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Specification Number SP-9217

Valex High Purity Ball Valve

1.0 Scope:

Configuration:	Ball valve fitted with tube stubs or compression fitting ends.
Materials of Construction:	Wetted Path: 316L stainless steel Non-Wetted Path: 300-series stainless steel, vinyl (handle sleeve), tamper-evident ink (on bolt threads). Standard seats/seals: Reinforced Teflon (RTFE) seats, virgin Teflon (PTFE) seals. Other seat/seal materials are available.
Sizes:	1/4" o.d. to 6" o.d. (6.4mm o.d. to 152.4mm o.d.)

2.0 Reference Documents:

General Note:	All specification references shall be taken as the latest editions, including appendices, addenda, errata, and revisions.
ASTM Specifications:	ASTM A269, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Use. ASTM A351/A351M, Standard Specification for Castings, Austenitic, Austenitic-Ferritic (Duplex), for Pressure Containing Parts. ASTM A632, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing (Small-Diameter) for General Service.
ANSI/ASME Specifications:	ANSI/ASME B46.1, Surface Texture.
ANSI/ISA Specifications:	ANSI/ISA S75.02, Control Valve Capacity Test Procedures.
CGA Specifications:	CGA G-4.1, Cleaning Equipment for Oxygen Service.
EN Specifications:	EN 10204, Inspection Documents for Metallic Products.
SEMI:	SEMI F32, Test Method for Determination of Flow Coefficient for High Purity Shutoff Valves.
ANSI/ASQC Standard:	ANSI/ASQC Z1.4-1993 Sampling Procedures and Tables for Inspection by Attributes

3.0 Material Characteristics:

ASTM Reference:	1/4" to 3/8" (6.4mm to 9.5mm) tube stubs: ASTM A632. 1/2" to 6" (12.7mm to 152.4mm) tube stubs: ASTM A269. 1/2" to 6" valve, cast bodies: ASTM A351-CF8M stainless steel. 1/2" to 6" valve, cast flanges: ASTM A351-CF3M stainless steel.
Manufacturing Method:	Tube stub: 1/4" to 1/2" (6.4mm to 12.7mm): Seamless. >1/2" (12.7mm): Welded. Body and Endcap Flange: Cast.
Tube Stub Sulfur Content:	Seamless tube stub: .005 to .012%. Welded tube stub: .005 to .017%.

Tube Stub Annealing Process:	1/4" to 4" (6.4mm to 101.6mm) tube: Solution annealed. 6" (152.4mm): Annealed, then pickled to a mill finish.
Tube Stub Hardness:	90 Rb maximum.
Internal Surface Roughness Tube Stub:	25 micro-inch maximum.
Assembled Length Tolerance:	Per brochure ± .25" (± 6.35mm)
Tube Stub Face:	Cut, faced, and squared suitable for autoweld installation.
Tube Stub Wall Thickness Tolerance:	± 10% of nominal.
Tube Stub Outside Diameter Tolerance:	1/4" to 3/8" (6.4mm to 9.5mm): +.004", -0 (+.102mm, -0) 1/2" to 1" (12.7mm to 25.4mm): ± .005" (± .127mm) 1 1/2" to 3" (38.1mm to 76.2mm): ± .010" (± .254mm) 4" (101.6mm): ± .015" (± .381mm) 6" (152.4mm): ± .030" (± .762mm)
Tube Stub Ovality Tolerance:	The following are the allowable deviations between the maximum and minimum diameter taken at any cross section. However, the mean diameter falls within the o.d. tolerances shown above. 1/4" to 3/8" (6.4mm to 9.5mm): +.004", -0 (+.102mm, -0) 1/2" x .049" wall (12.7mm x 1.24mm): +/-.010" (± .254mm) 1/2" x .065" wall (12.7mm x 1.65mm): +/-.005" (± .127mm) 3/4" to 1" (19.1mm to 25.4mm): ± .005" (± .254mm) 1 1/2" to 3" (38.1mm to 76.2mm): ± .020" (± 1.016mm) 4" (101.6mm): ± .030" (± 1.524mm) 6" (152.4mm): ± .060" (± 3.048mm)
Lubricant:	None

4.0 Operating Data:

Temperature Range:	-20°F to 400°F as dictated by standard seat/seal materials. Seat/seal materials other than standard may affect the working temperature range.
Maximum Working Pressure: (at 150°F)	1/4" to 2" (6.4mm to 50.8mm): 800 psi. 2-1/2" to 4" (63.5mm to 101.6mm): 500 psi. 6" (152.4mm): 400 psi.

Flow Coefficient Data:

Connection Size	Ball Orifice inches	Connection Orifice inches	*Cv
** 1/4" X .035"	0.402	0.180	0.86
** 3/8" X .035"	0.402	0.305	not tested
1/2" X.065"	0.370	0.370	3.6
1/2" X.049"	0.402	0.402	4.4
3/4" X.065"	0.620	0.620	10.8
1" X.065"	0.870	0.870	20.9
11/2" X.065"	1.370	1.370	81.7
2" X.065"	1.870	1.870	107
21/2" X.065"	2.370	2.370	210.8
3" X.065"	2.870	2.870	318.8
4" X.083"	3.834	3.834	579.1
6" X.109"	5.782	5.782	not tested

*Flow coefficient data empirically determined by independent testing lab using NIST traceable calibration and is based on ANSI/ISA S75.02-1996 and SEMI F32-0998 testing protocols.
**Uses 1/2" valve body. Not tube-full-port design.

5.0 Final Process:

General: Neither ozone-depleting nor mercury-bearing compounds are used during the Valex processing or testing of any product.

Clean-Room Certification: Class 100 per Federal Standard 209E and ISO 14644.

Component Cleaning (prior to assembly): DI water.

Component Drying: (prior to assembly): Nitrogen flow.

Final Assembly: Pre-cleaned components are assembled in a Class 100 cleanroom.

6.0 Testing and Inspection:

Visual Inspection: Tube stubs are inspected for i.d./o.d. defects and face quality as compared to the visual workmanship standards set by the Valex Library of Parts for this product line.

Tube stub and ball i.d. surfaces are inspected under ultraviolet light for absence of hydrocarbon fluorescence using a clean, lint-free cloth per CGA G-4.1. The same cloth is then evaluated under a white light for cleanliness against visual workmanship standards for this product line.

Surface Roughness Measurement: Tube stub and ball i.d. surfaces are measured with a stylus-type measuring device in accordance with ASME B46.1 for conformance to the roughness as specified in sections 3.0 and 9.0.

Dimensional Inspection: Assemblies are inspected for conformance to tolerances as specified in sections 3.0 and 9.0.

Leak Test: Assembled valves are leak tested at Valex to 1 x 10^{-6} atm·cc/sec.

Leak tests are performed using 99.995% helium. Assembled valves are tested in a Class 100 environment.

Note: Valex does not guarantee leak rates for valves rebuilt outside Valex facilities.

Body Pressure Test: Valve bodies are hydrostatically pressure tested to 1.5 times the working pressure given in section 4.0 per 0.4 AQL sampling.

7.0 Packaging:

Capping: Face-Seal Purge Port: Nickel gasket with metal threaded cap.
Compression purge port: Vinyl cap over metal threaded nut.
1/4" to 4" (6.4mm to 101.6mm) Tube Stub: Polyethylene cap over a polyamide film.
6" (152.4mm) Tube Stub: Vinyl cap.

Bagging: Double-bagged in Nitrogen-purged polyethylene and heat-sealed in a Class 100 cleanroom.

Shipping Container: Packaged for shipment in a manner that prevents damage to product and primary-product packaging.

8.0 Marking and Documentation:

Marking and Traceability: Each tube end, body casting, and flange casting is traceable to its producing mill and heat number by a metal-stamped code number. In addition, each body and flange has cast into it the appropriate ASTM material designation.
Each valve is pin-stamped with its work-order i.d. number.

Labeling: Each assembly's bag is affixed with a label identifying the assembly's part number and process date.

Documentation: The following reports and certificates accompany each shipment:

a. Test report including material chemistry and mechanical properties of the tube ends (if applicable).
b. Inspection certificate type 3.1.B per EN 10204.
c. Certificate of compliance to this specification.

9.0 Supplementary features:

The features listed in sections 1 through 8 describe the minimum specifications for the Valex ball valve identified by the letter "M" as the sixteenth character in the part number as shown on the table in section 10. The following supplementary features are available at extra cost by replacing that "M" with the letter preceding the desired features.

E: - Electropolished i.d. to 10 micro-inch (.25 micro-meter) Ra maximum.
- Assembled Length Tolerance: Per brochure ± .125" (± 3.175mm)
- Tube Stub Face-and-Square Tolerance:
  1/4" to 3/4" (6.4mm to 19.05mm): ± .5°.
  1" to 4" (25.4mm to 101.6mm): ± .010" (± .254mm) from the centerline.
  6" (152.4mm): ± .026" (± .660mm) from the centerline.
- Inboard helium leak tested to 8 x 10^{-9} atm·cc/sec.
- Across-the-seat helium leak tested to 5.8 x 10^{-9} atm·cc/sec.

N: - Mechanically polished i.d. to 20 micro-inch (.51 micro-meter) Ra maximum.
- All other features same as "E" above

L: - Assembled with Oxygen-compatible lube
- All other features same as "E" above.

P: - Assembled with Oxygen-compatible lube
- All other features same as "N" above.

The following supplementary testing is available at extra cost by adding the letter preceding the desired features as the last character of the part number .

O: - Outboard helium leak tested to 1 x 10^{-6} atm·cc/sec.

P: - Assemblies are tested to confirm the following:
  Less than 30 particles per cubic foot greater than .1 micron.
  Less than 10 particles per cubic foot greater than .5 micron.

B: - Both options P and O described above

10.0 Ordering Number System:

NOTE: Not all possible part number combinations are available.

Valex Ball Valve Part Numbering System

S - SHC 32 M - 16 M X R - E B

Material
S = 316LSS

Assembly Pattern
STR = straight
DHC = double horizontal cross
SHC = single horizontal cross
DHT = double horizontal tee
DVT = double vertical tee
DAV = double angle valve
DSS = double single sided

Main Tube Size **
04 = 1/4" o.d. x .035" wall
06 = 3/8" o.d. x .035" wall
08 = 1/2" o.d. x .049" wall
B8 = 1/2" o.d. x .065" wall
12 = 3/4" o.d. x .065" wall
16 = 1" o.d. x .065" wall
24 = 1-1/2" o.d. x .065" wall
32 = 2" o.d. x .065" wall
40 = 2-1/2" o.d. x .065" wall
48 = 3" o.d. x .065" wall
64 = 4" o.d. x .083" wall
96 = 6" o.d. x .109" wall

Main Tube Connections
C = compression fitting inlet and outlet
F = face-seal fixed male inlet and outlet
M = tube buttweld inlet and outlet
H = compression fitting inlet, tube buttweld outlet
J = tube buttweld inlet, compression fitting outlet
G = tube buttweld inlet, face-seal fixed male outlet
K = face-seal fixed male inlet, tube buttweld outlet

Branch Valve(s) Outlet Size

04 = 1/4"	24 = 1-1/2"
06 = 3/8"	32 = 2"
08 = 1/2" (.049w)	40 = 2-1/2"
B8 = 1/2" (.065w)	48 = 3"
12 = 3/4"	64 = 4"
16 = 1"	

X X = no branch valve(s)

Handle Sleeve Color
B = blue
K = black
G = green
P = purple
R = red

Section 9.0 Identifier
E = 10 Ra electropolished / no lube
N = 20 Ra mechanical polished / no lube
L = 10 Ra electropolished / oxygen-compatible lube
P = 20 Ra mechanical polished / oxygen-compatible
M = 180grit or 25Ra / no lube

Outlet Purge Port
X = no purge port
R= face seal (fixed male nut w/hex)*
S = face seal (swivel male nut w/hex)*
C= compression fitting*

Inlet Purge Port
X = no purge port
R= face seal (fixed male nut w/hex)*
S = face seal (swivel male nut w/hex)*
C= compression fitting*

Connection On Branch Valve(s)
X = no branch valve
M = tube buttweld
C = compression fitting
N = tube buttweld w/expansion plate
D = compression fitting w/expansion plate

* face seal purge port sizes:
1/4" purge port is used for valve sizes 1/4" through 1-1/2".
1/2" purge port is used for valve sizes 2" and up.

** Also available in JIS A-pipe sizes.

11.0 Revision Log:

Rev.	Ref. #	Date	Engr.	QA	Mfg.	Mat'ls	Sales	Ops.	Admin.
Prior Approvals on File									
L	DCN D00899	1/26/04	Mao	Burton	Kellenberger	Nevins	Wilson	Kottler	Mangan
M	DCN D00994	4/12/05	Mao	Burton	Kellenberger	Nevins	Wilson	--------	Mangan
N	DCN D01030	6/16/05	Mao	Burton	Kellenberger	Nevins	Simon	--------	Mangan
O	DCN D01052	05/30/06	Mao	Burton	Kellenberger	Nevins	Wilson	--------	Mangan
P	DCN D01151	5/29/08	Mao	Burton	Kellenberger	Nevins	Simon	--------	Mangan