

Type 3351 Pneumatic On/off Valve

SAMSON



Type 3351 Pneumatic On/off Valve



Type 3351 Pneumatic On/off Valve
Version with handwheel

Mounting and Operating Instructions

EB 8039 EN

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CE

Definition of signal words



DANGER!

Hazardous situations which, if not avoided, will result in death or serious injury



WARNING!

Hazardous situations which, if not avoided, could result in death or serious injury



NOTICE

Property damage message or malfunction



Note:

Additional information



Tip:

Recommended action

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1 General safety instructions



- The device must be mounted, started up, or serviced by fully trained and qualified personnel only; the accepted industry codes and practices are to be observed. Make sure employees or third persons are not exposed to any danger.
- All safety instructions and warnings given in these mounting and operating instructions, particularly those concerning installation, start-up and maintenance, must be strictly observed.
- According to these mounting and operating instructions, trained personnel refers to individuals who are able to judge the work they are assigned to and recognize possible dangers due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.
- The devices comply with the requirements of the European Pressure Equipment Directive 97/23/EC. The declaration of conformity issued for a regulator bearing the CE marking includes information on the applied conformity assessment procedure.
The declaration of conformity is available on request.
- To ensure appropriate use, only use the device in applications where the operating pressure and temperatures do not exceed the specifications used for sizing the device at the ordering stage.
- The manufacturer does not assume any responsibility for damage caused by external forces or any other external factors.
- Any hazards that could be caused in the valve by the process medium, operating pressure or by moving parts are to be prevented by taking appropriate precautions.
- Proper transport, storage, installation, operation, and maintenance are assumed.



Note:

According to the ignition risk assessment performed in accordance with EN 13463-1: 2009, section 5.2, the non-electrical actuators and valves do not have their own potential ignition source even in the rare incident of an operating fault. As a result, they do not fall within the scope of Directive 2014/34/EU. For connection to the equipotential bonding system, observe the requirements specified in section 6.4 of EN 60079-14 (VDE 0165 Part 1).

2 Process medium and scope of application

Type 3351 On/off Valve with tight shutoff for liquids, gases and vapors according to DIN or ANSI standards.

Valve size	DN 15 to 100	NPS ½ to 4
Pressure rating	PN 10 to 40	Class 150 and 300
Ambient temperature range	-35 to +100 °C	-30 to +212 °F
Medium temperature range	-50 to +250 °C	-58 to +482 °F

The Type 3351 Valve bears both the CE and EAC marks of conformity:



3 Transportation and storage

- ➔ The device must be carefully handled, transported, and stored.
- ➔ During storage and transportation, protect the device against adverse influences, such as dirt, moisture, or temperatures outside the ambient temperature range.
- ➔ Do not remove the protective caps from the valve ports until immediately before installing the valve into the pipeline.
- ➔ When valves are too heavy to be lifted by hand, fasten the lifting sling to a suitable place on the valve body support on the valve.



WARNING!

Incorrectly attached lifting slings or supports. The valve can be damaged or fall. Fasten slings or supports to the valve body and secure against slipping.

4 Design and principle of operation

See Fig. 1.

Standard version for pressure rating PN 10 to 40 or Class 150 and 300, fail-close or fail-open

Type 3351 · On/off valve with self-adjusting PTFE V-ring packing in nominal size DN 15 to 100 (NPS ½ to 4) for medium temperatures from -10 to +220 °C (14 to 428 °F)

Type 3351 with bellows seal · On/off valve with bellows seal and V-ring packing · Valve size DN 15 to 50 (NPS ½ to 2) · Medium temperatures from -50 to 250 °C (-58 to 482 °F)

Type 3351 with insulating section · On/off valve with insulating section and plug stem sealed by a PTFE V-ring packing · Valve size DN 15 to 50 (NPS ½ to 2) · Medium temperatures from -50 to +250 °C (-58 to +482 °F)

Principle of operation

The connected pneumatic control pressure (5.8) opposes the force of the spring (5.5) to open or close the valve.

Depending on the design of the valve seat (2) and where the plug (3) is located inside the valve, the valve has two different fail-safe actions which become effective when the pressure is relieved from the diaphragm (5.4) or the supply of control pressure fails.

- **Fail-close valve:** upon failure of the control pressure, the valve is closed by the spring.
- **Fail-open valve:** upon failure of the control pressure, the valve is opened by the spring.

For versions with the optional handwheel (6), a fail-close valve can be opened and a fail-open valve can be closed in the event of control pressure failure.

1	Valve body	4.3	Washer	5.9	Nuts and bolts with washers
1.1	Nuts	5	Valve bonnet	6	Handwheel (optional)
1.2	Gasket	5.1	Guide bushing	7	Bonnet with actuator (DN 100 only)
2	Seat	5.2	Threaded bushing	7.1	Diaphragm plate
3	Plug	5.4	Diaphragm	7.2	Nut/lock nut
3.1	Plug stem	5.5	Spring	7.3	Nut
3.2	Lock nut	5.6	Spring plate	7.4	Flattened area
3.3	Washer	5.7	Top diaphragm case		
4	Packing	5.8	Connection for control pressure		
4.1	Spring				
4.2	PTFE V-ring packing				

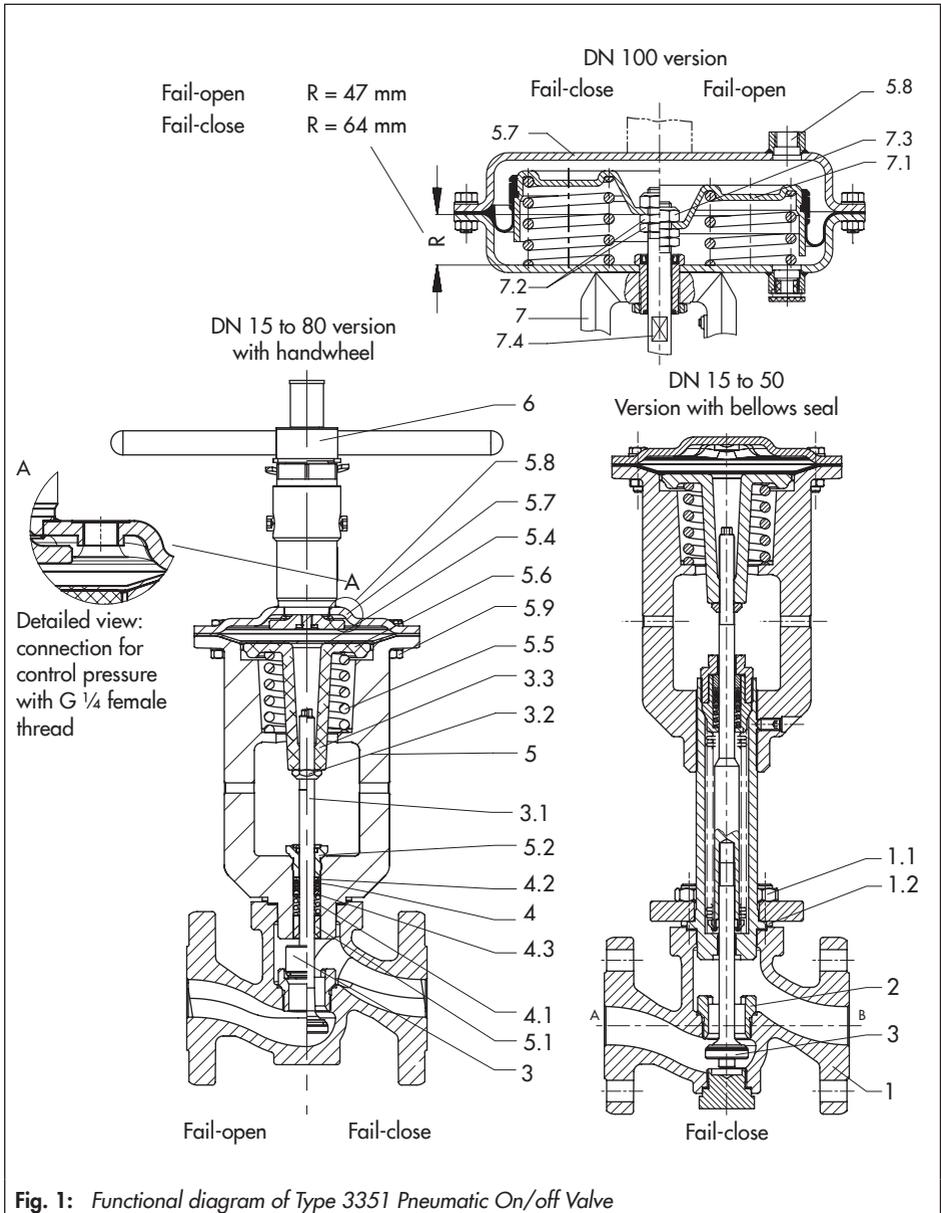


Fig. 1: Functional diagram of Type 3351 Pneumatic On/off Valve

Direction of flow

The direction of the medium flow in the valve depends on the process medium and the selected fail-safe action.

For fail-close valves which are used to control gases and vapors, the medium must flow against the valve plug in the closing direction (A → B).

Except for the DN 100 version: the medium must flow into the plug in the opening direction (B → A).

For control applications with liquids, the medium must flow into the plug in the opening direction (B → A).

In fail-open valves, all media must flow in the opening direction (A → B).

Control pressure and max. differential pressure Δp

Table 4 shows the correlation between control pressure and max. differential pressure Δp based on the process medium used.

5 Installation

5.1 Mounting position

Install the control valve with the actuator in the upright position.

Flush and clean the pipeline thoroughly before installing the valve.



Note:

Make sure the valve is installed free of stress. If necessary, support the pipelines near the connections. Do not attach supports directly to the valve or actuator.

5.2 Control pressure line

Connect the control pressure line to the connection (5.8) on the top diaphragm case (5.7). Connection with G 1/4 female thread.

5.3 Accessories

SAMSON provides mounting kits with additional parts to attach valve accessories (e.g. Type 3768 Limit Switch, Type 3730 Positioner). Specify the item number listed in Table 1 to order the suitable mounting kit from SAMSON.

6 Start-up

First start up the valve after mounting all parts.

As a general rule: open and close shut-off valves **slowly**. Open the shut-off valves first on the upstream pressure side (upstream of the valve). Afterwards, open all the valves on the consumer side (downstream of the valve).

Table 1: *Mounting accessories*

Mounting accessories for	Valve size	Description	Item no. (individual parts)	Item no. (assembly)
Type 3768 Limit Switch	DN 15 to 50/ NPS ½ to 2	Mounting accessories for Type 3768	1400-6787	1402-0101
		Accessories: stem connector and screws (according to IEC 60534-6-1)	1402-1152	
	DN 65 to 100/NPS 2½ to 4	Mounting accessories for Type 3768	1400-6787	1402-0102
		Accessories: stem connector and screws (according to IEC 60534-6-1)	1402-1153	
Type 3730 Positioner	DN 15 to 50/ NPS ½ to 2	Mounting accessories for Type 3730	1400-7454	1402-1154
		Accessories: stem connector and screws (according to IEC 60534-6-1)	1402-1152	
	DN 65 to 100/NPS 2½ to 4	Mounting accessories for Type 3730	1400-7454	1402-1155
		Accessories: stem connector and screws (according to IEC 60534-6-1)	1402-1153	

7 Maintenance

See Fig. 1.

The on/off valve is subject to normal wear, especially at the seat and plug. Depending on the operating conditions, check the valve at regular intervals to prevent possible failure before it can occur.

We recommend removing the parts, cleaning them, and, if necessary, replacing them with new ones.

Before starting any work on the valve body, disconnect and remove the control pressure line as well as the actuator.



WARNING!

Valves are not free of cavities. In particular, residual process medium might still be contained in the valve version with bellows seal.

Process medium can escape uncontrolled on dismantling the valve.

Depressurize and drain the valve before removing it from the pipeline.

When used at high temperatures, allow the plant section to cool down to ambient temperature.

External leakage can indicate that the diaphragm (5.4) and, in the special version, the PTFE V-ring packing (4.2) are defective.

If the valve does not close tightly, tight shut-off may be impaired by dirt stuck between the seat (2) and plug (3) or by damaged facings.

The procedures to disassemble the fail-close and fail-open valve are not the same as the plug is located differently in the valves.

A mounting device (see Fig. 2 and Table 2) is needed as the spring (5.5) in the actuator is preloaded.

To take out the seat ring, a special seat tool (Table 2) is necessary.

Refer to Table 3 for the required tightening torques.

7.1 Disassembly (DN 15 to 80)

1. Remove nuts and bolts at the actuator.
For versions with handwheel, turn the handwheel to ensure that the spring plate (5.6) is not under tension. Remove the diaphragm case (5.7) and take out the diaphragm.
2. Place shim (around 5 mm thick) according to Fig. 1 on the spring plate. Place on mounting device and fasten with three clamping bolts and nuts. Turn the nuts until the spring plate (5.6) is evenly loaded slightly. This causes the plug (3) to detach itself from the seat.
3. Completely undo the threaded bushing (5.2). Spray the lock nut (3.2) stuck with adhesive to the plug stem as well as the ends of the plug stem with solvent. Use a hot-air gun to soften the adhesive and undo the lock nut (3.2). Position plug wrench (see Table 2) or hex screwdriver (DN 65/80) and carefully turn the plug stem clockwise until its height has changed by approx. 6 mm.

4. Unthread the clamping bolts of the mounting device and the plug stem gradually until the plug stem is unscrewed out of the spring plate (5.6). Remove spring plate and spring. Unscrew lock nut (3.2).
 5. Remove valve bonnet (5) from valve body and carefully pull it up, for fail-close version over the plug stem, and for fail-open version together with the plug stem.
 6. To replace the seat and the plug in the fail-close version, unscrew the seat. To proceed, position the seat wrench (see Table 2) on the seat so that its recesses are aligned with the cams of the seat. Guide the seat wrench over the plug stem in the fail-close version. Observe tightening torque according to Table 3.
- Insert the guide part of the seat wrench into the body and unscrew seat with a suitable tool extension.
7. Carefully clean all parts. Remove gasket (1.2). If the packing leaks, unscrew the threaded bushing (5.2) in the valve bonnet and pull out the individual parts, e.g. V-ring packing (4.2), washer (4.3), and spring (4.1). When replacing the plug, renew the packing rings (4.2) as well. Carefully clean all parts and the packing chamber.

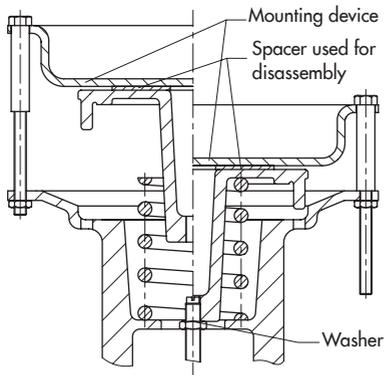


Fig. 2: Mounting device (DN 15 to 80)

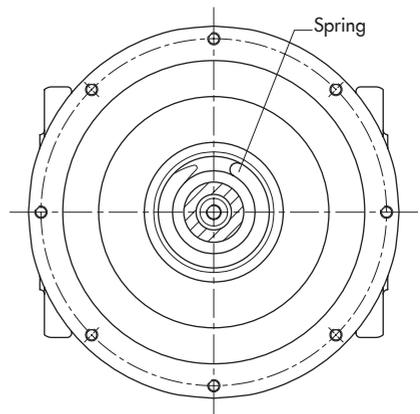


Fig. 3: Alignment of the spring

7.2 Assembly (DN 15 to 80)

1. In the fail-close version, place the plug in the body. In the fail-open version, push plug into the valve bonnet. Carefully degrease the thread of the plug stem.
2. Apply a suitable sealant to the seat and screw it in using the seat wrench. Observe tightening torque according to Table 3.
3. Packing: first insert spring (4.1) and washer (4.3) into the packing chamber, then the V-ring packing parts (4.2) after applying lubricant to them. Loosely screw in threaded bushing (5.2).
4. Insert gasket (1.2) into the body. Place the valve bonnet (5) on the body. In the fail-close version, lift the plug stem and carefully guide it through the packing. Fasten the valve bonnet by evenly tightening the nuts (1.1). Thread the lock nut (3.2) onto the plug stem until it reaches the thread end. Place on washer (3.3).
5. Insert spring (5.5) into the valve bonnet and align it according to Fig. 3. Screw spring plate (5.6) on the plug stem by hand, until it rests on the spring. Align the cam of the spring plate cams so that it is positioned above the recess of the diaphragm case.
6. Screw on mounting device. Evenly tighten clamping bolts until the spring is preloaded approx. 6 mm by the spring plate.
7. Apply a suitable adhesive to the thread of the plug stem. Position plug wrench or hex screwdriver and turn the plug stem

counterclockwise until it reaches the plug. Continue to gradually tension the mounting device until it rests on the diaphragm case with its three stop bushings in the fail-close version or approx. 2 mm away from it in the fail-open version. In this position, turn the plug counterclockwise as far as it will go and tighten the lock nut (3.2). Remove the mounting device.

8. Insert diaphragm (5.4), place diaphragm case on top and tighten evenly. Tighten threaded bushing (5.2) as far as it will go.

7.3 Disassembly (DN 100)

1. Remove nuts and bolts at the actuator. For versions with handwheel, turn the handwheel to ensure that the spring plate (7.1) is no longer under tension. Lift off the diaphragm case (5.7).
2. Loosen nut (7.3) and unscrew it while holding the plug stem stationary at the milled part with an open-end wrench (width across flats 14).
3. Remove diaphragm plate and springs. Unscrew nut (7.2) together with lock nut.
4. Carefully lift up the valve bonnet (7). In the fail-close version, lift it over the plug stem, and in the fail-open version, lift it together with the plug stem.
5. To replace the seat and the plug in the fail-close version, unscrew the seat. To proceed, position the seat wrench (see Table 2) on the seat so that its recesses are aligned with the cams of the seat. Guide the seat wrench over the plug

stem in the fail-close version. Observe tightening torque according to Table 3. Insert the guide part of the seat wrench into the body and unscrew seat with a suitable tool extension.

6. Carefully clean all parts. Remove gasket (1.2). If the packing leaks, unscrew the threaded bushing (5.2) in the valve bonnet and pull out the individual parts, e.g. V-ring packing (4.2), washer (4.3), and spring (4.1). When replacing the plug, renew the packing rings (4.2) as well. Carefully clean all parts and the packing chamber.

7.4 Assembly (DN 100)

1. In the fail-close version, place the plug in the body. In the fail-open version, push plug into the valve bonnet. Carefully degrease the thread of the plug stem.
2. Apply a suitable sealant to the seat and screw it in using the seat wrench. Observe tightening torque according to Table 3.
3. Packing: first insert spring (4.1) and washer (4.3) into the packing chamber, then the V-ring packing parts (4.2) after applying lubricant to them. Loosely screw in threaded bushing (5.2).
4. Insert gasket (1.2) into the body. Place the valve bonnet (5) on the body. In the fail-close version, lift the plug stem and carefully guide it through the packing. Fasten the valve bonnet by evenly tightening the nuts (1.1). Thread the lock nut

(3.2) onto the plug stem until it reaches the thread end. Place on washer (3.3).

5. Screw nut and lock nut onto the plug stem according to the dimension R (see Fig. 1) and tighten. On doing so, make sure the plug rests on the seat.
6. Insert springs into the valve bonnet. Align the end of the springs towards the middle.
7. Place diaphragm plate on the end of the plug stem (3.1), while pulling the plug stem as far as it will possibly go out of the valve. Screw nut (7.3) on tight, while holding the plug stem stationary at the milled part with an open wrench (width across flats 14).
8. Align the holes in the diaphragm, place diaphragm case on top and fasten tight by tightening the screws (5.9) evenly.

7.5 Function testing

After reassembling the valve, check whether the valve functions properly.

- ➔ Connect a suitable source of compressed air to the signal pressure connection (5.8) on the diaphragm actuator.

Fail-close version

- The valve must be completely closed at a control pressure of 0 bar.
- The valve must start to open at 3 bar at the latest.
- The valve must be completely open at 6 bar.

Fail-open version

- The valve must still be open at 0.5 bar.
- The valve must be completely closed at 4.5 bar.

Control pressure and max. differential pressure Δp

Table 4 shows the correlation between control pressure and max. differential pressure Δp based on the process medium used.

The max. differential pressure depends on the control pressure and can be adapted to the operating conditions by SAMSON before delivery.

Table 2: *Special tools*

Valve size	DN 15 to 25 NPS ½ to 1	DN 32 to 50 NPS 1½ to 2	DN 65 and 80 NPS 2½ and 3	DN 100 NPS 4
Tool	Order no.			
Mounting device	1281-0036	1281-0037	1281-0038	–
Seat wrench	1280-0006	1280-0013	1280-0008	1280-0009
Plug wrench	1281-0049	1281-0049	–	–

Table 3: *Tightening torques*

Part	Tightening torques			
Nuts (1.1)	M10/20 Nm	M12/35 Nm	M16/90 Nm	M20/170 Nm
Packing (5.2)	M20 x 1.5/ 20 Nm	M20 x 1.5/ 80 Nm	M26 x 1.5/ 110 Nm	M26 x 1.5/ 110 N
Nuts (5.9)	M6/13 Nm	M8/18 Nm	M8/18 Nm	M8/18 Nm
Plug stem (3.1)	150 Nm	400 Nm	850 Nm	1050 Nm

Table 4: Control pressure and max. differential pressure Δp_{max}

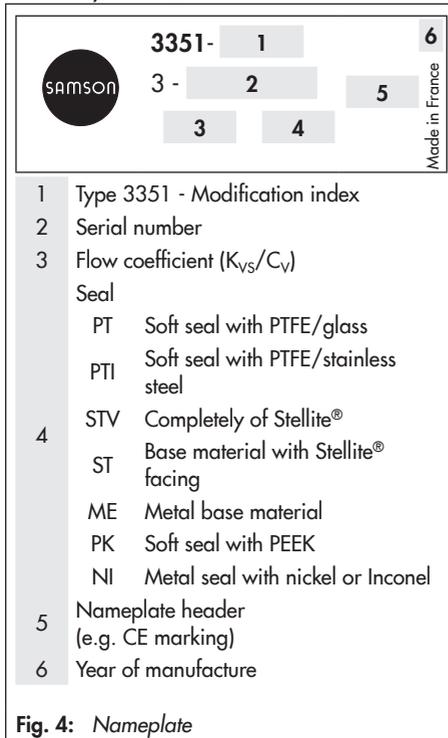
Valve size	DN	15	20	25	32	40	50	65	80	100
	NPS	½	¾	1	–	1½	2	2½	3	4
Flow coefficient	K_{VS}	6.3	10	14	25	31	40	72	90	170
	C_V	7.5	12	16	–	36	47	84	105	200
Max. control pressure ¹⁾		6 bar/88 psi								
Standard version										
Fail-close										
Min. control pressure to open the valve at Δp_{max}		4 bar/58 psi								
Max. perm. differential pressure Δp_{max}	Vapors, gases A → B	20 bar/290 psi			16 bar/235 psi		10 bar/145 psi		10 bar/145 psi	
	Liquids B → A	16 bar/235 psi			10 bar/145 psi		5 bar/73 psi			
Fail-open										
Min. control pressure to close the valve at Δp_{max}		4.5 bar/65 psi							4 bar/58 psi	
Max. perm. differential pressure Δp_{max} for vapors, gases or liquids		20 bar/290 psi			16 bar/235 psi		10 bar/145 psi			
Special version for fail-close version for higher differential pressure Δp										
Min. control pressure to open the valve at Δp_{max}		5.5 bar/80 psi							–	
Max. perm. differential pressure Δp_{max} for vapors, gases or liquids ²⁾		30 bar/435 psi			20 bar/290 psi		7 bar/102 psi		–	

¹⁾ The pressure must not exceed the nominal pressure of the valve body.

²⁾ For direction of flow B → A

8 Nameplate

The nameplate includes all details required to identify the on/off valve.



9 After-sales service

If malfunctions or defects occur, contact the SAMSON After-sales Service department for support.

The addresses of SAMSON AG, its subsidiaries, representatives and service facilities worldwide can be found on the SAMSON website, in all SAMSON product catalogs or on the back of these Mounting and Operating Instructions.

Please send your inquiries to:
aftersaleservice@samson.de.

Please submit the following details:

- Type, model number, nominal size of valve
- Order number, serial number
- Fail-safe position (fail-close or fail-open)
- Control air pressure
- Medium (including pressure and temperature)
- K_{VS}/C_V coefficient
- Installation drawing showing the exact location of the valve and all the additionally installed components (shut-off valves, pressure gauge, etc.)



Note:

See Data Sheet ► **T 8039** for dimensions and weights of the valves.



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