FLUITEN

INSTALLATION & MAINTENANCE

MECHANICAL SEALS
MUV, MUSV, & MMSV

REV 23.03.26

Contents

Introduction

Since **1962, Fluiten** has been at the forefront of the design and manufacture of seal systems for rotating shafts intended for highly critical applications. Safe, reliable products are developed thanks to the use of innovative, rigorously tested technologies.
The company's processes, compliant with the **ISO 9001 Quality** System, are certified by the Italian Naval Registry (Registro Italiano Navale, RINA). The mechanical seals **MUV** and **MMSV** for the marine sector are approved by Lloyd's Register and are used by the most prestigious shipyards, including the Military sector. These seals have been designed with the aim of guaranteeing **high-level reliability**, as is essential on board a vessel.

Our commitment is based on four key values:

Experience since 1962: Since 1962 we have been designing and manufacturing shaft sealing systems for rotating shafts for highly critical applications, consolidating technical expertise and specialist know-how in the marine sector.

International Certifications: Our company processes comply with the ISO 9001 Quality Management System certified by RINA; the MUV and MMSV mechanical seals are approved by Lloyd's Register for marine applications.

Innovative and Proven Technology: Our product development is based on innovative technologies that are subjected to rigorous testing to ensure operational safety, service continuity and optimal performance.

Reliability for the marine sector and defence: Designed to operate under extreme conditions, our solutions ensure high reliability and durability, essential qualities for civilian and military vessels.

Introductory Notes

This manual is an essential guide for the correct installation, operation and inspection of Fluiten seals models **MUV**, **MUSV** and **MMSV**, and is intended to ensure **optimal system performance** and **reliability**.

⚠️ WARNING

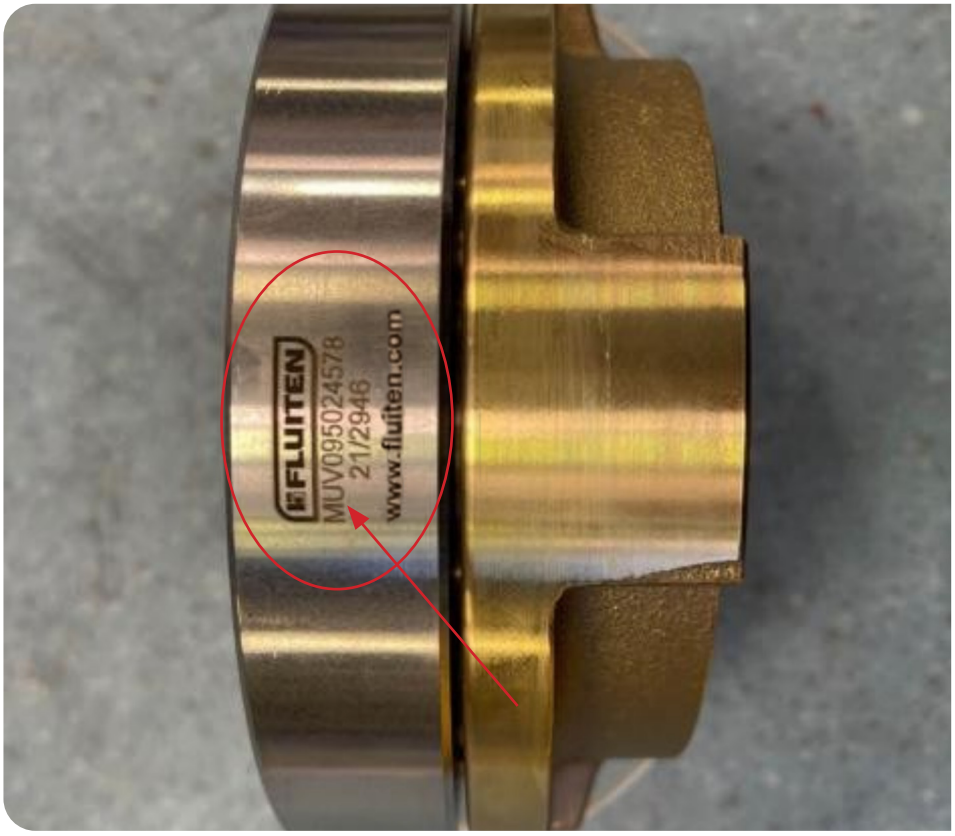
Fluiten Italia S.p.A. accepts no liability for any injury to persons or damage to property arising from failure to comply with the instructions contained in this document.

🔧 QUALIFIED PERSONNEL

The manual must be handed over to the on-board technician and carefully stored, so that it is always available to specialist personnel responsible for installation, inspection and maintenance operations.

ℹ️ IMPORTANT INFORMATION

For any request for technical support or supply of spare parts, it is necessary communicate the identification code of the rotating ring (indicated in the image "Rotating ring code detail") and send it to the **info@fluiten.com**

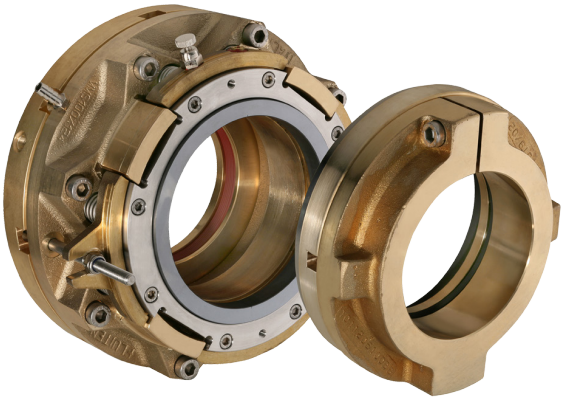


Rotating ring code detail

Operating Principle MUV, MUSV, & MMSV

Img.1

MUV - MUSV MODELS



Img.2

MMSV MODEL

Product Description

Fluiten **Mechanical Seals** types **MUV**, **MUSV**, & **MMSV** are face seals.
The seal consists of two units: one fitted to the vessel's rotating shaft, the other flange-mounted to the stern tube.

🔧 MECHANICAL CONFIGURATION

The two parts contain the rotating face ring and the stationary face ring, perfectly flat and lapped, manufactured from materials suitable for the application.
The Fluiten Mechanical Seal does not incorporate sliding elements on the shaft and therefore does not cause shaft wear.

⚙️ PRINCIPLE OF OPERATION

Contact between the rotating and stationary parts is ensured by the mechanical load generated by one or more springs and by the hydraulic load generated by the pressure of the water to be contained.

💧 LUBRICATION AND COOLING

The sealing faces are lubricated and cooled by the liquid film of the water to be contained.

ℹ️ APPROVED TECHNOLOGY

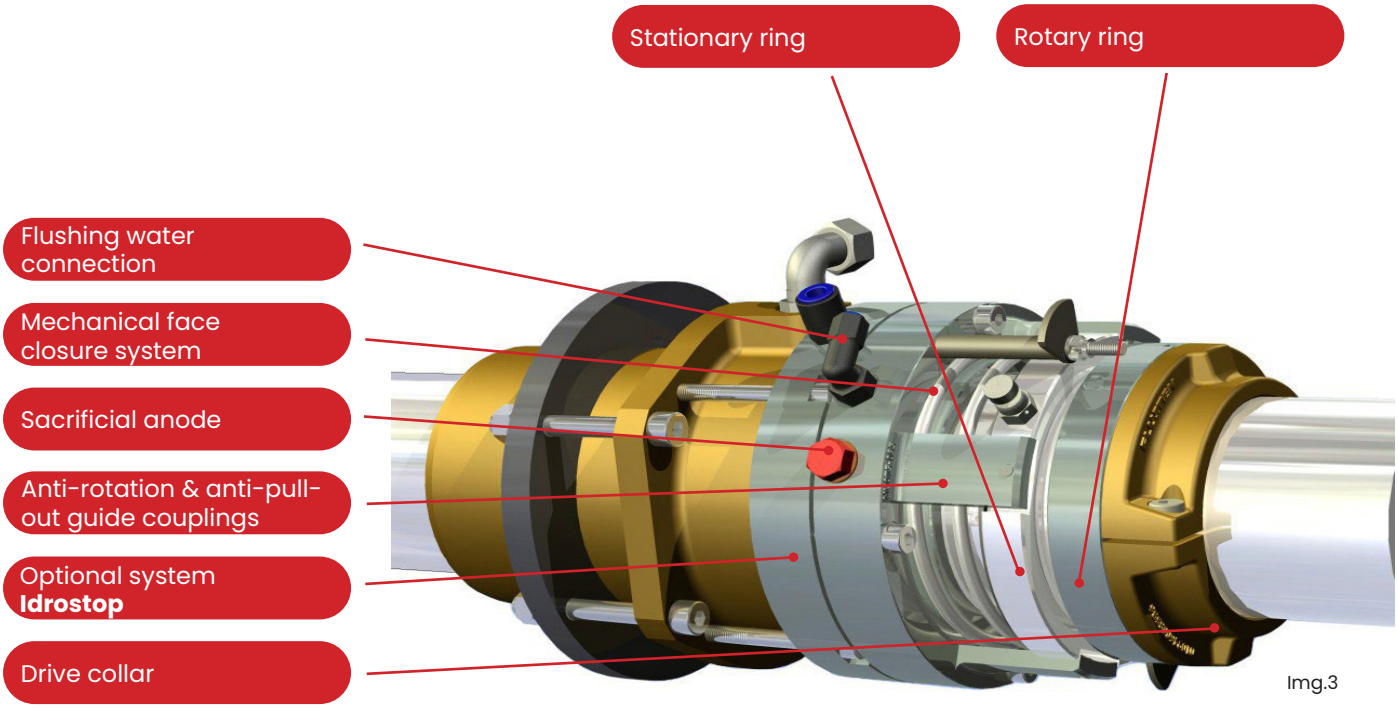
The technological solution adopted by Fluiten is the same as that approved for high-risk industrial installations.

Operating Principle MUV, MUSV, & MMSV

💧 **ENVIRONMENTAL COMPATIBILITY**
Fluiten seals are lubricated directly by seawater or fresh water; this eliminates the risk of environmental contamination and does not require additional lubricating fluids.

⚠️ **PREVENTION OF CATASTROPHIC FAILURES**
The absence of elastomeric hose or bellows reduces the risk of catastrophic leakage that could occur due to rubber ageing, fire, or overheating caused by dry running.

🔥 **SAFETY UNDER EXTREME CONDITIONS**
The construction design also prevents accidental failures caused by contact with metal parts, increasing the overall system reliability even under critical operating conditions.



Img.3

Main Components

STATIONARY PART

This consists of a seal body, stationary ring, single helical spring (MUV, MUSV version), multiple helical springs (MMSV version), and gaskets. The stationary ring, pushed by the spring(s), constitutes the elastic element of the MUV, MUSV and MMSV system and is designed to accept axial, radial, angular movements as well as shaft vibrations.

MAIN FEATURES

Resistance to structural stresses

Four robust metallic drive lugs absorb the mechanical stresses generated by the relative movements between the stationary ring (fixed to the hull) and the rotating ring (fixed to the shaft). Hull and shaft are subject to bending, torsion, vibration and misalignment.
The drive lugs provide protection against catastrophic failure. In systems equipped with elastomeric hose or bellows, insufficient lubrication generates excessive friction on the sealing surfaces; the resulting torque subjects the bellows to torsional stress that may cause a break.

Single spring system – MUV /MUSV models

Equipped with a single helical spring.
Available up to shaft diameter 120 mm.
Accept axial movement +10-8.5mm.

Multi-spring system – MMSV model

For diameters greater than 100 mm, the MMSV version features a series of helical springs ensuring load uniformity across the entire sealing surface.
Accept axial movement +6-4mm.

Ease of installation

The preload position of the stationary part is ensured by two positioning devices that simplify installation operations in the bilge. The positioning devices can be easily removed as required, once installation is completed.

ROTATING PART

This consists of:
• drive collar, precisely locked onto the shaft by one or two screws.
• rotating ring, driven by the collar via a robust pin, gasket.

Functional alignment

The rotating assembly, as a whole, has been designed to ensure that the rotating ring maintains a perfectly perpendicular position to the shaft, avoiding undue stresses on the stationary part of the seal.

Main Components

SEALING RINGS IN SPLIT VERSION

The MUSV and MMSV versions with Idrostop, allow the replacement of sealing rings and secondary seals directly with the vessel in the water. To facilitate this operation, the spare part components are supplied in split version.

⚠️ **OPERATIONAL NOTE**
Replacement of these components with the vessel afloat is permitted exclusively when the Idrostop Flange is installed.

OTHER CHARACTERISTICS OF THE MAIN COMPONENTS

🔥 **Fire-resistant secondary seals**
Manufactured from fire-resistant material, these avoid the risk of significant water ingress on board in the event of a fire in the bilge.

🔪 **Fluiclean system**
Protection system for the O-ring between the seal body and the stationary ring, assists in preserving needed flexibility even if fouling forms.

💨 **Air vent valve**
The stationary ring is equipped with a vent valve to prevent, at initial launch, dry running.

💧 **Flushing water connection**
The connection on the seal housing allows proper flushing to cool the sealing rings even at high rotating shaft speeds.

⚡ **Sacrificial anode**
Installed on the seal housing, easily inspected and replaceable, it allows monitoring of the presence of stray currents. Caution: for inspection/replacement of the sacrificial anode, the use of the Idrostop system is recommended.

MUV / MUSV

The **MUV** and **MUSV** mechanical seals are designed for marine applications on propeller shaft. They ensure high reliability, operational safety and long service life even under severe operating conditions, while providing rapid and simplified maintenance to reduce downtime.

💧 Lubrication with seawater or fresh water

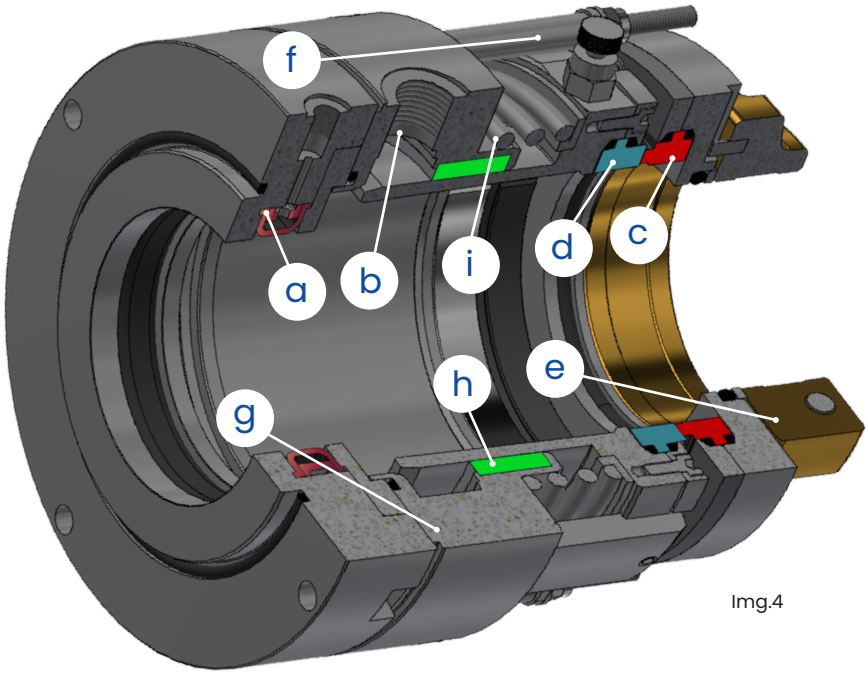
Both models are face mechanical seals, water-lubricated, with no sliding elements on the shaft and therefore no shaft wear.

🔧 Structural strength

The design configuration allows absorption of axial, radial, angular movements and vibrations typical of marine installations. The sealing faces are precision lapped and supported by robust metal components.

DESCRIPTION

a) Optional pneumatic safety system **IDROSTOP**
b) **Connection** for lubrication and cooling
c) **Rotating ring** in wear-resistant material for increased abrasion's resistance
d) **Stationary ring**
e) **Drive collar** of robust construction
f) **Positioners** for adjustable preload, ensuring easy and correct installation
g) **Seal body** in AISI 316
h) **Fluiclean:** Active Anti-Fouling Protection. Designed to ensure correct sliding even in the presence of marine fouling (shipworms and barnacles), the system prevents fouling and deposits on the dynamic sealing surface
i) **Spring outside** the water in AISI 316 to accept axial movements



Img.4

OPERATIONAL LIMITS

Shaft diameter [mm]	40 to 125
Speed [m/s]	<10
Temperature [°C]	-5 to 80
Pressure [bar]	vacuum to 5

MMSV

The **MMSV** is designed for marine applications on propeller shafts of **medium-to-large size**, where high reliability, uniform pressure distribution and maximum operational reliability are required.

Application on large diameters

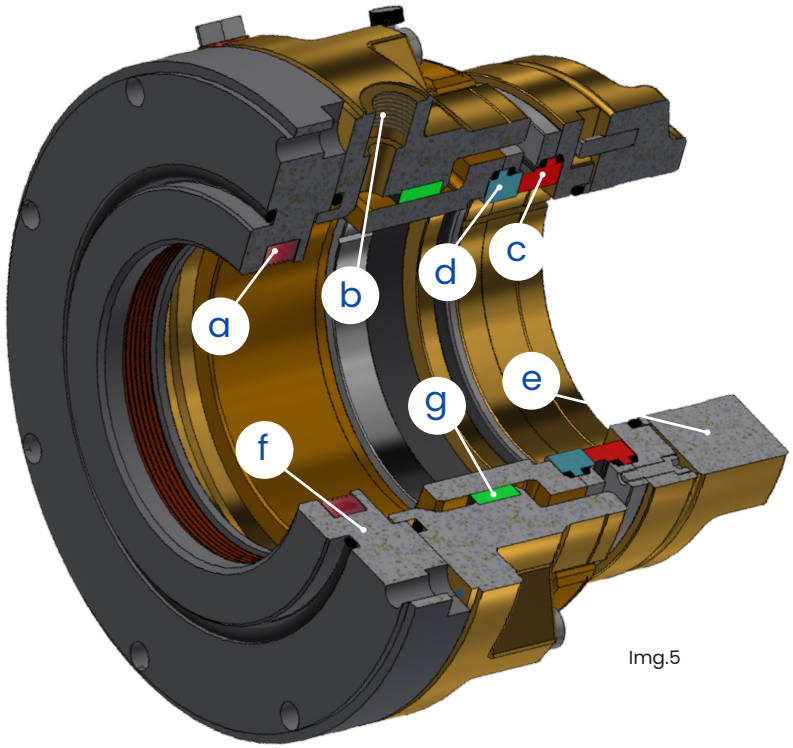
Available for shafts with a diameter greater than 100 mm, it is suitable for installations with high power and heavy duty conditions. Typical operating conditions for large vessels such as mega yachts, military vessels, workboats and ferries.

Multi-spring system

The design configuration allows absorption of axial, radial and angular movements, as well as vibrations typical of marine installations. The sealing faces are precision lapped and supported by robust metal components.

DESCRIPTION

a) Optional pneumatic safety system **IDROSTOP**
b) **Connection** for lubrication and cooling
c) **Rotating ring** in wear-resistant material for increased abrasion's resistance
d) **Stationary ring**
e) **Drive collar** of robust construction
f) **Positioners** for adjustable preload, ensuring easy and correct installation
g) **Seal body** in marine brass
h) **Fluiclean:** Active Anti-Fouling Protection. Designed to ensure correct sliding even in the presence of marine fouling (shipworms and barnacles), the system prevents fouling and deposits on the dynamic sealing surface
i) **Spring outside** the water in AISI 316 to accept axial movements



Img.5

OPERATIONAL LIMITS

Shaft diameter [mm]	100 to 300
Speed [m/s]	<10
Temperature [°C]	-5 to 80
Pressure [bar]	vacuum to 5

IDROSTOP System

Optional component

⚙️ IDROSTOP DEVICE

Fluiten mechanical seals can be equipped with (highly recommended) Idrostop device. The device can be installed on the shaft line between the Stern tube and the Mechanical seal.

🛠️ Device function

Installed between the mechanical seal and the stern tube, the Idrostop creates a hermetic barrier with the shaft stopped, preventing water entry into the bilge. In addition to ensuring maintenance operations in complete safety, its activation allows the other propeller shaft line to continue operating in the event of an emergency.

⚠️ Intended use

The device must only be used exclusively:
- in emergency situations
- during maintenance operations
- for cleaning operations of the mechanical seal

💧 PRINCIPLE OF OPERATION

The seal is achieved by means of a special inflatable gasket, shaped and integrated within a properly dimensioned flange.

🔵 Activation

With the shaft stopped, air inflation at 2.5–3 bar via the dedicated connection expands the inflatable gasket, ensuring complete sealing of the shaft and preventing any water entry.

⚠️ SAFETY WARNINGS

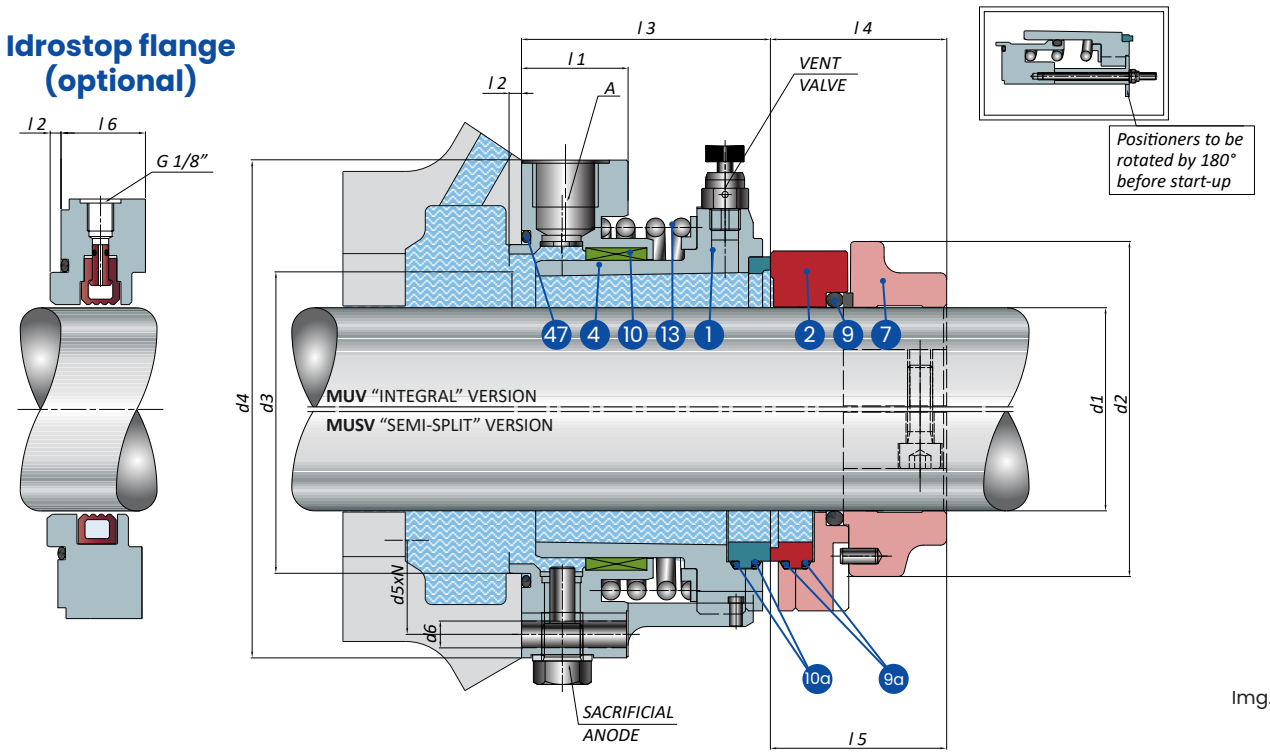
🚫 Prohibition of use with a rotating shaft.
The Idrostop must not be used with the shaft in motion.

⚠️ Before restarting the shaft

It is mandatory to verify that all air has been completely vented via the dedicated connection.

Missing air vent may result in:
- damage to the inflatable gasket
- overheating
- loss of lubrication to shaft bearing and seals resulting in deterioration of both.

MUV-MUSV Dimensions



Img.6

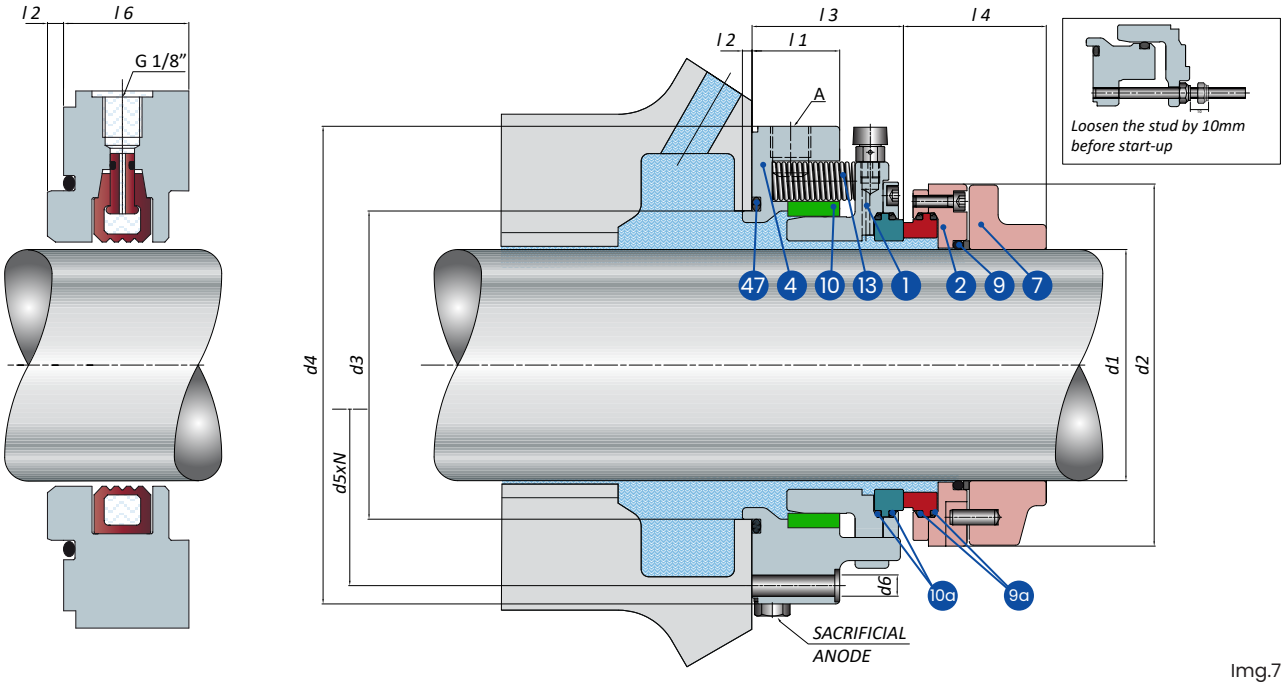
d1	d2	d3 H8	d4	d5	N	d6	l1	l2	l3 ±0,5	l4	l5	l6	A	Axial Movement
040÷050	84	85	135	120	4	8,5	26	4	74	39	46	20	3/8"	+10/-8,5
055÷070	107	105	159	144	4	8,5	34	4	79,5	46	56	20	1/2"	+10/-8,5
075÷095	140	115	175	162	4	8,5	33	4	103,5	56	59	31	1/2"	+10/-8,5
096÷124	175*	160	224	209	8	8,5	44	5	109,5	61	74	30	1/2"	+10/-8,5

* for MUSV: 188

PART NAME	MUV MATERIALS	MUSV MATERIALS
1 - STATIONARY SEALING RING	**Z32**: AISI 316+Graphite Impr. Resins	**U41**: Carburo di silicio
2 - ROTATING RING	**Y1**: CrMo steel	**Z31**: Graphite Impr. Resins AISI 316
4 - SEAL BODY	**E**: AISI 316	
7 - DRIVE COLLAR	**B6**: Marine brass	
9 - GASKET OF ROTATING RING	**V**: Fluoroelastomer	
9a - GASKET OF ROTATING RING INSERT	**V**: Fluoroelastomer	
10 - GASKET OF STATIONARY RING	**V3**: HS Fluoroelastomer	
10a - GASKET OF STATIONARY RING INSERT	**V**: Fluoroelastomer	
13 - SPRING	**E**: AISI 316	
47 - SEAL BODY GASKETS	**V**: Fluoroelastomer	

MMSV Dimensions

Idrostop flange (optional)



Img.7

d1	d2	d3 H8	d4	d5	N	d6	l1	l2	l3 ±0,5	l4	l6	A	Axial Movement
100÷124	187	160	248	229	8	11	53,5	5	88,6	74	30	G 1/2"	+6/-4
125÷149	232	185	285	260	8	13	53,5	5	91	111	31	G 1/2"	+6/-4
150÷174	266	210	310	285	8	13	53,5	5	90	120	38,5	G 1/2"	+6/-4
175÷199	304	250	360	330	8	17	62,5	5	95	124	52,5	G 3/4"	+6/-4
200÷229	350	290	410	380	8	17	62,5	6	107,5	147	52,5	G 3/4"	+6/-4
230÷259	380	320	440	410	8	17	54	6	95	147	59,5	G 3/4"	+6/-4
260÷300	425	370	515	475	8	21	62	8	115	176	59,5	G 3/4"	+6/-4

MECHANICAL SEAL	STANDARD MATERIAL
PART NAME	
1 - STATIONARY SEALING RING	**U41**: silicon carbide + **B6** : Marine brass
2 - ROTATING RING	**Z31**: Graphite Impr. Resins + **B6** Marine brass
4 - SEAL BODY	**B6**: Marine brass
7 - DRIVE COLLAR	**B6**: Marine brass
9 - GASKET OF ROTATING RING	**V**: Fluoroelastomer
9a - GASKET OF ROTATING RING INSERT	**V**: Fluoroelastomer
10 - GASKET OF STATIONARY RING	**V3**: HS Fluoroelastomer
10a - GASKET OF STATIONARY RING INSERT	**V**: Fluoroelastomer
13 - SPRINGS	**E**: AISI 316
47 - SEAL BODY GASKETS	**V**: Fluoroelastomer

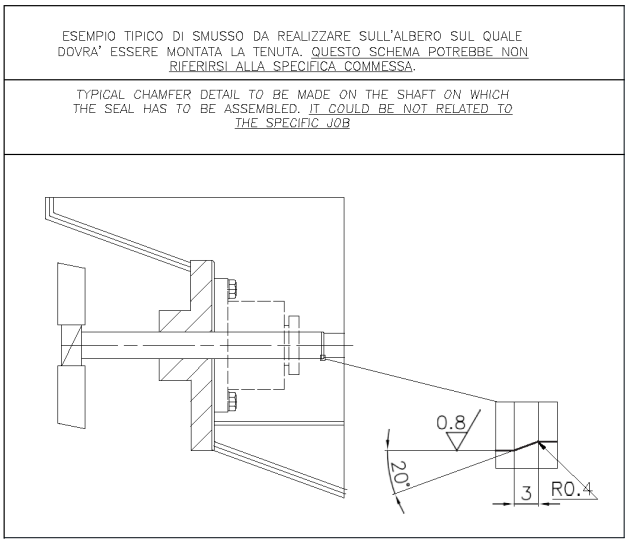
Installation Specifications

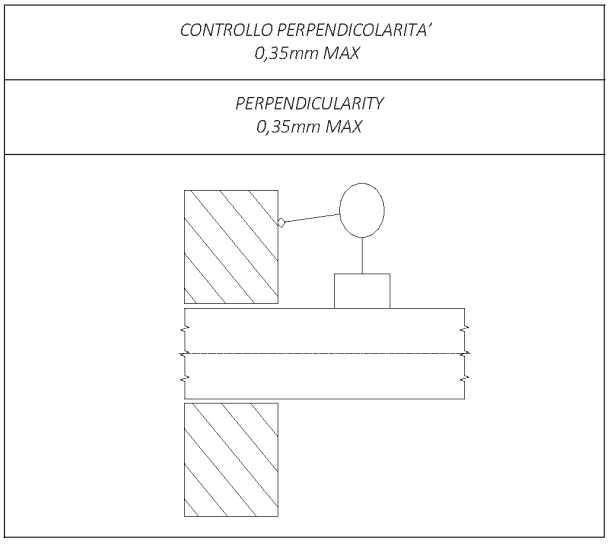
Shaft size tolerance	h8
Shaft roughness (Ra)	0.8 µm
Shaft/stern tube concentricity shaft diameter: 40–65 mm 70–100 mm 105 and above	 0.15 mm 0.25 mm 0.50 mm
Chamfered groove on shaft	3x20°
Stern tube shaft perpendicularity	0.35 mm MAX

table No.1

	BOLT SIZES	TIGHTENING TORQUE (Nm)
Bolt tightening torque	M6 M8 M10 M12 M16	5 7 20 30 66

table No.2





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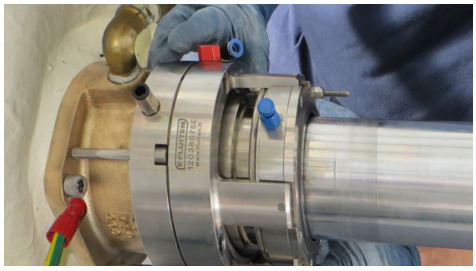
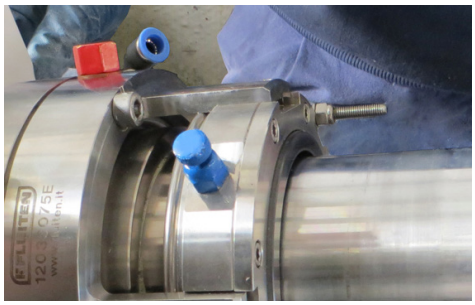
Installation Sequence

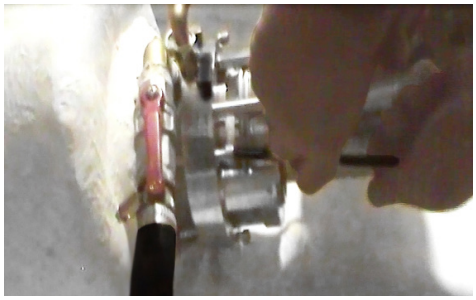
01) Handle the seal with care in a very clean environment, avoiding impact and contact with contaminated parts. The seal surfaces are micro-lapped, scratches or impact may damage them.



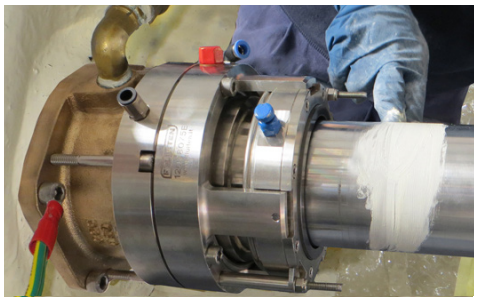
02) Insert the seal housing, including the stationary ring, onto the shaft, ensuring that the O-ring between the seal housing and the stern tube is correctly seated. Grease the O-ring to prevent it from coming out of its seat. The image shows the **Idrostop** Flange



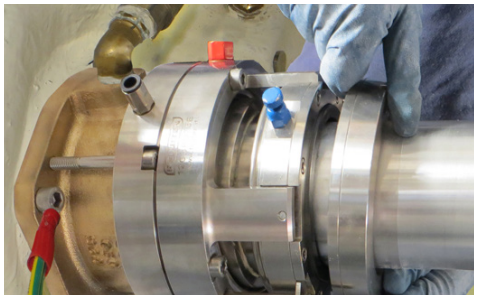
03) Orient the stationary part so that the vent valve is facing upwards.



04) Secure the stationary part to the stern tube using the appropriate screws and tighten carefully.
(*see table 2 on page 12 for tightening torques)



05) Lubricate the shaft with a thin layer of lithium grease.



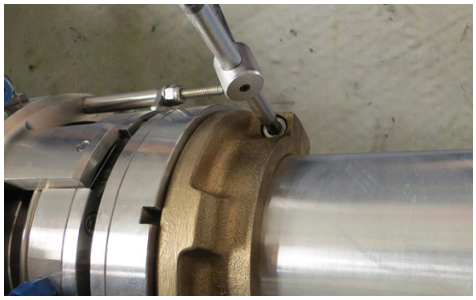
06) Fit the rotating ring with the gasket and drive collar onto the shaft.

Installation Sequence

07) Keep the stationary part and the rotating part separated and protected; proceed with installation of the sleeve coupling, following the supplier's instructions.

08) Clean the sealing faces with a soft, clean and dry cloth. Remove the grease from the collar setting area.

09) Position the drive collar and the rotating ring in contact with the stationary ring.



10) Secure the drive collar onto the shaft by tightening the screws in accordance with the instructions on page 12 (see table 2 on page 12 for tightening torques)

11) Release the stationary ring by loosening the positioning devices.

12) Connect the flushing hose to the connection on the seal housing, open the vent valve until water flows out. It is suggested to install a double valve as indicated Img. 8 on page 15

Pre-Start Checks

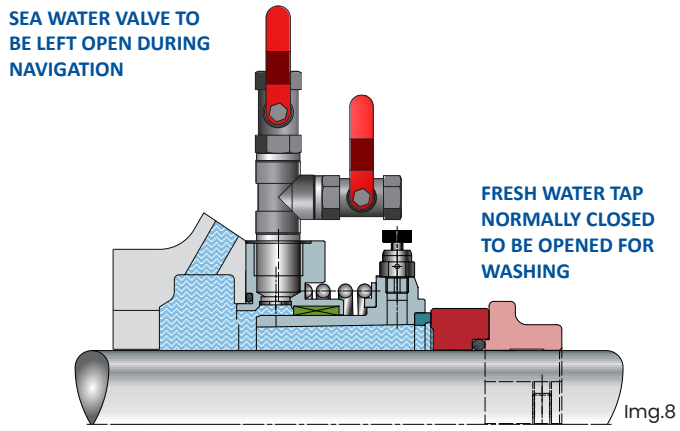
FLUSHING AND COOLING CONNECTION

🛠️ Flushing system connection
Connect the flushing hose for seal cooling to the dedicated connection on the seal housing and open the water valve.

💧 Required flow rate
The water flow rate required for correct cooling of the seal is indicated in the graph shown in this manual. **(Img. 9)**

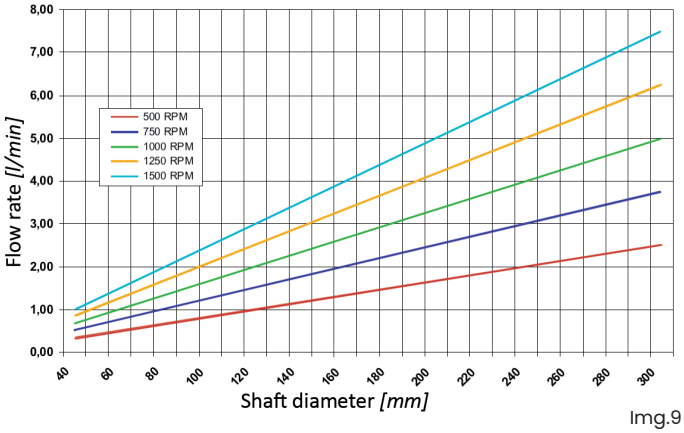
⚠️ Flushing circuit limitation
The seal flushing port is not sized to supply or cool the shaft bearing bushes located in the stern tube. A double connection can be requested.

ℹ️ Technical note
The seal cooling circuit must be considered independent from the shaft bush lubrication system.



Img.8

Flow rate calculation graph



Img.9

🔧 Dual inlet connection
A double valve installed at the flushing inlet port allows connection of two supply lines and control of the water flow to the seal. (Example shown in Img. 8)

⚙️ Flow management
The system allows control of flushing during the normal operation of the seal or washing procedures with the vessel stationary, in accordance with the instructions provided in this manual.

⚠️ Correct system use
During washing operations, ensure that the flow is correctly regulated to avoid pressures > 5 bar in the seal cooling circuit.

Pre-Start Checks

FLUSHING AND COOLING CONNECTION

🛠️ **Stationary part positioners check**
Before start-up, check that the positioners have been released.

💧 **Air venting from the sealing system**
Open the air vent valve and check that water flows out, ensuring that all air trapped between the sealing faces is removed. It is advisable to repeat this operation periodically, with the shaft at rest.

⚠️ **CAUTION**
Removal of any air pockets is essential to ensure correct seal operation.

🔍 **Static check**
Check that no water leakage is present with the shaft stationary.

ℹ️ **Operational note**
A normal drip of 4–5 drops per minute may occur during the initial navigation phase, during transient conditions and reversing manoeuvres, and is generally due to the necessary break-in of the sealing surfaces.

CHECKS DURING SEA TRIAL

Check that there are no over leaks during operation; in the first hours a dripping up to **4–5 drops** per minute may be normal. This should stabilise after the first hours of operation. Check the temperature on the stationary ring using a laser thermometer.
CAUTION: the use of a contact thermometer on a rotating shaft is a hazard.
The seal temperature **must not exceed 70°C**, even at the maximum rotation speeds. If this limit is exceeded, refer to **page 20 case 4 Failure Analysis**.

POST SEA TRIAL CHECKS

Check that the seal body locking screws and that of the drive collar are properly tightened. If abnormal propeller shaft vibrations are present, it is recommended to secure the screws with thread-locking sealant. Check shaft/stern tube alignment in accordance with the vessel manufacturer's specifications.

Periodic Inspection and Maintenance

Fluiten Mechanical Seal type **MUV, MUSV, MMSV**	
Vessel in-water lay-up for periods exceeding 30 days	• Carry out fresh water flushing every 20–30 days via the flushing connection (***see Img.10 page 18***) • Carry out external cleaning of the seal with fresh water to remove any deposits formed during operation. • Open the vent valve to allow air trapped inside the seal to escape. Even if this operation is performed at launch, air may accumulate at the sealing rings following high-speed navigation or in the presence of turbulence. Operation with air bubbles may compromise the service life of the sealing rings.
Vessel dry lay-up (boat hauled out)	• After hauling out the vessel and before storage, carry out fresh water flushing via the flushing connection. (***see Img.10 page 18***) • Carry out external cleaning of the seal with fresh water to remove any deposits formed during operation. • Vent the air.
Re-launch after lay-up period	• Carry out fresh water flushing via the flushing connection, (***see Img.10 page 18***) and external cleaning of the seal. • Check that the stationary part of the seal has kept its elasticity on the spring(s): compress the stationary ring by hand or using the positioners. It must return to its contact position with the rotating ring without sticking. If the ring is blocked or has reduced elasticity, cleaning of the stationary ring is required (**see page 18**). • Vent the air.
EVERY **300 HOURS** OR **6 MONTHS** OF OPERATION	
Idrostop (if installed)	1. Shaft stopped – lock the shaft so it does not rotate. 2. Close the seal flushing valve. 3. Inflate Idrostop to 2.5–3 bar (over pressure may damage the Inflatable gasket). 4. Close the Idrostop pressurisation air inlet valve. 5. Check that no pressure drop exceeding 0.2 bar is visible on the pressure gauge after 10 min and/or no water leakage from the vent valve 6. Before carrying out any operation, open the seal vent valve and check that no continuous water flow is present. If the flow does not stop, the Idrostop may not have fully adhered to the shaft or may be damaged. 7. After carrying out the required maintenance/checks, deflate the Idrostop. **IMPORTANT:** Starting the shaft with Idrostop under pressure will result in damage. 8. Vent residual air via the dedicated valve on the seal.
Flexibility check	**CAUTION: TO BE PERFORMED ONLY IF IDROSTOP IS INSTALLED** Check that the stationary part of the seal has kept its elasticity on the spring(s): compress the stationary ring by hand or using the positioners. It must return to its contact position with the rotating ring without sticking. If the ring is blocked or has reduced elasticity, cleaning of the stationary ring is required (see page 18).
Wear Check	For MUV, MUSV seals: *1 mm max* (**See Img.11 page 18**) For MMSV seals: *1.5 mm max* (**See Img.11 page 18**) When the above thickness limits are reached, schedule overhaul or replacement of the seal. If graphite dusting is visible around the sealing surfaces, check the cooling water flow rate and vent the air.
Anode	**Caution:** If the IDROSTOP FLANGE, which ensures watertight sealing with the shaft at rest, is not installed, block water ingress during anode removal. Schedule replacement intervals based on anode wear. If wear occurs every 1–2 months, contact the shipyard to identify the cause and corrective actions.
EVERY **5000 HOURS** OR **3 YEARS** OF OPERATION	
Overhaul	• Perform the checks required every 300 hours / 6 months. • Carry out cleaning of the stationary ring (**see page 18**). • In case of excessive wear, carry out a complete overhaul at an authorised Fluiten Service Centre or replace the seals.

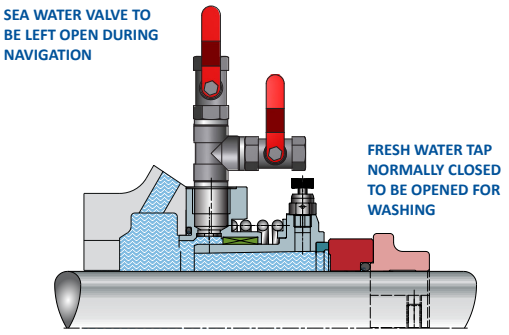
Cleaning the stationary elastic element

ACTIVITY TO BE CARRIED OUT BY AUTHORISED SERVICE CENTRES

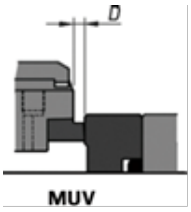
After a long period of immersion or dry storage (12 months), if effective periodic fresh-water flushing has not been performed, it is recommended to lubricate the stationary element. Fluiten seals are made with metal parts such as to allow their use after cleaning and greasing.
If Idrostop is installed, the cleaning operation can be carried out with the vessel in the water.
If not, the vessel must be hauled out.

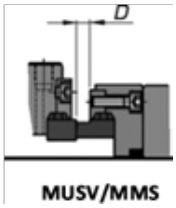
LUBRICATION AND CLEANING OF THE STATIONARY ELEMENT

1. Close the flushing valves.
2. Inflate the Idrostop to 2.5–3 bar.
3. Open the vent valve on the mechanical seal to verify the effectiveness of the static seal provided by the Idrostop.
4. Engage the positioning device to fit the stationary part in the work position.
5. Loosen the drive collar screw(s).
6. Slide the rotating ring and drive collar away from the stationary ring, avoiding leverage on the sealing faces to prevent damage.
7. Release the positioning device to allow removal of the stationary ring from the seal housing, taking care that it does not impact the shaft and become damaged.
8. Clean the surface of the stationary ring on which the gasket operates and lubricate with lithium grease.



Img. 10





WEAR LIMIT	
SEAL TYPE	D
MUV, MUSV	1 mm
MMSV	1.5 mm

Img. 11

Cleaning the stationary elastic element

MAINTENANCE AND REASSEMBLY PROCEDURE OF THE SEAL

⚠️ CAUTION:
Do not damage the gaskets positioned in the internal part of the body on which the stationary ring works. Wash with fresh water without extracting them from their seat.

• Clean the metal parts with fresh water and emery cloth.
• Reposition and reset the stationary ring using the positioning device to ensure the correct working position.
• Clean the sealing surfaces in graphite, silicon carbide or chrome steel with a clean cloth or paper, isopropyl or denatured ethyl alcohol, or water. Relocate the O-ring and carefully fit it into its seat. DO NOT USE SHARP TOOLS.
• Slide the drive collar and position it against the rotating ring, ensuring that the pin is aligned with the slot on the rotating element (pin inserted into the drive collar).
• Secure the collar to the shaft, firmly tightening the screws. Once assembly is complete with the shaft in its final position.
• Disengage the positioning device from the stationary ring: for MMSV seals, loosen the positioner nuts by approximately 10 mm.
For the MUV/MUSV seals, rotate the positioners by 180°, loosening the nuts and retighten them to allow reuse.
• Deflate the Idrostop.
• Open the water flushing valve.
• Vent the air inside the seal using the vent valve.

Failure Analysis

No.	OBSERVED PHENOMENON	POSSIBLE CAUSE	SOLUTION
1	The seal leaks after a prolonged shutdown with the vessel in dry dock or afloat.	• Fouling have formed inside the seal.	• Perform cleaning as indicated on pages 18–19.
2	The seal is tight in static conditions but leaks during operation.	• Fouling have formed inside the seal. • The seal has not been installed correctly. • The shaft is not aligned as required by the specifications and is mechanically stressed beyond tolerances.	• Perform cleaning as indicated on pages 18-19. • Check that the assembly operations have been correctly performed. • Check alignment according to the manufacturer's specifications and the instructions on page 13.
3	The seal leaks at first launch.	• The seal has not been installed correctly. • The seal was damaged during installation.	• Check working position by resetting the positioning device. • Check that the positioning device have been disengaged as per the instructions on page 15. • Inspect the integrity of the sealing faces.
4	The stationary ring visibly oscillates ("flutters") visibly at initial start-up.	• Excessive angular misalignment of the shaft relative to the stern tube. • The rotating part has not been installed correctly; O-ring or drive pin out of position.	• Check alignment according to the manufacturer's specifications and the instructions on page 13. • Check that the assembly operations have been correctly performed.
5	Seal temperature exceeds 70°C.	• An air pocket is present within the sealing surfaces. • Insufficient or absent flushing water.	• Vent the seal using the dedicated valve. • Check the seal flushing line.
6	Excessive graphite dusting occurs (normal during initial start-up, but cannot persist).	• An air pocket is present within the sealing surfaces. • Insufficient or absent flushing water.	• Vent the seal using the dedicated valve. • Check that the water passage is not obstructed and that flow rate is sufficient.

ℹ️ If the problem persists even after carrying out the checks indicated in this analysis, contact Fluiten technical service at **info@fluiten.com**

Failure Analysis

No.	OBSERVED PHENOMENON	POSSIBLE CAUSE	SOLUTION
7	The seal leaks with the vessel stationary after shaft maintenance.	• Sealing surfaces or other components have been damaged. • Working position is incorrect.	• Verify that installation procedures have been correctly followed as indicated on pages 13-14. • If the stationary part does not slide freely, cleaning of internal parts is necessary as indicated on pages 18-19. • Check working position by resetting the positioing device. • Arrange for replacement or maintenance.
8	During reverse operation, the seal leaks heavily or drips excessively.	• Over axial movement of the shaft. • Working position of the seal is incorrect.	• Check alignment according to the manufacturer's specifications and the instructions on page 13. • Check working position by resetting the positioners. • Perform cleaning as indicated on pages 13-14.
9	Level of leakage tends to increase.	• Seal wear. • Sealing faces subjected to abrasion. • Insufficient or absent flushing water.	• After checking the level of wear, arrange for replacement or overhaul if necessary. If sealing faces are abraded, check water filtration level and inspect flushing line.
10	The seal leaks at high speeds.	• Deposits have formed inside the seal.	• Check that the stationary element has maintained its elasticity and perform cleaning as indicated on pages 13-14.
11	Seal leaks after anode replacement.	• Non-original anode installed, interfering with the stationary ring and preventing proper elasticity.	• Replace anode with an original component.
12	Seal is unloaded.	• The seal has lost preload due to incorrect installation.	• Use positioners to check the correct working position. Repeat operations on pages 14–15. • Check that drive collar is properly tightened and on right position.

If the problem persists even after carrying out the checks indicated in this analysis, contact Fluiten technical service at **info@fluiten.com**