



INSTALLATION, OPERATION & MAINTENANCE MANUAL

# ACMO-AVK DIAPHRAGM AUTOMATIC CONTROL VALVE

## SERIES 879 - M400 - 879/BB2X99

### FLOW CONTROL VALVE

Rev. 02 - 20210316



**ACMO**

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Thank you for purchasing our product. We kindly invite you to read carefully the operating instructions and safety rules in this manual, which is part of the product.

## 1. Manufacturer identification

AC.MO S.r.l.

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## 2. General health and safety measures

- Read the IOM manual before using the valve. Comply with the manual at all times.
- The IOM manual must be available in the workplace.
- Non-compliance with the general safety measures can seriously damage human health and valve functioning. AC.MO S.r.l. will not assume any responsibility or liability for consequential damage due to the non-compliance with these instructions.
- The valve can be used for drinking water and clean service water. Other uses are prohibited because they can alter the valve safety.
- Never use the valve in plants where the pressure is higher than the one indicated.
- Only qualified staff can install the valve. Unqualified or underage staff cannot perform the installation. Always use protective equipment such as safety boots, safety helmets, goggles, protective gloves, etc... Personnel involved in the installation or maintenance of valves should be constantly alert to possible damages caused by an improper handling of the valve.
- Before performing any work on the valve, depressurize the pipeline section and ensure it is free of hazards.
- Unauthorized, unintentional and unexpected actuation, as well as any hazardous movement caused by stored energy (pressurized air, water under pressure) must be prevented.
- When a valve needs to be dismantled from a pipeline, water may emerge from the pipeline or the valve. The pipeline must be emptied completely before the valve is dismantled. It is strictly prohibited to disinstall any component when the system is under pressure (working) or when there is any fluid inside.
- Statutory and local provisions as well as the safety and accident prevention regulations must be observed and complied with at all times.
- For equipment that must be monitored, the relevant laws and regulations such as the Industrial Code, Accident Prevention Regulations, etc. must be complied with. In addition to this, local accident prevention regulations apply.

**PLEASE NOTE:** That if the valve closes too rapidly it can generate a water hammer in the pipes.

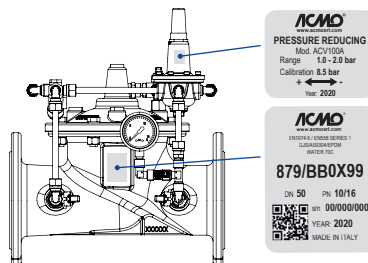
For product improvement purposes, AC.MO S.r.l. reserves the right to change the data in this manual at any time and without notice. Unauthorized use of data is forbidden.

Please contact us for up-to-date information.

### 3. Receiving and storage

#### 3.1 Product identification

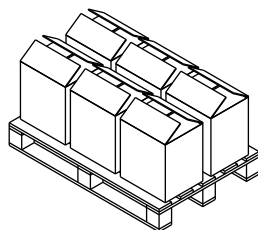
- The valve is labeled on the body with ACMO/AVK logo and model identification number of the valve.
- The pilot is labeled with ACMO/AVK logo, the model identification number and the setting parameters.



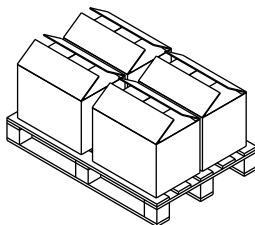
#### 3.2 Packing

The valves are generally delivered in europallets, alternatively, in dedicated high thickness paper boxes. In both cases, they are fastened to the pallet using bolts and covered with a polyethylene heat-shrinking film. The package depends on the valve dimensions and on the actuator and/or hydraulic circuit that may be installed on the valve. The package depends on the valve dimensions and on the hydraulic circuit dimensions.

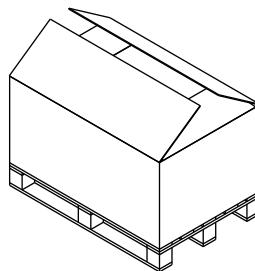
Packing examples:



DN50....100



DN125....150



DN200....600

#### 3.3 Transport and storing

**WARNING:** Please carefully inspect the unit for damages or discrepancies with the order upon arrival and report a claim immediately before unloading the goods.

Lifting the valve improperly may damage it. Lift the valves using slings (ISO 4878), otherwise, if present on one valve, using the specific eyebolts.

Make sure the slings do not interfere with circuit components. Don't lift up the valves using the position indicator or the accessories and pipes installed on the valve.

Please make sure the lifting tools (lift truck, slings, cranes, hooks, etc.) are adequate for the weight. Before you move the valve it is necessary to consult the weight table at page 7. Make sure their coefficient of safety is equal or higher than the coefficient allowed by law.

If the valve is stored for a middle or long term, it is necessary to:

- Lay the valve in a horizontal and firm position, in order to avoid capsizings which could damage things or people.
- Store the valves in an area protected from weather conditions especially from sunlight, which could damage the coats and the gaskets.

## 4. Testing valves

All valves AC.MO S.r.l. designs are tested and controlled before leaving our premises.  
The test (inspection certificate) is available on request.

## 5. Warranty

AC.MO S.r.l. guarantees its products for the supplier or the client for a 12 month consecutive period since the delivery date to the final client. The warranty coverage period will correspond to the date on the final client's delivery note. Product faults and damages must be pointed out within 8 days since their identification.

The warranty covers all the parts manufactured/provided by AC.MO S.r.l..

Warranty does not cover normal wear damages.

The warranty does not apply to:

- Valves equipped with tools and accessories, unauthorized by AC.MO S.r.l..
- Valves damaged by misuse, accidents or other chances, negligence, excess load etc..
- Valves damaged by lack of maintenance.
- Valves equipped with non-original spare parts.
- Valves modified without authorisation.

## 6. Disposal and recycling

Even though AC.MO S.r.l. valves are designed and built to be extremely long lasting, at the end of their life cycle they must be removed and replaced.

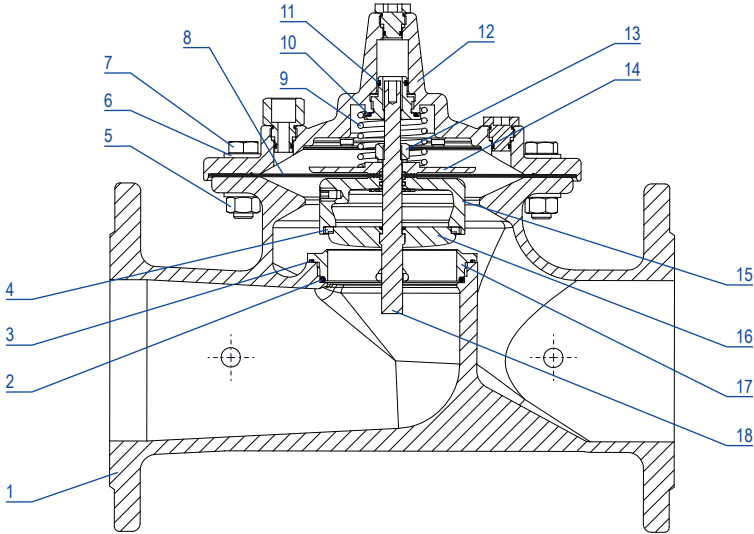
Dismantle the valve, separate its components to dispose them of and recycle them (e.g., metal parts must be separated from plastic parts etc.).

**WARNING: Always respect the directives on waste collection, disposal and recycling.**

Carefully observe all steps listed in National Laws on waste disposal and recycling.

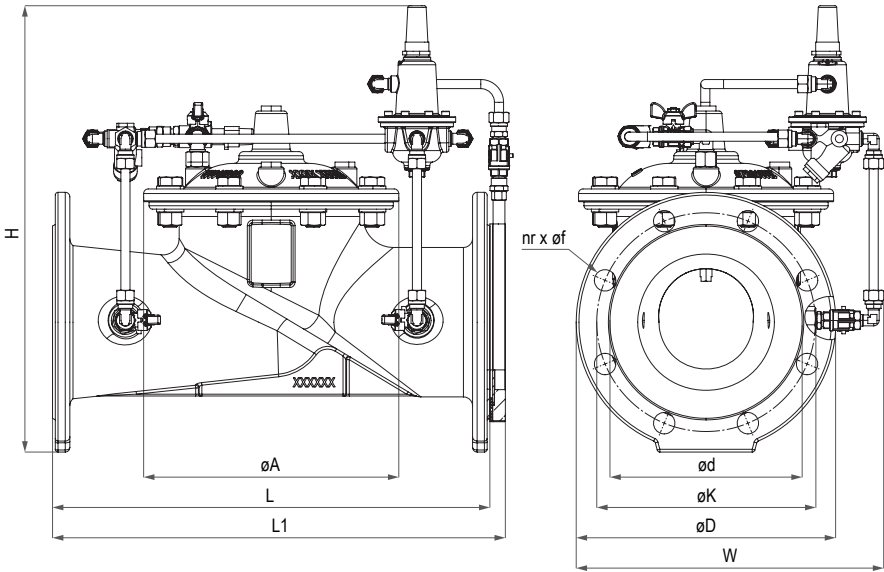
## 7. Series 879 overview

### 7.1 Valve components description



ITEM	DESCRIPTION	MATERIALS		STANDARDS
1	BODY	DUCTILE IRON	EN GJS-500-7	EN 1563
2	O-RING	RUBBER	EPDM	EN 681-1
3	O-RING	RUBBER	EPDM	EN 681-1
4	PLUG SEALING	RUBBER	EPDM	EN 681-1
5	HEX NUT	STAINLESS STEEL	A2	EN ISO 3506-1
6	WASHER	STAINLESS STEEL	AISI304	EN 10088-3
7	BOLTS	STAINLESS STEEL	A2	EN ISO 3506-1
8	DIAPHRAGM	RUBBER	EPDM	EN 681-1
9	SPRING	STAINLESS STEEL	AISI304	EN 10088-3
10	FLAT SEAL	RUBBER	EPDM	EN 681-1
11	FLAT SEAL	RUBBER	EPDM	EN 681-1
12	COVER	DUCTILE IRON	EN GJS-500-7	EN 1563
13	HEX NUT	STAINLESS STEEL	A2	EN ISO 3506-1
14	DIAPHRAGM SUPPORT	DUCTILE IRON	EN GJS-500-7	EN 1563
15	OBTURATOR	DUCTILE IRON	EN GJS-500-7	EN 1563
16	REGULATING PLUG	STAINLESS STEEL	AISI304	EN 10088-3
17	SEAT	STAINLESS STEEL	AISI304	EN 10088-3
18	STEM	STAINLESS STEEL	AISI304	EN 10088-3

7.2 Valve dimensions



EN588 S1			FULL BORE			REDUCED BORE			DRILLING FLANGES										WEIGHT kg*	
DN	L	L1	H*	øA	W*	H*	øA	W*	EN1092-2 PN10					EN1092-2 PN16					FULL BORE	RED. BORE
50 <sup>(1)</sup>	230	247	399	188	244	-	-	-	øD	øK	øf	nr	ød	øD	øK	øf	nr	ød	17	-
65	290	307	422	215	255	416	188	251	185	145	19	4	118	185	145	19	4	118	22	20
80	310	327	437	234	270	433	215	269	200	160	19	8	132	200	160	19	8	132	26	23
100	350	367	460	280	290	449	234	288	220	180	19	8	156	220	180	19	8	156	35	28
125 <sup>(2)</sup>	400	417	-	-	-	468	234	308	250	210	19	8	184	250	210	19	8	184	-	32
150	480	497	588	406	410	492	280	340	285	240	23	8	211	285	240	23	8	211	81	45
200	600	617	667	507	510	582	406	423	340	295	23	8	266	340	295	23	12	266	137	95
250	730	747	737	554	555	686	507	507	395	350	23	12	319	405	355	28	12	319	198	156
300	850	867	806	604	605	760	554	554	445	400	23	12	370	460	410	28	12	370	255	220
350	980	997	928	710	710	842	604	605	505	460	23	16	429	520	470	28	16	429	456	323
400	1100	1117	990	780	780	966	710	710	565	515	28	16	480	580	525	31	16	480	542	494
450	1200	1217	1168	929	930	1027	780	780	615	565	28	20	530	640	585	31	20	548	868	641
500	1250	1267	1242	1018	1020	1215	929	930	670	620	28	20	582	715	650	34	20	609	1113	931
600	1450	1467	1391	1186	1090	1325	1018	1020	780	725	31	20	682	840	770	37	20	720	1672	1268

\* INDICATIVE VALUES  
(1) ONLY FULL BORE  
(2) ONLY REDUCED BORE

UNIT: mm

7.3 Diagrams

DIAGRAM FOR THE CAVITATION CHECK

The diagram shows indicatively the two operating areas of the reducer, according to the applicable upstream and downstream pressures.

**AREA A:** continuous working conditions.  
No cavitation risk.

**AREA B:** intermittent working conditions.  
Possible cavitation risk.

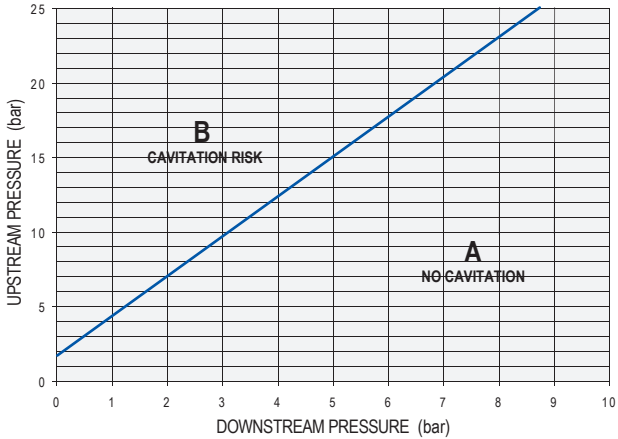
Continuous working conditions in the B ZONE can damage rapidly the internal parts. Appropriate design precautions must be adopted if the valve works in this ZONE. Please, contact our Technical Department.

Limit of use

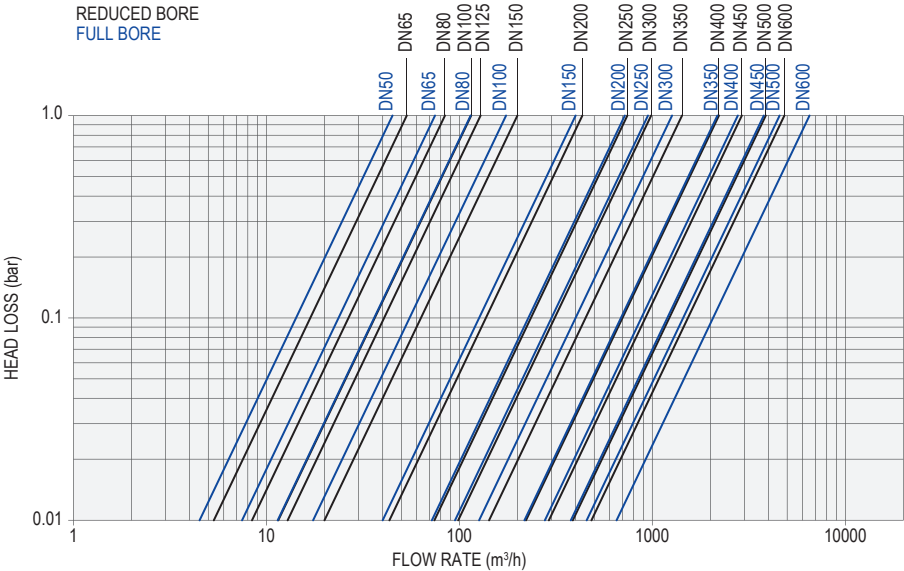
Recommended fluid velocity upstream of the valve: Continuous service: 3,5 m/s  
Peak service: 5 m/s

Minimum necessary differential pressure: 0,2 bar.

Working temperature from -10°C to +80°C.



HEAD LOSS DIAGRAM





#### 7.4. Hydraulic specifications

DN - REDUCED BORE	65	80	100	125	150	200	250	300	350	400	450	500	600
Kv [m3/h]	53	83	119	135	202	435	734	990	1584	2221	2899	3865	4735
STROKE [mm]	16	18.5	23.2	23.2	25.2	44.5	53.8	64.3	74.9	89.2	100	113.3	125.1
DN - FULL BORE	50	65	80	100	150	200	250	300	350	400	450	500	600
Kv [m3/h]	44	76	116	175	400	710	947	1355	2174	2734	3757	4548	6539
STROKE [mm]	16	18.5	23.2	25.2	44.5	53.8	64.3	74.9	89.2	100	113.3	125.1	150

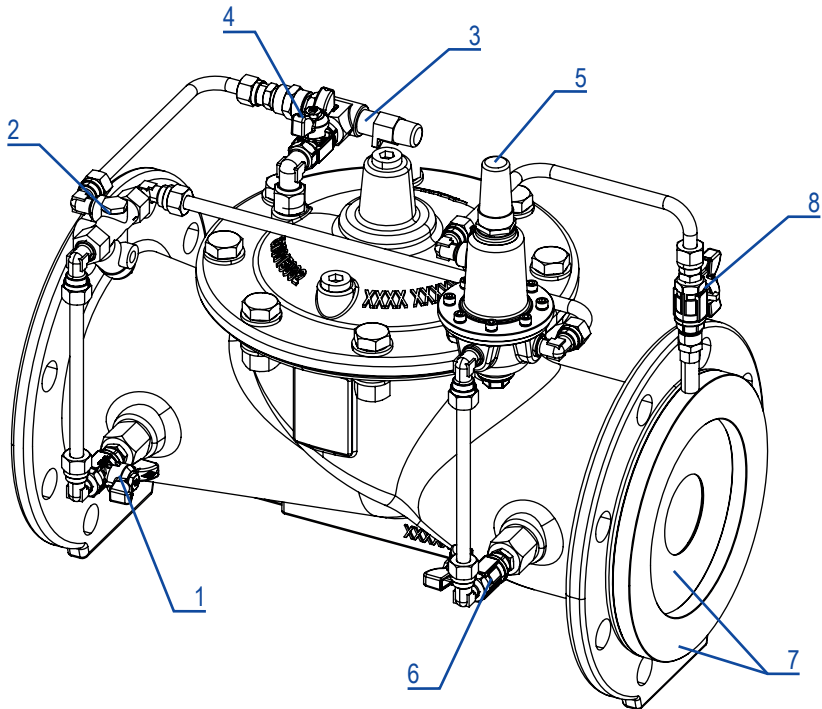
## 8. Principle of operation

The flow control valve is an automatic control valve designed to maintain the flow at the value less or equal to the setting value, independently from the upstream and/or downstream pressure variations. The flow control is achieved by keeping a constant differential pressure across the calibrated plate.

## 9. Installation

- Leave appropriate space to facilitate the assembling/dismantling and maintenance operations.
- Before the installation, wash the pipes properly to eliminate any residual. Not washing the pipes properly can compromise the valve functioning.
- Install a resilient seat gate valves upstream and downstream the valve in order to facilitate maintenance operations.
- Install the valve on the pipeline, checking the arrow printed on the valve must follow the water flow. Use the eyelet on the cover to lift or lower the valve.
- The valve should be installed in a horizontal position with the cover up; other positions are also possible but must be verified with our Technical Office.
- Make sure the valve position permits to easily dismantle the hydraulic circuit or its components.
- After the installation, check there are not damages to any joint, pipe or tools.

## 10. Hydraulic circuit



ITEM	DESCRIPTION	MATERIALS
1	2-WAY BALL VALVE	NICKEL BRASS
2	Y-STRAINER + CALIBRATED ORIFICE (3 mm)	BRASS + S.S. AISI316
3	UNIDIRECTIONAL NEEDLE VALVE	STAINLESS STEEL
4	2-WAY BALL VALVE	NICKEL BRASS
5	FLOW CONTROL PILOT type AEP400	STAINLESS STEEL
6	2-WAY BALL VALVE	NICKEL BRASS
7	CALIBRATED ORIFICE + SUPPORT	STAINLESS STEEL AISI304
8	2-WAY BALL VALVE	NICKEL BRASS

The designs, materials and specifications shown are subject to change without notice. This is due to the continuous development of our product programme.  
Unauthorized use is forbidden.

Expect... **AVR**

## 11. Static tests once installed

**OPEN** valve static test:

1. Close ball valves **1 - 4 - 6 - 8** to isolate the pilot control system. This prevents impurities from entering the control circuit.
2. Fully open the main valve by removing the cap on the cover or by loosening a junction or opening ball valve **4**.

**WARNING:** Check this procedure does not cause any damage to the pipeline.

3. Check that the flanged junctions, pipe fittings, etc. do not leak.
4. Reassemble the cap on the cover and/or tighten the junctions.

**CLOSE** valve static test:

1. Close the ball valve **6**, and open ball valves **1 - 4**.
2. Release the air under the cover of the main valve loosening the junction situated in the highest point of the cover. Tighten the junction. This will keep the valve shut when the pipeline is pressurized.
3. Check the cover does not leak, in case, tighten the fixing bolts.

## 12. Commissioning

**WARNING:** A constant flow in the system is necessary to start and calibrate the automatic control valve. Open a hydrant, a pressure relief valve, a by-pass etc. to ensure a constant water flow in the system.

1. Close the main valve closing and opening the ball valves as previously explained.
2. The needle valve **3** has been calibrated in our factory. To reduce the closing speed of the hydraulic valve, turn needle valve **3** clock wise. Vice versa to increase it.
3. Turn the calibration screw, sited on pilot valve **5**, clock wise until it reaches the total blocking position. Open ball valve **1**: the main valve will remain closed.
4. Completely open upstream gate valve. Partially open downstream gate valve. The automatic valve will open and a flow rate equal or less of the setting value will start to flow trough it.
5. Slowly, turn pilot calibration screw **5** clockwise to increase the flow rate setting point until the desired flowrate is achieved. Turn the calibration screw slowly stopping at each half rotation to reach the equilibrium. Tighten the lock nut on the calibration screw. The control range is +/- 30% of the flow rate setting.
6. To check the valve functioning, slowly open and close the downstream gate valve. The flow rate have to be always equal or less than the set value.
7. If necessary, modify the valve opening and closing speed by regulating the needle valve **3**.
8. Completely open the downstream gate valve.

### 13. Maintenance

The quality of the material used to manufacture our valves and control circuits avoids abnormal wear of the internal components for many years. However, we recommend checking the valve as follows:

After 5 months operation:

- Control and clean the strainer (if present) installed on the main pipeline and the strainer on the pilot circuit of the valve.
- If blocked, the strainer on the pilot circuit takes the main valve gradually out of order.

**NOTE:** Clean the strainer regularly following the specific timetable of the plant. This timetable cannot be predetermined but must be decided only when the valve is on duty.

After 12 months operation:

- Control and clean the strainer (if present) installed on the main pipeline and the strainer on the pilot circuit of the valve.
- Remove the control circuit.
- Remove the screws on the valve cover, remove the cover, and take out the obturator completely.
- Check for any eventual damage of the rubber components, such as: the lip seals of the piston and the seal gasket to schedule the maintenance intervention.
- Assemble the obturator, the valve cover and tighten the bolts properly.
- Put the valve back into service.

This kind of check allows scheduling the maintenance required by the valve, taking into account the real working conditions.

### 14. Recommended spare parts

ITEM (see page 6)	QTY	DESCRIPTION	MATERIALS
<b>2-3</b>	1	O-RING	RUBBER EPDM
<b>9</b>	1	SPRING	STAINLESS STEEL AISI304
<b>8</b>	1	DIAPHRAGM	RUBBER EPDM

# 15. Troubleshooting

PROBLEM	CAUSE	SOLUTION
<b>THE VALVE DOES NOT OPEN</b>	Low inlet pressure.	Check the pressure or apply a higher inlet pressure.
	Pilot spring <b>5</b> is insufficiently compressed.	Turn the pilot calibration screw <b>5</b> clockwise until the valve opens.
	Insufficient water demand.	Check the water demand or make it increase.
	Ball valves <b>4 - 6 - 8</b> are closed.	Open ball valves <b>4 - 6 - 8</b> .
<b>THE VALVE DOES NOT CLOSE</b>	Circuit strainer <b>2</b> is clogged.	Clean the strainer <b>2</b> .
	Ball valves <b>1 - 4</b> closed.	Open ball valves <b>1 - 4</b> .
	The needle valve <b>3</b> is clogged.	Check the needle valve <b>3</b> is not clogged.
	Residues in the main valve.	Remove and inspection the actuator. Inspection the disc gasket and the seat.
	The main valve diaphragm leaks.	Close the ball valve <b>1 - 4 - 6 - 8</b> and remove the plug from the cover. If the diaphragm continues leaking it must be substituted because it has been damaged. <b>WARNING: The valve will open completely.</b>
<b>THE VALVE DOES NOT REGULATE</b>	The needel valve <b>3</b> is to much close	Calibrate the needle valve <b>3</b> between 1 and 1.5 anti-clockwise turn starting from the completely closed position.
	Insufficient water demand.	Check or set an higher water demand target.
	Inadequate calibration range.	Modify the calibrated plate.

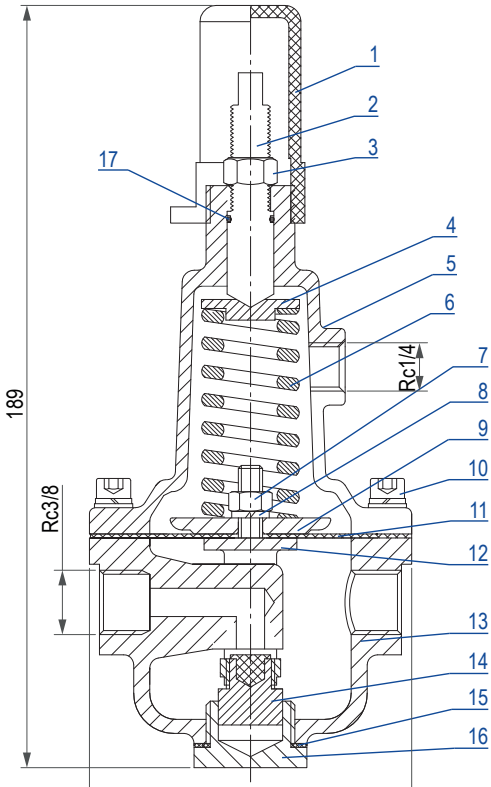
**PLEASE NOTE:** While working, ball valves **1 - 4 - 6 - 8** must be OPEN.  
While cleaning the strainer **2** ball valves **1 - 4 - 6 - 8** must be CLOSE.

# 16. AEP400 pilot

## 16.1 Pilot: Components and dimensions

ITEM	DESCRIPTION	MATERIALS	STANDARDS
1	CAP	ABS	-
2	CALIBRATION SCREW	STAINLESS STEEL AISI304	EN 10088-3
3	JAM NUT	STAINLESS STEEL AISI304	EN 10088-3
4	SPRING GUIDE	STAINLESS STEEL AISI304	EN 10088-3
5	COVER	STAINLESS STEEL AISI304	EN 10088-3
6	SPRING	TEMPERED STEEL SiCrV	EN 10027
7	NUT	STAINLESS STEEL A2	EN ISO 3506-1
8	WASHER	STAINLESS STEEL A2	EN ISO 3506-1
9	FIXING HOLDER	STAINLESS STEEL AISI304	EN 10088-3
10	SCREW	STAINLESS STEEL A2	EN ISO 3506-1
11	DIAPHRAGM	EPDM+NYLON	EN 681-1
12	OBTURATOR	STAINLESS STEEL AISI304	EN 10088-3
13	BODY	STAINLESS STEEL AISI304	EN 10088-3
14	SHUTTER	AISI304+EPDM	EN 10088-3 + EN 681-1
15	O-RING	NBR	EN 681-1
16	PLUG	STAINLESS STEEL AISI304	EN 10088-3
17	O-RING	NBR	EN 681-1

TYPE PILOT	RANGE (bar)	SPRING COLOR
<b>AEP400</b>	0,1 - 2,0	YELLOW



16.2 Pilot: Troubleshooting

PROBLEM	CAUSE	SOLUTION
<b>THE PILOT VALVE DOES NOT CLOSE TIGHT</b>	Spring <b>6</b> is insufficiently compressed.	Turn the pilot calibration screw <b>2</b> clockwise.
	Shutter seal gasket <b>14</b> is damaged.	Substitute seal gasket <b>14</b> .
<b>THE COVER OF THE PILOT LEAKS</b>	Diaphragm <b>11</b> is damaged.	Substitute diaphragm <b>11</b> .

16.3 Pilot: Recommended spare parts

ITEM	QTY	DESCRIPTION	MATERIALS
<b>6</b>	1	SPRING	TEMPERED STEEL SiCrV
<b>11</b>	1	DIAPHRAGM	EPDM + NYLON
<b>14</b>	1	SHUTTER	AISI304 + EPDM



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