

BOA-RPL/RPL F-F / BOA-RFV

Installation/Operating Manual



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Installation/Operating Manual BOA-RPL/RPL F-F / BOA-RFV

Original operating manual

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1 General

1.1 Principles

This operating manual is valid for the type series and variants indicated on the front cover.

The operating manual describes the proper and safe use of this equipment in all phases of operation.

In the event of damage, immediately contact your nearest KSB sales organisation responsible to maintain the right to claim under warranty.

1.2 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel.

1.3 Other applicable documents

Table 1: Overview of other applicable documents

Document	Contents
Type series booklet	Description of the valve
Flow characteristics	Information on Kv values and zeta values
General assembly drawing ¹⁾	Sectional drawing of the valve
Sub-supplier product literature ²⁾	Operating manuals and other product literature for the accessories

Observe the relevant manufacturer's product literature for the accessories.

1.4 Symbols

Table 2: Symbols used in this manual

Symbol	Description
✓	Conditions which need to be fulfilled before proceeding with the step-by-step instructions
▷	Safety instructions
⇒	Result of an action
⇄	Cross-references
1. 2.	Step-by-step instructions
	Note Recommendations and important information on how to handle the product

1.5 Key to safety symbols/markings

Table 3: Definition of safety symbols/markings

Symbol	Description
 DANGER	DANGER This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury.
 WARNING	WARNING This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.

¹ If included in agreed scope of supply; otherwise refer to the type series booklet.

² If included in agreed scope of supply

Symbol	Description
	<p>CAUTION This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.</p>
	<p>General hazard In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury.</p>
	<p>Electrical hazard In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage.</p>
	<p>Machine damage In conjunction with the signal word CAUTION this symbol indicates a hazard for the machine and its functions.</p>



2 Safety

All the information contained in this section refers to hazardous situations.

In addition to the present general safety information the action-related safety information given in the other sections must be observed.

2.1 General

- This operating manual contains general installation, operating and maintenance instructions that must be observed to ensure safe operation of the system and prevent personal injury and damage to property.
- Comply with all the safety instructions given in the individual sections of this operating manual.
- The operating manual must be read and understood by the responsible specialist personnel/operators prior to installation and commissioning.
- The contents of this operating manual must be available to the specialist personnel at the site at all times.
- Information and markings attached directly to the product must always be complied with and kept in a perfectly legible condition at all times. This applies to, for example:
 - Manufacturer
 - Type designation
 - Nominal pressure
 - Nominal size
 - Flow direction arrow
 - Year of construction
 - Valve body material
- The operator is responsible for ensuring compliance with all local regulations not taken into account.
- The design, manufacture and testing of the valve are subject to a QM system to DIN EN ISO 9001 as well as the current regulations and directives for pressure equipment.
- Bear in mind that valves exposed to creep-rupture conditions have a limited service life and have to meet the applicable regulations stipulated in the technical codes.
- In the case of customised special variants, further restrictions may apply with regard to the operating mode and service life. Refer to the relevant sales documentation for applicable limitations.
- The operator is responsible for any eventualities or incidents which may occur during installation performed by the customer, operation and maintenance.

2.2 Intended use

- Only operate valves which are in perfect technical condition.
- Do not operate the valve in partially assembled condition.
- Only use the valve for fluids specified in the product literature. Take the design and material variant into account.
- Only operate the valve within the operating limits described in the other applicable documents.
- The valve's design and rating are based on predominantly static loading in accordance with the codes applied. Consult the manufacturer if the valve is subjected to dynamic loads or any other additional influences.
- Consult the manufacturer about any other modes of operation not described in the product literature.
- Do not use the valve as a foothold.

2.2.1 Prevention of foreseeable misuse

- Never exceed the permissible application and operating limits specified in the data sheet or product literature regarding temperature, etc.
- Observe all safety information and instructions in this manual.

2.3 Personnel qualification and training

- All personnel involved must be fully qualified to transport, install, operate, maintain and inspect the product this manual refers to and be fully aware of the interaction between the valve and the system.
- The responsibilities, competence and supervision of all personnel involved in transport, installation, operation, maintenance and inspection must be clearly defined by the operator.
- Deficits in knowledge must be rectified by means of training and instruction provided by sufficiently trained specialist personnel. If required, the operator can commission the manufacturer/supplier to train the personnel.
- Training on the valve must always be supervised by specialist technical personnel.

2.4 Consequences and risks caused by non-compliance with this manual

- Non-compliance with these operating instructions will lead to forfeiture of warranty cover and of any and all rights to claims for damages.
- Non-compliance can, for example, have the following consequences:
 - Hazards to persons due to electrical, thermal, mechanical and chemical effects and explosions
 - Failure of important product functions
 - Failure of prescribed maintenance and servicing practices
 - Hazard to the environment due to leakage of hazardous substances

2.5 Safety awareness

In addition to the safety information contained in this operating manual and the intended use, the following safety regulations shall be complied with:

- Accident prevention, health regulations and safety regulations
- Explosion protection regulations
- Safety regulations for handling hazardous substances
- Applicable standards, directives and laws

2.6 Safety information for the operator/user

- Fit protective equipment (e.g. contact guards) supplied by the operator for hot, cold or moving parts, and check that the equipment functions properly.
- Do not remove any protective equipment (e.g. contact guards) during operation.
- Provide the personnel with protective equipment and make sure it is used.
- Contain any leakage of hazardous fluids (e.g. explosive, toxic, hot) so as to avoid any danger to persons and the environment. Adhere to all relevant laws.
- Eliminate all electrical hazards. (In this respect refer to the applicable national safety regulations and/or regulations issued by the local energy supply companies.)
- Take protective measures against the impact of potentially occurring surge pressure (e.g. bursting discs).

2.7 Safety information for maintenance, inspection and installation

- Modifications or alterations of the valve require the manufacturer's prior consent.
- Use only original spare parts or parts/components authorised by the manufacturer. The use of other parts/components can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that maintenance, inspection and installation are performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
- Carry out work on the valve during standstill only.
- The valve body must have cooled down to ambient temperature.
- The pressure in the valve body must have been released and the valve must have been drained.
- When taking the valve out of service always adhere to the procedure described in the manual. (⇒ Section 6.4.1, Page 17)
- Decontaminate valves which handle fluids posing a health hazard.
- Protect the valve body and body bonnet/cover from any impacts.
- As soon as the work has been completed, re-install and re-activate any safety-relevant devices and protective devices. Before returning the product to service, observe all instructions on commissioning.

2.8 Unauthorised modes of operation

- The valve is operated outside the limits stated in the operating manual.
- The valve is not operated in accordance with the intended use.

(⇒ Section 2.2, Page 7)

3 Transport/Storage/Disposal

3.1 Checking the condition upon delivery

1. On transfer of goods, check each packaging unit for damage.
2. In the event of in-transit damage, assess the exact damage, document it and notify KSB or the supplying dealer and the insurer about the damage in writing immediately.

3.2 Transport

	<p>! DANGER</p>
	<p>The valve could slip out of the suspension arrangement Danger to life from falling parts!</p> <ul style="list-style-type: none"> ▷ Only transport the valve in the specified position. ▷ Observe the information on weights, centre of gravity and fastening points. ▷ Observe the applicable local accident prevention regulations. ▷ Use suitable, permitted lifting accessories, e.g. self-tightening lifting tongs.
	<p>CAUTION</p>
	<p>Improper transport Damage to the valve!</p> <ul style="list-style-type: none"> ▷ Protect the valve and components against external forces (e.g. impacts, blows, vibrations).

3.3 Storage/preservation

If commissioning is to take place some time after delivery, we recommend that the following measures be taken for storing the valve:

	<p>CAUTION</p>
	<p>Incorrect storage Damage due to dirt, corrosion, humidity and/or frost!</p> <ul style="list-style-type: none"> ▷ Store the valve in a frost-proof room where the level of atmospheric humidity is as constant as possible. ▷ Protect the valve elastomers from sunlight or UV light from other sources. Observe the DIN 7716 standard for the storage of elastomers. ▷ Store the valve in a dust-free environment (use suitable caps or film for protection). ▷ Protect the valve from contact with solvents, lubricants, fuels or other chemicals. ▷ Store the valve in a vibration-free environment.

Storage and/or temporary storage of the valves must ensure that, even after a prolonged period of storage, the valves' function is not impaired.

The temperature in the storage room must not exceed +40 °C.

For storing a valve that has already been operated, observe the measures to be taken for shutdown. (⇒ Section 6.4, Page 17)

3.4 Return to supplier

1. Drain the valve as described in the manual.
2. Flush and clean the valve, particularly if it has been used for handling noxious, explosive, hot or other hazardous fluids.
3. If the valve has handled fluids whose residues could lead to corrosion damage in the presence of atmospheric humidity or could ignite upon contact with oxygen also neutralise the valve and blow through with anhydrous inert gas to ensure drying.

3.5 Disposal

	 WARNING
	<p>Fluids handled, consumables and supplies which are hot or pose a health hazard Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ Collect and properly dispose of flushing fluid and any residues of the fluid handled. ▷ Wear safety clothing and a protective mask if required. ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.

1. Dismantle the valve.
Collect greases and other lubricants during dismantling.
2. Separate and sort the valve materials, e.g. by:
 - Metals
 - Plastics
 - Electronic waste
 - Greases and other lubricants
3. Dispose of materials in accordance with local regulations or in another controlled manner.

4 Description of the valve

4.1 Product information

4.1.1 Product information as per Regulation No. 1907/2006 (REACH)

For information as per chemicals Regulation (EC) No. 1907/2006 (REACH), see <https://www.ksb.com/ksb-en/About-KSB/Corporate-responsibility/reach/>.

4.2 Marking

Table 4: General marking

Description	Marking
Nominal size	DN ...
Nominal pressure class	PN ...
Manufacturer	KSB
Type series/Model	BOA-..
Material
Flow direction arrow	→

4.3 Nozzle Check Valves to DIN/EN

4.3.1 BOA-RFV

4.3.2 General description

- Nozzle check valve with flanged ends

Valve for preventing backflow of fluids in hot-water supply systems, heating systems and air-conditioning systems.

4.3.3 Design details

Design

- Design to EN 12516
- Single-piece body:
 - PN 10/16: DN 40 to 400
 - PN 25: DN 40 to 300
 - PN 40: DN 40 to 200
- Two-piece body:
 - PN 10/16: DN 400 to 600
 - PN 25: DN 350 to 600
 - PN 40: DN 250 to 500
- Exterior coating: epoxy coating, thickness 80 µm, RAL 5017 (blue)
- Venturi-type body
- Stainless steel seat
- Rapid closure without pressure surges

Variants

- Other flange designs
- PN 63 on request



Fig. 1: BOA-RFV

4.3.4 Function

Design The nozzle check valve consists of a pressure-retaining, single-piece body 1 and the functional unit (valve disc 3 and guide stem 5 or 6).

Function The fluid flows through the nozzle check valve in a defined direction. The valve is spring-loaded and closes automatically if the flow direction is reversed. Disc 3 is guided in body 1 by a guide stem (5 or 6). The flow conditions and the compression spring (6 or 8) determine the position of disc 3.

4.4 Ball Check Valves to DIN/EN

4.4.1 BOA-RPL/RPL F-F

4.4.2 General description

- Ball check valve with flanged or female/female threaded ends

Valve for preventing flow reversal in water supply systems, water treatment systems and waste water.

4.4.3 Design details

Design

- Ball check valve to EN 1074-3
- Tested to EN 12266-1
- Nodular cast iron (BOA-RPL)
- Threaded ends to BSPP ISO 228 (BOA-RPL F-F)
- Suitable for horizontal and vertical installation
- DN 50 to DN 300: PN 16 flanges

Variants

- Larger nominal sizes up to DN 400

4.4.4 Function

Design The ball check valve comprises a pressure-retaining, single-piece body 1, cover 3 and ball 2.

Function The fluid flows through the ball check valve in a defined direction. When the flow is in the appropriate direction, ball 2 is lifted off its seat and out of the flow cross-section, i.e. the valve opens. When the flow is in the opposite direction, ball 2 is pressed against the body seat and prevents flow reversal, i.e. the valve closes.

4.5 Scope of supply

The following items are included in the scope of supply:

- Valve
- Valve operating manual

4.6 Dimensions and weights

For dimensions and weights please refer to the type series booklet.



Fig. 2: BOA-RPL/RPL F-F

5 Installation at Site

5.1 General information/Safety regulations

The consultant, construction company or operator are responsible for positioning and installing the valves. Planning errors and installation errors may impair the reliable function of the valves and pose a substantial safety hazard.

	<p style="background-color: yellow; margin: 0;">CAUTION</p> <p>Improper installation Damage to the valve!</p> <ul style="list-style-type: none"> ▷ Protect the body and body bonnet/cover from any impacts.
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5.2 Installation position

5.2.1 Nozzle check valve installation position

Nozzle check valves must be installed in a vertical pipe with an upward flow direction.

The flow direction must correspond to the flow direction arrow.

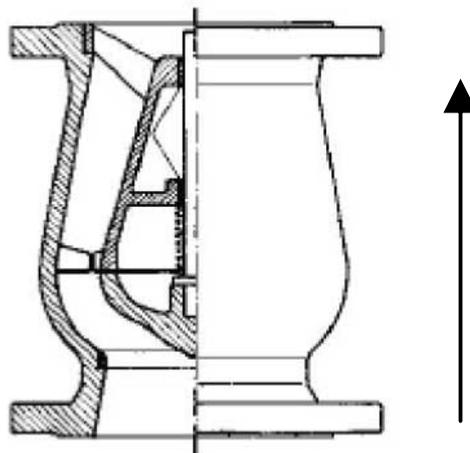


Fig. 3: Installation position of BOA-RFV

5.2.2 Ball check valve installation position

Install ball check valves vertically in horizontal or vertical pipes. Installation in an upward inclined, horizontal or downward inclined position is not permitted. The flow direction in vertical pipes must be upwards.

The flow direction must correspond to the flow direction arrow.

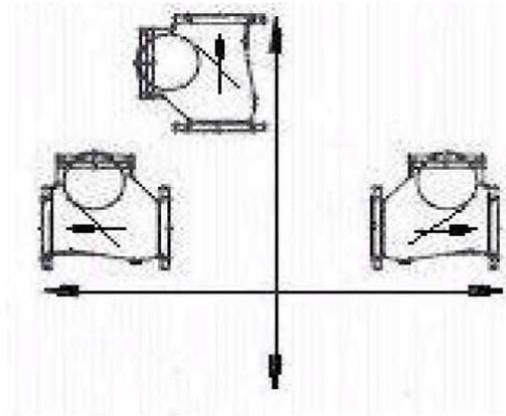


Fig. 4: Installation position of BOA-RPL/RPL F-F

5.3 Preparing the valve

	CAUTION
	<p>Outdoor installation Damage due to corrosion!</p> <ul style="list-style-type: none"> ▷ Provide weather-proof protection to protect the valve against moisture.

1. Thoroughly clean, flush and blow through all vessels, piping and connections.
2. Remove the valve's flange covers before installing it in the piping.
3. Check that the inside of the valve is free from any foreign objects. Remove any foreign objects.
4. If required, install a strainer in the piping.

5.4 Piping

	⚠ WARNING
	<p>Impermissible piping forces Leakage from or rupture of the valve body!</p> <ul style="list-style-type: none"> ▷ Connect the pipes to the valve without transmitting any stresses or strains. ▷ Take structural measures to prevent any piping forces from being transmitted to the valve. ▷ Avoid mechanical loads beyond normal levels, e.g. piping forces, moments and vibrations.

5.4.1 Flange connections

Fasteners	Always use all flange bolt holes provided when connecting the valve to the pipe.
Flange connection	<ul style="list-style-type: none"> ✓ The mating flange faces are clean and undamaged. ✓ Verify that the pipe is correctly aligned and the flanges are parallel. <ol style="list-style-type: none"> 1. Align the valve between the pipe flanges. 2. Use an appropriate tool to evenly tighten the fasteners crosswise.
Threaded connection	<ul style="list-style-type: none"> ✓ The threads are clean and undamaged. <ol style="list-style-type: none"> 1. Align the valve between the threaded connections of the pipe. 2. Use an open-ended spanner to tighten the threaded connection.

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6 Commissioning/Start-up/Shutdown

6.1 Commissioning

	CAUTION
	<p>Welding beads, scale and other impurities in the piping Damage to the valve!</p> <ul style="list-style-type: none"> ▷ Remove any impurities from the piping, e.g. by flushing the pipe with the valve in fully open position. ▷ If necessary, install a strainer.

6.2 Operating limits

6.2.1 Pressure/temperature ratings of BOA-RFV

Table 5: Permissible operating pressures [bar] (to EN 12266-1)

PN	Material	[°C]						
		-10 to 120	150	180	200	230	250	300
10	EN-GJL-250	10,0	9,0	8,4	8,0	7,4	7,0	6,0
16		16,0	14,4	13,4	12,8	11,8	11,2	9,6
25		25,0	22,5	21,0	20,0	18,5	17,5	15,0
40		40,0	36,0	33,6	32,0	29,6	28,0	24,0

Table 6: Permissible operating pressures [bar] (to EN 12266-1)

PN	Material	[°C]					
		-10 to 120	150	200	250	300	350
16	EN-GJS-400-15	16,0	15,5	14,7	13,9	12,8	11,2
25		25,0	24,3	23,0	21,8	20,0	17,5
40		40,0	38,8	36,8	34,8	32,0	28,0
63		63,0	62,0	58,8	55,6	51,2	44,8

6.2.2 Pressure/temperature ratings of BOA-RPL/RPL F-F

Table 7: Permissible operating pressure [bar]³⁾

PN	DN	[°C]
		up to +70
16	25 - 300	16,0

6.3 Returning to service

For returning the equipment to service, observe the sections on commissioning/start-up and the operating limits (⇒ Section 6.2, Page 16) .

In addition, carry out all servicing/maintenance operations before returning the valve to service. (⇒ Section 7, Page 18)

³ Static load

6.4 Shutdown

6.4.1 Measures to be taken for shutdown

During prolonged shutdown periods, ensure that the following conditions are met:

1. Drain fluids which change their physical condition due to changes in concentration, polymerisation, crystallisation, solidification, etc. from the piping.
2. If required, flush the piping with the valves fully opened.

7 Servicing/Maintenance

7.1 Safety regulations

	DANGER
	<p>Valve under pressure Risk of injury! Leakage of hot and/or toxic fluids! Risk of burns!</p> <ul style="list-style-type: none"> ▷ Depressurise the valve and its surrounding system prior to any maintenance work and installation work. ▷ If there is fluid leakage, depressurise the valve. ▷ Allow the valve to cool down until the temperature of the fluid in all the valve's chambers is lower than the fluid's vaporisation temperature. ▷ Never vent the valve by releasing the cover bolting. ▷ Use original spare parts and appropriate tools, even in emergencies.

	WARNING
	<p>Fluids handled, consumables and supplies which are hot and/or pose a health hazard Risk of injury!</p> <ul style="list-style-type: none"> ▷ Observe all relevant laws. ▷ When draining the fluid take appropriate measures to protect persons and the environment. ▷ Decontaminate valves used in fluids posing a health hazard.

A regular maintenance schedule will help avoid expensive repairs and contribute to trouble-free, reliable operation of the valve with a minimum of servicing/ maintenance expenditure and work.

	NOTE
	<p>Before removing the valve from the piping, ensure that the pipe has been taken out of service and released for repair/maintenance work.</p>

	NOTE
	<p>All maintenance work, service work and installation work can be carried out by KSB Service or authorised workshops. For contact details refer to the enclosed "Addresses" booklet or visit "www.ksb.com/contact" on the Internet.</p>

Never use force when dismantling and reassembling the valve.

Original spare parts are only ready for operation following assembly/installation and subsequent shell and leak testing of the valve.

7.2 Dismantling the valve

7.2.1 General information/Safety regulations

	WARNING
	<p>Hot surface Risk of injury!</p> <ul style="list-style-type: none"> ▷ Allow the valve to cool down to ambient temperature.

	 WARNING
	<p>Unqualified personnel performing work on the valve Risk of injury!</p> <ul style="list-style-type: none"> ▷ Always have repair work and maintenance work performed by specially trained, qualified personnel.

Always observe the safety instructions and information. (⇒ Section 7, Page 18)
 In the event of damage you can always contact KSB Service.

7.2.2 Preparing the valve

1. Depressurise and drain the valve.

7.3 Assembling the valve

7.3.1 General information/Safety regulations

	CAUTION
	<p>Improper reassembly Damage to the valve!</p> <ul style="list-style-type: none"> ▷ Reassemble the valve in accordance with the general rules of sound engineering practice. ▷ Use original spare parts only.

Tightening torques Use an appropriate tool to tighten the fasteners crosswise.

8 Trouble-shooting

	 WARNING
	<p>Improper remedial work on the valve Risk of injury!</p> <p>▷ For any work performed in order to remedy faults on the valve observe the relevant information given in this operating manual and/or the product literature provided by the accessories manufacturers.</p>

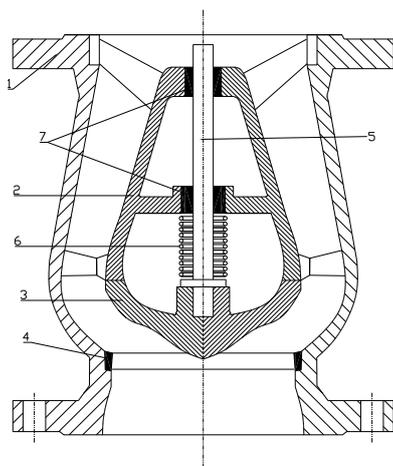
If problems occur that are not described in the following table, consultation with the KSB service is required.

Table 8: Trouble-shooting

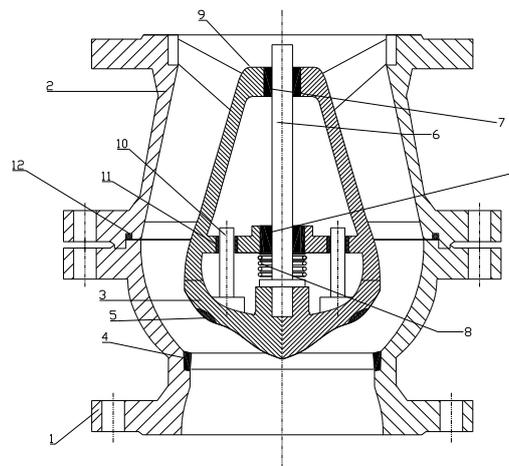
Problem	Possible cause	Remedy
Leakage at the bonnet/cover gasket	Unevenly tightened bonnet/cover bolts.	1. Tighten the bonnet/cover bolting.
	Defective bonnet/cover gasket	<ol style="list-style-type: none"> 1. Dismantle the bonnet/cover bolting. 2. Remove the gasket and clean sealing surfaces. Replace the bonnet/cover gasket. Do not use any additional sealants with asbestos-free gaskets. If anti-adhesive coatings are used, use sealing agents recommended by the sealing material manufacturer. 3. Fit the cover. 4. Perform a leak test.
Leakage at the seat/disc interface	<ul style="list-style-type: none"> ▪ Contaminated fluid or solids in the fluid ▪ Erosion, corrosion or abrasion ▪ Excessive loads from piping forces or thermal stresses 	<ol style="list-style-type: none"> 1. Dismantle the bonnet/cover bolting. 2. Rework the seating faces of gate valve discs and body using a suitable re-seating tool. 3. Continue re-seating until the seating faces exhibit a consistently smooth and even ring.
No flow after prolonged shutdown with BOA-RPL/RPL F-F	The ball is jammed.	1. Increase the pressure inside the pipe for a short period.

9 Related Documents

9.1 General assembly drawing with list of components for BOA-RFV



PN 10/16, DN 40 - 400
 PN 25, DN 40 - 300
 PN 40, DN 40 - 200



PN 10/16, DN 400 - 600
 PN 25, DN 350 - 600
 PN 40, DN 250 - 500

Table 9: Parts list DN 40 - 400 (PN 10/16), DN 40 - 300 (PN 25), DN 40 - 200 (PN 40)

Part No.	Description	Material	Material number	PN	DN	Note
1	Body	EN-GJL-250	5.1301	10/16	40 - 400	Epoxy coating
		EN-GJL-250	5.1301	25	40 - 50	Epoxy coating
		EN-GJS-400-15	5.1306	25	65 - 400	Epoxy coating
		EN-GJL-250	5.1301	40	40 - 50	Epoxy coating
		EN-GJS-400-15	5.1306	40	65 - 400	Epoxy coating
2	Flow diffuser	Bronze	-	10/16/25/40	40 - 100	-
		EN-GJL-250	5.1301	10/16/25	125 - 400	-
		EN-GJS-400-15	5.1306	40	125 - 400	-
3	Valve disc	Stainless steel 18/8	-	10/16/25/40	40 - 150	-
		EN-GJS-400-15	5.1306	10/16/25/40	200 - 400	Seat ring, stainless steel 18/8
4	Body seat	Stainless steel SS316	-	10/16/25/40	40 - 400	-
5	Guide stem	Stainless steel SS316	-	10/16/25/40	40 - 400	-
6	Compression spring	Stainless steel SS316	-	10/16/25/40	40 - 400	-
7	Bush	Bronze	-	10/16/25/40	200 - 400	-

Table 10: Parts list DN 400 - 600 (PN 10/16), DN 350 - 600 (PN 25), DN 250 - 500 (PN 40)

Part No.	Description	Material	Material number	PN	DN	Note
1	Lower body section	EN-GJL-250	5.1301	10/16	400 - 600	Epoxy coating
		EN-GJS-400-15	5.1306	25	350 - 600	Epoxy coating
		EN-GJS-400-15	5.1306	40	250 - 500	Epoxy coating
2	Upper body section	EN-GJL-250	5.1301	10/16	400 - 600	Epoxy coating
		EN-GJS-400-15	5.1306	25	350 - 600	Epoxy coating
		EN-GJS-400-15	5.1306	40	250 - 500	Epoxy coating
3	Valve disc	EN-GJS-400-15	5.1306	10/16	400 - 600	-
		EN-GJS-400-15	5.1306	25	350 - 600	-
		EN-GJS-400-15	5.1306	40	250 - 500	-
4	Body seat	Stainless steel SS316	-	10/16	400 - 600	-
		Stainless steel SS316	-	25	350 - 600	-
		Stainless steel SS316	-	40	250 - 500	-

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Part No.	Description	Material	Material number	PN	DN	Note
5	Valve disc seat	Stainless steel SS316	-	10/16	400 - 600	-
		Stainless steel SS316	-	25	350 - 600	-
		Stainless steel SS316	-	40	250 - 500	-
6	Guide stem	Stainless steel SS316	-	10/16	400 - 600	-
		Stainless steel SS316	-	25	350 - 600	-
		Stainless steel SS316	-	40	250 - 500	-
7	Bush	Bronze	-	10/16	400 - 600	-
		Bronze	-	25	350 - 600	-
		Bronze	-	40	250 - 500	-
8	Compression spring	Stainless steel SS316	-	10/16	400 - 600	-
		Stainless steel SS316	-	25	350 - 600	-
		Stainless steel SS316	-	40	250 - 500	-
9	Flow diffuser	Aluminium	-	10/16	400 - 600	-
		Aluminium	-	25	350 - 600	-
		Aluminium	-	40	250 - 500	-
10	Locking pin	Stainless steel 18/8	-	10/16	400 - 600	> DN 500
		Stainless steel 18/8	-	25	350 - 600	> DN 500
11	Bush	Bronze	-	10/16	400 - 600	-
		Bronze	-	25	350 - 600	-
		Bronze	-	40	250 - 500	-
12	O-ring	Rubber	-	10/16	400 - 600	-
		Rubber	-	25	350 - 600	-
		Rubber	-	40	250 - 500	-

9.2 General assembly drawing with list of components for BOA-RPL

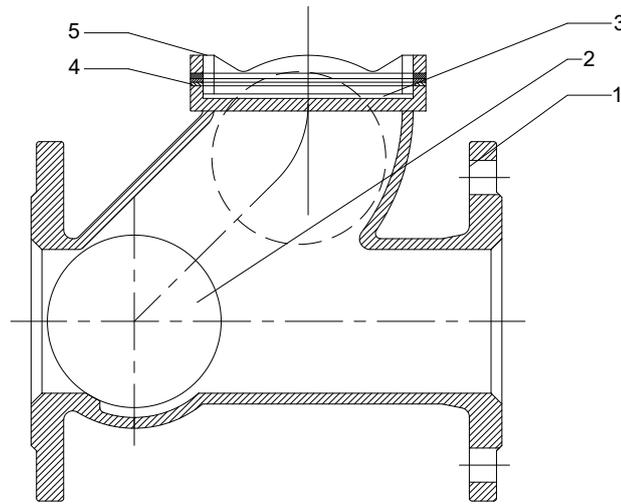


Fig. 5: Sectional drawing of BOA-RPL with part numbers

Table 11: Overview of available materials

Part No.	Description	Material	Material number	Note
1	Body	EN-GJS-400-15	EN-JS1030	Epoxy-coated
2	Ball	Aluminium		NBR-coated
3	Cover	EN-GJS-400-15	EN-JS1030	
4	Cover gasket	NBR		
5	Screw/bolt	S5304		

9.3 General assembly drawing with list of components for BOA-RPL F-F

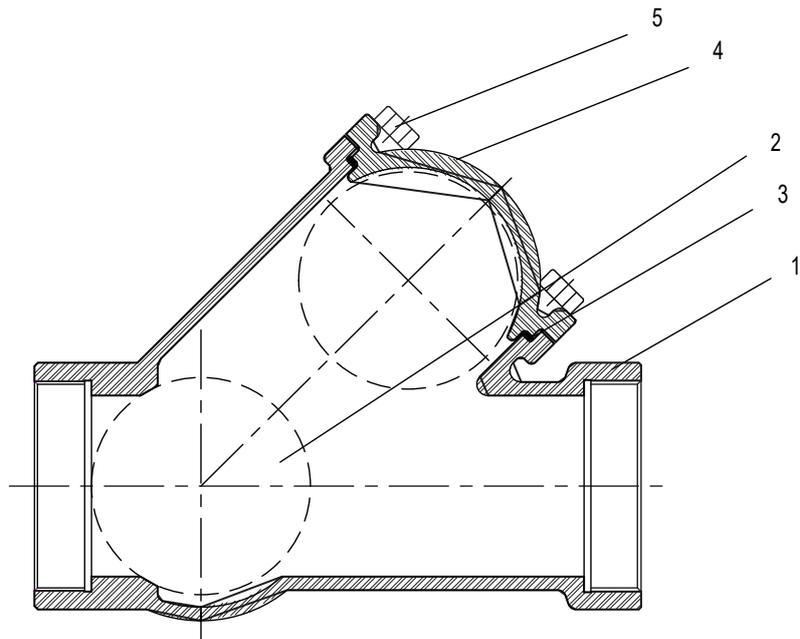


Fig. 6: Sectional drawing of BOA-RPL F-F with part numbers

Table 12: Overview of available materials

Part No.	Description	Material	Material number	Note
1	Body	EN-GJS-400-15	EN-JS1030	Epoxy-coated
2	Ball	Aluminium		NBR-coated
3	Cover gasket	NBR		
4	Cover	EN-GJS-400-15	EN-JS1030	Epoxy-coated
5	Screw/bolt	SS304		

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