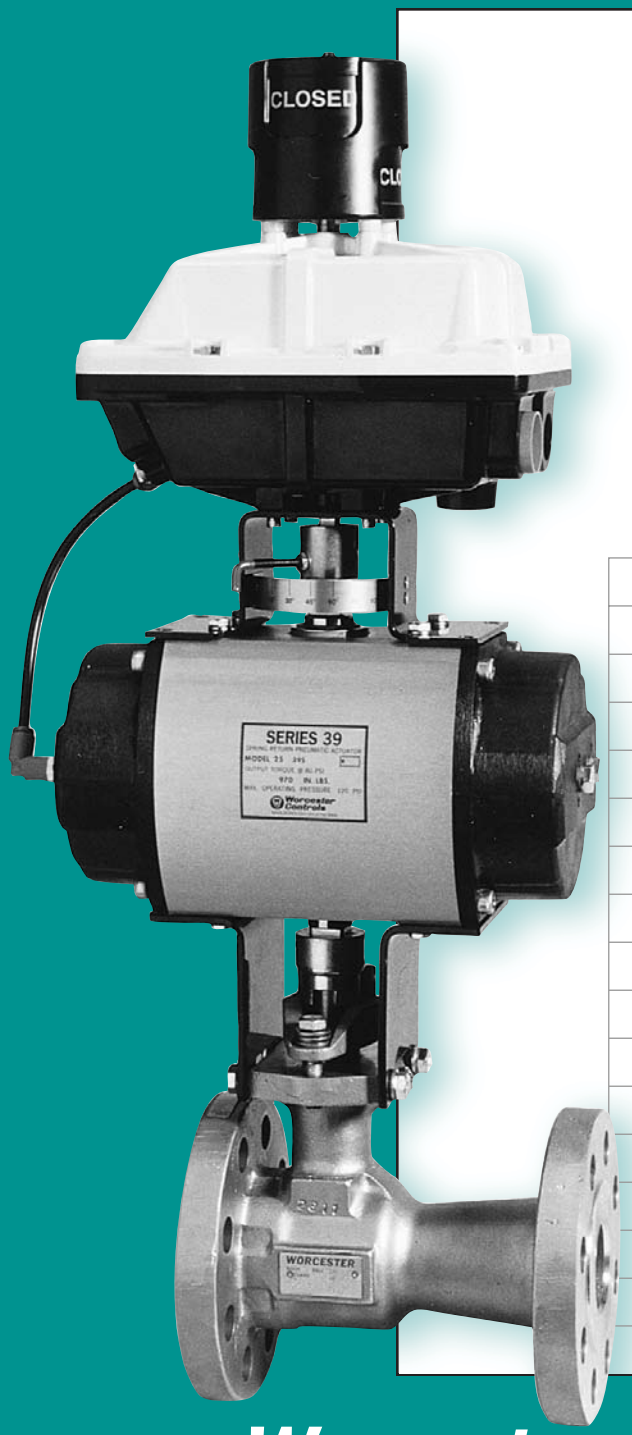
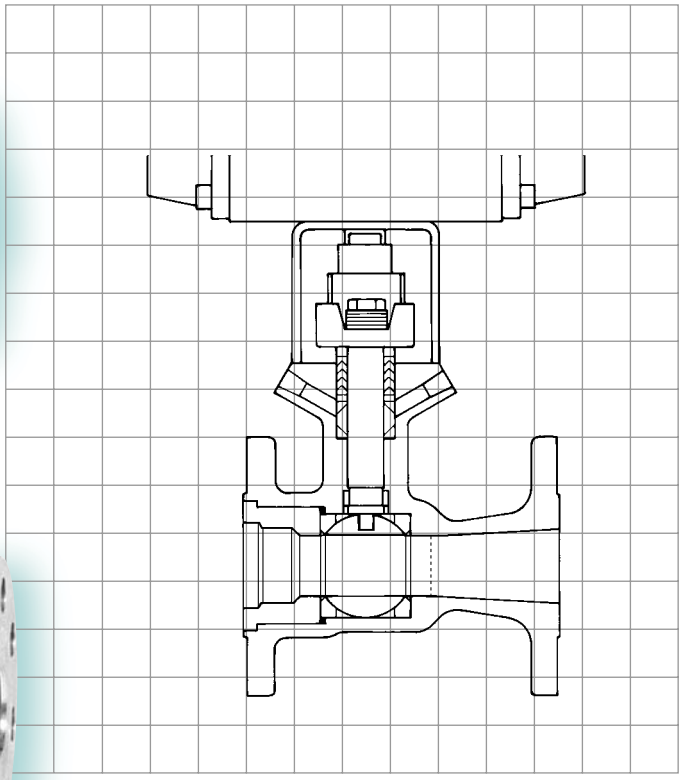
FLOWSERVE

Worcester Controls

SB 441-19



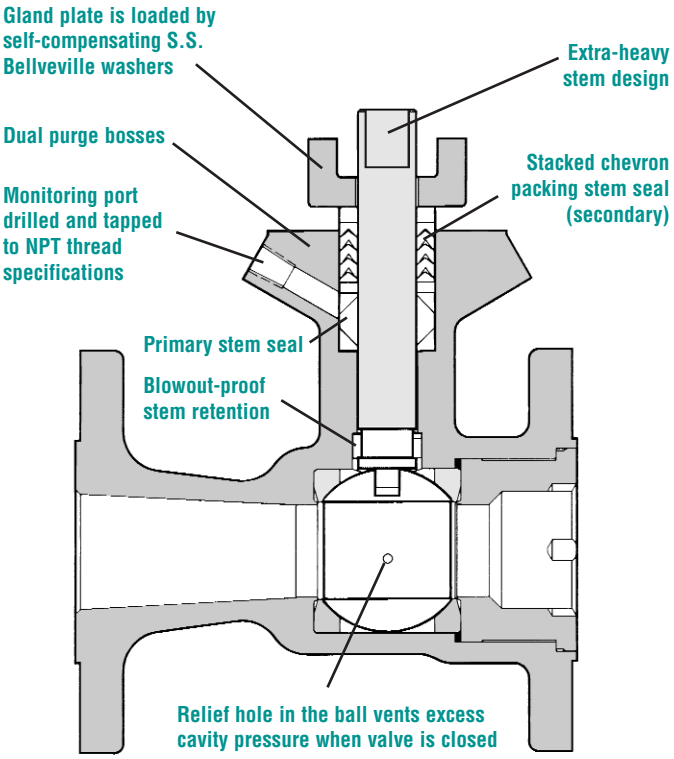
An ISO 9001 Registered Company



Worcester Chlorine Ball Valves

Corrosion resistant valves for critical chlorine applications

Worcester's Series CL94, CL44 and CL51/52 Valves for high-performance control, containment and shutoff of dry, liquid and gaseous chlorine.



CL94 Flanged Valve

Worcester Controls has the quality solution for tough applications involving chlorine, from the manufacture of the basic chemical to processes involving its use including pulp and paper bleaching and production of feedstocks.

With many years experience in handling dry chlorine (less than 150 ppm water), Worcester offers two basic lines of valves; the Series CL44 and CL51/52 for general service and the Series CL94 for anti-fugitive emission containment and high-cycle applications. All valves feature leak-tight seats, adjustable stem seals, body cavity pressure relief and corrosion resistant materials. An emission monitoring port is standard with the CL94 design.

Chlorine Institute Specifications

All of Worcester's Chlorine Ball Valves are constructed in accordance with the guidelines of the Chlorine Institute as outlined in Pamphlet 6, Piping Systems for Dry Chlorine.

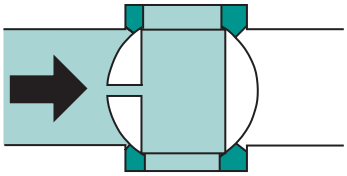
These guidelines include:

- A relief hole in the ball to bypass the upstream seat and ensure that expansion pressure in the ball and body cavity of a closed valve will relieve spontaneously toward the direction of high pressure.
- Stem seals that are externally adjustable to stop stem leakage.
- A bottom-entry stem to prevent accidental removal while valve is in service. (CL44, CL51/52)
- Internal Stem Retention (CL94)
- Visual indication of valve position.
- Body, ball and stem materials proven compatible with chlorine.
- Special testing for seat tightness.
- Special cleaning.
- Special packaging.

Seats will seal in both directions — providing added safety

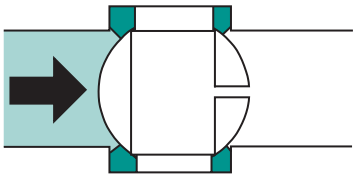
Relief hole upstream (preferred)

The valve seals against the downstream seat and the cavity pressure will vent upstream as recommended in Pamphlet 6.



Relief hole downstream

The upstream seat provides the seal. The valve should only be used in this direction if relief of cavity pressure can be tolerated downstream.



Pressure/Temperature Limitations

All Worcester Chlorine Ball Valves have a temperature range of -20°F to +300°F as specified by the Chlorine Institute.

Carbon steel is limited to -20°F. For service at lower temperatures, consult Flowserve.

CL94-150 and CL51 valves are limited to 150 psig maximum per Pamphlet 6, "Piping Systems for Dry Chlorine," The Chlorine Institute. CL94, CL94-300, CL44 and CL52 valves are limited to 300 psig maximum per Chlorine Institute Pamphlet 6.

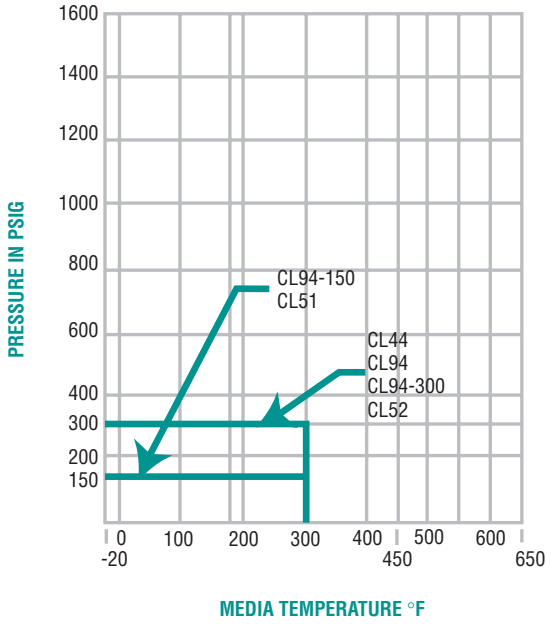
Cv Data
CL94 Three-Piece
CL44 Three-Piece

Valve Size	Cv (USPGM)
¼" - ½"	8
¾"	12
1"	32
1½"	82
2"	120

Cv Data
CL94 Flanged
CL44 Flanged

Valve Size	Cv (USPGM)
½"	7
¾"	10
1"	30
1½"	89
2"	130
3"	350
4"	720

PRESSURE TEMPERATURE RATINGS



Carbon Steel is limited to -20°F. For service at lower temperatures, consult Flowserve.

CPT 94 Control Valve for Throttling Gas or Liquid Chlorine

For automated control and computer control. Available on all three-piece and flanged chlorine valves.

The traditional globe-style control valve for throttling applications of chlorine liquid or gas has been the most difficult component of the loop to maintain. Corrosion of the valve shaft, sticking actuators and leaky packings are, now more than ever, very serious concerns.

To completely eliminate all these problems, the flanged CPT 94 valve (characterized seat Series 94) with carbon steel body, Hastelloy C® ball and stem, characterized seat and Polyfill® upstream seat with your choice of Series 39 Pneumatic or Series 75 Electric actuator and positioner is highly recommended for your chlorine throttling applications. See Bulletins PB-94, PB-V and CV.

Material Recommendations for CL44, CL51/52, CL94, CPT94 Valves

Environment	Service	H_2O Conc.	Rec. Materials
Clean (no chlorine in the air)	Mid-line	20 ppm 50 ppm	Monel® ball and stem; N/A on 94 Hastelloy C ball, Monel stem
		150 ppm	Hastelloy C ball and stem
Chlorine contaminated	Mid-Line	150 ppm	Hastelloy C ball and stem
Chlorine contaminated	End of Line	150 ppm	Hastelloy C ball and stem

CL94 Three-Piece Valves

Sizes: ½", ¾", 1", 1½", 2"

Ends: Screwed Ends, Socket Weld, Carbon Steel ASTM A105

Body Materials: Carbon Steel ASTM A216-WCB

Stem: Hastelloy® C ASTM B574-N10276, One-piece construction with increased stem support for high cycling.

Stem Seals: Virgin TFE

Seat/Seal: TFE/Polyfill® one-piece seat/seal allows flow in both directions

Ball: Hastelloy C ASTM B574-N10276, with hole in ball and stem slot

Flow: This is a bidirectional valve. It is recommended that the valve be installed with ball relief hole upstream to ensure that cavity relief is upstream as suggested in Chlorine Institute Pamphlet 6.

Leak-off Port: One leak-off port drilled and tapped to ⅛" NPT standard. Optional second port for purging.

Options: Alloy 20® body bolts and X750 Inconel Belleville washers (order V-57). Oval handles and locking handles available.

Operation: Lever handle standard. Gear operators, pneumatic or electric actuators are optional.

Standards: ANSI B1.20.1 (for SE NPT threads) B16.11, B31.1, B31.3 (including Category M) and MSS SP-72 Chlorine Institute Pamphlet 6, "Piping Systems for Dry Chlorine."

ANSI B16.34 dimensional requirements.

CL94 Screwed or Welded

CL94 Flanged Valves

Sizes: ½", ¾", 1", 1½", 2", 3", 4"

Flanges: CL94 150 (ANSI Class 150 raised face), CL94 300 (ANSI Class 300 raised face)

Body: Carbon Steel ASTM A216-WCB

Stem: Hastelloy C ASTM B574-N10276, one-piece construction with increased stem support for high cycle.

Stem Seals: Virgin TFE

Seats: Reinforced TFE

Body Seal: TFE

Ball: Hastelloy C ASTM B574-N10276 with hole in ball and stem slot

End Plug: Carbon Steel AISI 1008-1030, Blackodized Threaded Style (1"-2"), Retention Bolt Style (3"-4")

Flow: This is a bidirectional valve. It is recommended that the valve be installed with ball relief hole upstream to ensure that cavity relief is upstream as suggested in Chlorine Institute Pamphlet 6.

Leak-off Port: One leak-off port drilled and tapped to ⅛" NPT standard. Optional second port for purging.

Options: X750 Inconel® Belleville washers. Order V-57.

Operation: Lever handle standard. Gear operators, pneumatic or electric actuators are optional.

Standards: ANSI B16.5 (flange dimensions), B16.10 (face-to-face dimensions), B31.1, B31.3 (including Category M materials) and MSS SP-72. Chlorine Institutes guidelines including those specified in Pamphlet 6 "Piping Systems for Dry Chlorine."

ANSI B16.34 dimensional requirements.

CL94 Flanged Valve

CL44 Three-Piece Valves

Sizes: ¼", ⅜", ½", ¾", 1", 1½", 2"

Ends: Screwed Ends, Socket Weld, Carbon Steel ASTM A105 or A216 WCB

Body: Carbon Steel ASTM A105

Stem: Monel® ASTM 164 or Hastelloy C ASTM B574-N10276. One-piece bottom entry.

Stem Seals: Polyfill

Seat/Seal:TFE/Polyfill one-piece seat/seal allows flow in both directions.

Ball: Monel ASTM 164, Hastelloy C ASTM B574-N10276 with hole in ball and stem slot.

Flow: This is a bidirectional valve. It is recommended that the valve be installed with the ball relief hole upstream to ensure that cavity relief is upstream as suggested in Chlorine Institute Pamphlet 6.

Options: Oval safety handle to prevent accidental opening. Available in all sizes, order V-32. For more security, order locking handle.

Operation: Lever handle standard. Gear operators, pneumatic or electric actuators are optional.

Standards: ANSI B1.20.1 (for SE NPT threads) B16.11, B31.1, B31.3 and MSS SP-72 Chlorine Institute Pamphlet 6, "Piping Systems for Dry Chlorine."

ANSI B16.34 dimensional requirements.

CL44 Three-Piece Valve with Series 75 Actuator

CL 51/52 Flanged Valves

Sizes: ½", ¾", 1", 1½", 2", 3", 4"

Flanges: CL51 (ANSI Class 150 raised face), CL52 (ANSI Class 300 raised face)

Body: Carbon Steel ASTM 216-WCB

Stem: Monel ASTM B164, Hastelloy C ASTM B574-N10276, one-piece bottom entry

Stem Seals: Polyfill — (½" - 2"), Reinforced TFE — (3", 4")

Seats: Reinforced TFE

Body Seal: TFE

Ball: Monel ASTM B164, Hastelloy C ASTM B574-N10276 with hole in ball and stem slot

End Plug: Threaded style (½" - 2"), Retention bolt style (3" - 4")

Operation: Lever handle standard. Gear operators, pneumatic or electric actuators are optional.

Standards: ANSI B16.5 flange dimension, ANSI B16.10 face-to-face dimensions, MSS SP-72 ball valves for general service.Chlorine Institute's guidelines including those specified in Pamphlet 6 "Piping Systems for Dry Chlorine."

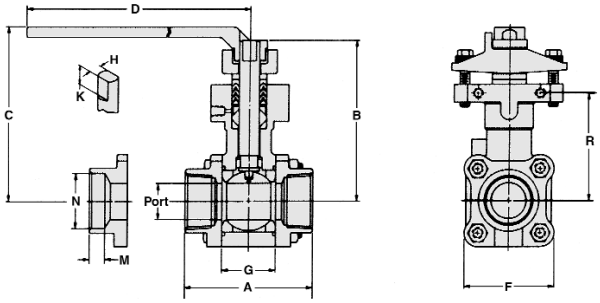
ANSI B16.34 dimensional requirements.

CL51/52 Flanged Valve

Dimensions for CL94 Three-Piece Valves

Note: For CL44 dimensions, refer to brochure PB-401.

½" - 2"



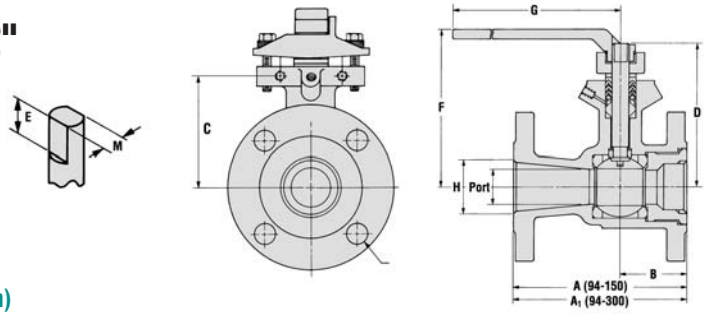
inches (mm)

Valve Size	A	B	C	D	F	G	H	K	M	N	R	Port	Wt. lbs. (kg)
½"	2.54 (64.50)	4.40 (111.76)	4.75 (120.65)	8.00 (203.20)	1.75 (44.45)	.813 (20.65)	.296 (7.52)	.70 (17.78)	.44 (11.18)	.855 (21.72)	2.67 (67.82)	.44 (11.18)	3 (1.4)
¾"	2.76 (70.10)	4.49 (114.05)	4.84 (122.94)	8.00 (203.20)	2.00 (50.80)	.969 (24.61)	.296 (7.52)	.70 (17.78)	.56 (14.22)	1.065 (27.05)	2.76 (70.10)	.56 (14.22)	4 (1.8)
1"	3.66 (93.00)	4.91 (124.71)	5.26 (133.60)	8.00 (203.20)	2.38 (60.45)	1.250 (31.75)	.343 (8.71)	.70 (17.78)	.72 (18.29)	1.330 (42.55)	3.18 (80.77)	.81 (20.57)	5 (2.3)
1½"	4.50 (114.00)	5.66 (143.76)	6.14 (155.96)	10.00 (254.00)	3.16 (80.26)	1.906 (48.41)	.500 (12.70)	.75 (19.05)	.72 (18.29)	1.915 (48.64)	3.82 (97.03)	1.25 (31.75)	11 (5.0)
2"	4.94 (126.00)	5.85 (148.59)	6.33 (160.78)	10.00 (254.00)	3.56 (90.42)	2.213 (56.21)	.500 (12.70)	.75 (19.05)	.84 (21.34)	2.406 (61.11)	4.01 (101.85)	1.50 (38.1)	13 (5.9)

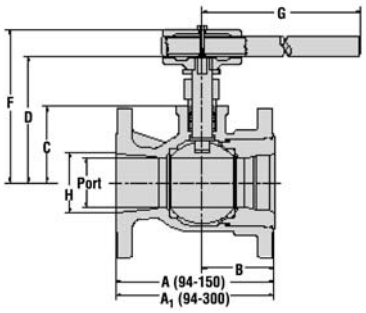
Dimensions for CL94 Flanged Valves

Note: For CL44 dimensions, refer to brochure PB-401.

½" - 2"



3" - 4"



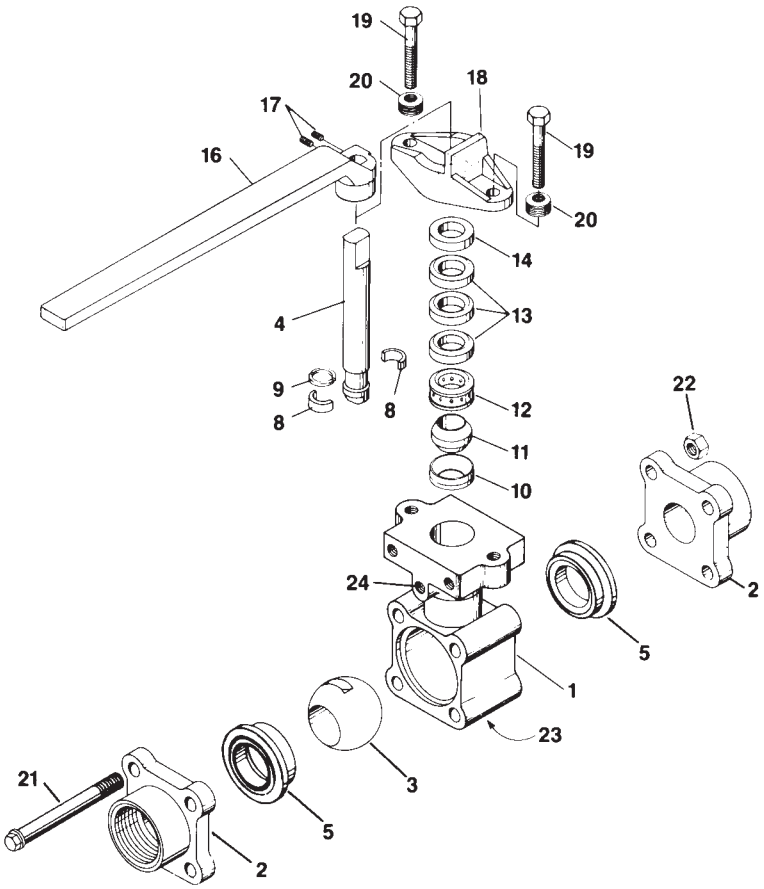
inches (mm)

Valve Size	A	A_1	B	C	D	E	F	G	H	M	Port	Weight lbs. (kg) 150#	300#
½"	4.25 (107.95)	5.50 (139.70)	1.81 (45.97)	2.67 (67.82)	4.40 (111.76)	.70 (17.78)	4.75 (120.65)	8.00 (203.20)	.59 (14.99)	.296 (7.52)	.44 (11.18)	5.3 (2.4)	6.3 (2.9)
¾"	4.62 (117.35)	6.00 (152.40)	1.94 (49.28)	2.76 (70.10)	4.49 (114.05)	.70 (17.78)	4.84 (122.94)	8.00 (203.20)	.83 (21.08)	.296 (7.52)	.56 (14.22)	8 (3.6)	8.9 (4.0)
1"	5.00 (127.0)	6.50 (165.1)	2.25 (57.2)	3.18 (80.77)	4.91 (124.71)	.70 (17.78)	5.26 (133.60)	8.00 (203.20)	1.05 (26.67)	.343 (8.71)	.81 (20.57)	11 (4.9)	12.5 (5.7)
1½"	6.50 (165.10)	7.50 (190.50)	2.45 (62.23)	3.82 (97.03)	5.66 (143.76)	.75 (19.05)	6.14 (155.96)	10.00 (254.00)	1.63 (41.40)	.500 (12.70)	1.25 (31.75)	16 (7.3)	19.1 (8.7)
2"	7.00 (177.80)	8.50 (215.90)	2.67 (67.82)	4.01 (101.85)	5.85 (148.45)	.75 (19.05)	6.33 (160.78)	10.00 (254.00)	2.01 (51.05)	.500 (12.70)	1.50 (38.10)	22 (10.0)	26 (11.8)
3"	8.00 (203.20)	11.12 (282.45)	3.62 (91.95)	3.88 (98.55)	6.38 (162.05)	.66 (16.76)	7.91 (200.91)	22.00 (558.80)	3.06 (77.72)	.745 (18.92)	2.50 (63.50)	39.5 (17.9)	50 (22.7)
4"	9.00 (228.60)	12.00 (304.80)	4.00 (101.60)	4.48 (113.79)	7.00 (177.80)	.66 (16.76)	8.53 (216.66)	22.00 (558.80)	4.03 (102.36)	.745 (18.92)	3.25 (82.55)	62 (28.1)	80 (36.3)

Dimensions are for layout purposes only. For tolerances, contact Flowserve. Metric dimensions are converted from standard English.

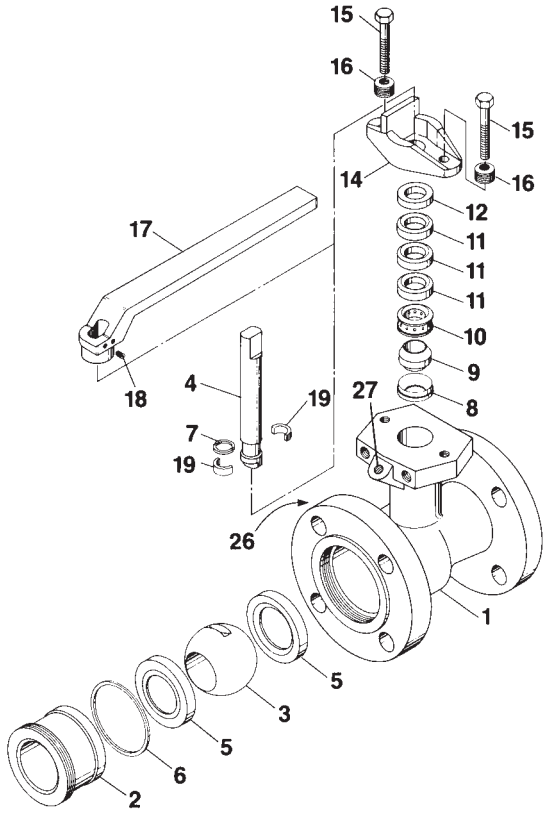
CL94 Three-Piece (½" - 2")

Part No.	Part Name	Qty per Valve
1	Body	1
2	Pipe End	2
3	Ball	1
4	Stem	1
5	Seat/Seal	2
8	Split Ring	2 halves
9	Thrust Bearing	1
10	Filler Ring	1
11	629 Seal	1
12	Lantern Ring	1
13	Chevron Ring	3
14	Follower	1
16	Handle	1
17	Set Screw	2
18	Gland Plate	1
19	Gland Bolt	2
20	Belleville Washer	12
21	Body Bolt	4
22	Body Nut	4
23	Nameplate	1
24	Plug	1



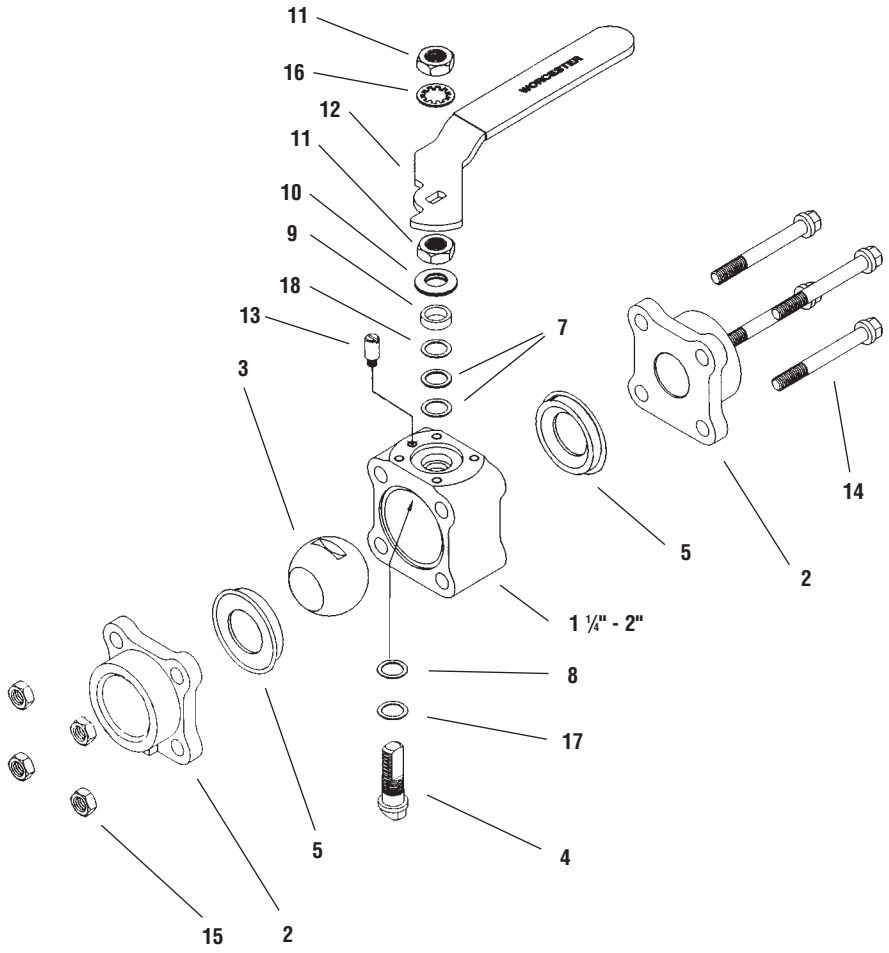
CL94 Flanged (½" - 4")

Part No.	Part Name	Qty per Valve
1	Body	1
2	End Plug	1
3	Ball	1
4	Stem	1
5	Seat	2
6	Body Seal	1
7	Thrust Bearing	1
8	Filler Ring	1
9	629 Seal	1
10	Lantern Ring	1
11	Chevron Ring	3
12	Follower	1
14	Gland Plate	1
15	Gland Bolt	2
16	Belleville Washer	12
17	Handle (½" - 2" only)	1
18	Set Screw (½" - 2" only)	2
19	Split Ring (½" - 2" only)	2 halves
20	Stop (3" - 4" only)	1
22	Wrench Block (3" - 4" only)	1
23	Hex Head Bolt (3" - 4" only)	1
24	Wrench Extension (3" - 4" only)	1
25	End Plug Screw (3" - 4" only)	4-8
26	Nameplate	1
27	Plug	1



CL 44 (½" - 2")

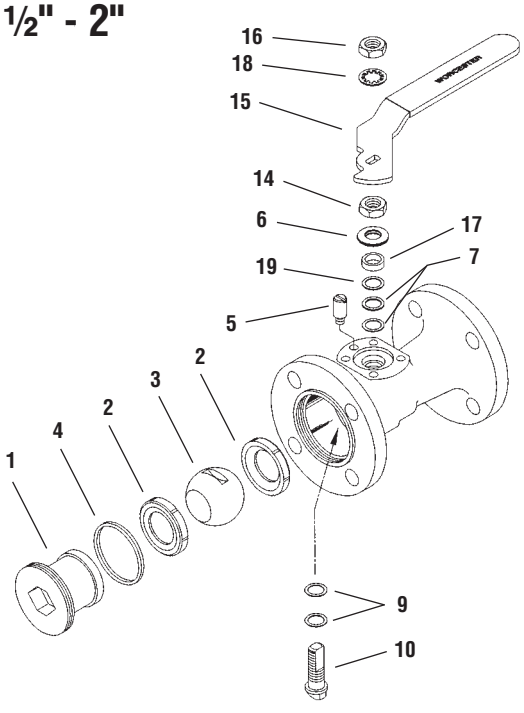
Part No.	Part Name	Qty. per Valve
1	Valve Body	1
2	Pipe Ends	2
3	Ball	1
4	Stem	1
5	Seat/Seal	2
7	Stem Seals	2
8	Thrust Bearing	1
9	Stem Seal Follower	1
10	Belleville Washers	2
11	Retaining Nuts	2
12	Handle Assembly	1
13	Stop Pin(s)	1 or 2
14	Body Bolts	4
15	Body Nuts	4
16	Lockwasher	1
17	Thrust Bearing	1
18	Seal Protector	1



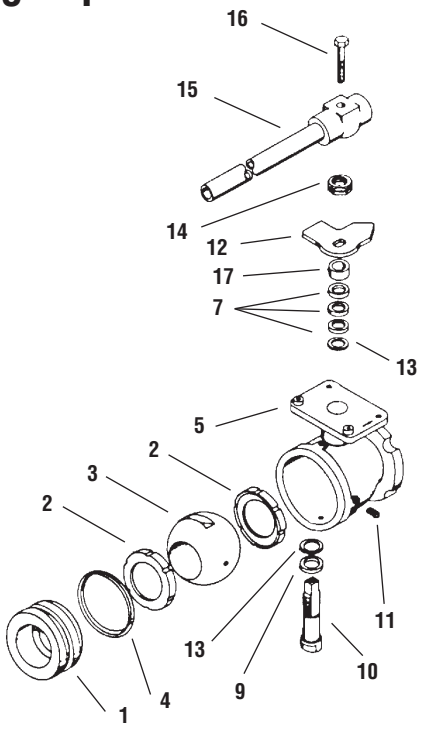
CL 51/52 (½" - 4")

Part No.	Part Name	Qty per Valve
1	End Plug	1
2	Seat	2
3	Ball	1
4	Body Seal	1
5	Stop Pin(s)	1 or 2
6	Belleville Washers (½" - 2")	2
7	Stem Seals	2 or 3
8	Body	1
9	Thrust Bearing	1 or 2
10	Stem	1
11	End Plug Retention Bolts (3" - 4" only)	4-8
12	Stop Plate	1
13	Washer (3" - 4")	1
14	Retaining Nut	1
15	Handle	1
16	Handle Nut/Bolt	1
17	Follower	1

½" - 2"



3" - 4"



How to Order

Example: ¾" CL944CTSE

CAUTION: Ball valves can retain pressurized media in the body cavity when closed. Use care when disassembling. Always open valve to relieve pressure prior to disassembly.

How to Order CL94 Handles

Operating handles are ordered separately. If ordering a 2" CL94 valve, order a 2" HK94 handle. Please specify on the order whether you wish the handle mounted at the factory or shipped separately.

Example: 2" HK94 handle – factory mounted.

Due to continuous development of our product range, we reserve the right to alter the product specifications and information contained in this leaflet as required.

***NOTE**: Although readily available, repair kits are unique to the Chlorine Valves, and must be specifically ordered with the "CL" prefix.*

Chlorine Valves (Three-Piece)

Size	Product Series	Body, Pipe Ends	Ball, Stem	Seat, Seal	End Connection	Variations Listings (V-Number Options)
1/2" **3/4"** **1"** **1 1/2"** **2"**	**CL94**	**4 -** Carbon Steel	**C -** Hastelloy C Ball & Stem	**T -** TFE **P -** Polyfil	**SE -** Screw End **SW -** Socket Weld **BW4 -** Sch. 40 **BW8 -** Sch. 80	**Blank** - No Variation **V6** - Source Inspection **V36** - Certificate of Complianc **V38** - Assemble without lubricant **V57** - Alloy 20 Body Bolts, Nuts and X750 Inconel Belleville Washers **V58** - B16.34 Compliance **V66** - Certificate of Compliance, European Valve Orders
	CL44	**4** - Carbon Steel	**7 -** Monel Ball & Stem **C7 -** Hastelloy C Ball, Monel Stem **C -** Hastelloy C Ball, & Stem	**T -** TFE **P -** Polyfil	**SE -** Screw End **SW -** Socket Weld **BW4 -** Sch. 40	**Blank** - No Variation **V6** - Source Inspection **V17** - Grounding Thrust Bearing **V32** - Oval Handle **V36** - Certificate of Complianc **V48** - Extended Lever Handle **V58** - B16.34 Compliance **V59** - Extended Oval Handle **V60** - OSHA Lockout **V66** - Certificate of Compliance, European Valve Orders

Chlorine Valves (Flanged)

Size	Product Series	Body, Pipe Ends	Ball, Stem	Seat, Seal	End Connection	Variations Available
1/2" **3/4"** **1"** **1 1/2"** **2"** **3"** **4"**	**CL94 (150# or 300#)**	**4 -** Carbon Steel	**C -** Hastelloy C Ball & Stem	**RT -** Reinforced TFE Seats & TFE Body Seal	**150 -** ANSI Class 150 Flanges **300 -** ANSI Class 300 Flanges	**Blank** - No Variation **V6** - Source Inspection **V36** - Certificate of Complianc **V57** - X750 Belleville Washers **V58** - B16.34 Compliance **V66** - Certificate of Compliance European Valve Orders
1/2" **3/4"** **1"** **1 1/2"** **2"** **3"** **4"**	**CL51**-(150#) **CL52**-(300#)	**4 -** Carbon Steel	**7 -** Monel Ball & Stem **C7 -** Hastelloy C Ball, Monel Stem **C -** Hastelloy C Ball, & Stem	**RT -** Reinforced TFE Seats & TFE Body Seal	**150 -** ANSI Class 150 Flanges **300 -** ANSI Class 300 Flanges	**Blank** - No Variation **V6** - Source Inspection **V17** - Grounding Thrust Bearing **V32** - Oval Handle, (1/2" - 2" only) **V36** - Certificate of Complianc **V48** - Extended Lever Handle **V58** - B16.34 Compliance **V59** - Extended Oval Handle **V66** - Certificate of Compliance European Valve Orders

Worcester … All The Right Valves In All The Right Places

Flowserve Corporation has established industry leadership in the design and manufacture of its products. When properly selected, this Flowserve product is designed to perform its intended function safely during its useful life. However, the purchaser or user of Flowserve products should be aware that Flowserve products might be used in numerous applications under a wide variety of industrial service conditions. Although Flowserve can (and often does) provide general guidelines, it cannot provide specific data and warnings for all possible applications. The purchaser/user must therefore assume the ultimate responsibility for the proper sizing and selection, installation, operation, and maintenance of Flowserve products. The purchaser/user should read and understand the Installation Operation Maintenance (IOM) instructions included with the product, and train its employees and contractors in the safe use of Flowserve products in connection with the specific application.

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FLOWSERVE CORPORATION
FLOW CONTROL DIVISION
1978 Foreman Drive
Cookeville, Tennessee 38501 USA
Phone: 931 432 4021
Facsimile: 931 432 3105
www.flowserve.com

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