

EO86815 Submerged Camera Houses



Submerged camera houses for PIV measurements

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1.0 Introduction

This user guide covers the installation and operation of Two Submersible Camera Housings (EO86815). The setup contains two camera housings including two one-axis Scheimpflug mounts. These camera housings are equipped with a 20-meter-long hose at the rear housing, all necessary cables for the camera, lens control, and Scheimpflug adjustments. Additionally, a 3mm hose is included to facilitate the supply of purge gas to the lens and window, while another hose is designated for the discharge of the purge gas.

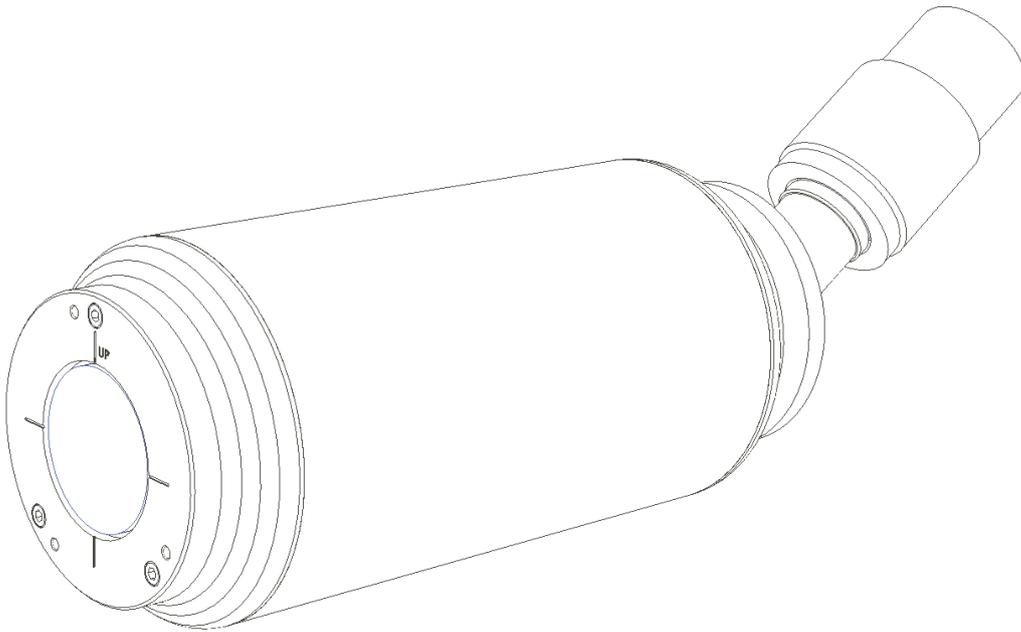


Figure 1 Submersible Camera Housing (EO 86815)

2.0 Unboxing

Please check that nothing has been damaged during transportation. If the box shows signs of cutting or impact, please contact your local Dantec Dynamics representative. Please also check that all parts are included according to the delivery note:

Two pieces of Scheimpflug

Two Cameras (Can be pre-mounted inside the camera house)

Two Camera Houses with Hydraulic hoses including cables (20m)

Power supply for cameras, water detection cable and pneumatic lines.

Scheimpflug Controller

Spare O-rings

Installation & User's Guide.

If anything is missing, please contact your local Dantec Dynamics representative.

3.0 Checking and preparing the Camera Housings

Pre-Assembly Preparation:

Prior to assembling the camera housings, ensure a clean environment including the table and tools. This is crucial for handling precise mechanical tools and optical equipment effectively.

Installation and Usage Guidelines:

When installing and utilizing the submersible camera housings, adhere to the following guidelines:

1. Handle mechanical parts delicately; they contain fragile optics and electronics vulnerable to shocks and vibrations.
2. Ensure precise fitting of components for water tightness and stability; dropping may alter shape and compromise sealing.
3. Prevent window scratches; damage affects captured images.
4. Protect the hose with cables from pulling, squeezing, and sharp edges to prevent punctures or damage.
5. Maximum underwater depth: 5m. Monitor the Water Detection System while submerged; respond to alarms promptly.
6. Avoid prolonged exposure to saltwater and high temperatures to prevent corrosion.
7. Keep mechanics clean, especially attachment surfaces; replace O-rings upon opening Camera Housing.
8. Rinse with clean water directly after use in fresh/salt water; prevent water entry into hose ends and connectors.
9. Store Camera Housings in a dry, controlled environment when not in use.

4.0 Installation

General notice about screw connections:

To avoid seizing the screw connections, especially stainless steel against stainless steel, it is strongly recommended to use anti-seize grease, such as copper grease or similar.

4.1.1 Disassembly and assembly of the camera houses

The Camera and optics should be delivered pre-mounted. In the case where it is not or the camera house should be disassembled for inspection, use the disassembly and assembly guide.

Disassembling:

- Extract 3 M5 x 30 screws. Introduce 3 M5 screws into threaded holes, gently contacting the Front part. Turn each screw ½ rotation sequentially to release the Front part.
- Take off the Front part. Avoid window damage (e.g., scratches). Inspect the O-ring and grease (Dow Corning High Vacuum Grease or equivalent). Maintain window cleanliness.

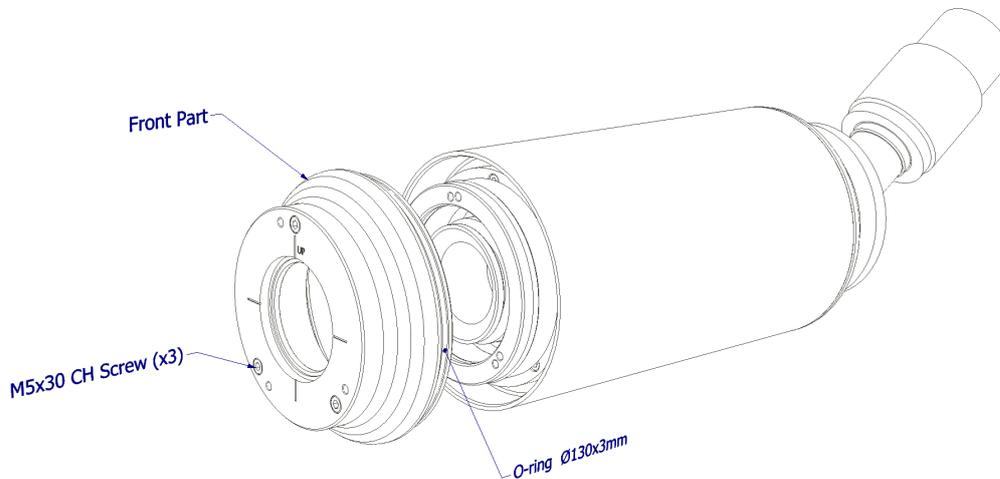


Figure 2 Front Part Removal

- Detach the Camera tube from Rear Cover. Check the O-ring and grease, if needed. Disconnect the Leak detection cable connector carefully.

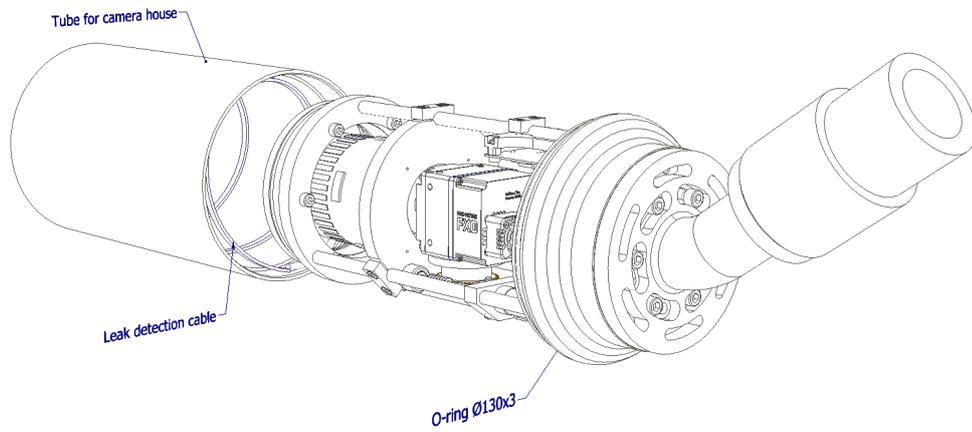


Figure 3 Removal of camera tube

- Eliminate 6 pcs. M5 x 16 screws securing End Cover Ring. Remove it. Examine O-rings and grease (Dow Corning High Vacuum Grease or equivalent), if required.

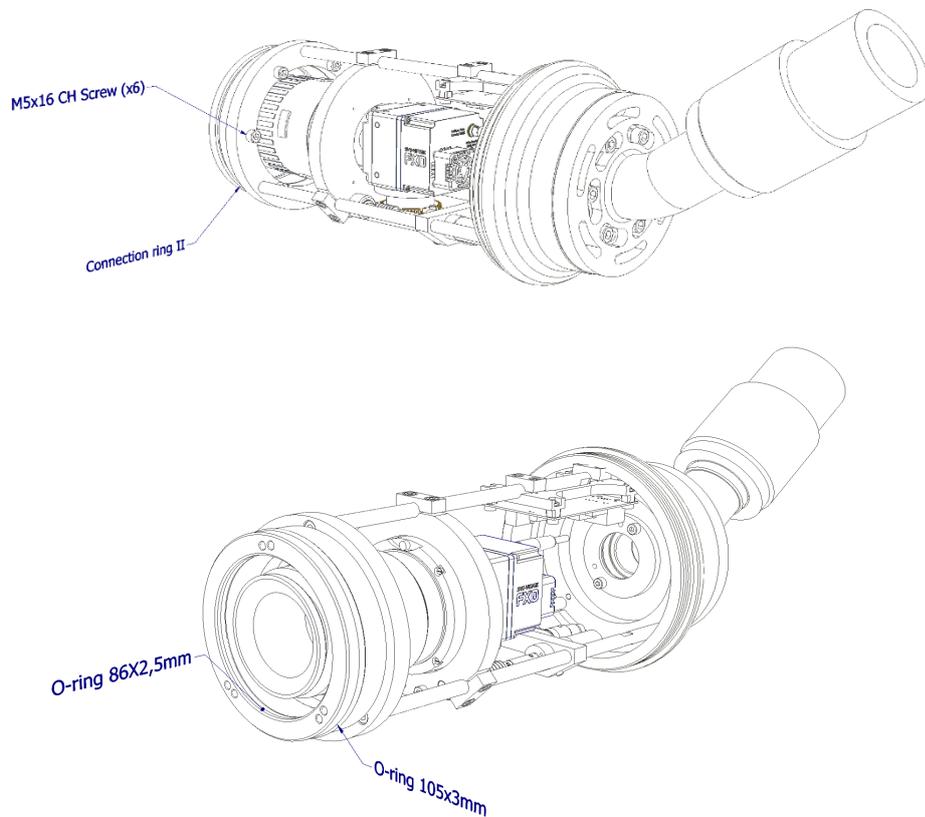


Figure 4 O-rings and removal of Connection ring II

- Eminate 3 pcs. M5 x 10 screws holding Front coupling. Remove it.

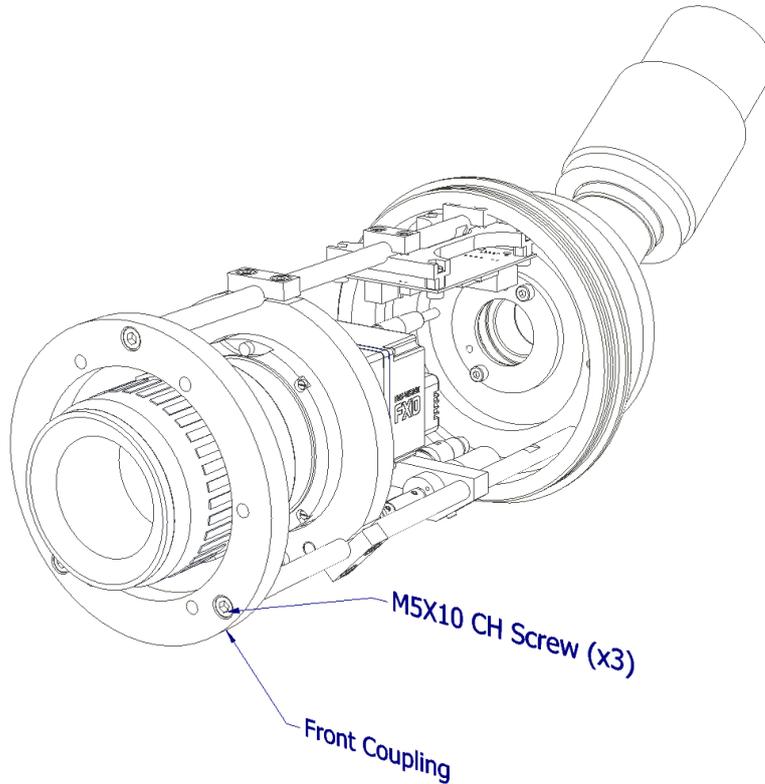


Figure 5 Front Coupling Removal

Cables, Camera and Lens can now be inspected. If it is desired to unmount the camera, please see attached exploded view.

If the camera module or Scheimpflug parts need to be adjusted, please remove the front coupling (see Figure 5).

Notes when inspecting the setup:

- Ensure the Camera Lens is fully extended (applicable to 50 mm lens). Switch from AF to MF, extend the lens, and then return to AF.
- Extend the Camera Module forward, protruding it beyond rods by A=70 mm (refer to figure 3). Maintain distance below 75 mm at all costs.

Note: Ensure the AF/MF switch is set to AF (Auto Focus).

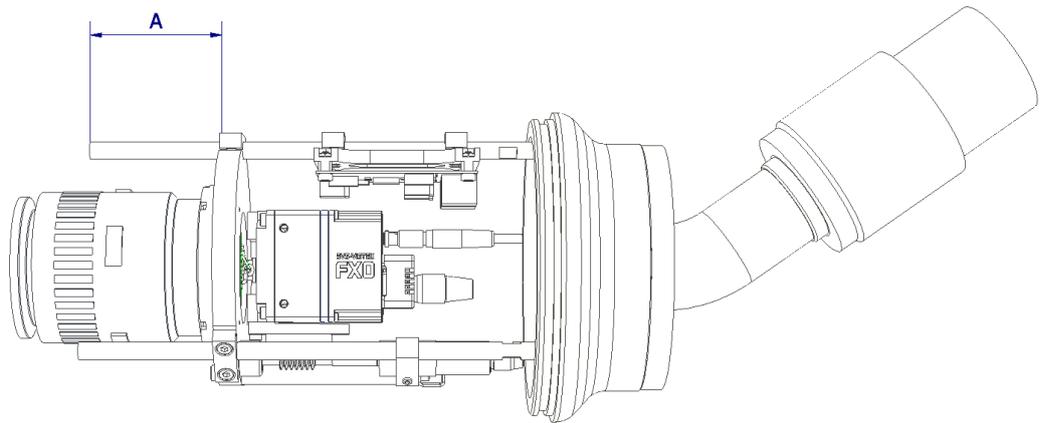


Figure 6 Distance for camera module to rod end.

- Secure the Camera Module to the rods by tightening the 3 sets of bracket hex M4 screws.

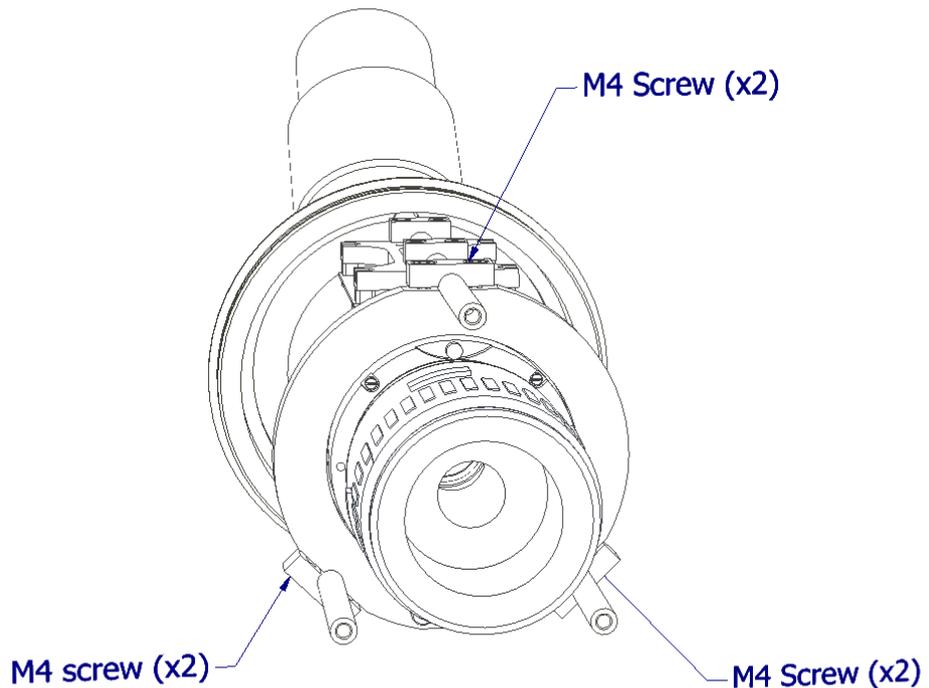


Figure 7 Tightening of camera module.

Having all the mechanical parts adjusted and ready for use it is time for connecting electrical components.

Establish electrical connections for:

- o Power to the Scheimpflug Motor
- o Power to the Birger Unit (Focus and Aperture Control)
- o Power to the Camera
- o Trigger to the Camera
- o Camera Link

Ensure that the blue purge air hose is repositioned in front of the window.

Assembly:

To assemble the camera housing, follow the disassembly procedure in reverse order, starting from the end.

Make sure to change all O-rings when housing has been disassembled.

4.1.2 Connections

All connections from Camera Housings are labelled with their respective functions, simplifying their linkage to the Control Box, Computer, Timer Box, and Dry Air Supply.

The Control Box contains the following features:

- Cameras Power Supply: 12VDC
- Canon Lens Controllers (Birger Units) Power Supply: 12VDC
- PLC for monitoring Liquid sensors in Camera Housings (Water Detection)
- Scheimpflug adjustment Control PCBs

Additionally, a Breakout Box accompanies the Control Box, providing convenient access to control buttons near the PC monitor for Scheimpflug angle adjustments.

4.1.3 Camera Control System

The Camera Control System contains the following components:

- Motorized Scheimpflug mechanism
- Focus control
- Aperture control

Motorized Scheimpflug Mechanism

The Motorized Scheimpflug operates through a step motor with a high-ratio planetary gear system.

Buttons on the Breakout Box govern the step motors and consequently, the scheimpflug angle.

Both Cameras feature two momentary switches each for adjusting the scheimpflug angle forward and backward.

Speed selection offers choices between fast (for quick angle changes) and slow (for precise adjustments).

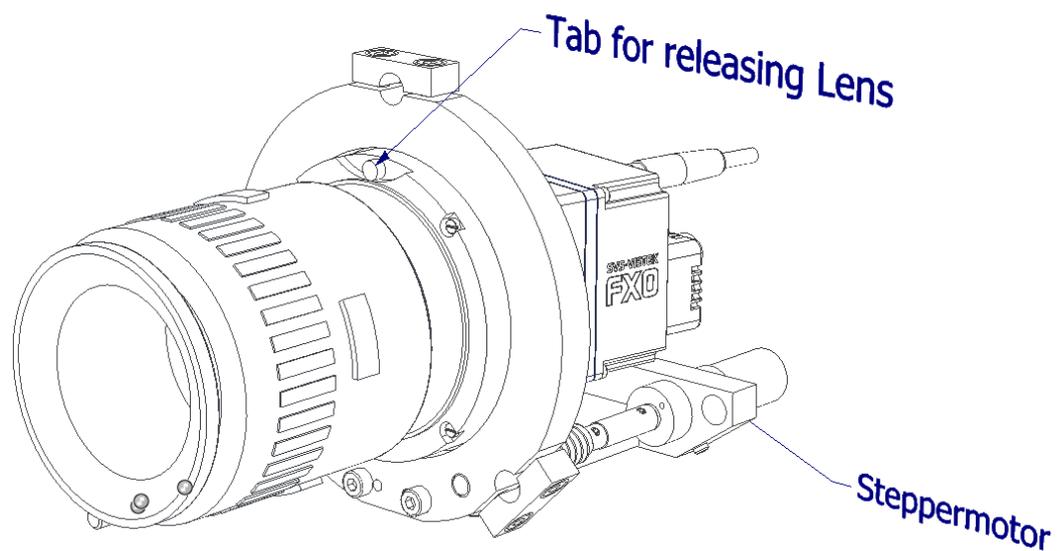


Figure 8 Scheimpflug mechanism

Focus and Aperture Controls

Focus and Aperture adjustments are managed by motors within Canon Lenses.

Connect RS232 connectors from Camera houses to the PC (via the Special Serial Connection Card).

Focus and Aperture operations are seamlessly integrated into the Dynamic Studio software.

4.1.4 Connecting the Leak Detection Sensors and Camera Module

Connect the Water Sensors to the Control Box. The cables from the camera houses are labelled as "Water Sensor 1" and "Water Sensor 2," and they should be connected to the Control Box.

Also, link cables from the Camera Modules (on the probe) to the Control Box.

Within the Control Box, a PLC receives signals from the water sensors in the camera housings. If this signal is lost (indicating water presence on the sensors), a high-pitched beep will sound.

In such an event, lift the probe out of the water and inspect the indicated camera housing for leaks.

To silence the alarm, press the "Reset" button on the Control Box, stopping the sound.

The water detection system will be fully operational once the water is cleared from the sensors.

4.1.5 Power supply for cameras and lenses

The Camera control box supplies the cameras and lenses with power.

Cables from the Camera Housings are to be connected to the Control Box.

4.1.6 Air Purge

Camera Housings feature a Dry Air Purge system with an included Air Hose.

Provide approximately 0.3 bar of dry, clean air to prevent condensation in Camera Housings.

Air hose details: Festo $\varnothing 3 \times 0.5$ (PUN 3x0.5-BL) Polyurethane Tubing.

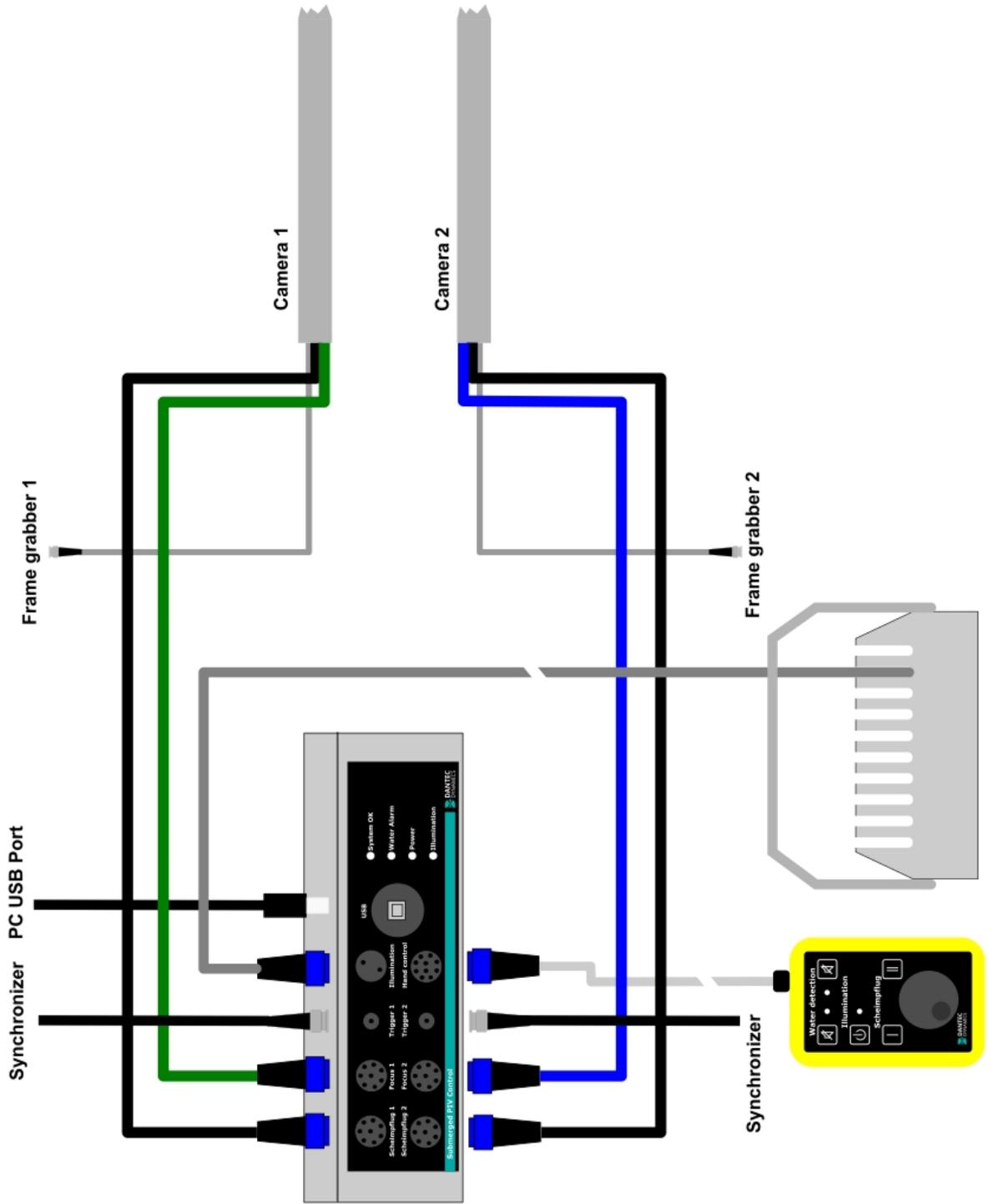


Figure 9 Schematic of setup

5.0 Maintenance

Mechanics

Camera housings are constructed from electro-polished stainless steel, but prolonged exposure to saltwater and high temperatures could lead to corrosion.

Maintain cleanliness, especially on surfaces where different mechanical modules interconnect. Keep O-rings clean (apply grease if needed) and replace damaged ones. Use O-ring Kit 86815A004.

After each use in fresh or saltwater, thoroughly rinse the Camera Housings and hydraulic hose with clean water. Prevent water from entering the open end of the hydraulic hose and avoid contact with electrical connectors.

When not in use, store the Camera Housings in a dust-free and dry, controlled environment.

Cameras

For camera maintenance please refer to the appropriate camera manual.

Optics

When the windows are submerged for an extended time – the optical surfaces are gradually covered with grease from the water. These surfaces should be cleaned regularly. Unclean surfaces may reduce the performance of the system.

To prevent particles and residues from adhering to the surface, it's recommended to rinse the windows with clean water whenever the Camera Housings are removed from the water.

The windows separate the watertight sections, and the water is not coated on the outside. This allows for easy cleaning of the optical surfaces. Use ethanol or a similar substance with lens tissue following the ordinary methods of cleaning optics.

Take utmost care to assemble the camera on the Scheimpflug in a clean and dry place, not contaminating the camera chip.

6.0 Leak test

After disassembly and before use, it is recommended to do a leak test in a safe environment.

The leak test involves two key phases: first, submersion at a 1-meter depth, followed by a 5-meter depth.

1. Verify water leak detector functionality.
2. Submerge Camera Housing at 1-meter depth, maintaining a horizontal position for 15 minutes.
3. Visually inspect the Camera Housing window.
4. Submerge Camera Housing at 5-meter depth, maintaining horizontal position for 15 minutes.
5. Visually examine the Camera Housing window.

7.0 Spare Parts

O-ring Kit 86815A004 containing:

- 2 pieces O-ring 30-2 72 NBR
- 2 pieces O-ring 40-3 72 NBR
- 2 pieces O-ring 85-2,5 72 NBR
- 2 pieces O-ring 105-3 72 NBR
- 4 pieces O-ring 130-3 72 NBR

Number of O-rings are for two Camera Housings. Remember to use grease (Dow Corning High Vacuum Grease or equivalent), when renewing the O-rings.

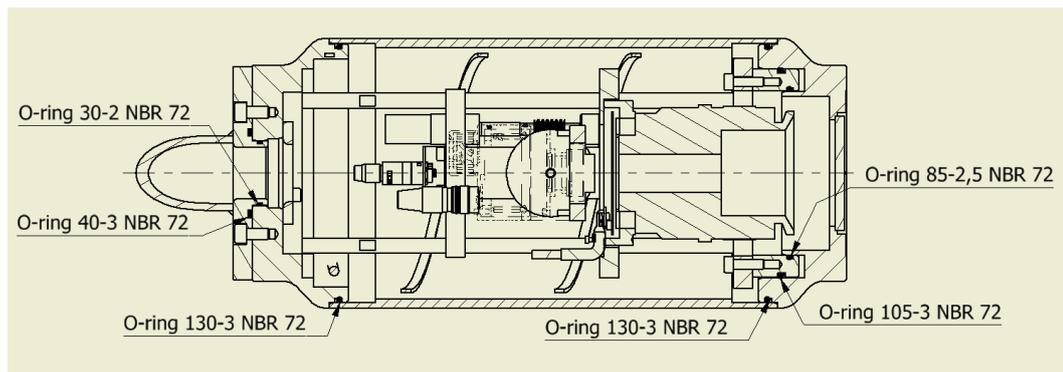


Figure 10 Section view showing the O-rings placement.

8.0 Specifications

Item no	EO86815 20770S01 Camera Housing with installed camera and lens and hydraulic hose assembled.
Weight	45 kg / assembled camera and hose

Maximum depth 5 m

Figure 11 Specification table.



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