FLOWSERVE

USER INSTRUCTIONS

Installation
Operation
Maintenance

Valtek® Multi-Z
Severe Service Control Valve

Experience In Motion

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1 General information

1.1 Scope of manual

The following instructions are designed to assist in unpacking, installing and performing maintenance as required on Flowserve products. Product users and maintenance personnel should thoroughly review this bulletin prior to unpacking, installing, operating or performing any maintenance. In most cases, Flowserve valves, actuators and accessories are designed for specific applications (e.g., with regard to medium, pressure and temperature). For this reason, they should not be used in other applications without first contacting the manufacturer. The product Installation, Operation and Maintenance Instructions provide important additional safety information.

⚠ ***Failure to comply with the information provided in the User Instructions is considered to be misuse. Personal injury, product damage, delay in operation, or product failure caused by misuse are not covered by the Flowserve warranty.***

1.2 Applicability

The following instructions are applicable to the maintenance and installation of the Flowserve Valtek Multi-Z severe service control valve:

- English ASME units:
  - Class 300 to 1500, sizes NPS 1 to 8
  - Class 2500, sizes NPS 1 to 6
- End connection: Buttweld and flanges according to ANSI
- Assembled with a pneumatic, hydraulic or electric actuator
- Refer to actuator manual for further instructions
- Comes with or without ancillary equipment

1.3 Disclaimer

These instructions cannot claim to cover all details of all possible product variations, nor can they provide information for every possible example of installation, operation or maintenance. This means that the instructions normally include only the directions to be followed by qualified personnel using the product for its defined purpose. If there are any uncertainties in this respect, particularly in the event of missing product-related information, clarification must be obtained via the appropriate Flowserve sales office. All Flowserve User Manuals are available at www.flowserve.com.

1.4 Certification instruction

It is a legal requirement that machinery and equipment put into service within certain regions of the world shall conform to the Marking Directives applicable to Flowserve products (i.e., Machinery Directive, Low Voltage Directive, Electromagnetic Compatibility [EMC] Directive, Pressure Equipment Directive [PED], Equipment for Potentially Explosive Atmospheres [ATEX], etc.).

▶ **NOTE:** Certificates defined in the Contract requirements are provided with these instructions where applicable. Examples of the certificates can be found in the Annex of this document. If required, copies of other certificates sent separately to the Purchaser should be retained with this User Instruction.

2 Safety information

2.1 Intended use

⚠ ***WARNING: Severe service control valves are designed and rated for specific application conditions. Before installation, check the serial number and/or the tag number to ensure that the valve and actuator being installed are correct for the intended application. Do not use the valve outside of its rated design limits. Exceeding the design limits may cause hazardous conditions, including leakage of the process media resulting in possible process loss, equipment or environmental damage, or serious personal injury or death.***

2.2 Safety symbols and description

The safety terms ☠DANGER, ⚠WARNING, ⚠CAUTION and ▶NOTE are used in these instructions to highlight particular dangers and/or provide additional information on aspects that may not be readily apparent.

Table 1: *Definition of safety symbols and markings*

Symbol	Description
DANGER	Indicates that death, severe personal injury and/or substantial property damage will occur if proper precautions are not taken.
WARNING	Indicates that death, severe personal injury and/or substantial property damage can occur if proper precautions are not taken.
CAUTION	Indicates that minor personal injury and/or property damage can occur if proper precautions are not taken.
NOTE	Indicates, and provides, additional technical information, which may not be obvious.

2.3 General hazard sources

2.3.1 Mechanical hazards

a) Lifting limits and guidelines

WARNING: When lifting a valve, be aware that the center of gravity may be above the lifting point. Accordingly, support must be given to prevent the valve from rotating. Failure to do so can cause serious injury to personnel and damage to the valve and nearby equipment.

Many precision parts have sharp corners which require appropriate personal protective equipment during handling. Prior to any attempt to lift an item, employees must first determine the approximate weight and stability of the load.

- Large, unstable or awkward loads should always be handled with the assistance of additional personnel or appropriate mechanical means.
- Loads in excess of 23 kg (50 lbs) should only be lifted by appropriate mechanical means and in accordance with current local legislation or with the assistance of additional personnel.
- Lifting items less than 23 kg (50 lbs) may be prohibited without assistance if the lift is repetitive and/or awkward (i.e., away from the body, above the shoulders or below the knees), thus placing excessive stress on the personnel.
- Repetitive lifting of any kind should be evaluated as part of a documented end-user safety program.

b) Other tips to avoid issues and hazards

WARNING: Keep hands clear of pinch points. Follow the proceeding instructions to avoid hazardous pinch.

2.4 Responsibility of the operating company

- Complete a risk assessment of the site where the product/system will be in operation, by observing the working conditions.
- Create site-specific work instructions for the operation of the product.
- Ensure that the personnel have read and understand all applicable instructions.
- Provide training to the necessary personnel in regular intervals.
- Provide the required personal protective equipment.

2.5 Qualified personnel

Qualified personnel are people who, on account of their training, experience and instruction and their knowledge of relevant standards, specifications, accident prevention regulations and operating conditions, have been authorized by those responsible for the safety of the plant to perform the necessary work and who can recognize and avoid possible dangers. Contact your local Flowserve representation for a schedule of training schools.

2.6 Protective equipment

DANGER: Flowserve products are often used in problematic applications (e.g., under extremely high pressures with dangerous, toxic or corrosive mediums). When performing service, inspection or repair operations, always ensure that the valve and actuator are depressurized and the valve has been cleaned and is free from harmful substances. In such cases, pay particular attention to personal protection (e.g., protective clothing, gloves, glasses etc.).

3 Product description

3.1 General product description

Multi-Z severe service control valves are designed to operate in high pressure drop applications where entrained solids and cavitation are a problem. The valve design has been optimized for excessive noise, cavitation, erosion and/or high pressure drops.

3.2 Design

Body

The body may be angle or globe style. The design is compliant with ASME B16.34 and ASME B16.5.

Plug/stem/liner

The trim components are seat ring, plug with stem, and liner. These three matching parts are typically made of the same material. For pressure-balanced designs, often the sleeve is made with the same material as the trim. Because of the close guided nature of the trim, material selection and surface treatments must be resistant to any potential for galling and erosion.

Upper bolting kit

This kit provides necessary bolts, nuts, live-loaded parts (if applicable) and packing gland flange for the valve to fix the used actuator onto the valve and provide the necessary pre-load for the packing kit.

Packing

There are several options for packing in the Multi-Z valve.

There are both standard and spring-loaded options for fugitive emissions requirements and fire-safe designs.

3.3 Connections

3.3.1 Mechanical connections

The Multi-Z valve is connected in line through a:

1. buttweld
2. integral flange per ASME B16.5

3.4 Accessories

3.4.1 Electrical connections

The valve may be configured with electrical accessories, such as positioners. Electro-pneumatic digital positioners require a 4-20 mA connection. Electric valve actuators also require an electrical connection. Follow all appropriate IOM instructions for each component as applicable.

3.4.2 Pnuematic connections

A pneumatic actuator typically requires a ¼-in air supply of at least 60 psi (4 bar). Larger actuators will require a ⅜-in air supply. Flow boosters will require a ½- to ¾-in independent air supply from the positioner. Limit switches or position indicators may be mounted external to a positioner. See OEM IOM literature for their connection and adjustment instructions.

4 Packaging, transportation and storage

4.1 Consignment receipt

Immediately after receipt of the product/system, it must be checked against the delivery/shipping documents for its completeness and that there has been no damage in transportation. Any shortage and/or damage must be reported immediately to Flowserve and received in writing within one month of receipt of the equipment. Later claims cannot be accepted.

4.2 Unpacking

4.2.1 While unpacking the valve, check the packing list against the materials received. Lists describing the valve and accessories are included in each shipping container.

4.2.2 When lifting the valve from shipping container, use straps through the lifting lugs. Take care to position lifting straps to avoid damage to tubing and mounted accessories. Valves up through 14 in may be lifted by the actuator lifting ring. On larger valves equipped with a VR cylinder actuator, lift the valve using lifting straps or hook through the yoke legs and outer end of the body.

4.2.3 Contact the shipper immediately if there is shipping damage.

4.2.4 Should any problem arise, contact your Flowserve representative.

4.3 Packaging and transport

Careful packing, loading and transport arrangements are required to prevent products from being damaged during transport. Standard packaging includes a cardboard box, with or without a wooden pallet base as needed. Special packaging may include a wooden box. Packaging may use cardboard, plastic wrap, foam or paper as packing material. Filling material may be a carton type or paper.

Shipping marks display package dimensions and weight. Packing guidelines for export follow HPE standards.

4.4 Storage

▶ **NOTE:** Typical packaging used for delivery will begin to break down over time. Leakage may develop.

Upon arrival on site, store the valve on a solid base in a cool, dry closed room. Until its installation, the valve must be protected from the weather, dirt and other potentially harmful influences.

Do not remove the protective covers from the body flanges of the control valve or from the instrument ports of the actuator and accessories until the valve is ready for installation at the site.

5 Installation

5.1 Inspection and preparation

▶ **NOTE:** Before installation, check the purchase order number, serial number, and/or the tag number to ensure that the valve and actuator being installed are correct for the intended application.

Before installing the valve, clean the line of dirt, scale, welding chips and other foreign material. Clean the line gasket surfaces thoroughly to ensure leak-proof joints.

5.2 Mounting

▶ **NOTE:** Selecting the proper fastener material is the responsibility of the customer. Typically, the supplier does not know what the valve service conditions or environment may be. Flowserve's standard body bolting material is B7/2H. B8/8 (stainless steel) is optional for applications more than 425°C (800°F) and with stainless steel or alloy body valves. The customer therefore must consider the material's resistance to stress corrosion cracking in addition to general corrosion. As with any mechanical equipment, periodic inspection and maintenance are required. For more information about fastener materials, contact your Flowserve representative.

5.3 Installation

5.3.1 Check flow direction indicator on the body to be sure valve is installed correctly. The valve should be installed in the configutation specified on the data sheet. Failure to install the valve as specified may result in incorrect valve performance. Consult the factory if the valve must be mounted in a manner other than what is specified on the data sheet.

5.3.2 Fully close the valve before and during the installation process with pneumatic supply or handwheel (if provided). Check the actuator closing and opening stops when the valve plug is seated at the fully closed and fully open positions. Adjust the actuator stops as needed to get a good seal against the valve seats.

⚠ ***WARNING: Keep hands, hair, clothing, etc. away from the moving components when operating the valve. Failure to do so could cause serious injury.***

5.3.3 Connect air supply and instrument signal. Throttling valves are usually equipped with valve positioners. Two connections are marked for the air supply and for the instrument signal. Both Valtek cylinders and positioners are suitable for 150 psi (10 bar) air supply. An air regulator is not required unless the supply pressure exceeds 150 psi (10 bar). An air filter is recommended unless the supply air is unusually clean and dry. All connections must be free of leaks.

⚠ ***CAUTION: On valves equipped with air filters, the air filter bowl must point down; otherwise, the air filter will not perform properly.***

5.3.4 Make sure proper clearance exists internally in the mating piping to permit proper valve movement.

5.3.5 Install valve in line by tightening opposite line bolts together in a minimum of 25% increments of the total recommended torque while alternating the tightening pattern until all line bolts have achieved the standard recommended torque.

6 Commissioning

Prior to start-up, check the control valve by following these steps:

1. Check for full stroke by making the appropriate instrument signal change.
2. Check all air connections for leaks. Tighten or replace any leaky lines.
3. Evenly tighten the packing nuts to slightly over finger-tight.

⚠ ***CAUTION: Do not overtighten packing. This can cause excessive packing wear and high shaft friction, which may impede shaft movement.***

After the valve has been in operation for a short time, check the torque on the packing nuts. If packing leaks occur, tighten the packing nuts only enough to stop the leakage.

4. To observe the valve failure mode in case of air failure, position the valve to mid-stroke and shut off the air supply or disconnect the instrument signal. By observing the indicator plate, the valve should either fail open or closed. If incorrect, refer to the Reversing the Actuator section in the appropriate Actuator Maintenance Instructions.

7 Operation

7.1 Preparatory activities

7.1.1 Activate the valve.

⚠ ***WARNING: Keep hands, hair and clothing away from all moving parts when operating the valve. Failure to do so can cause serious injury.***

7.1.2 Check for full movement of the valve by making appropriate instrument signal changes.

7.1.3 Check all air connections for leaks.

7.2 Start-up

Prior to start-up, check the control valve by following these steps:

7.2.1 Check for process leakage past the shaft flange gasket.

7.2.2 Adjust actuator limit stops as necessary. If possible, check for seat leakage when the valve is in the closed position.

7.2.3 Check for any packing leakage. Tighten if necessary.

⚠ ***CAUTION: Do not overtighten packing. This can cause excessive packing wear, high stem friction that may impede plug movement, and damage the packing. Over-tightening packing will not improve the stem seal unless the packing has been previously damaged. Damaged packing should be replaced.***

7.2.4 Make sure the valve fails in the correct direction in case of air failure. This is done by turning off the air supply and observing the failure direction.

7.3 Normal operation

Check to ensure that the temperature and pressures do not exceed the limits of the rating of the valve.

Make sure stable air supply is present to the positioner/actuator.

If valve body is insulated, ensure bonnet and actuator are exposed to the environment.

7.4 Shut-down

Prior to working on valve, the valve will need to be removed from line. Ensure that the precautions listed in section 8.3 are followed.

8 Maintenance

8.1 Schedule

At least once every six months, check for proper operation by following the preventive maintenance steps outlined below. These steps can be performed while the valve is in line and, in some cases, without interrupting service. If an internal problem is suspected, refer to the Disassembly and Reassembly section.

1. Look for signs of gasket leakage through body and line gaskets. Tighten flange bolting if necessary.
2. Note if any corrosive fumes or process drippings are damaging the valve.
3. Clean valve and paint any areas of severe oxidation.
4. Check packing bolting for proper tightness. Tighten as necessary to prevent stem leakage.

⚠ ***CAUTION: Do not overtighten packing.***

5. If possible, stroke valve and check for smooth, full-stroke operation. Unsteady movement of the plug stem could indicate an internal valve problem. (Some stick-slip breakout motion is normal if graphite packing is used).
6. Check positioner calibration by observing the gauges and the plug stem position. Make sure the positioner is calibrated to the correct range.
7. Check positioner linkage and internal actuator parts are securely fastened. Also, check for air leaks through actuator stem seal, using a soap solution.
8. Be sure that all accessories, brackets and bolting are securely fastened.
9. If possible, remove air supply and observe stroke indication for correct fail-safe action.
10. Check external piping and fittings for leaks. Tighten or replace fittings if necessary.
11. Clean any dirt or other foreign material from the exposed portion of the shaft.
12. If an air filter is supplied, check and replace cartridge if necessary and ensure correct vertical orientation.

8.2 Required replacement parts for maintenance

See Table 6 for parts that are required to be replaced during maintenance and recommended spare parts.

8.3 Disassembly

If an internal problem is suspected with the valve and disassembly is required, remove the valve from the line by proceeding as follows:

⚠ ***WARNING: Depressurize line to atmospheric pressure, drain all process fluids, and decontaminate the valve (if caustic or hazardous materials are present). Failure to do so can cause serious injury.***

1. Make sure the valve is fully closed.

▶ **NOTE:** On valves with fail-open action, air pressure must be supplied under the actuator piston to close the valve. If the valve is supplied with a handwheel, it can be used to close the valve.

2. Attach a hoist or some means to safely and securely support the valve and actuator.
3. Remove the line bolting. Do not attempt to pry line flanges apart by pushing or pulling on valve actuator.
4. Slide the valve carefully from the line. To avoid damage to gasket surfaces, do not twist the valve.

Remove the actuator from body

To remove the actuator, proceed as follows (refer to the applicable actuator IOM for additional information):

1. Support actuator assembly before disconnecting it from the valve assembly.
2. Remove the transfer case cover bolts. Carefully pry or slide the cover plate from the end of the shaft.
3. On Valtek actuators with a clamping lever-arm design, loosen the linkage bolt.
4. Loosen the actuator adjusting screw to release spring pressure.
5. Remove the bolts connecting yoke to the body subassembly.
6. Slide entire actuator assembly off the shaft. For Valtek actuators with a clamping lever-arm design, it may be necessary to wedge the halves of splined lever arm apart to loosen it from the shaft splines.

Disassemble the body

To disassemble the body, refer to Figure 1 and proceed as follows:

▶ **NOTE:** Use lifting lugs for heavy parts.

1. Unscrew and remove upper bolting kit.
2. Unscrew and remove nuts from bonnet stud bolts. It is not necessary to remove the studs. Remove bonnet from body and check packing area for damage. Clean packing area if necessary.
3. Remove stem/plug.

▶ **NOTE:** Lifting lug can be screwed onto the stem thread.

4. Remove liner and seat ring with appropriate tool.

▶ **NOTE:** If seat ring surface needs to be machined, seat and plug seating surfaces must also be reworked.

5. Remove packing follower from the bonnet and press out the packing kit from below, using a punch or pin that is a slightly larger diameter than the plug stem.
6. Remove gaskets from body and seat ring. Check body grooves and guiding faces for damage. Clean surfaces if necessary.
7. If plug is pressure balanced, remove guiding rings and seal rings from the plug.

Item	Description
1	Body
20	Seat ring
30	Liner
31	PB sleeve
40	Bonnet
50	Plug
55	Seat gasket
56	Bonnet gasket
58	Sleeve gasket
65	PB seal
66	PB guide
80	Gland flange
87	Packing follower
88	Packing kit
107	Upper bolting kit
108	Bonnet stud
114	Bonnet nut

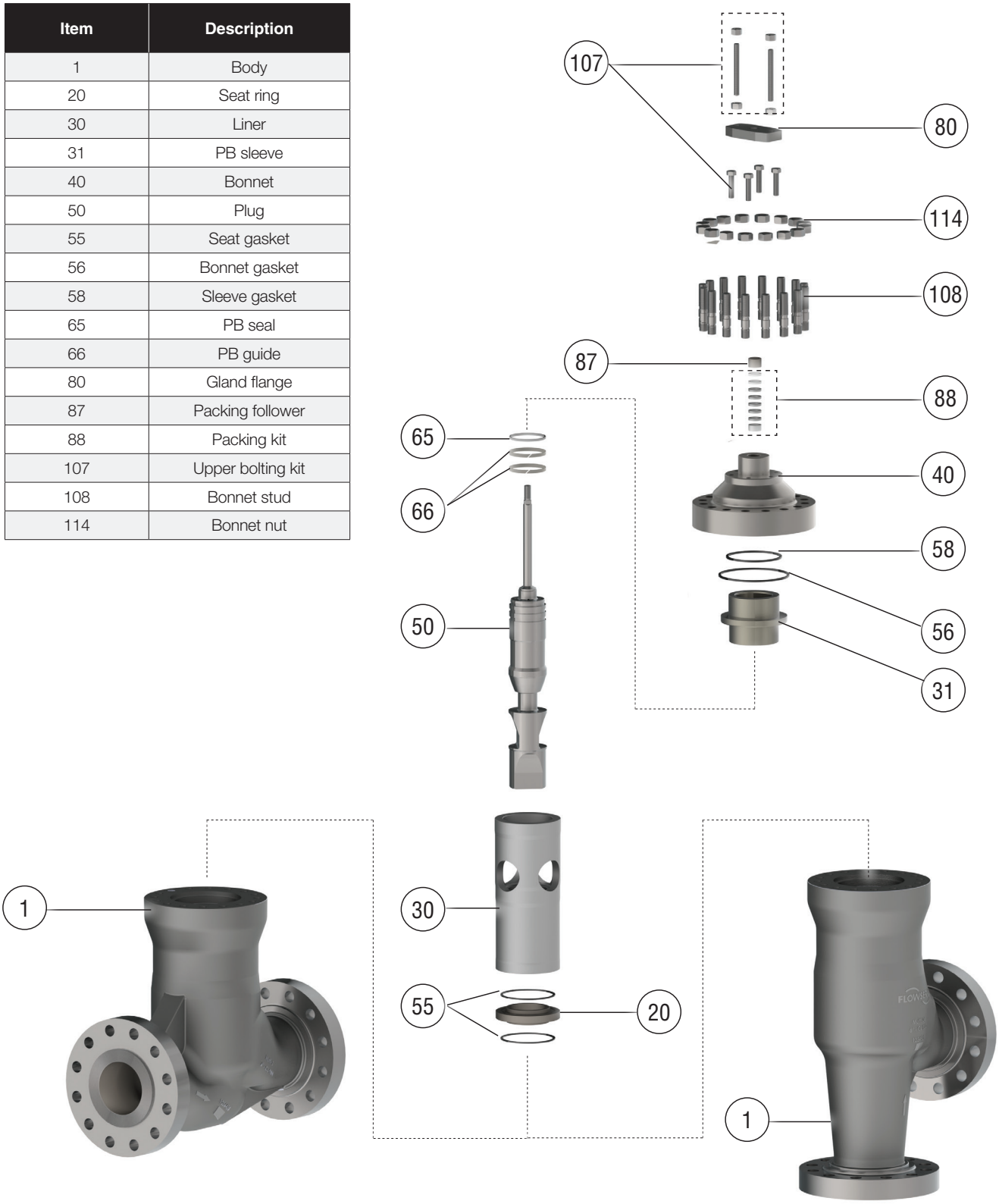

Figure 1: *Multi-Z valve exploded view*

8.4 Reassembly

To reassemble the valve assembly, refer to Figure 1 and proceed as follows:

1. Prior to assembly, check that all parts are clean and free of damage.
2. Check sealing and guiding surfaces of seat, plug, stem, liner and body for damage.
3. Replace soft goods, such as gaskets, seals and packing.
4. Assemble seat gaskets into seat ring grooves. Insert seat ring with tool.
5. Insert liner with tool.

▶ **NOTE:** Position liner so that one of the four liner openings faces the body exit line.

6. If applicable, carefully install pressure balance guides and seal in plug grooves. Insert the plug into the liner until it contacts the seat ring.
7. If applicable, insert the pressure balance sleeve in the liner and place the body and sleeve gaskets into the body. Ensure the guides and seal remain in plug groove.
8. Thread the studs into the body and carefully place the bonnet on the gaskets.
9. Evenly tighten the bonnet nuts in an alternating pattern.
10. Replace the packing kit; refer to Figure 1. Carefully slide each packing ring individually onto the plug shaft and into the bonnet.

▶ **NOTE:** Ensure the gaps in the packing rings do not align vertically but are alternated around the circumference of the shaft.

11. Install packing follower and upper bolting kit. Tighten packing firmly and evenly.

⚠ ***CAUTION: Do not overtighten packing. This can cause excessive packing wear and high shaft friction, which may impede shaft movement.***

Remounting actuator to valve

The procedure for mounting the actuator is as follows:

1. Slide the entire actuator assembly onto the shaft.
2. Bolt the actuator yoke to the valve body.
3. Position the actuator lever arm on the shaft so the actuator stem is centered in the transfer case. Firmly tighten the linkage bolt on clamping lever-arm actuators.

⚠ ***CAUTION: On clamping lever-arm actuators, do not apply air to the actuator without the cover plate installed; otherwise, the unsupported shaft may sustain damage.***

4. Adjust the actuator stroke stop bolts until the plug is resting on the seat ring.

⚠ ***CAUTION: Actuator stroke stop bolts must be properly adjusted to prevent the valve plug from overstroking.***

5. Install the valve in line as outlined in Installation section.

Table 2: *Bonnet torque values in Nm (lbf ft)*

Thread	Stud bolts per DIN939		
	B7 and L7	B7M and L7M	B8M
M10	50 (37)	38 (28)	48 (35)
M12	85 (63)	65 (48)	81 (60)
M16	204 (150)	156 (115)	195 (144)
M20	395 (291)	301 (222)	301 (222)
M24	682 (503)	521 (384)	521 (384)
M27	997 (735)	762 (562)	623 (460)
M30	1,362 (1,005)	1,040 (767)	851 (628)
M33	1,829 (1,349)	1,397 (1,030)	876 (646)
M36	2,357 (1,738)	1,800 (1,328)	1,129 (833)
M52	7,272 (5,364)	5,555 (4,097)	3,485 (2,570)

9 Troubleshooting

Table 3: *Troubleshooting recommendations*

Scenario	Causes	Remedies
Stem motion impeded	Packing too tight	
Excessive leakage	Bonnet is loose	Tighten bonnet nuts evenly in alternating pattern to torque specifications noted in Table 2
	Worn or damaged seat ring or plug	Rework or replace seat ring or plug
	Damaged seals and/or gaskets	Replace seals and/or gaskets
	Inadequate actuator thrust	Check pneumatic tubing and air supply
	Plug not properly seated or aligned	Reassemble plug to seat and align properly
	Incorrect direction of flow	Check specification and/or contact dealer
Inadequate flow	Short stroke due to plug not being properly seated or aligned	Reassemble plug to seat and align properly
	Positioner defective	See applicable positioner IOM
	Operating requirements too high	Check operating data and/or contact dealer
Blow out pipe leaks	Damaged seat gasket	Replace seat gasket
	Damaged pressure balance seal	Replace seal
	Damaged sleeve and/or bonnet gaskets	Replace sleeve and/or bonnet gasket
	Damaged packing	Replace packing kit

10 Returns and disposal

10.1 Returns

⚠ ***WARNING: Before products are returned to Flowserve for repair or service, Flowserve must be provided with a certificate that confirms that the product has been decontaminated and is clean. Flowserve will not accept deliveries if a cleaning certificate has not been provided. Return authorization is also required before parts are returned. Contact your local Flowserve representative to obtain return authorization.***

10.2 Disposal and recycling

Up to 95% of the Valtek Multi-Z control valve is metal. The remaining materials are synthetic, rubber, polytetrafluoroethylene (PTFE), graphite, paint and lubricants.

▶ **NOTE:** Potential hazards and their sources are under the operator's influence. The operator must observe national and international environmental conditions for control valve removal from the pipeline and cleaning.

Permissible limit values must be maintained to ensure suitable protective measures; service personnel must be properly instructed in performing the disassembly and reassembly procedure.

The valve should be professionally disassembled and reassembled. Metal parts should be scrapped, with the remaining materials disposed of according to the national conditions.

Peripheral units (accessories) should be recycled according to the relevant manufacturer's User Instructions.

10.3 Serial plate

Each Valtek Multi-Z control valve comes with an attached serial plate, which includes key information specific to the control valve:

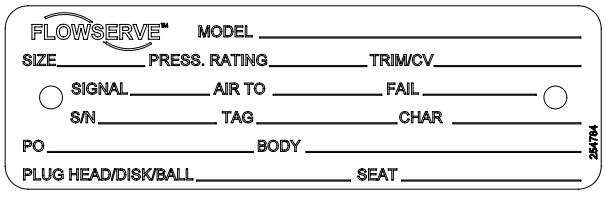

Figure 2: *Valve serial plate*

11 SIL 3 requirements for safety integrity

This section provides information and additional user responsibilities to meet up to Safety Integrity Level 3 (SIL 3) per IEC 61508.

11.1 Safety function

The Multi-Z valve moves to a fail-safe state upon the removal of actuator and positioner control.

11.2 Fail-safe state

The valve fail-safe state may vary depending on actuator spring configuration and tubing. Ensure the fail-safe valve state is appropriate for your application.

11.3 Time to move to fail-safe state

To accurately assess timing of the valve movement, measurements must be taken after the entire system is installed. Process fluid pressure may also affect the timing of valve movement.

11.4 Valve size and pressure class

Any Multi-Z valve mentioned within the scope of this manual can be used for up to SIL 3 type applications.

11.5 Installation

Verify installation of the valve is secure and correct according to this manual. Ensure tubing is configured to the actuator so that the desired fail-safe state of the valve matches the fail-safe state of the positioner.

11.6 Maximum achievable SIL

The achieved SIL for a particular Safety Instrumented Function (SIF) needs to be verified by PFDAVG calculation for the entire SIF, including the failure rates of the associated sensors and valves that are also part of the SIF.

For details, contact your Flowserve representative for Failure Mode, Effects, and Diagnostics Analysis (FMEDA) report number FLO 20-03-200 R001 for the Multi-Z valve.

11.7 Reliability data

For reliability data, a detailed Failure Mode, Effects, and Diagnostics Analysis (FMEDA) report has been prepared and is available from Flowserve with all failure rates and failure modes for use in SIL verification. See FMEDA report number FLO 20-03-200 R001 for the Multi-Z valve.

▶ **NOTE:** The failure rates of the associated sensors, logic solver, valves and actuators need to be accounted for in the Safety Instrumented Function (SIF) level PFDAVG calculation.

11.8 Lifetime limits

The expected lifetime of the Multi-Z valve is approximately 15 years. The reliability data listed in the FMEDA report is only valid for this period. The failure rates of the valve may increase sometime after this period. Reliability calculations based on the data listed in the FMEDA report for lifetimes beyond 15 years may yield results that are too optimistic, i.e., the valve may not achieve the calculated Safety Integrity Level.

11.9 Proof testing

The objective of proof testing is to detect failures in the Multi-Z valve and associated system components that may not be detected by normal diagnostics. Proof testing is also designed to detect failures that could prevent the Multi-Z valve and associated system components from performing an intended safety function.

The reliability calculations and end user practices determine the frequency of the proof tests (or the proof test interval) for the safety instrumented functions applied to the Multi-Z valve. Perform the proof tests at least as often as specified in the calculation to maintain required safety integrity of the safety instrumented function.

Execute the following test during a proof test. Document the results of the proof test and include it as part of a plant safety management system. See FMEDA report number FLO 20-03-200 R001 for proof test coverage of the Multi-Z valve.

Steps for proof test

Step action

1. Bypass the safety function and take appropriate action to avoid a false trip.
2. Interrupt or change the air supply to the actuator to force the valve to the fail-safe state and confirm that the safe state is achieved and within the allowed amount of time.
3. Inspect the actuator, valve and any other associated system components for leaks, visible damage or contamination.
4. Restore the original air supply/input to the actuator and confirm that the normal operating state is achieved.
5. Remove the safety function bypass and otherwise restore normal operation.

▶ **NOTE:** For the proof test to be considered effective, movement of the valve must be confirmed. To confirm valve movement, monitor the valve and fluid to ensure the system behaves as expected and fail-safe results are achieved.

11.10 Maintenance

Follow routine maintenance. See section 8, Maintenance; and section 9, Troubleshooting.

11.11 Repair and replacement

Report any failure of the Flowserve Valtek Multi-Z valve immediately to Flowserve. Replace faulty components according to section 8 of this manual or return the valve to Flowserve for service. With experience and the right parts, repair times for any component can be less than an hour. Assume a 24-hour mean time to repair for safety availability calculations.

11.12 Training requirements

A service technician trained in the installation and maintenance of process instrumentation activities should perform activities specified in this manual.

Annex A: Ordering spare parts and accessories

Use only Flowserve original spare parts. Flowserve cannot accept responsibility for any damages that occur from using spare parts or fastening materials from other manufacturers. If Flowserve products (especially sealing materials) have been in inventory for long periods of time, check them for corrosion or deterioration before putting them into use. If products have been stored longer than the manufacturer-recommended storage life, discard and replace with new parts.

▶ **NOTE:** Unauthorized modification of the Valtek Multi-Z severe service control valve voids the product test certification and product warranties, could drastically affect product performance, and could be hazardous to personnel and equipment.

When ordering spare parts, the following information should be provided to Flowserve:

1. Product serial number
2. Product size
3. Part name – taken from the parts list/sectional drawing
4. Part number – taken from the parts list/sectional drawing
5. Number of the parts required

The product size and serial number are provided on the nameplate.

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