FLOWSERVE

McCANNA/MARPAC Valves

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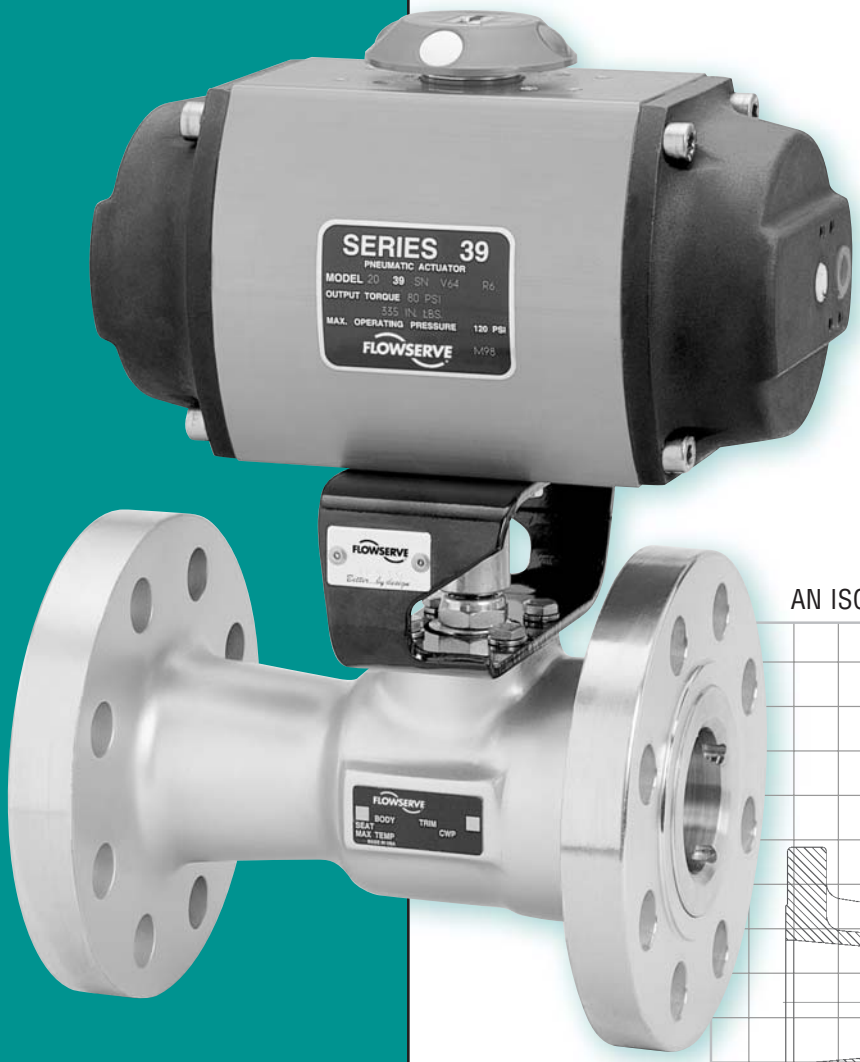
(Part SA-101)



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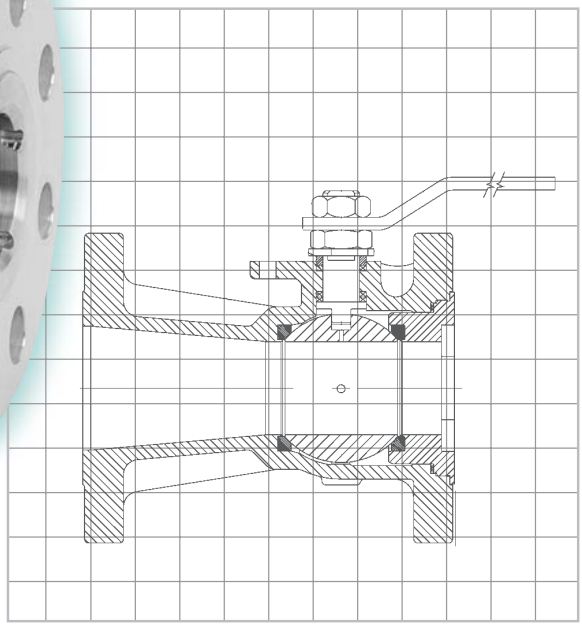


Chlorine Service Ball Valves

McCANNA/MARPAC Chlorine Service Ball Valves

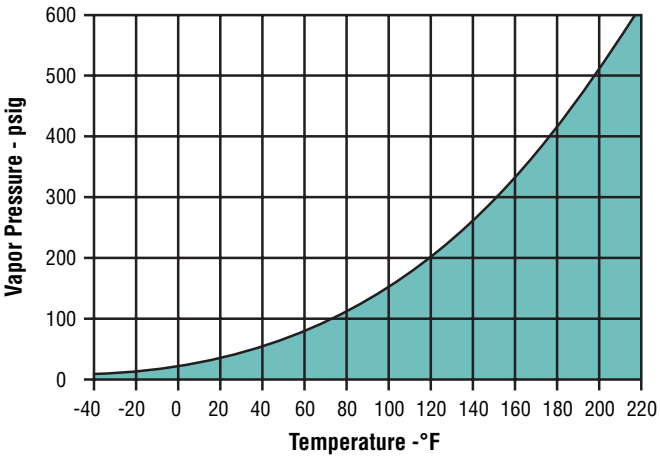
Introduction

Chlorine is extremely hazardous. It is highly reactive and toxic, causing skin burns on contact with the liquid, or respiratory irritations by breathing the gas. The gas has an irritating odor that many people can detect with as little as 3.5 parts per million (PPM) chlorine present. Breathing air containing 1000 PPM (or more) chlorine can be fatal.

Chlorine also has a very high expansion rate; one liter of liquid chlorine will vaporize to about 460 liters of gas. The graph shows the rapid increase in vapor pressure as temperature goes up. This means chlorine trapped in piping between two closed valves, or in the body cavity of a closed valve, can cause destructive pressures, unless the design includes features to prevent it.

Valves used in chlorine services must be safe, and reliable. There can be no external leakage permitted which could create a health hazard or unsafe working conditions, and valves must positively prevent the dangers of over-pressurization. McCANNA/MARPAC Chlorine Service Ball Valves are designed to meet these challenges, and rigorously tested to prove it. Your pipefitters and maintenance personnel can "work behind" McCANNA/MARPAC Chlorine Service Ball Valves without worrying about them.

VAPOR PRESSURE OF CHLORINE



Terminology

Chlorine terms can be confusing; is it liquid or gas; wet or dry? Liquid or gas refer to the physical state of chlorine; wet or dry refer to the moisture content of either the liquid or the gas. Dry chlorine is either liquid or gaseous chlorine containing less than 150 parts PPM water, by weight. Over 150 PPM is wet chlorine, liquid or gas.

McCANNA/MARPAC Chlorine Service Ball Valves are primarily intended for use on dry chlorine. Wet chlorine and hydrogen chloride as hydrochlorus or hydrochloric acid require special consideration due to their corrosiveness. Consult Flowserve on all wet chlorine applications.

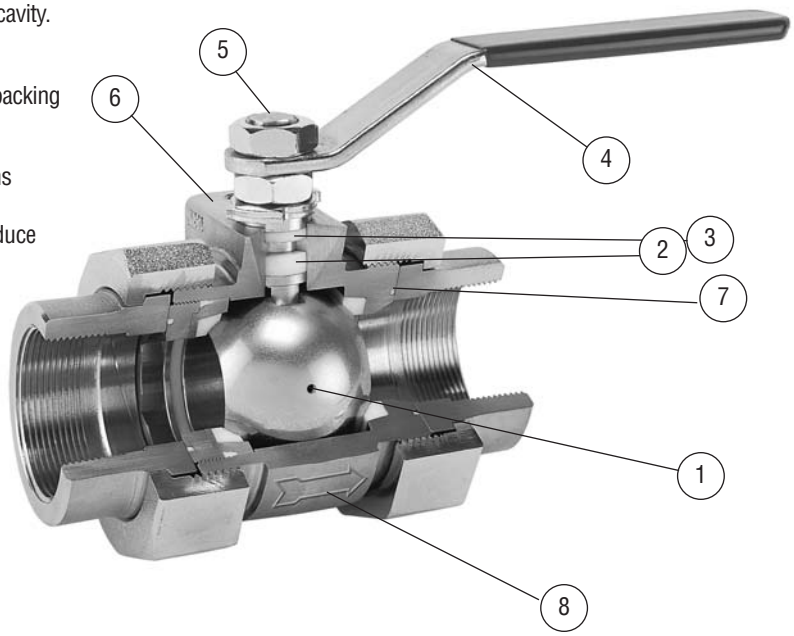
Industry Specifications

The Chlorine Institute publishes several pamphlets on the safe handling of chlorine, and recommends materials, practices, and design features. Pamphlet #6 applies to dry chlorine piping systems, including ball valves. McCANNA/MARPAC Chlorine Service Ball Valves meet or exceed the Pamphlet #6 guidelines.

Chlorine Ball Valve Design Features

Features and Benefits

1. Positive body cavity venting prevents trapping chlorine in body cavity. (See below.)
2. Conical-shaped TFE and RTFE packing rings completely fill the packing cavity to provide tight sealing at low compressive force.
3. Dual packing sets maximize seal integrity and eliminate problems commonly associated with multiple top-loaded designs. Greater distance between stem support points and tighter tolerances reduce destructive stem wobble.
4. Positive position Indication by handle and stem tang position, which align with ball port.
5. Blowout-proof internal entry stem to ensure maximum integrity.
6. Integral actuator mounting pad allows easy automation.
7. Encapsulated body seals eliminate cold flow of TFE seals, preventing external leakage.
8. Flow direction is permanently indicated for safe installation.



Body Cavity Relief — An Explanation

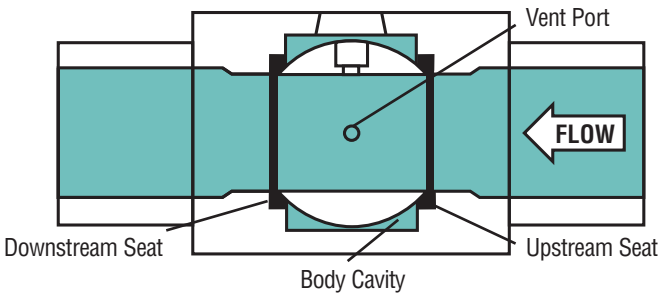
Ball valves sealing tightly on both seats can trap chlorine in the body cavity when closed. Dangerous pressures can build if temperature rises, unless means are provided to safely relieve this pressure. The Chlorine Institute recommends two ways to do this:

1. Self-relieving seats – The downstream seat seals, and the upstream (high pressure side) seat flexes or moves to relieve excess pressure.
2. Upstream Venting – A hole drilled in the side of the ball connects the body cavity to the upstream side when closed, bypassing the upstream seat.

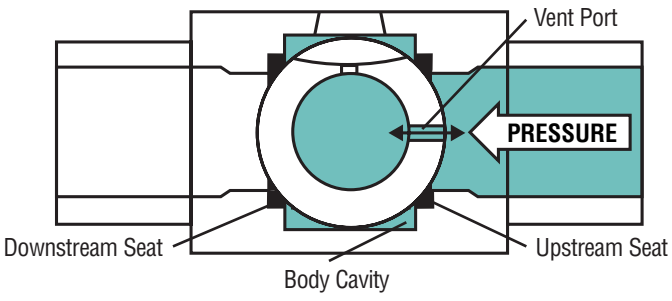
Chlorine systems are notoriously dirty, which can affect the self-relieving seat function. Also, these seats will always relieve towards the higher pressure side of the valve. If both sides are equal in pressure, relief will be towards the side with the "weaker" seat. This is unpredictable, and may result in a chlorine release.

All McCANNA/MARPAC Chlorine Service Ball Valves are provided with upstream venting. These valves will always relieve to the upstream side, regardless of pressure on either side of the valve, and without dependence on seat flexure or movement.

Upstream Venting Illustration



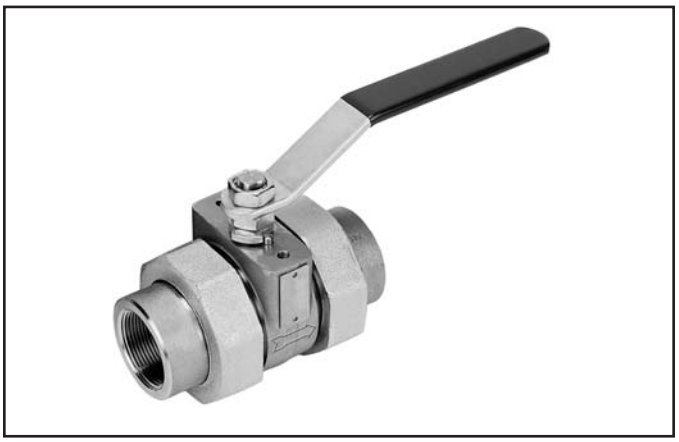
VALVE OPEN



VALVE CLOSED

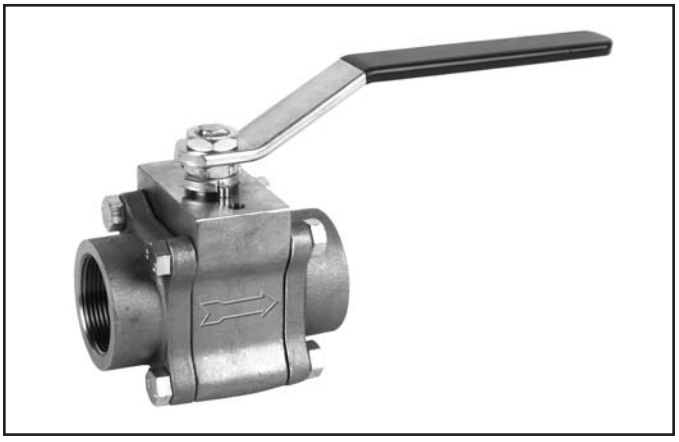
Specifications

Model E790-Y Double-Union End Valve



Size Range: 1/4"–2"
Porting: Full port – 1 1/2", oversize regular port 2"
End Connections: threaded, socket-weld, butt-weld
Pressure Rating: 300 psig (Cl_2)
Temperatures: -20°F to 300°F
Standards: ANSI B2.1 (NPT); B16.11, (socket ends);
B16.24, (butt-weld ends); Chlorine Institute Pamphlet #6
Body Material: Carbon Steel
Ball Material: Monel® (Hastelloy® C-276 optional)
Stem Material: Monel® (Hastelloy® C-276 optional)
Seat Material: RTFE
Seal Material: TFE
Options: Handles, locking devices, electric and pneumatic actuators

Model E325-Y/E525-Y Three-Piece Bolted Body Valve



Size Range: 1/4"–2"
Porting: Regular port/Full-port
End Connections: threaded, socket-weld
Pressure Rating: 300 psig (Cl_2)
Temperatures: -20°F to 300°F
Standards: ANSI B2.1 (NPT); B16.11, (socket ends);
Chlorine Institute Pamphlet #6
Body Material: Carbon Steel
Ball Material: Monel (Hastelloy C-276 optional)
Stem Material: Monel (Hastelloy C-276 optional)
Seat Material: RTFE
Seal Material: TFE
Options: Handles, locking devices, electric and pneumatic actuators

Models EFP1-Y, ERP1-Y and ERP3-Y Unibody Flanged Valves

Note: Larger sizes (through 12"), in both regular and full-port are available in two-piece construction. Contact Flowserve for information.

Size Range: 1/2"–4"
Model EFP1-Y: 1/2"–1 1/2"
Model ERP1-Y: 3"–4"
Model ERP3-Y 300 Class: 1 1/2"–4"
Full Port: 1/2"–1 1/2" EFP1-Y
Regular Port: 2"–4" ERP1-Y; ERP3-Y; 1 1/2" ERP3-Y
Pressure Rating (Cl_2)
Class 150: 150 psig
Class 300: 300 psig
Temperatures: -20°F to 300°F
Standards: ANSI B16.5 (design); Chlorine Institute Pamphlet #6
Body Material: Carbon Steel
Ball Material: Monel (Hastelloy C-276 optional)
Stem Material: Monel (Hastelloy C-276 optional)
Seat Material: RTFE
Seal Material: TFE
Options: Handles, locking devices, gear, electric, and pneumatic actuators

Technical Data

Recommended Materials of Construction

The following construction materials are recommended for dry chlorine service by the Chlorine Institute, Pamphlet #6.

Component Part	Material Recommended
Valve Body	ASTM A216 Grade WCB (casting) ASTM A105 (forging)
Ball	Monel or Hastelloy C-276
Stem	Monel or Hastelloy C-276
Seats	RTFE
Seals	TFE

Note: Hastelloy C has superior corrosion resistance in dry chlorine with high moisture content. Consult Flowserve on wet chlorine applications.

Performance Data

PRESSURE/TEMPERATURE RATINGS (per Chlorine Institute Pamphlet #6)

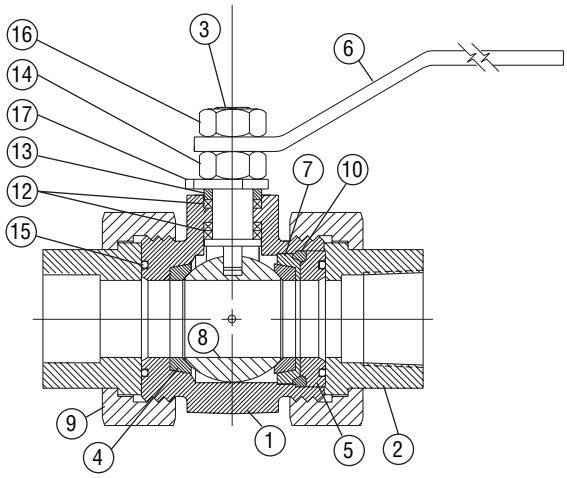
System Rating	Chlorine Service	Available Models
Class 150	Dry gas: -20°F to 300°F Vacuum to 150 psig	¼" – 2" E790-Y; ¼" – 2" E325-Y/E525-Y; ½" – 1½" EFP1-Y; 2" – 4" ERP1-Y
Class 300	Dry gas or liquid: -20°F to 300°F Vacuum to 300 psig	¼" – 2" E790-Y; ¼" – 2" E325-Y/Y525-Y; 1½" – 4" ERP3-Y

FLOW COEFFICIENTS (C_v)

Model/Size	¼"	⅜"	½"	¾"	1"	1¼"	1½"	2"	3"	4"
E790-Y	5.5	12	23	35	53	90	127	180	—	—
E325-Y	4.8	6	8	12	29	50	60	110	—	—
E525-Y	—	—	12	29	50	—	110	500	—	—
½" – 1½" EFP1-Y 2" – 4" ERP1-Y	—	—	9	18	29	—	90	165	355	645
ERP3-Y	—	—	—	—	—	—	375	400	1050	1650

Dimensions, Parts Identification and Materials of Construction

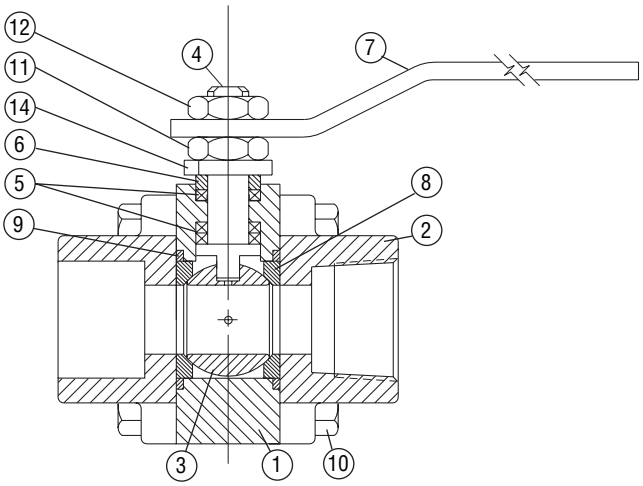
Model E790-Y: Double Union End, Full-Port



Parts and Materials E790-Y

Item No.	Description	Material
1	Body	Carbon Steel (see pg. 5)
2	Union End	Carbon Steel (see pg. 5)
3	Stem	Monel Hastelloy C-276 (optional)
4	Seat	RTFE
5	Threaded Spacer	Carbon Steel (Manganese Phosphate Coated)
6	Handle	Carbon Steel (Zinc-Plated) Plastic Coated (1/4"–3/4" sizes)
7	Seat Socket	Carbon Steel (Manganese Phosphate Coated)
8	Ball	Monel Hastelloy C-276 (optional)
9	Union Nut	Carbon Steel (Zinc-Plated)
10	Spacer Seal	TFE
11	Stop Pin (not shown)	Carbon Steel (1/4"–3/4" sizes) Low Alloy Steel (1"–2" sizes)
12	Stem Seal Set	TFE, RTFE (Flexible Graphite used on FIRE-GARD)
13	Gland Ring	Carbon Steel (Zinc-Plated)
14	Adjusting Nut	Carbon Steel (Zinc-Plated)
15	Body Seal End Seal	TFE, RTFE, (Flexible Graphite used on FIRE-GARD)
16	Stem Nut	Carbon Steel (Zinc-Plated)
17	Travel Stop	Carbon Steel (Zinc-Plated)
18	Grounding Washer (not shown)	302 Stainless Steel (non-FIRE-GARD only)

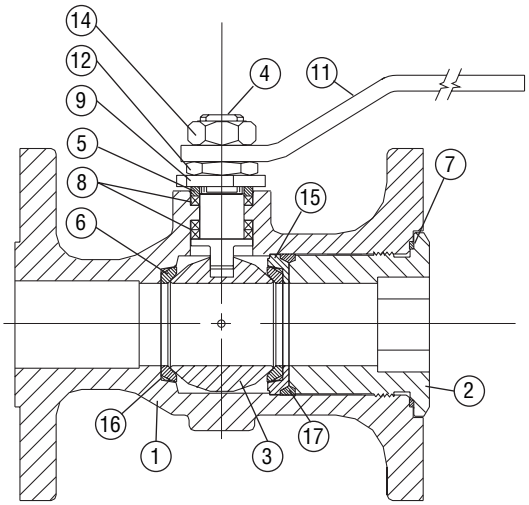
Model E325/E525-Y: Three-piece, In-line Maintainable



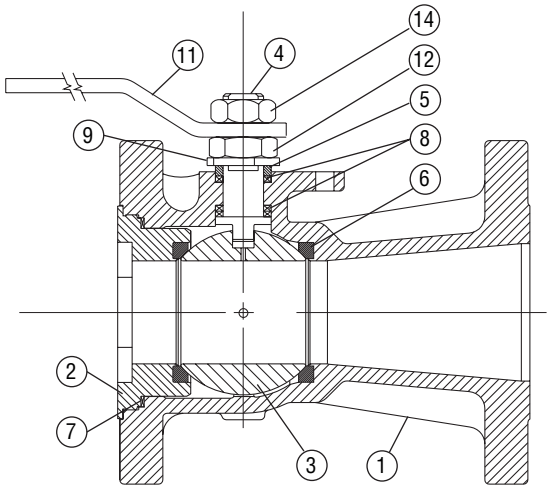
Parts and Materials E325-Y/E525-Y

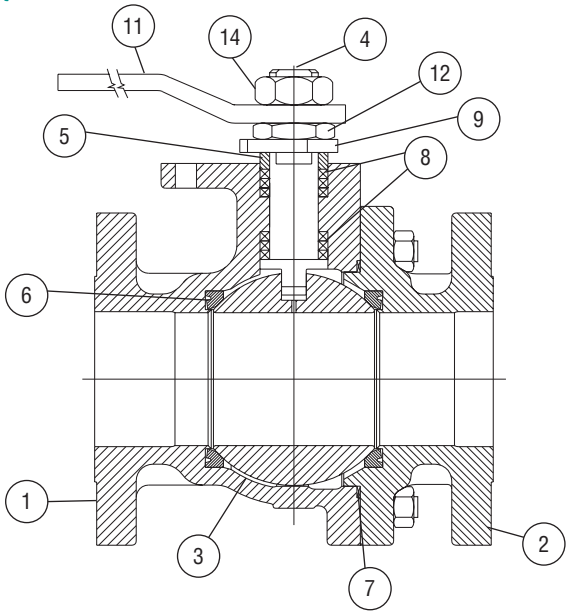
Item No.	Description	Material
1	Body	Carbon Steel (see pg. 5)
2	End Adapter	Carbon Steel (see pg. 5)
3	Ball	Monel Hastelloy C-276 (optional)
4	Stem	Monel Hastelloy C-276 (optional)
5	Stem Seal Set	TFE, RTFE (Flexible Graphite used on FIRE-GARD)
6	Gland Ring	Carbon Steel (Zinc-Plated)
7	Handle	Carbon Steel (Zinc-Plated) Plastic-Coated
8	Seat	RTFE
9	Body Seal	TFE, FIRE-GARD – Flexible Graphite
10	Bolt	Carbon Steel ASTM A193 Gr.B7
11	Adjusting Nut	Carbon Steel (Zinc-Plated)
12	Stem Nut	Carbon Steel (Zinc-Plated)
13	Stop Pin (not shown)	Carbon Steel (Zinc-Plated)
14	Travel Stop	Carbon Steel (Zinc-Plated)
15	Grounding Washer (not shown)	302 Stainless Steel (non-FIRE-GARD only)

Model EFP1-Y: Flanged ANSI Class 150, Full-Port



Models ERP1-Y Flanged ANSI Class 150 & ERP3-Y ANSI Class 300, Regular Port





Parts and Materials E325-Y/E525-Y

Item No.	Description	Material	Item No.	Description	Material
1	Body	Carbon Steel (see pg. 5)	11	Handle	2" & under CS (Zinc-Plated) (Plastic-Coated) 3"–4" Cast Ductile Iron (Manganese Phosphate Coated)
2	Threaded Spacer/Body End	Carbon Steel (see pg. 5)			
3	Ball	Monel Hastelloy C-276 (optional)			
			12	Adjusting Nut	Carbon Steel Zinc-Plated
4	Stem	Monel Hastelloy C-276 (optional)	13	Grounding Washer (not shown)	302 Stainless Steel (omitted on FIRE-GARD)
5	Gland Ring	Carbon Steel (Zinc-Plated)	14	Handle Nut	Carbon Steel (Zinc-Plated)
6	Seat	RTFE	15	Seat Socket	Carbon Steel (Manganese Phosphate-Coated)
7	Body Seal	TFE			
8	Stem Seal Set	PTFE RTFE (Conical Packing) (Flexible Graphite used on FIRE-GARD)	16	Seat Seal	PTFE (Flexible graphite on FIRE-GARD)
			17	Compression Ring Seal	PTFE, Flexible Graphite on FIRE-GARD)
9	Travel Stop	Carbon Steel (Zinc-Plated) Not used on 1/2" size			
10	Stop Pin (not shown)	Heat Treated Alloy Steel (Zinc-Plated)			

Automation Information

Automation Capabilities

McCANNA/MARPAC offers a full range of actuators and accessories for Chlorine Service Ball Valves, for either "On-Off" or modulating applications, and will custom design a complete Automated valve package to suit a particular application.

Actuators

Pneumatic, Double-acting	Electric
Pneumatic, Fail-safe	Hydraulic

Accessories

Solenoid Pilot Valves	Air Filters
Limit Switches	Air Regulators
Manual Overrides	Position Indicators
Positioners (Air, I/P)	Speed Controls
I/P Transducers	Process Controllers

By ordering complete valve packages from McCANNA/MARPAC the user gains the advantages of single-source responsibility, automated packages tailored to system requirements, reduced installation time, and the confidence that the unit will perform as expected. McCANNA/MARPAC automated Chlorine Service Valves are fully performance tested to ensure trouble-free start-up and operation. For additional actuator information, refer to McCANNA/MARPAC "Ball Valve Torque Information for Actuator Sizing Brochure."

Sizing Torques for Actuator Selection

The torque values shown in the following table are maximum values for valves in 150 and 300 class chlorine systems. The torque values listed for the E790-Y and E325-Y valves apply to both chlorine system classes.

Torque values are for clean liquid service. For dry chlorine gas, multiply by 1.25. For special sizing, and Flowserve actuator recommendations, see McCANNA/MARPAC "Ball Valve Torque Information for Actuator Sizing Brochure."

Sizing Torques (in-lb)

Model/Size	¼"	⅜"	½"	¾"	1"	1¼"	1½"	2"	3"	4"
E790-Y	110	110	110	175	250	410	375	440	—	—
E325-Y	50	50	50	70	130	200	200	230	—	—
E525-Y	—	—	70	130	200	—	230	310	—	—
½"–1½" EFP1-Y 2"–4" ERP1-Y	—	—	125	200	250	—	375	400	1050	1650
ERP3-Y	—	—	—	—	—	—	375	400	1050	1650

Important Considerations

Chlorine Valve Preparation

Valves for dry chlorine systems must be thoroughly cleaned before use, as dry chlorine reacts violently with normal shop oils, cutting fluids, and hydrocarbons. McCANNA/MARPAC employs strict procedures for cleaning, assembly, testing, and packaging of Chlorine Service Valves to ensure safe operation when installed. McCANNA/MARPAC procedures for preparation of Chlorine Service Valves are available for review, on request.

Special Applications

McCANNA/MARPAC Chlorine Service Ball Valves are intended for use in dry chlorine systems. Piping systems handling other chlorine compounds, such as dry hydrogen chloride, are also suitable applications. For wet chlorine, or other chlorine compounds, corrosion resistance becomes a primary concern, and materials selection is critical.

For example, wet chlorine and hydrogen chloride are extremely corrosive. Concentrations, temperature, aeration, and presence of other chemicals all affect material selection. In this case Hastelloy C-276 has been found suitable for wet chlorine, while Hastelloy B is the most resistant nickel alloy in wet hydrogen chloride.

When applications vary from dry chlorine, great care must be taken in selection of materials. McCANNA/MARPAC will recommend materials, and will manufacture valves of special materials for specific applications on request.

Ordering Information

Size	Body Material	Model	Trim	Seat/Seal	Special Service Code	Actuator Code
1/4" 3/8" 1/2" 3/4" 1" 1 1/4" 1 1/2" 2" 3" 4"	CS - Carbon Steel (A216 WCB, or A105)	E790 - Double Union End E325 - 3-piece E525 - bolted body EFP1 - CL 150 ERP1 CL 150 ERP3 - CL 300 ERP3 - CL 300	08 - Monel 27 - Hastelloy C	RT - Reinforced TFE seats, TFE seals RF - Reinforced TFE seats, Fire-Gard (Flexible Graphite) seals	Y - Chlorine Service	See List Below

Notes: (1) Not all sizes shown available in all models. Other materials available.
(2) McCANNA/MARPAC offers two-piece Flanged Ball Valves in sizes 2"–12" prepared for chlorine service.

Option Codes

End Connections:
- P - Socket Weld (790, 325/525)
- PL - Extended Socket Weld (790 only)
- BW - Butt Weld (790)
- EB - Extended Butt Weld (790)

Actuation:
- 03 - Gear Actuator
- 04 - Pneumatic (D.A.)
- 05 - Pneumatic (F.C.)
- 06 - Pneumatic (F.O.)
- 08 - Electric
- D - Safety Handle
- L - Locking Device

Other:
- S2 - Stainless Topworks
- N - Stainless Bolting

(Union Nuts on E790)

Consult Flowserve for other additional options.

Example	1/2" -	CS -	EFP1 -	08 -	RT -	Y
	Size	Body Material	Model	Monel Trim	RTFE Seat TFE Seal	Chlorine Service Valve

McCANNA/MARPAC Chlorine Service Ball Valves For Industry

McCANNA/MARPAC Chlorine Service Ball Valves are recommended for use in the following industrial applications:

- **Pulp and Paper**
  - Bleach Plant
  - Chlorinated Stock
  - Dry Chlorine Vaporizers
  - Chlorination Systems
- **Municipal Water Systems**
  - Chlorine Transfer
  - Chlorinator Systems
- **Chemical Plants**
  - Chlorine Handling
  - Vinyl Chloride Production
  - Organic Chlorinations
- **Chlorine Production**
  - Transfer Systems
  - Production Piping

McCANNA/MARPAC – One of the Industry's Most Diversified Ball Valve Lines

McCANNA/MARPAC offers one of the industry's most diversified selections of ball valves for manual and automated service. McCANNA/MARPAC ball valves are available in a wide selection of body materials, including carbon steel, stainless steel, brass and others. A variety of end configurations is available — standard threaded, union end, socket weld and flanged. Standard sizes range from 1/4 inch through 12 inch. Want to know more? Just give us a call at (508) 481-4800 or FAX us your requirements at (508) 481-4454.

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