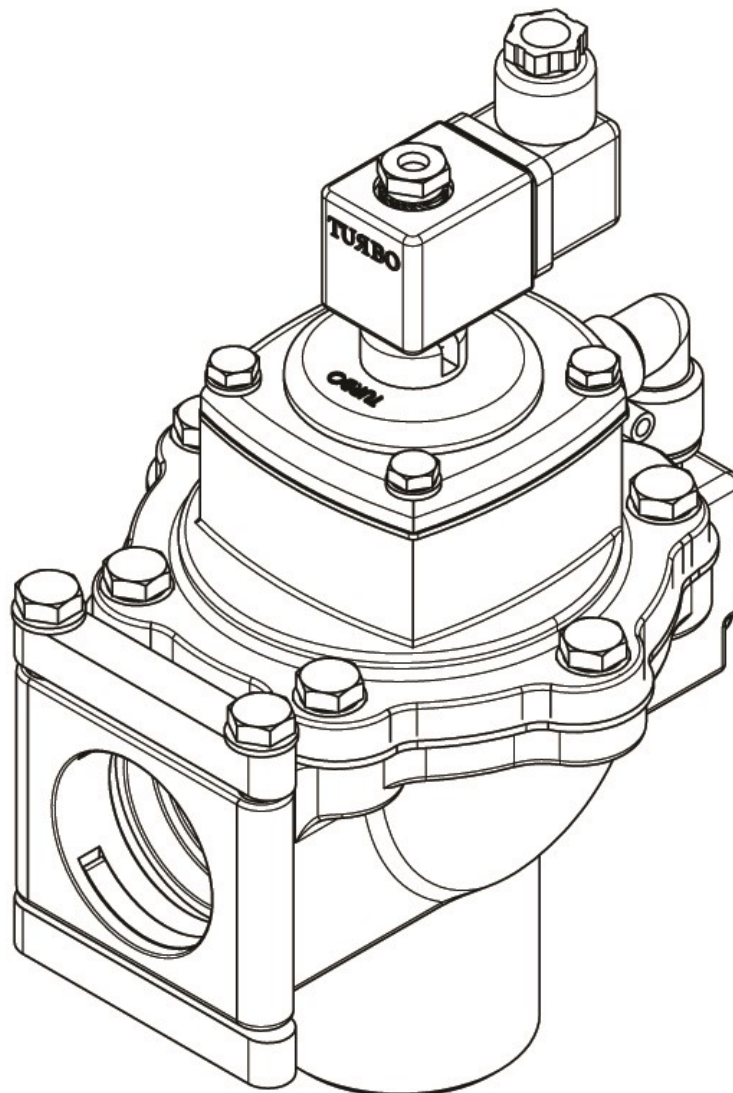


DATA AND OPERATING INSTRUCTIONS FOR RUNNING AND MAINTENANCE OF SOOT REMOVAL SYSTEM

AEROVIT International Patent



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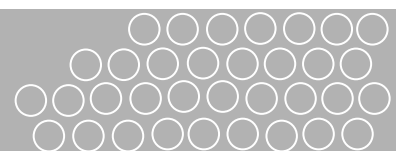


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1. Function

The sonic shock wave installation is normally programmed to automatically activate the valves in sequence, the interval between signals depending on the type of fuel, the amount of fouling and boiler output. Increased smoke temperature indicates a need for shorter intervals between signals. Constant low smoke temperature indicates that the interval between signals may be prolonged. This is to minimize the air consumption. Use the guide to the PLC/Timer for changing the cleaning cycle.

2. Operation of the system

The PLC/Timer is turned on and off by the switch on the front side of the panel. Always remember to turn off the electrical supply to the valves at boiler inspection and shutdowns. The operation can be governed automatically by the boiler operation by connecting e.g. an exhauster to the short circuit inlet on the controller panel.

IMPORTANT: Always pressurize the system before start of boiler / engine.
Always pressurize the system during boiler / engine running.
Always turn off the electrical supply before removal of the valves.
Always depressurize the system before removal of the valves.
Always depressurize the system before boiler inspection.

3. Compressed air supply

The air receiver is fed from a compressor through a ½" pipe line. The pressure of the system is adjusted by the air regulator. The filter, which is obligatory, under the regulator has to be inspected periodically in order to empty and clean the bowl and the filter. A non-return valve is mounted on the pipe line together with a 3-way valve to depressurize the installation.

The size of the compressor and the air consumption are dependent on the cleaning cycle, not on the number of valves. The number of signals per hour alone determines the air consumption, because the air consumption per signal is constant. The air receiver should operate on 0.8 - 0.9 MPa (8.0 - 9.0 bar).

Normally the pressure of the air receiver drops from 0.8 to 0.5 MPa when a valve is activated. With a standard air receiver of 150 litres the air consumption per signal will amount to: $3 \times 150 = 450$ litres or $0,45 \text{ Nm}^3/\text{h}$ "open air". With a cycle of 12 signals per hour the air consumption will amount to: $3 \times 150 \times 12 = 5400$ litres or $5,4 \text{ Nm}^3/\text{h}$ "open air".

If the system is prepared for overpressure, the cooling air will be blown into the valves. This means that the total air consumption per valve is 1000 litre or $1 \text{ Nm}^3/\text{h}$.

The service life of the air receiver is 3.6 million activations.

Always keep the system pressurized to provide cooling of the valves and the diaphragms.

4. Boiler inspection - fixed installation

The valves are installed on the boiler and/or the inspection doors.

Proceed inspection of the boiler through doors with Aerovit as below:

- 1) Turn off the electrical supply to the installation.
- 2) Depressurize the installation through the 3-way valve.
- 3) Separate the multi-cable plug.
- 4) Separate the pipe connector between valve pipe and pressure vessel.
- 5) Open or lift the inspection door together with valve installation.

After inspection remount the valve installation as below:

- 6) Shut or lower the inspection door with valve installation.
- 7) Reassemble the pipe connector and tighten it thoroughly.
- 8) Reassemble the multi-cable plug.
- 9) Repressurize the installation through the 3-way valve.
- 10) Turn on the electrical supply to the installation.

5. Boiler inspection - detachable installation

The valves are connected to inspection doors through quick-release couplings.

Proceed inspection of the boiler through doors with Aerovit as below:

- 1) Turn off the electrical supply to the installation.
- 2) Depressurize the installation through the 3-way valve.
- 3) Separate the multi-cable plug.
- 4) Separate the couplings with the coupling arms.
- 5) Separate the pipe connector between valve pipe and pressure vessel.
- 6) Separate valve pipe with couplings from inspection door. Put aside.

After inspection remount the valve installation as below:

- 7) Reassemble valve pipe with couplings to inspection door.
- 8) Reassemble the pipe connector and tighten it thoroughly.
- 9) Reassemble couplings with the coupling arms.
- 10) Reassemble the multi-cable plug.
- 11) Repressurize the installation through the 3-way valve.
- 12) Turn on the electrical supply to the installation.

6. Aerovit patented cooling system

All Aerovit valves have the patented cooling system which prevent corrosive flue gases to enter the valve.

With underpressure in the boiler:

Cooling air is sucked in through the calibrated nozzle. Aerovit recommend that the nozzle is checked regularly to avoid getting it blocked.

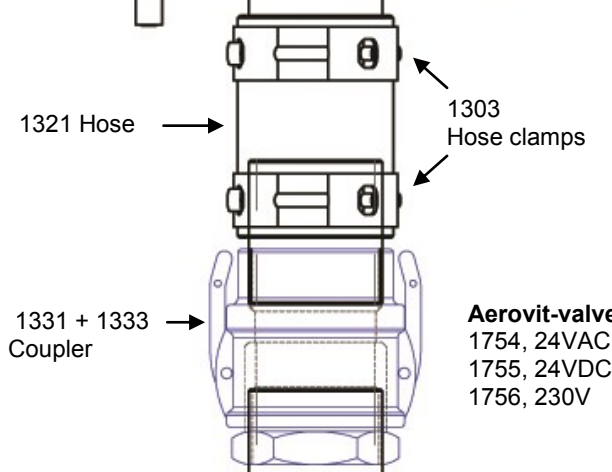
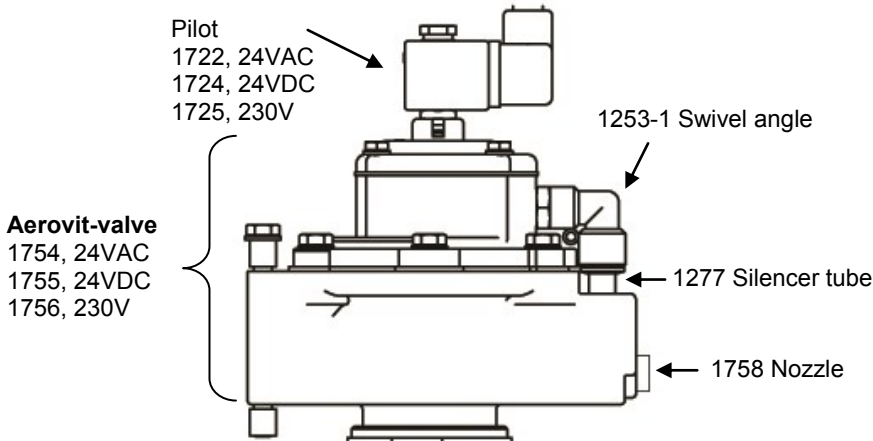
With overpressure in the boiler:

Cooling air is supplied from the pressure vessel and is blown into the Aerovit valve. The pressure from the cooling air should be higher than the pressure within the boiler. Aerovit recommend the filter/regulator to be set at 3 bar.

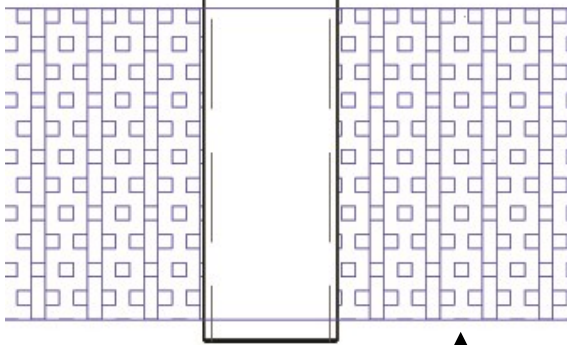
7. Drawings

International patent

Demountable installation

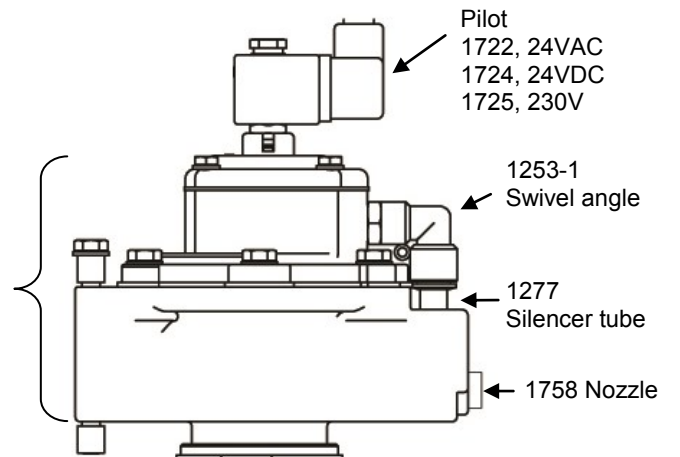


Aerovit-valve
1754, 24VAC
1755, 24VDC
1756, 230V



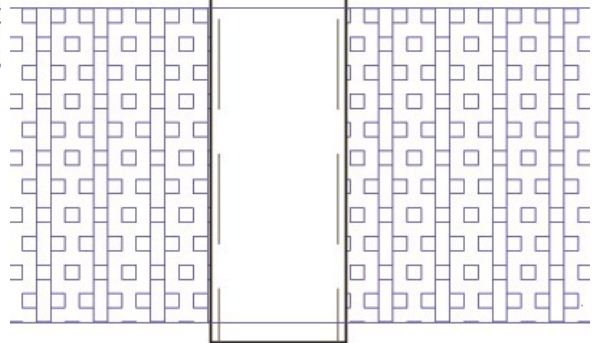
Boiler

Fixed installation



1321 Hose

1303 Hose clamps



8. Diaphragm valves series A40

The valves are 2-way normally closed diaphragm valves operated by a solenoid valve. They are designed for extremely fast opening/closing and high flow rates.

The body and cover are of anodized die-cast aluminium alloy and all bolts are in stainless steel. The solenoid valve is integrally mounted on the diaphragm valve and has an encapsulated coil (Class H insulation) with a waterproof (IP-65) plug-on connector.

8.1 Operation

The diaphragm divides the valve into an upper and a lower chamber. The air inlet leads into the lower chamber and is connected to the outlet when the diaphragm lifts. The diaphragm has a bleed hole through which the high pressure inlet air passes into and fills up the upper chamber, creating the same pressure on both sides of the diaphragm. The pressure in the upper chamber acts on the full surface of the diaphragm, whereas the pressure in the lower chamber acts on a reduced area of the diaphragm. This keeps the diaphragm pressed down on the outlet port, closing it.

The upper chamber is connected to the atmosphere via the outlet in the pilot base. The plunger in "normal" conditions keeps the outlet closed, maintaining the pressure in the upper chamber and hence the diaphragm valve closed.

When the solenoid is energised the plunger lifts within the core tube and the compressed air in the upper chamber exhausts quickly into the atmosphere.

Because the exhaust air passage has a higher flow rate than the bleed hole in the diaphragm, the pressure in the upper chamber falls suddenly. The pressure in the lower chamber then lifts the diaphragm, causing the compressed air to flow from inlet through outlet. As this happens within 1/40 second, a sonic shock wave leaves the outlet with supersonic speed.

When the solenoid is de-energised, the plunger closes the air passage and the air is trapped above the diaphragm, closing the valve outlet.

8.2 Disassembly & Reassembly procedures

Depressurize valve, turn off electrical supply and proceed as below:

1. Loosen connector screw and remove Plug Connector (1+2) from Coil (3).
2. Remove the bolt and slip Coil off Solenoid base (5).
3. Loosen core sleeve and remove Solenoid base from Pilot valve bonnet (8).
The Core and the Spring (6+7) come loose.
4. Loosen Screws (4) holding Pilot valve bonnet to Main valve bonnet (10) and remove Pilot valve bonnet (9).
5. Loosen Bonnet screws and remove Bonnet and Diaphragms (9+12) from Valve body (13).
6. All parts are now accessible for cleaning or replacements. Clean the air passage in Pilot Base. Replace worn or damaged parts.
7. Reassemble in reverse order paying careful attention to the exposed view.
8. Clean the bleed hole and replace Diaphragms with the steel plate up facing the Bonnets. The bleed hole in diaphragm must match the cavity in valve body and bonnet.
9. Tighten the Bonnet screws in Pilot valve bonnet to 16 Nm and in the Mainvalve bonnet to 20 Nm. Tighten the Pilot Base Screws criss-cross 1 Nm. Tighten the connector screw to 0.6 Nm.
10. After reassembly, operate the valve a few times to be sure of proper opening and closing.

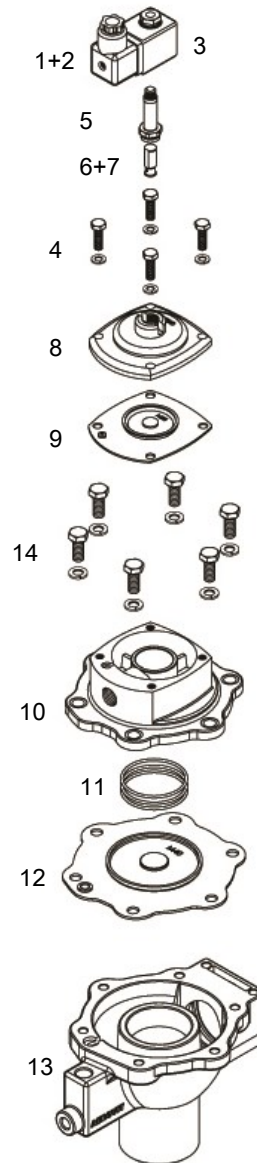
IMPORTANT: When mounting the valve on the manifold make sure to tighten the bolts at the quick-mount-set with 20 Nm.

IMPORTANT: When mounting the valve tighten the clamps until they begin to deform. They should be retightened after a week of operation.

8.3 Exploded view and spare parts, series A40 1½”

Spare Parts

<u>1717</u>	<u>Spare part kit</u>
	(9) Diaphragm Pilot
	(11) Spring
	(12) Diaphragm Main
<u>1722</u>	<u>(3) Coil 24V AC</u>
<u>1724</u>	<u>(3) Coil 24V DC</u>
<u>1725</u>	<u>(3) Coil 230V</u>
<u>1726</u>	<u>(6+7) Core assembly + spring</u>
<u>1728</u>	<u>(1+2) Connector + gasket</u>
<u>1727</u>	<u>(5) Solenoid base</u>
<u>1729</u>	<u>(4) Bonnet screws small</u>
<u>1729-1</u>	<u>(14) Bonnet screws large</u>
<u>1720</u>	<u>(8) Pilot valve bonnet</u>
<u>1721</u>	<u>(10) Main valve bonnet</u>
<u>1760</u>	<u>(13) Valve body</u>



Voltage:

DC 24V
AC 24V - 115V - 230 V / 50Hz

Power consumption:

23 VA

Temperature rating:

Coil: -40°C +80°C
Pilot: -40°C +80°C

Material diaphragm:

Nitril rubber with nylon reinforcement

Temperature rating:

STD: -20°C + 80°C
Viton: -20°C + 200°C

Operating pressure:

0,5 bar – 10 bar

9. Maintenance

Warning: Turn off electrical supply and depressurise valve before making any repairs.
It is not necessary to remove the valve from pipe line during maintenance.

9.1 Cleaning

A periodic cleaning of the valves is desirable. The time between cleanings will depend on the compressed air and the duty conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive leakage or noise will indicate that cleaning is required.

9.2 Preventative maintenance

- Keep the compressed air clean, dry and free from oil.
- Check the valves at least once a month to ensure proper opening and closing.
- Periodically inspect the valves' internals for damage, wear or clogging of the bleed hole on the diaphragm and on the pilot base. Thoroughly clean and replace worn or damaged parts.
- Periodically inspect the hoses connecting the valves to the boiler for damage or wear.
- Replace the hoses if necessary.

10. Improper operation

If the installation does not function:

- Check for and ensure supply to solenoid coil.
- Check for "burn out" of coil and replace if faulty.
- Check and ensure voltage to coil is at least 90% of rated.
- Check and ensure pressure of compressed air, 8 - 9 bar (0.8 - 0.9 MPa).
- Check tightness of cover screws.
- If fault not corrected with above, disassemble valve, clean and replace worn or damaged parts.

11. Recommended spare parts

- Coil, 24 V or 230 V
- Diaphragms + springs
- Pilot group

- Hose
- Hose clips

- Coupler (if installed)
- Packing ring Buna N 2".