0	10.0
2*1-1/2	50*40	1.50	38	2.00	51	8.50	216	4.53	115	9.06	230	24.3	11.0
2-1/2*2	65*50	2.00	51	2.50	64	9.49	241	4.72	120	9.06	230	51.8	23.5
3*2	80*50	2.50	64	3.00	76	11.14	263	6.02	153	15.75	400	66.1	30.0
4*3	100*80	3.00	76	4.00	102	12.01	305	6.38	162	15.75	400	86.0	39.0
6*4	150*100	4.00	102	6.00	152	15.87	403	7.52	191	18.11	460	159.8	72.5
8*6	200*150	6.00	152	8.00	203	19.76	502	11.42	290	11.81	*300	326.3	148.0
10*8	250*200	8.00	203	10.00	254	22.36	568	13.38	340	15.75	*400	705.5	320.0

\* Gear Operator



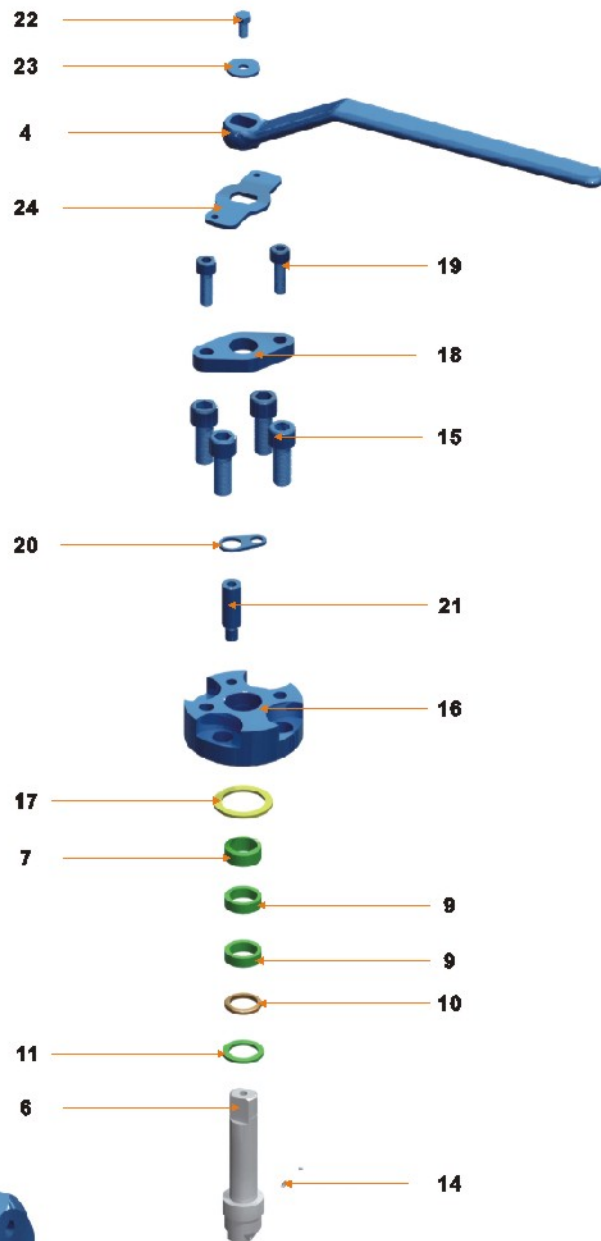
- 1 **Double "D" Stem Head:** Insures handle lever will always be mounted correctly, parallel to the media flow, indicating valve open and closed positions.
- 2 **Secure Line Flow Locking Device:** Valve is equipped with an integral locking device to secure line flow.
- 3 **Anti-static Device:** Spring-loaded pins assures the electrical continuity between the ball, stem and body, to avoid arcing due to static buildup.
- 4 **Blow-out Proof Stem:** The lower end of the separate stem is T-shaped to create an integral collar making the stem blowout-proof.
- 5 **Bolted Body / Flanged Adapter:** Maintains seal integrity with properly torqued stud/nut.
- 6 **Fire Safe Design:** Metal to metal sealing shuts off valve flow when soft sealing materials are destroyed by fire.

## APPLICATIONS

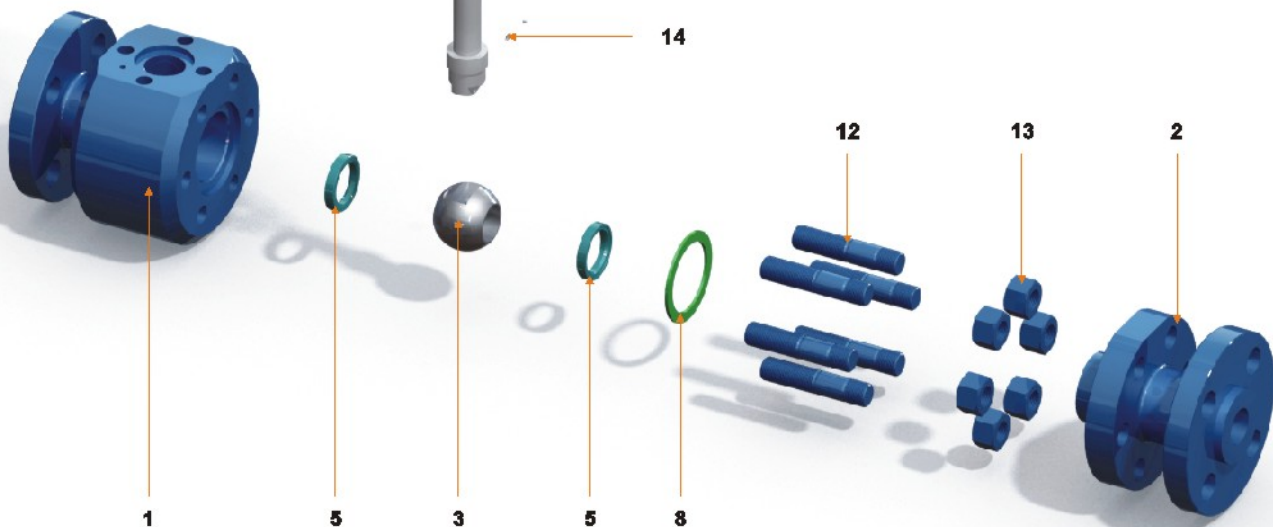
- Refinery
- Petrochemical
- Power
- Chemical
- Pharmaceutical
- Paper

# BB Series Ball Valve

## Material specifications



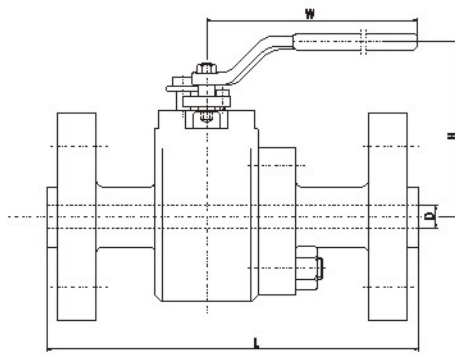
Index no	Part
1	Body
2	Bonnet
3	Ball
4	Lever
5	Seat Ring
6	Stem
7	Gland
8	Gasket
9	Packing Set
10	Space Ring
11	Thrust Washer
12	Stud
13	Nut
14	Anti Static Device
15	Bolt
16	Gland Cap
17	Gasket
18	Gland Flange
19	Bolt
20	Locking Plate
21	Screw
22	Bolt
23	Washer
24	Stop Plate



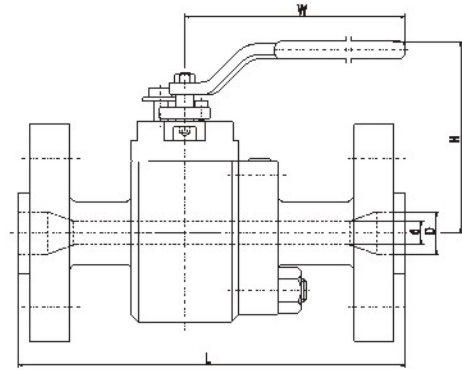
No	Part	Standard	Stainless Steel	Sour Service	Low Temperature Service
1	Body	ASTMA105N	ASTMA182-F316	ASTMA105N	ASTMA350-LF2
2	Bonnet	ASTMA105N	ASTMA182-F316	ASTMA105N	ASTMA350-LF2
3	Ball	ASTMA105N/ENP	ASTMA182-F316	ASTMA105N/ENP	ASTMA182-F316
4	Lever	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel
5	Seat Ring	PTFE	PTFE	PTFE	PTFE
6	Stem	ASTMA182-F6a	ASTMA182-F316	ASTMA182-F6a	ASTMA182-F316
7	Gland	ASTMA276-420	ASTMA276-316	ASTMA276-420	ASTMA276-316
8	Gasket	316 S.S.+Graphlte	316 S.S.+Graphlte	316 S.S.+Graphlte	316 S.S.+Graphlte
9	Packing Set	Graphlte	Graphlte	Graphlte	Graphlte
10	Space Ring	ASTMA276-420	ASTMA276-316	ASTMA276-420	ASTMA276-316
11	Thrust Washer	PTFE	PTFE	PTFE	PTFE
12	Stud	ASTMA193-B7	ASTMA193-B8	ASTMA193-B7M	ASTMA320-L7M
13	Nut	ASTMA194-2H	ASTMA194-8	ASTMA194-2HM	ASTMA194-7M
14	Anti Static Device	S.S.	S.S.	S.S.	S.S.
15	Bolt	Carbon Steel	S.S.	Carbon Steel	S.S.
16	Gland Cap	ASTMA105N	ASTMA182-F316	ASTMA105N	ASTMA350-LF2
17	Gasket	316 S.S.+Graphlte	316 S.S.+Graphlte	316 S.S.+Graphlte	316 S.S.+Graphlte
18	Gland Flange	ASTMA216-WCB	ASTMA351-CF8	ASTMA216-WCB	ASTMA352-LCB
19	Bolt	ASTMA193-B7	ASTMA193-B8	ASTMA193-B7M	ASTMA320-L7M
20	Locking Plate	S.S.	S.S.	S.S.	S.S.
21	Screw	S.S.	S.S.	S.S.	S.S.
22	Bolt	Carbon Steel	S.S.	Carbon Steel	S.S.
23	Washer	Carbon Steel	S.S.	Carbon Steel	S.S.
24	Stop Plate	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel

# BB Series Ball Valve

Two-piece, split body, forged steel, side entry design



Full Port



Reduced Port

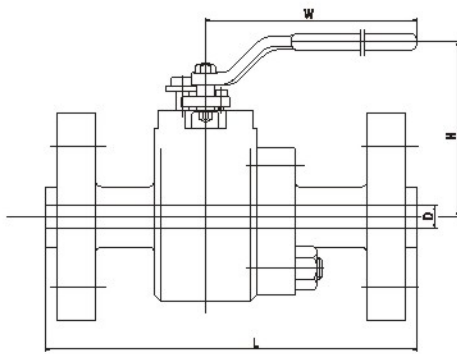
## 600 LB Dimensions

Full Port											
Size		D		L		H		W		Weight	
In	mm	In	mm	In	mm	In	mm	In	mm	lb	Kg
1/2"	15	0.50	12.7	6.50	165	4.21	107	5.91	150	7.7	3.5
3/4"	20	0.75	19	7.52	191	5.08	129	7.09	180	12.8	5.8
1"	25	1.00	25.4	8.50	216	5.93	150.5	9.06	230	14.3	6.5
1-1/2"	40	1.50	38	9.49	241	7.72	196	11.81	300	29.1	13.2
2"	50	2.00	51	11.50	282	8.00	228.5	13.78	350	63.9	29.0

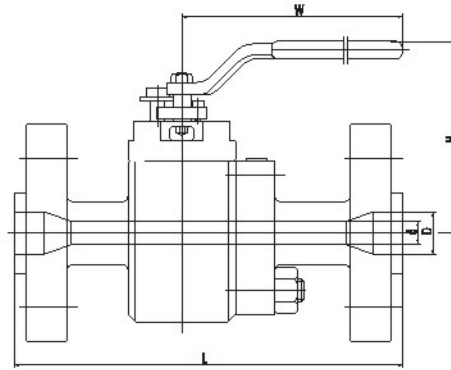
Reduced Port													
Size		d		D		L		H		W		Weight	
In	mm	In	mm	In	mm	In	mm	In	mm	In	mm	lb	Kg
1/2*3/8	15*10	0.37	9.5	0.50	12.7	6.50	165	3.15	80	4.45	113		
3/4**1/2	20*15	0.50	12.7	0.75	19	7.52	191	4.21	107	5.91	150	11.0	5.0
1*3/4	25*20	0.75	19	1.00	25.4	8.50	216	5.08	129	7.09	180	11.7	5.3
1-1/2*1	40*25	1.00	25.4	1.50	38	9.49	241	5.93	150.5	9.06	230	23.4	10.6
2*1-1/2	50*40	1.50	38	2.00	51	11.50	292	7.72	196	11.81	300	55.1	25.0

## 900 LB Dimensions

Full Port											
Size		D		L		H		W		Weight	
In	mm	In	mm	In	mm	In	mm	In	mm	lb	Kg
1/2"	15	0.50	12.7	8.50	216	4.21	107	5.91	150	18.7	8.5
3/4"	20	0.75	19	9.02	229	5.08	129	7.09	180	24.3	11.0
1"	25	1.00	25.4	10.00	254	5.93	150.5	9.06	230	35.3	16.0
1-1/2"	40	1.50	38	12.01	305	7.72	196	11.81	300	72.8	33.0
2"	50	2.00	51	14.49	368	8.00	228.5	14.57	370	99.2	45.0



Full Port



Reduced Port

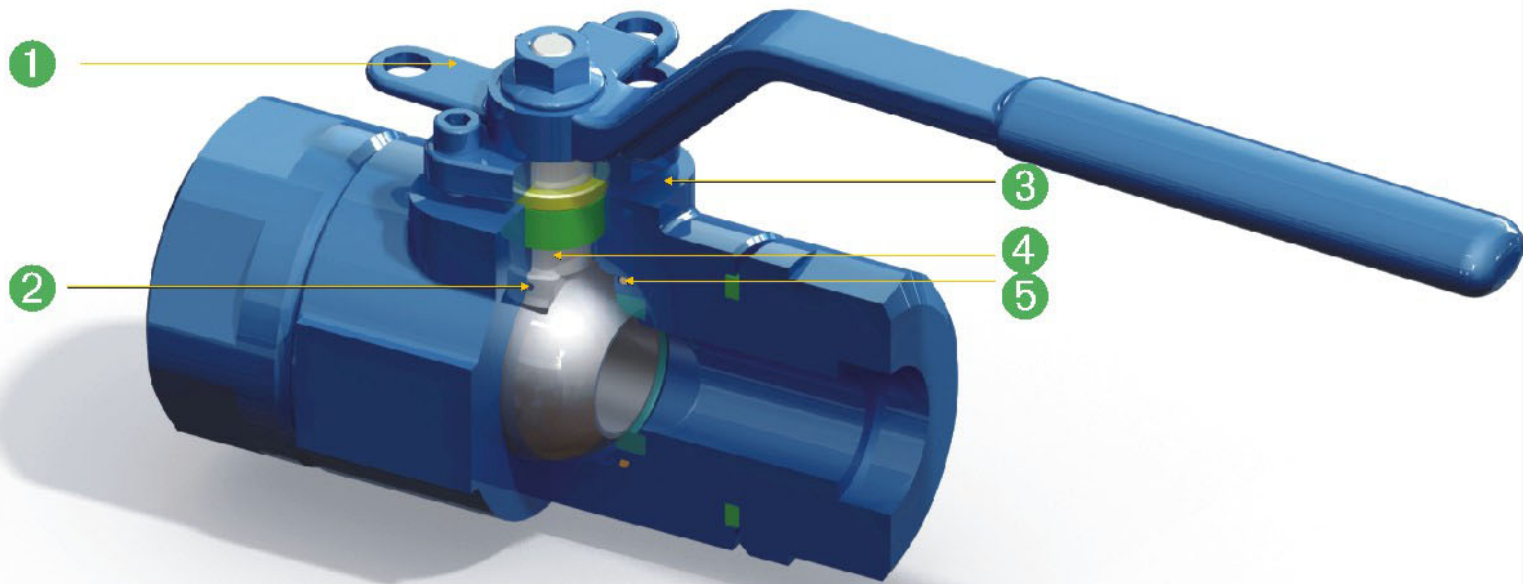
## 900 LB Dimensions

Port ced Redu													
Size		d		D		L		H		W		Weight	
In	mm	In	mm	In	mm	In	mm	In	mm	In	mm	lb	Kg
1/2*3/8	15*10	0.37	9.5	0.50	12.7	8.60	216	3.15	80	4.45	113	0.0	
3/4*1/2	20*15	0.50	12.7	0.75	19	9.02	229	4.21	107	5.91	150	22.0	10.0
1*3/4	25*20	0.75	19	1.00	25.4	10.00	254	5.08	129	7.09	180	33.1	15.0
1-1/2*1	40*25	1.00	25.4	1.50	38	12.01	305	5.83	150.5	9.06	230	0.0	
2*1-1/2	50*40	1.50	38	2.00	51	14.49	368	7.72	196	11.81	300	88.2	40.0

## 1500 LB Dimensions

Full Port													
Size		D		L		H		W		Weight			
In	mm	In	mm	In	mm	In	mm	In	mm	lb	Kg		
1/2"	15	0.50	12.7	8.60	216	4.21	107	5.91	150	15.0	6.8		
3/4"	20	0.75	19	9.02	229	5.08	129	7.09	180	24.3	11.0		
1"	25	1.00	25.4	10.00	254	5.83	150.5	9.06	230	35.3	16.0		
1-1/2"	40	1.50	38	12.01	305	7.72	196	11.81	300	71.9	32.6		
2"	50	2.00	51	14.49	368	9.00	228.5	14.57	370	141.1	64.0		

Port ced Redu													
Size		d		D		L		H		W		Weight	
In	mm	In	mm	In	mm	In	mm	In	mm	In	mm	lb	Kg
1/2*3/8	15*10	0.37	9.5	0.50	12.7	8.60	216	3.15	80	4.45	113	0.0	
3/4*1/2	20*15	0.50	12.7	0.75	19	9.02	229	4.21	107	5.91	150	22.0	10.0
1*3/4	25*20	0.75	19	1.00	25.4	10.00	254	5.08	129	7.09	180	33.1	15.0
1-1/2*1	40*25	1.00	25.4	1.50	38	12.01	305	5.83	150.5	9.06	230	61.7	28.0
2*1-1/2	50*40	1.50	38	2.00	51	14.49	368	7.72	196	11.81	300	90.4	41.0

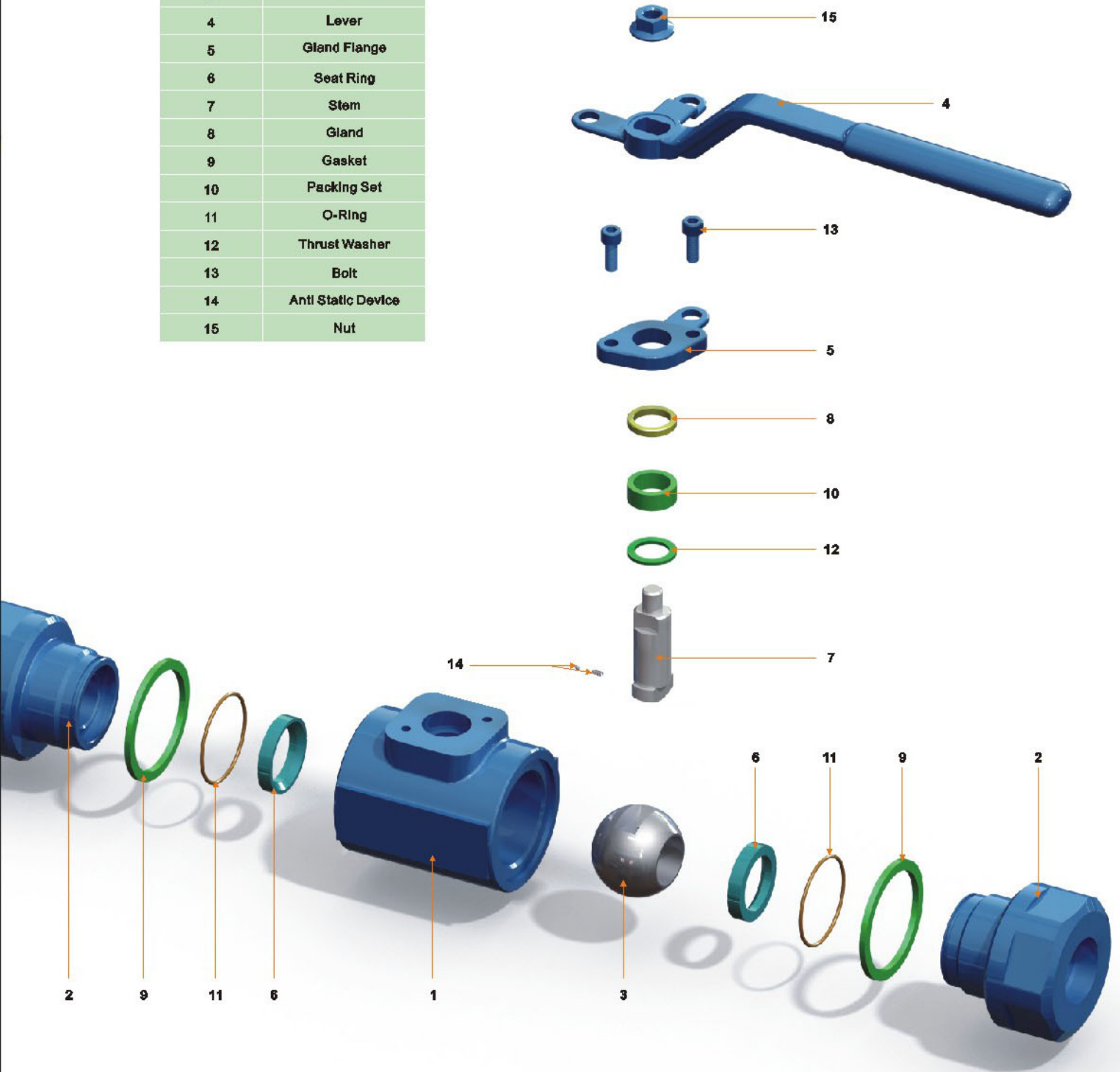


- ① **Secure Line Flow Locking Device:** Valve is equipped with an Integral locking device to secure line flow.
- ② **Anti-static Device:** Spring-loaded pins assures the electrical continuity between the ball, stem and body, to avoid arcing due to static buildup.
- ③ **ISO 5211 Mount Pad:** Simplifies the installation of actuators with standardized connections.
- ④ **Blow-out Proof Stem:** The lower end of the separate stem is T-shaped to create an Integral collar making the stem blowout-proof.
- ⑤ **O-ring Seal Design:** Protects threads from crevice corrosion.

## APPLICATIONS

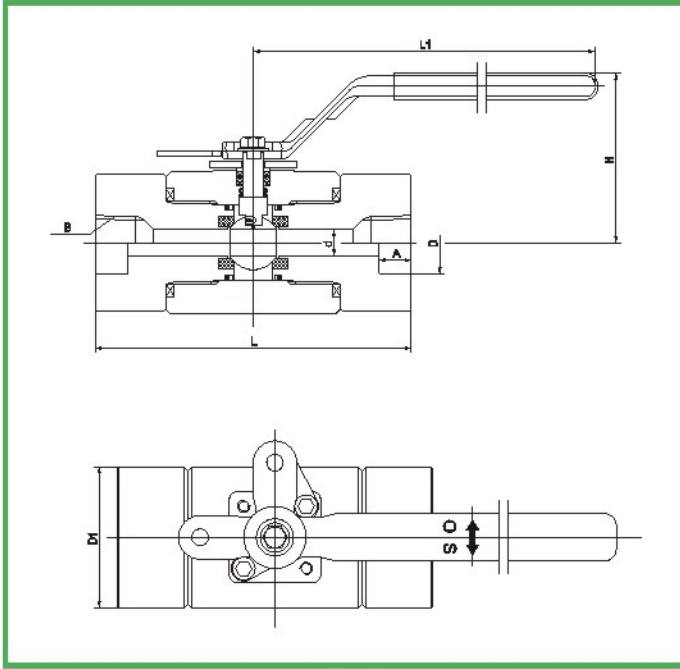
- Refinery
- Chemical
- Power
- Petrochemical

Index no	Part
1	Body
2	Bonnet
3	Ball
4	Lever
5	Gland Flange
6	Seat Ring
7	Stem
8	Gland
9	Gasket
10	Packing Set
11	O-Ring
12	Thrust Washer
13	Bolt
14	Anti Static Device
15	Nut

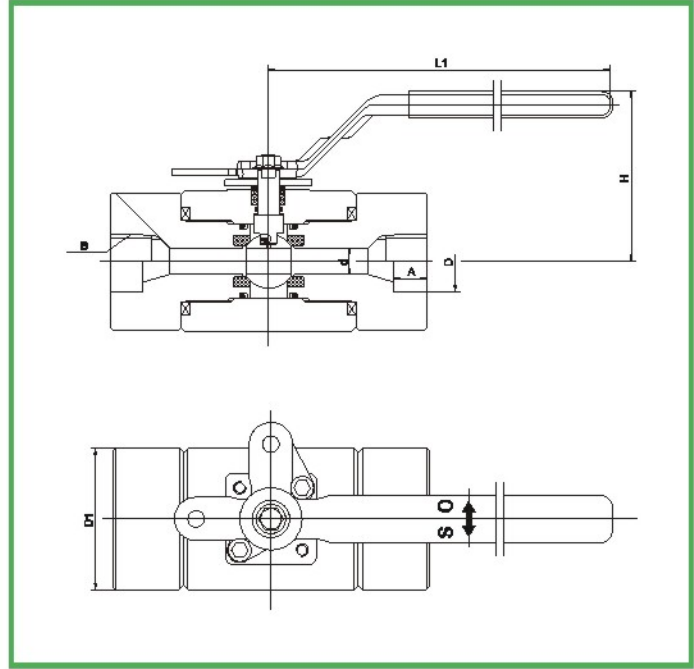




No	Part	Standard	Stainless Steel	Sour Service	Low Temperature Service
1	Body	ASTM A105N	ASTM A182-F316	ASTM A105N	ASTM A350-LF2
2	Bonnet	ASTM A105N	ASTM A182-F316	ASTM A105N	ASTM A350-LF2
3	Ball	ASTM A105N/ENP	ASTM A182-F316	ASTM A105N/ENP	ASTM A182-F316
4	Lever	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel
5	Gland Flange	ASTM A216-WCB	ASTM A351-CF8	ASTM A216-WCB	ASTM A352-LCB
6	Seat Ring	PTFE	PTFE	PTFE	PTFE
7	Stem	ASTM A182-F6a	ASTM A182-F316	ASTM A182-F6a	ASTM A182-F316
8	Gland	ASTM A276-420	ASTM A276-316	ASTM A276-420	ASTM A276-316
9	Gasket	316 S.S.+Graphite	316 S.S.+Graphite	316 S.S.+Graphite	316 S.S.+Graphite
10	Packing Set	Graphite	Graphite	Graphite	Graphite
11	O-Ring	Viton AED	Viton AED	Viton AED	Viton AED
12	Thrust Washer	PTFE	PTFE	PTFE	PTFE
13	Bolt	ASTM A193-B7	ASTM A193-B8	ASTM A193-B7M	ASTM A320-L7M
14	Anti Static Device	S.S.	S.S.	S.S.	S.S.
15	Nut	Carbon Steel	S.S.	Carbon Steel	S.S.



Full Bore



Reduced Bore

## 800 /1500/2500LB Dimensions

Full Bore																		
Size		d		L		H		L1		A		D		D1		B	Weight	
In	mm	In	mm	In	mm	In	mm	In	mm	In	mm	In	mm	In	mm		kg	lb
1/4	8	0.25	6.4	0.25	76	2.99	41	1.80	100	3.94	9.5	0.37	14.2	0.56	33.0	1/4-18NPT	0.6	1.4
3/8	10	0.38	10	0.37	84	3.31	46	1.76	120	4.72	9.5	0.37	17.6	0.69	38.0	3/8-18NPT	0.9	1.9
1/2	15	0.50	13	0.51	104	4.09	62	2.44	150	5.91	9.5	0.37	21.8	0.86	42.0	1/2-14NPT	1.2	2.7
3/4	20	0.75	20	0.79	127	5.00	82	3.23	180	7.09	12.6	0.49	27.2	1.07	58.0	3/4-14NPT	2.9	6.3
1	25	1.00	25	0.98	157	6.18	100	3.94	230	9.06	12.5	0.49	33.9	1.33	72.0	1-11.5NPT	5.4	12.0
1-1/2	40	1.50	38	1.50	197	7.76	135	5.31	300	11.81	12.5	0.49	48.8	1.92	106.0	1-1/2-11.5NPT	14.3	31.6
2	50	2.00	51	2.01	210	8.27	165	6.50	370	14.57	16.0	0.63	61.2	2.41	134.0	2-11.5NPT	24.8	54.1

Reduced Bore																		
Size		d		L		H		L1		A		D		D1		B	Weight	
In	mm	In	mm	In	mm	In	mm	In	mm	In	mm	In	mm	In	mm		kg	lb
3/8*1/4	10*8	0.25	6.4	0.25	76	2.99	40.6	1.80	100	3.94	9.5	0.37	17.6	0.69	33	3/8-18NPT	0.5	1.2
1/2*3/8	15*10	0.37	9.6	0.37	84	3.31	44.8	1.76	120	4.72	9.5	0.37	21.8	0.86	38	1/2-14NPT	0.8	1.7
3/4*1/2	20*15	0.51	13	0.51	104	4.09	62	2.44	150	5.91	12.5	0.49	27.2	1.07	42	3/4-14NPT	1.1	2.4
1*3/4	25*20	0.79	20	0.79	127	5.00	82	3.23	180	7.09	12.5	0.49	33.9	1.33	58	1-11.5NPT	2.7	5.9
1-1/2*1	40*25	0.98	25	0.98	157	6.18	100	3.94	230	9.06	12.5	0.49	48.8	1.92	72	1-1/2-11.5NPT	5.1	11.3
2*1-1/2	50*40	1.50	38	1.50	197	7.76	135	5.31	300	11.81	16	0.63	61.2	2.41	105	2-11.5NPT	14.0	30.9

### Seat

Properties		PTFE	NYLON	PEEK	PCTFE	DEVLON V-API
Temperature Range °F		-328~428	-58~248	-148~500	-328~302	-148~302
Temperature Range °C		-200~220	-50~120	-100~260	-200~150	-100~150
Pressure Rating		150~600	150~1500	150~2500	150~1500	150~1500
Mechanical Property	Hardness (D)	58	72	88	85	78
	Tensile Strength(MPa)	14~34	55.2	134	35.9	79.9
	Tensile Elongation(Break,%)	350	250	2.2	150	5.4
Physical Property	Specific Gravity (g/cm3)	2.17	1.02	1.44	2.12	1.14
	Water Absorption 24hrs(%)	0.00	1	0.06	0.00	0.1
	Water Absorption saturation	<0.01	1.6	0.2	<0.01	3
Service Application		Chemical & low temperature	High Pressure & Hydrocarbon	High pressure & temperature	Cryogenic	High Pressure & Hydrocarbon

### Sealing

Type	NBR	HNBR	VITON	FFKM	EPDM
Temperature Range °F	-22~230	-40~302	-4~392	-4~620	-58~302
Temperature Range °C	-30~110	-40~150	-20~200	-20~327	-50~150
Specific Gravity (g/cm3)	1.31	1.34	1.85	2	0.87
Hardness (shore A)	75	75	75	75	75

### Flow Coefficient (Cv value) Specification

Size (Inch)	150LB	300LB	600LB	900LB	1500LB
1/2	25	25	20	16	16
3/4	56	56	48	34	34
1	95	95	64	55	55
1-1/2	308	308	308	165	165
2	500	430	370	320	320
3	1360	1100	1020	920	
4	2500	2000	1850		
6	5300	5250			
8	10750	10100			
10	17500	16820			
12	26750	25950			

\* Other elastomer materials available upon request.

#### Notes:

- 1.All the sizes are in full port.
- 2.Pressure Ratings are according to B 16.34.

#### Method of Calculating Flow

The Flow Coefficient Cv of a valve is the flow rate of water (gallons/minute) through a fully opened valve, with a pressure drop of 1 psi across the valve. To find the flow of liquid through the valve from the Cv, use the following formulas:

#### Liquid Flow:

$$QL = Cv (P/G)^{1/2}$$

QL = Flow rate of liquid (gal. /min.)

P = differential pressure across the valve

G = specific gravity of liquid (for water, G=1)

#### Gas Flow:

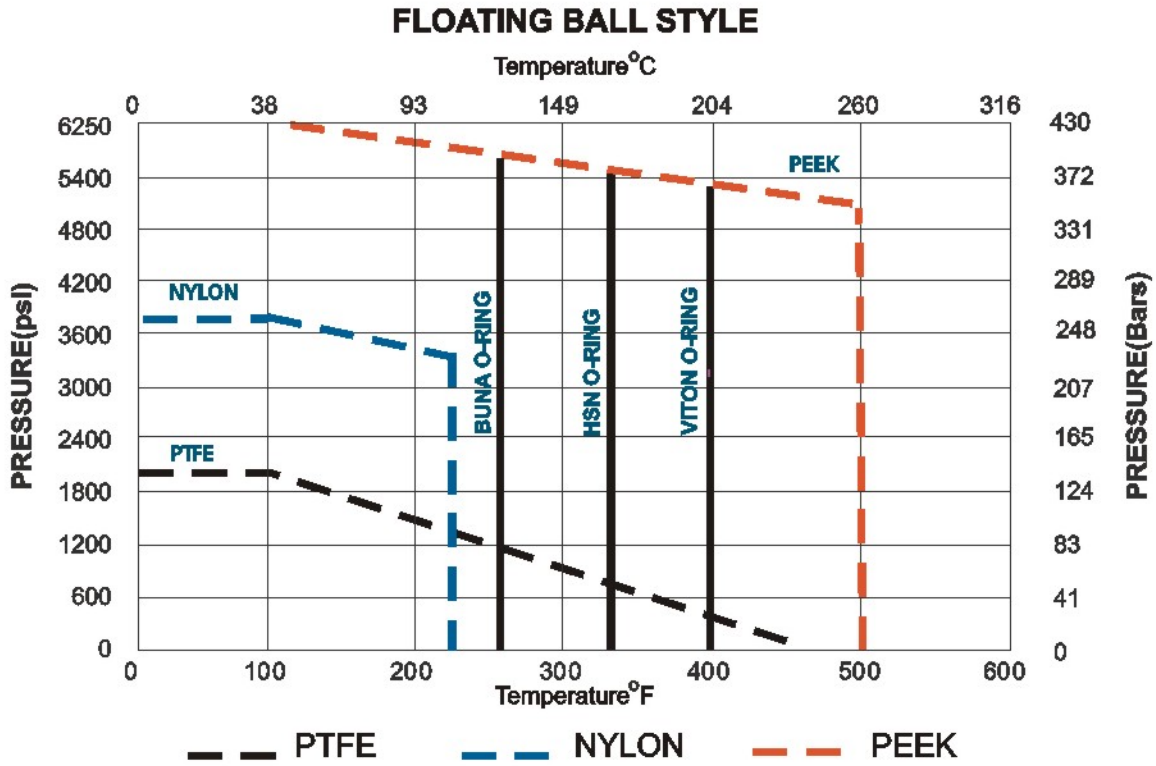
$$Qg = 61Cv (P_2/P)^{1/2}$$

(For non-critical flow, P/P<1.0)

Qg = Flow rate of gas (CFH at STP)

P<sub>2</sub> = outlet pressure (psia)

g = specific gravity of gas (for air, g=1.0)



O-Ring materials for floating ball valves are for seat and stem. All Body/bonnet seals are graphite. Above ratings are for soft seal components. Please consult ASME B16.34 for Body and Closure Pressure /Temperature ratings.

## Operating Torque

in	150LB		300LB		400LB		600LB	
	N.m	Ft/Lbs	N.m	Ft/Lbs	N.m	Ft/Lbs	N.m	Ft/Lbs
1/4	5	3.69	6	4.43	8	5.90	12	8.86
3/8	5	3.69	6	4.43	8	5.90	12	8.86
1/2	6	4.43	9	6.64	11	8.12	16	11.81
3/4	10	7.38	12	8.86	14	10.33	20	14.76
1	15	11.07	20	14.76	29	21.40	42	31.00
1-1/4	32	23.62	48	35.42	45	33.21	60	44.28
1-1/2	40	29.52	60	44.28	62	45.76	90	66.42
2	50	36.90	70	51.66	90	66.42	130	95.94
2-1/2	80	59.04	90	66.42	104	76.75	150	110.70
3	90	66.42	120	88.56	138	101.84	200	147.80
4	180	132.84	230	169.74	255	188.19	370	273.06
5	340	250.92	420	309.96				
6	840	619.92	930	686.34				
8	1100	811.80	1930	1424.34				
10	2000	1476.00	4500	3321.00				
12	3200	2361.60						

in	800LB		900LB		1500LB		2500LB	
	N.m	Ft/Lbs	N.m	Ft/Lbs	N.m	Ft/Lbs	N.m	Ft/Lbs
1/4	15	11.07	15	11.07	22	16.24	32	23.62
3/8	15	11.07	15	11.07	22	16.24	32	23.62
1/2	19	14.02	20	14.76	32	23.62	56	41.33
3/4	33	24.35	35	25.83	45	33.21	100	73.80
1	65	47.97	70	51.66	120	88.56	190	140.22
1-1/4	90	66.42	100	73.80	170	125.46	310	228.78
1-1/2	130	95.94	140	103.32	189	138.48	360	265.68
2	187	138.01	200	147.80	420	309.96		
2-1/2	280	206.64	320	236.16				
3	403	297.41	431	318.08				

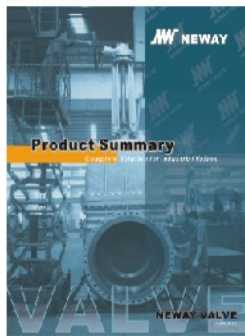
**Notes:**

1. Torque is calculated based on normal temperature, with RPTFE seat for 150LB~300LB and NYLON seat for 600LB~1500LB.
2. For cryogenic service, torque shall be increased about 2~2.5 times.
3. Torque shown in this table is to be used as a guide for actuator selection. A safety factor of 1.3~1.5 is recommended for actuator sizing.
4. Torque may be changed according to different fluid and trim material.

## Product Warranty

---

Seller will replace without charge or refund the purchase price of products provided by Seller which prove to be defective in material or workmanship, provided in each case that the product is properly installed and is used in the service for which Seller recommends it and that written claim, specifying the alleged defect, is presented to the Seller within 18 months from the date of shipment or 12 months after installation, whichever occurs first. Seller shall in no event bear any labor, equipment, engineering or other costs incurred in connection with repair or replacement. The warranty stated in this paragraph is in lieu of all other warranties, either expressed or implied. With respect to warranties, this paragraph states Buyer's exclusive remedy and seller's exclusive liability.



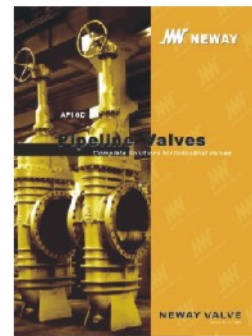
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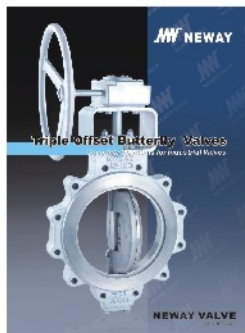
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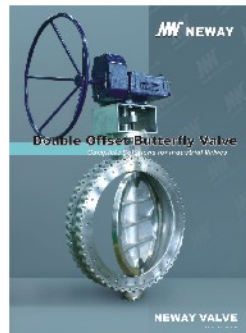
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Cat.no.:E-PLV



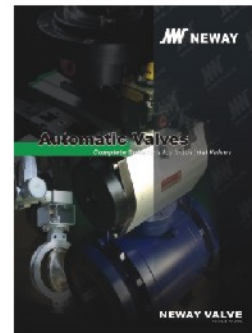
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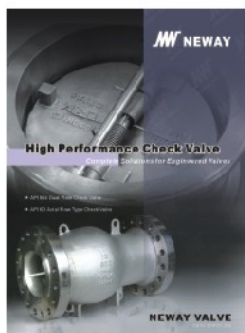
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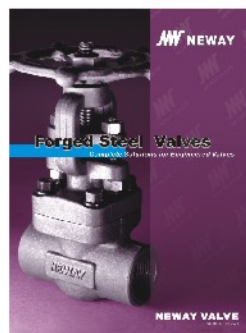
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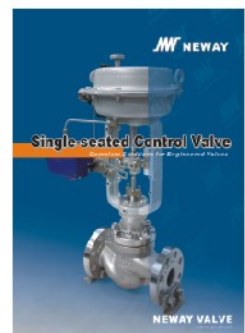
Cat.no.:E-AV



Cat.no.:E-HPCV



Cat.no.:E-FSV



Cat.no.:E-CSS



Cat.no.:E-CSC

**JW NEWAY**  
**NEWAY VALVE (SUZHOU) CO., LTD.**

No.999 Xiangjiang Road, Suzhou New District, P.R. China  
 Post Code: 215129  
 Tel: 86-512-666-51365  
 Fax: 86-512-666-51360  
 E-Mail: [neway@neway.com.cn](mailto:neway@neway.com.cn)  
<http://www.newayvalve.com>

Distributed by:



# N Series

## General Information

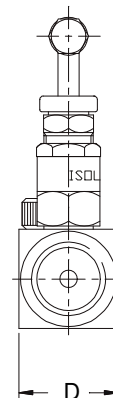
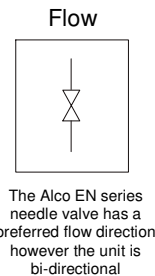
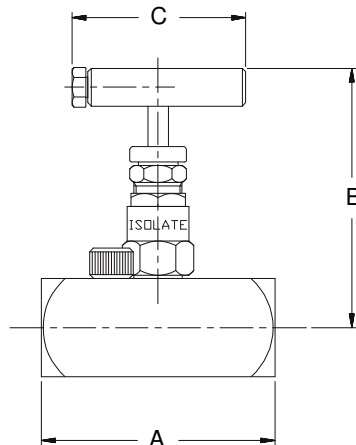
### Needle Valves 6,000 psi & 10,000 psi

The precision made 'N' series, single isolation hand valve utilising metal to metal seat and body to bonnet connection for superior, bubble tight sealing capabilities at both extreme pressures and temperatures. The "N" series also offers non-rotating hardened tip for extended service life. The unique anti-vibration cam locking device at the body bonnet connection is for extra safety. Working pressures are 6,000 psi and 10,000 psi. Maximum working temperature up to 230°C and up to 570°C with GP option.

## Design Features

Bubble tight metal to metal seat for positive shut off.  
2 piece non-rotating hardened (17-4PH) tip for first time seal and long service life.  
Pressure responsive multi-ring / piston packing for compression and pressure dynamic sealing.  
Metal to metal body bonnet seal for high pressure and high temperature sealing.  
Unique bonnet locking cam. No accidental removal of head unit, or loosening due to vibration.  
Positive no slack stem action.  
Bi-directional flow, with preferred flow indicated.  
Back sealing stem to extend packing life.  
Available NPT, BSPP, BSPT threaded.

Temperature range -100°C to 230°C (570°C with GP option).  
Repair / service kits available to extend field life further.  
Actuating threads are above the packings to prevent contamination by the process medium.  
Body to bonnet ingress seal fitted as standard to prevent crevice corrosion.  
Full material traceability of major components.  
Available fire safe to BS6755 Part 2.  
Materials of construction can be supplied to meet the requirements of NACE MR-01-75.



## Part Numbers

St / St Part No.	Connections Size	A	B (Open)	Orifice size	C	D	CV	KV	Weight (Kgs)
N2NS	1/4" NPT	61	73	5	50	26	0.3	0.26	0.35
N3NS	3/8" NPT	61	73	5	50	26	0.75	0.65	0.35
N4NS	1/2" NPT	68	75	5	50	28	0.75	0.65	0.38
N6NS	3/4" NPT	76	77	5	50	38	0.75	0.65	0.7
N8NS	1" NPT	85	85	8	50	45	1.8	1.6	1.1

For 10,000 psi version add "U" i.e. UN4NS  
For BSPP threads change "N" to "P" i.e. N2PS  
For BSPT threads change "N" to "T" i.e. N2TS  
Packing materials: RTFE (standard) graphoil high temperature option -GP  
Orifice may vary with rating

Dims are in mm (Appx)

See technical section for important additional valve data.



Europe (UK)  
Tel : 01484 710511 Fax 01484 713009  
International : ++ 44 1484 710511  
USA & Canada  
Tel : ++ (1) 519 767 6655 Fax ++ (1) 519 767 6740  
www.alco-valves.com

REF: AVCAT2005057  
REV: 01

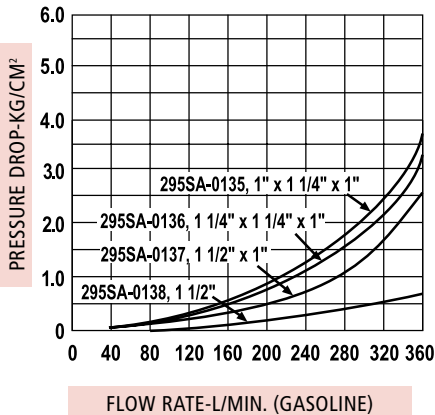
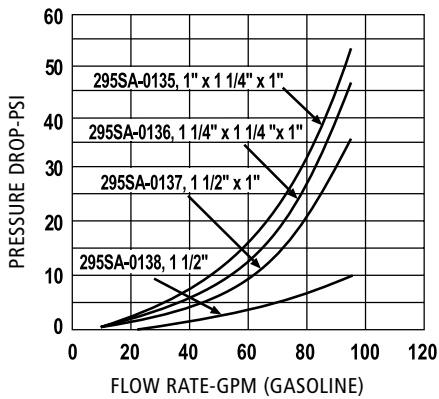
SECTION 8

Page 2



## OPW 295SA & SAJ Aircraft Nozzles

### For Overwing Aircraft Service



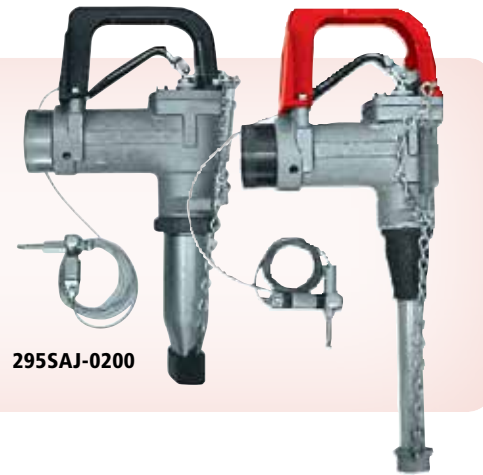
### Ordering Specifications

Product #	Inlet Thread		Spout O.D		Spout O.D	
	in.	mm	lbs.	kg	in.	mm
295SA-0135	1	25	4.60	2.10	1	25
295SA-0136	1 1/4	32	4.50	2.00	1	25
295SA-0137	1 1/2	38	4.50	2.00	1	25
295SA-0138	1 1/2	38	5.10	2.30	1 5/8	41
295SAJ-0200	1 1/2	38	5.60	2.50	2 2/3	54
295SAC-0156*	1 1/4	32	4.50	2.00	1	25
295SAC-0157*	1 1/2	38	4.50	2.00	1	25
295SAC-0158*	1 1/2	38	5.15	2.30	1 5/8	41
295SACJ-0200*	1 1/2	38	5.65	2.60	2 2/3	54

\*Check Valve

### Materials

- Body: Cast aluminum
- Main Stem: Stainless steel
- Stem Seal: Buna-N O-Ring
- Disc: Viton®
- Spout: Aluminum



### Features

- ◆ Aluminum Body – lighter weight, easier to maneuver.
- ◆ Dual Poppets – easy-to-open nozzle against high inlet pressures.
- ◆ Color-Coded Composite Lever Guards – helps distinguish between AVGAS and Jet A. Easily replaced in lever guard kit.
- ◆ Right Angle Design – provides larger lever area for better grip and easier control.
- ◆ Vinyl-Coated Lever – insulates fingers against cold.
- ◆ 100 Mesh Strainer – prevents foreign matter from entering fuel tank; easy to remove and clean.
- ◆ Dust Cap – keeps spout free from dirt and stops fuel drippage when connected.
- ◆ Adjustable Dash Pot – permits adjusting the main poppet closure rate over a wide range of flows to overcome line shock with minimum afterflow.
- ◆ Easily replaced spout – the spout is easily threaded into the body. Replacement spouts are readily available from OPW.
- ◆ Built-In Swivel – eliminates twisting and kinking of the hose. This swivel is electroless nickel-plated and has full-bearing surfaces.
- ◆ NPT Female Threads at Inlet End of 295SA – accepts all 1", 1-1/4" or 1-1/2" male connections.
- ◆ NPT Female Threads At Inlet End Of 295SAJ – accepts all 1-1/2" male connections.
- ◆ Unique Jet Aircraft Spout Design of 295SAJ – to help prevent inadvertent fueling of piston engine aircraft with turbine fuel.
- ◆ Ground Wire Assembly – included on all aviation nozzles.

### Design working pressure

- ◆ 110 psi (7.58 bar) maximum pressure

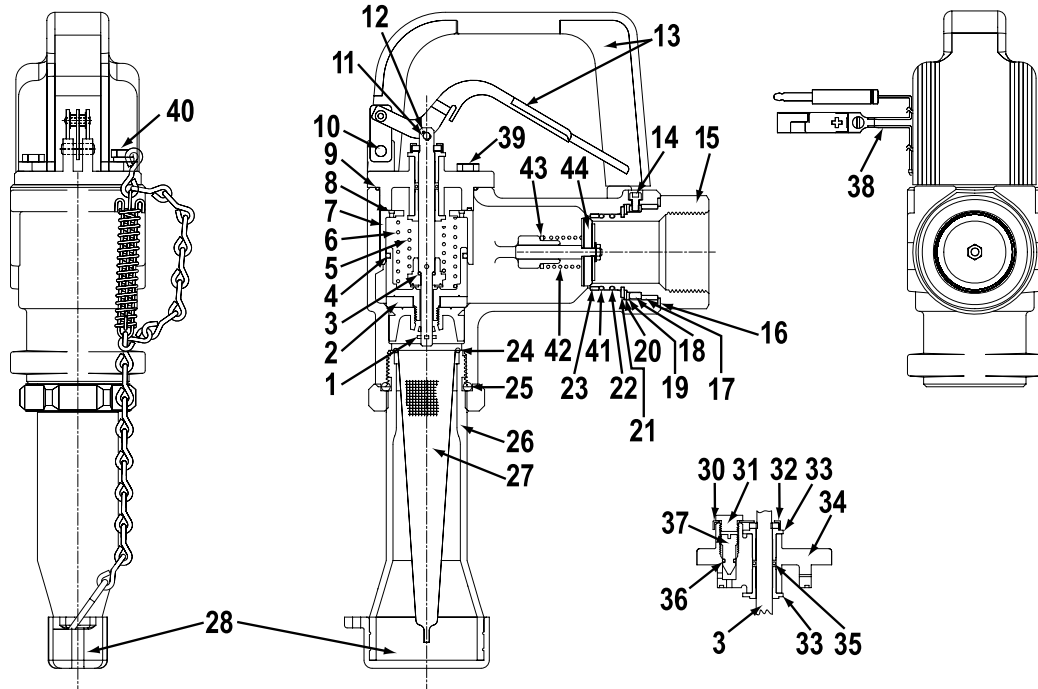
### Level Guard Replacement Kits

Product #	Nozzle
295KLG-0300	295SA-0135, 0136, 0137, 295SAC-0156, 0157 Red
295KLG-0350	295SA-0138, 275SAC-0158 Red
295KLG-0400	295SAJ-0200, 295SACJ-0200 Black

All lever guard kits include new lever sub-assembly.  
295 Series Instruction Sheet Order Number: **H09237PA**

NOTE: See OPW's Website at [www.opwglobal.com](http://www.opwglobal.com) for product instruction sheets, trouble-shooting guides, how-to-use guide and to view the Do's & Don'ts at the Gas Pump video.

## Replacement Parts - OPW 295SA/295SAC & 295SAJ



Key	Part #	Description	295SA-0135 inlet/ spout 1" x 1"	295SA-0136 & 295SAC-0156 inlet/ spout 1 1/4" x 1"	295SA-0137 & 295SAC-0157 inlet/ spout 1 1/2" x 1"	295SA-0138 & 295SAC-0158 inlet/ spout 1 1/2" x 1 1/2"	295SAJ-0200 & 295SACJ-0200 inlet/ spout 1 1/2" x 1 1/2"
1	H02477M	Cotter Pin	•	•	•	•	•
2	H07719	Main Poppet S/A	•	•	•	•	•
3	H09420	Stem & Sec. Poppet	•	•	•	•	•
3	H09417	Stem & Sec. Poppet	•	•	•	•	•
4	H12706M	O-Ring	•	•	•	•	•
5	H09367M	Spring	•	•	•	•	•
6	H05064M	Spring	•	•	•	•	•
7	H05088M	Skirt	•	•	•	•	•
8	H05198M	Seal	•	•	•	•	•
9	H04828M	Seal	•	•	•	•	•
10	H03981RE	Pin	•	•	•	•	•
11	H05000M	Cotter Pin	•	•	•	•	•
12	H07580M	Rivet	•	•	•	•	•
13	295KLG-0300	Lever Guard Kit*	•	•	•	•	•
13	295KLG-0350	Lever Guard Kit*	•	•	•	•	•
13	295KLG-0400	Lever Guard Kit*	•	•	•	•	•
14	H13774M	Screw (3 req'd)*	•	•	•	•	•
15	295SWK-0007	Swivel Repair Kit**	•	•	•	•	•
15	295SWK-0009	Swivel Repair Kit**	•	•	•	•	•
15	295SWK-0014	Swivel Repair Kit**	•	•	•	•	•
15	295SWK-0013	Swivel Repair Kit**	•	•	•	•	•
16	H08886M	Dust Seal	•	•	•	•	•
16	H01227M	Dust Seal	•	•	•	•	•
17	H08887M	Bearing	•	•	•	•	•
17	H08879M	Bearing	•	•	•	•	•
18	H09713RS	Retainer	•	•	•	•	•
18	H09712RS	Retainer	•	•	•	•	•

\* Replacement part for nozzles built after 08/1998. Part is unavailable for nozzles built before this date.

\*\* Includes 295SRK-0001 or 295SRK-0002 and contact ring.

## Replacement Parts-OPW 295SA/SAC & SAJ Aircraft Nozzles

Key	Part #	Description	295SA-0135 inlet/ spout 1" x 1"	295SA-0136 & 295SAC- 0156 inlet/spout 1 1/2" x 1"	295SA-0137 & 295SAC- 0157 inlet/spout 1 1/2" x 1"	295SA-0138 & 295SAC- 0158 inlet/spout 1 1/2" x 1 1/2"	295SAJ-0200 & 295SACJ-0200 inlet/ spout 1 1/2" x 1 1/2"
19	H08881M	Thrust Bearing	•	•	•		
19	H08889M	Thrust Bearing				•	•
20	H08882M	Lock Ring	•	•	•		
20	H08890M	Lock Ring				•	•
21	H09365M	Retaining Ring	•	•	•		
21	H09366M	Retaining Ring				•	•
22	H12319M	O-Ring, Buna-N	•	•	•		
22	H12320M	O-Ring, Buna-N				•	•
23	H08884M	Bearing	•	•	•		
23	H08892M	Bearing				•	•
24	H06026M	O-Ring	•	•	•		
24	H07670M	O-Ring				•	
24	H11499M	O-Ring					•
25	H05297M	O-Ring	•	•	•		
25	H07766M	O-Ring				•	
25	H10458M	O-Ring					•
26	297SA-9050	Spout S/A	•	•	•		
26	297SA-9060	Spout S/A				•	
26	696J-7010	Spout S/A					•
27	1905-7063	Strainer	•	•	•		
27	153-0910	Strainer				•	
27	153J-0100	Strainer					•
28	H10387	Cap & Chain S/A	•	•	•		
28	H10388	Cap & Chain S/A				•	
28	296CJ-0100	Cap & Chain S/A					•
29	H09212	Body Cap S/A**	•	•	•		
29	H09213	Body Cap S/A**				•	•
30	H05135M	Retainer	•	•	•	•	•
31	H08441RS	Screw	•	•	•	•	•
32	H05087M	Felt Wiper	•	•	•	•	•
33	H05063M	Bushing	•	•	•	•	•
34	C02115A	Cap	•	•	•		
34	C02117A	Cap				•	•
35	H12707M	O-Ring	•	•	•	•	•
36	H12705M	O-Ring	•	•	•	•	•
37	H04825M	Adj. Screw	•	•	•	•	•
38	190WM-8001	Ground Wire S/A	•	•	•	•	•
39	H07062M	Screw (4 req'd)	•	•	•	•	•
40	H06045M	Screws (2 req'd)	•	•	•	•	•
41	H13776M	O-Ring, Viton®				•	•
41	H13775M	O-Ring, Viton®	•	•	•		

\*\* Body Cap sub-assembly includes parts 30-37.

## Replacement Parts - OPW 295SAC & 295SACJ Only

Key	Part #	Description	295SAC-0156	295SAC-0157	295SAC-0158	295SACJ-0200
42	H07595M	Spring SST	•	•		
42	H07593M	Spring SST			•	•
43	H07613M	Washer, nylon	•	•	•	•
44	H09214	Poppet S/A	•	•		
44	H09215	Poppet S/A			•	•



# **SECTION F: CONTACT FOR INFORMATION & SERVICE**

For any enquiries or services, contact us  
at:

Petrico Pte Ltd

No.2 Penjuru Place

#01-03/04, 2-8 Penjuru Tech Hub.

Singapore 608783

Mr Lu Shao Yu

[sy.lu@petrico.com.sg](mailto:sy.lu@petrico.com.sg)

# **SECTION G: QUALITY CONTROL DOCUMENTATION**

# 1.0 OVERALL FUEL LOG

## Overall Fuel Log – Tank No. \_\_\_\_\_

No.	Fuel Consumption (liters)						Received Amount	Fuel Balance in the Tank
	Sample Check					Filling to Helicopter		
	Tank	Filter Separator	Water Monitor	Nozzle End (Before)	Nozzle End (After)			
1								
2								
3								
4								
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6								
7								
8								
9								
10								
11								
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# **2.0 HELICOPTER REFUELING LOG**



# **3.0 TANSPORT LOG HELICOPTER FUEL JET A1**



# **4.0 FILTER WATER SEPARATOR/ FILTER MONITOR FOLLOW UP LOG**



# **5.0 TANK INSPECTION & CLEANING LOG**

### Inspection and cleaning log – fuel tank Jet A-1

Installation: \_\_\_\_\_

Tank no.: \_\_\_\_\_

Capacity: \_\_\_\_\_

Non-corrosive/type of interior surface  
treatment: \_\_\_\_\_

Date of inspection: \_\_\_\_\_

Point of inspection	Signature of inspector
State the approximate volume delivered since last inspection/cleaning	
Describe the condition at the last inspection; water or pollution, the condition of the bottom plates and any surface coating	
Describe the work carried out during cleaning	
Describe any work or modifications. Any change in inclination or drainage point shall be taken into consideration	



# **6.0 HOSE INSPECTION & TEST JOURNAL**

### Hose inspection and test journal

Manufacturer: \_\_\_\_\_ Hose identification no.: \_\_\_\_\_

Type of hose: \_\_\_\_\_ Length: \_\_\_\_\_

Date of production: \_\_\_\_\_ Diameter: \_\_\_\_\_

Hose with connector:      Factory installed       Locally installed       (mark)

Date taken in use: \_\_\_\_\_ Location: \_\_\_\_\_

Date of test	Inspection interval		Test result	Signature
	Monthly	Yearly		

Use one page for each hose that is in use or in storage.

# **7.0 MONTHLY SERVICEABILITY REPORTS**

## MONTHLY SERVICEABILITY REPORT –

YEAR	MONTH	CARRIED BY	FINDINGS/REMARKS