ePG
Electric Pressure Pump and Controller

Dear user,

We have made every effort to ensure the accuracy of the contents of this manual. Should any errors be detected, we would greatly appreciate to receive suggestions to improve the quality of the contents of this manual.

For more detailed technical data about Beamex ePG Electric Pressure Pump and Controller, please contact the manufacturer.

Table of Contents

Prologue

Thank you for buying Beamex ePG, Electric Pressure Pump and Controller.

Beamex ePG is a portable, hand-held, battery-powered device that is used to generate reference pressure in pressure calibration applications. With ePG you can generate pressure between -0.85 to 20 bar / -12.4 to 300 psi. Since the device does not have a display to indicate the generated pressure reading, it must be connected to an external pressure device with an appropriate display, e.g. Beamex pressure calibrator or a pressure indicator. ePG contains a lithium-ion battery pack that can be charged using a USB Type-C charger either separately or while attached to the device (see chapter Battery Pack).

Typographical Conventions

The following typographical conventions apply to the ePG User Manual:

Bold text is used in following situations:

- References to User Manual topics and parts
- ePG keywords, i.e. terms shown in the User Interface

> ⓘ **Note:** This is a note. Notes typically inform you of something useful concerning the current topic.

> ⚠ **Caution:** This is a caution. Whenever you see a caution, read it carefully and take it seriously. By not observing cautions, you may damage the pump.

> ⚠ **Warning:** This is a warning. Whenever you see a warning, read it carefully and take it seriously. By not observing warnings, you may -at worst- damage the pump and/or get personal injury.

Unpacking and Inspection

At the factory, each new ePG passes a careful inspection. It should be free of scrapes and scratches and in proper operation condition upon receipt. The receiver should, however, inspect the unit for any damage that may have occurred during transportation. If there are signs of obvious mechanical damage, package contents are incomplete, or ePG does not operate according to specifications, contact the purchasing sales office as soon as possible.

If you have to return the device to the factory for any reason, use the original packing whenever possible (see chapter Service and transportation instructions). Include a detailed description of the reason for the return.

ePG is available in two different configurations with different delivery contents:

ePG Pump Only (9021000)

• ePG with a hand strap
• Battery pack
• USB Type-C charger with a country-specific power cord and mains plug
• USB Type-A to Type-C communication cable
• Warranty terms
• Accessories flyer
• This User Manual

ePG Complete Kit (9021115)

• ePG with a hand strap
• Shoulder strap
• Battery pack
• USB Type-C charger with a country-specific power cord and mains plug
• USB Type-A to Type-C communication cable
• A carrying case with foaming and places for hoses, charger and a USB communication cable, etc.
• Pressure T-hose with NPT fittings
• Pressure fitting plug set
• A package of USB Type-C dust covers (5 pcs)
• Warranty terms
• Accessories flyer
• This User Manual

OPTIONS, ACCESSORIES AND SPARE PARTS

• Battery pack (8006030)
• USB Type-C charger (8006090, EU) with a country-specific power cord and mains plug:
    ◦ AU (8006091)
    ◦ UK (8006092)
    ◦ US (8006093)
    ◦ CH (8006094)
• USB Type-A to Type-C communication cable (6690980)
• Shoulder strap (8006110)
• A carrying case with foaming and places for hoses, charger and a USB communication cable, etc (8003350)

- Pressure T-hose (8009550)
- Pressure fitting set for connecting high pressure EXT module to the low pressure hose (8003100)
- Pressure fitting plug set (8003610)
- A package of USB Type-C dust covers (8006120, 5 pcs)
- Set of Mesh filters for the output connector (8006160, 5 pcs)
- Set of Adhesive Vents (8006165, 3 pcs)
- ePG Piston Seal Service kit: piston seals and cylinder's o-ring (8006130)
- ePG Cylinder Service kit: cylinder and o-ring (8006140)
- ePG Non-return valve kit: non-return valves and o-rings (8006145)

All these are available at https://shop.beamex.com/

Feedback

We want to improve our products and services constantly. Therefore we'd like to know your opinion of the product you use. Please spend a moment of your valuable time by giving us feedback about the product.

Address:	**Beamex Oy Ab**
	Quality Feedback
	Ristisuonraitti 10
	FIN-68600 Pietarsaari
	FINLAND
E-mail:	support@beamex.com
Internet:	https://www.beamex.com

Safety

Approvals

All available approvals and declaration of conformity can be downloaded from Beamex's website.

Symbols Used on the device

	Caution! Please read the manual for further information

Operating Environment and Specifications

	Warning: Only use the device for purposes and in environments specified in the user manual.

	Caution: Do not exceed the max. operating pressure of the device and the hose.

Table 1: Specifications

SPECIFICATION	ePG
Pressure Range[1]	-0.85 to 20 bar / -12.4 to 300 psi [1] Valid at nominal barometric pressure of 1013 mbar abs" /14.7 psi abs
Pressure Generation Rate from 0 to 20 bar / 300 psi[2] from 0 to -0.85 bar / -12.4 psi[2]	< 110 s < 45 s [2] into a volume max.20 ml / 0.68 fl.oz.
Setpoint Adjustability[3] from 0 to 20 bar / 300 psi from 0 to -0.85 bar / -12.4 psi	< 10 mbar / < 0.1 psi < 5 mbar / < 0.05 psi [3] into a volume 20 ml / 0.68 fl.oz.
Wetted Parts	Aluminum, brass, stainless steel, NBR, FKM, PEEK, PA, MS, TPE, food grade lubricants
Dimensions	See technical drawing: Figure 1: Technical drawing.
Weight	~ 2.3 kg / ~ 5 lb
Pressure Ports	G1/8" (ISO228/1) female port with adapter for Beamex low pressure hose
Filter Elements	A filter element (36 micron) included in the pressure port
Pressure Media	Clean dry non-corrosive gases
Battery Pack	Li-ion battery pack with USB Type-C connector, 14.4V, at least 2600 mAh
Charger (minimum requirements)	USB Type-C charger PD 2.0/3.0 Profile 4 20V / 2.25A / 45W
Storage Temperature	-20 to 60 °C / -4 to 140 °F

SPECIFICATION	ePG
Operating Temperature	0 to 50 °C / 32 to 122 °F
Humidity from 0 to 40 °C / 32 to 104 °F from 40 °C to 50 °C / 104 to 122 °F	 ≤ 90 %RH ≤ 50 %RH[4] [4] ePG will work at higher humidity, but its performance may drop

i **Note:** If the device has been stored in different environment it should be stabilized to the new environment before use.
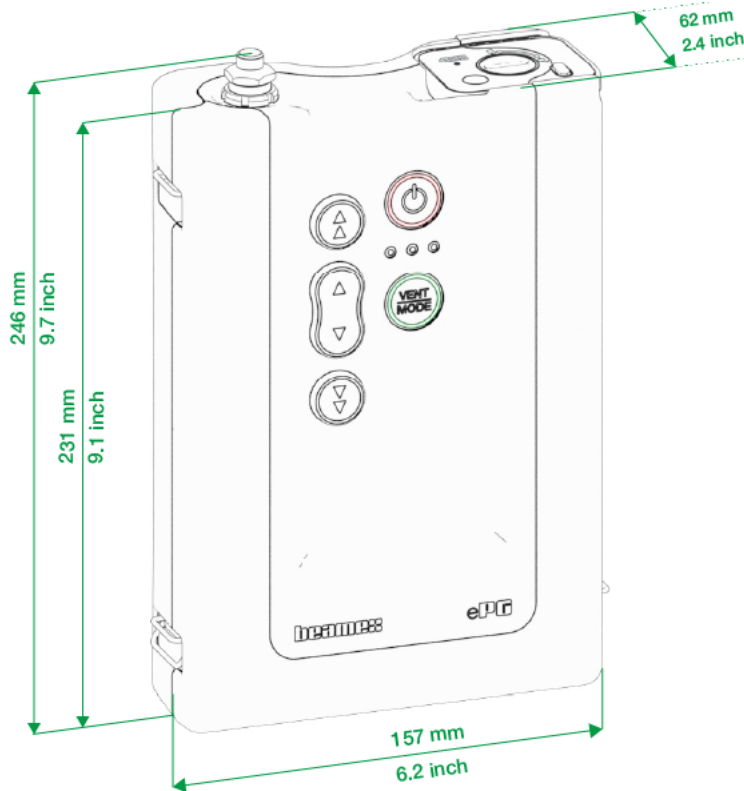
i **Note:** Please notice that these specifications apply at sea-level.

i **Note:** Please notice that generated pressure is limited to 20.7 bar / 300.2 psi.

Figure 1: Technical drawing

Safety Precautions and Warnings

⚠	**Caution:** Read and fully understand this manual and all other safety instructions before operating this Electric Pressure Pump and Controller.

⚠	**Warning:** Only personnel with good experience and knowledge of pressure media, pressure instruments and connections are allowed to work with ePG. Incorrect use may result in damage to the device, the instrument connected to it and/or personal injury.

⚠	**Warning:** Use only the pressure measurement T-hose delivered by Beamex, marked with "Max. 40 bar". Other hoses may not withstand the pressure generated by ePG.

⚠	**Warning:** Wear protective glasses.

⚠	**Warning:** Do not connect the device to an external pressure source.

⚠️ **Warning:** Vent external systems before connecting to the device.

⚠️ **Warning:** Ensure that all connections are made correctly and the hose and the connectors are undamaged. Do not use faulty hoses or connectors.

⚠️ **Warning:** Use only the connector provided with ePG. Impurities from wrong materials may block the device.

⚠️ **Warning:** Do not use Teflon (PTFE) tape to seal anything in the device.

⚠️ **Warning:** Do not use ePG in any other way than as described in this manual.

General Warnings Concerning Pressure Measurement

⚠️ **Warning:** Always depressurize the system before opening or connecting any pressure fittings or connectors. Use proper valves for venting the system. Ensure that all connections are made correctly and that the hose and the connectors are intact.

⚠️ **Warning:** Never exceed the maximum pressure of connected devices. The maximum pressure of Beamex modules is stated on module's sticker.

⚠️ **Warning:** Never plug a hose with your hands or put hands in front of a gas spray coming from a leakage. A gas bubble in the blood circulation can cause death.
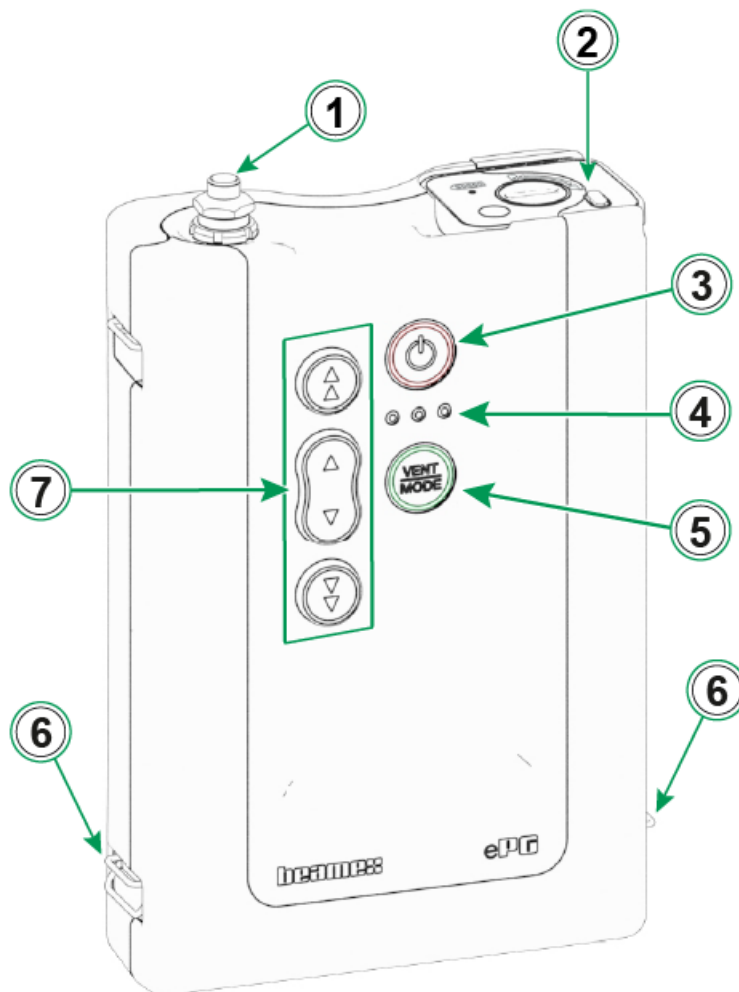
⚠️ **Warning:** Do not use the same tubing with different liquids or gases.

About ePG

General

Figure 2: Overview presents a general view of ePG, its parts and its buttons' functionality.
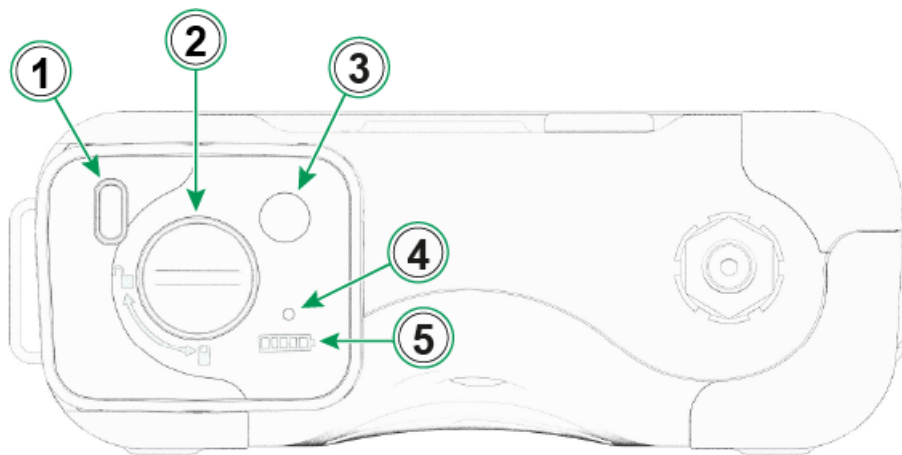

Figure 2: Overview

Legend:

1. Pressure Output Connector
2. Lithium-ion Battery Pack
3. Power Button

4. LED indicators:

   • Yellow blinking / On = Warning
   • Green blinking = Busy/Wait
   • Green On = Ready
   • Blue reserved for future expansion

5. Vent / Mode Button

6. Shoulder Strap Hook

7. Operation buttons for pressure/vacuum generation

Top view

Figure 3: ePG, top view

Legend:

1. USB-C port, for charging the Battery Pack and firmware updates
2. Locking mechanism, when locked, prevents the battery pack from falling out
3. When pressed, the number of LEDs in the battery indicator indicates the battery status
4. The green LED lits when the Battery Pack is connected to suitable charger
5. Battery indicator

Battery Pack
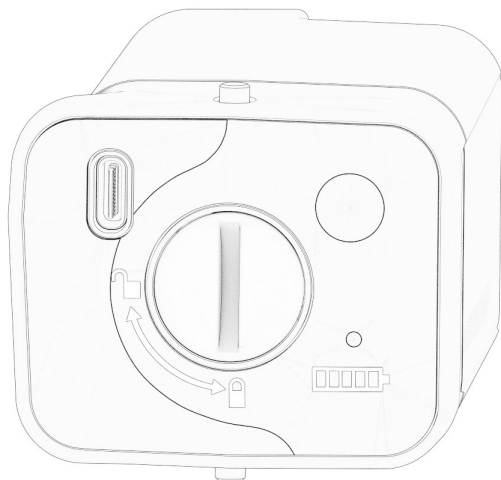
Figure 4: Battery Pack locked

When the slot is in a vertical position the Battery Pack is locked.

Figure 5: Battery Pack unlocked

To unlock the Battery Pack, turn the slot to the right (in horizontal position).

> **Note:** You can use a screwdriver, a washer or even a coin to lock/ unlock the Battery Pack. Push the Battery Pack gently inside to make the lock mechanism move easily.

> **Note:** Always lock the Battery Pack to prevent it from falling out when it is installed in the device.

When the temperature is under or over the limits (other than 0 °C to 45 °C / 32 °F to 113 °F) the battery pack cannot be charged. Also if the internal temperature is over 60 °C / 140 °F, ePG stops working automatically as a precaution until the temperature is again within limits.

> **Note:** Please notice that upon delivery the battery might not be fully charged. In that case, charge the battery before the first use for at least 4 hours.

> **Note:** Please note that ePG vents and turns itself automatically off when in has been unused for 60 min or when there is only a few percent charge remaining in the Battery Pack.

Operating instructions

Setting Up

1. Connect one of the three ends of the T-pressure hose to the ePG's output connector.

2. Connect one of the remaining open ends to the calibrator's / pressure measuring device's input connector.

3. Connect the last open end to DUT's* input connector.

    *DUT = device under test

4. Start generating pressure/vacuum with your ePG.
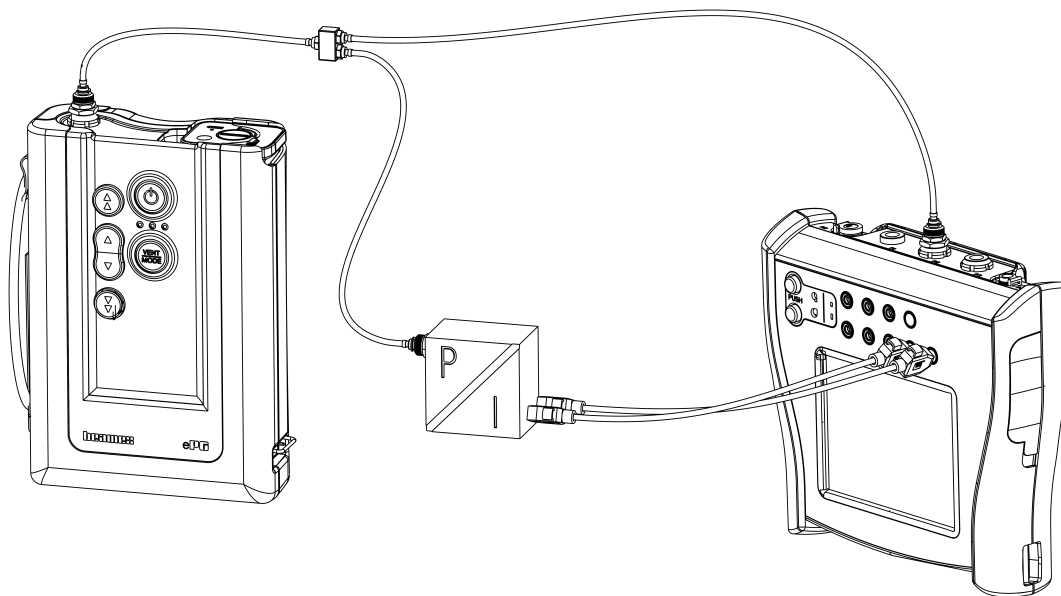
Figure 6: ePG connected to MC6 and DUT

User Interface and Functionality

You can operate the ePG by pressing the buttons on the device.
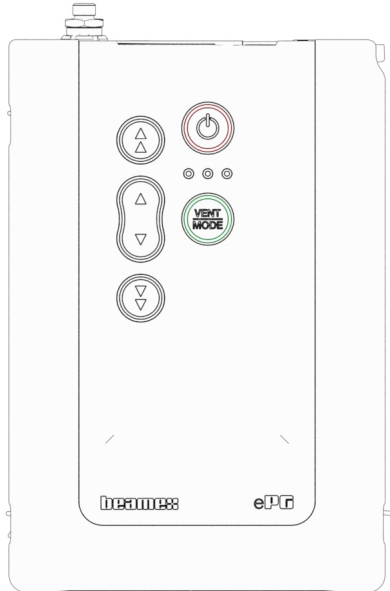
Figure 7: Buttons on the device

Figure 8: Power button

ePG is powered on by pressing the Power button. This is indicated by Power button lighting up.

When powered on, the device goes automatically into vent mode. This is indicated by green LED blinking. After ca. 30 seconds the green LED lights up and ePG is ready to generate pressure or vacuum. During venting, the calibrator's pressure module can be zeroed.

Venting can also be interrupted after minimum ~3s venting time by pressing the Vent / Mode button again (or any other button) during the vent mode.

ePG is powered off by pressing the Power button. The device automatically vents before switching itself off.

Figure 9: Vent / Mode button

Vent / Mode button is used to vent the ePG or change the mode from pressure to vacuum and vice versa. When pressed, the ePG goes into vent mode which is indicated by the green LED blinking.

If needed, venting can be interrupted by pressing the Vent / Mode button again. Otherwise after ca. 30 seconds venting ends and the green LED lights up to indicate that ePG is ready to generate pressure or vacuum.

Figure 10: Coarse Adjustment Up button

Coarse Adjustment Up button is used to generate pressure in bigger steps or at maximum speed. The button can be either clicked or pressed and held.

When it is clicked, the ePG generates pressure in bigger steps (~ 100 to 200 mbar / 1.45 to 2.90 psi per step). When it is pressed and held, the output pressure increases as fast as possible. Notice, that when the generated pressure is < 2 bar / 29 psi, pumping speed is limited to prevent possible overshots. When the pressure reaches 2 bar / 29 psi, the pump accelerates to maximum speed.

When desired set point is getting closer, release the button ~ 0.1 to 0.2 bar / 1.45 to 2.90 psi before (the set point is reached). After releasing, the output pressure stabilizes after a short waiting time.

Coarse Adjustment Up button can also be locked by pressing and holding it and pressing the Fine Adjustment Up button at the same time. Locking is indicated by the Coarse Adjustment Up button lighting up. After locking you can lift your fingers from the buttons.

Locking can be released by pressing any of the operation (arrow) buttons. Then the ePG holds the generated pressure and waits for further instructions. Please notice, that if the Power or Vent / Mode button is pressed, the device either switches itself off or vents itself.

Figure 11: Fine Adjustment Up button

Fine Adjustment Up button is used to generate pressure slowly, so that it can be fine adjusted to desired set point. This button can be either pressed and held or clicked. When you click the button, the output pressure changes in small steps. After releasing the button, the output pressure stabilizes after a short waiting time.
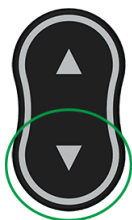
Figure 12: Fine Adjustment Down button

Fine Adjustment Down button is used to decrease pressure slowly, so that it can be fine adjusted to desired set point. This button can be either pressed and held or clicked. When you click the button, the output pressure changes in small steps. After releasing the button, the output pressure stabilizes after a short waiting time.

Figure 13: Coarse Adjustment Down button

Coarse Adjustment Down button is used to decrease pressure in bigger steps or at maximum speed. The button can be either clicked or pressed and held.

When it is clicked, the ePG decreases pressure in bigger steps (~ 100 to 200 mbar / 1.45 to 2.90 psi per step). When it is pressed and held, the output pressure decreases as fast as possible.

When desired set point is getting closer, release the button before the set point is reached. After releasing, the output pressure stabilizes after a short waiting time.

Coarse Adjustment Down button can also be locked by pressing and holding it and pressing the Fine Adjustment Down button at the same time. Locking is indicated by the Coarse Adjustment Down button lighting up. After locking you can lift your fingers from the buttons.

Locking can be released by pressing any of the the arrow buttons. Then the ePG holds the generated pressure and waits for further instructions. Please notice, that if the Power or Vent / Mode button is pressed to release the lock, the device either switches itself off or vents itself.

Using the ePG as remotely controlled pressure controller

Beamex ePG can be used as an automatic pressure controller, which can be controlled remotely with a Beamex MC6 family calibrator when both devices are connected via a USB cable.
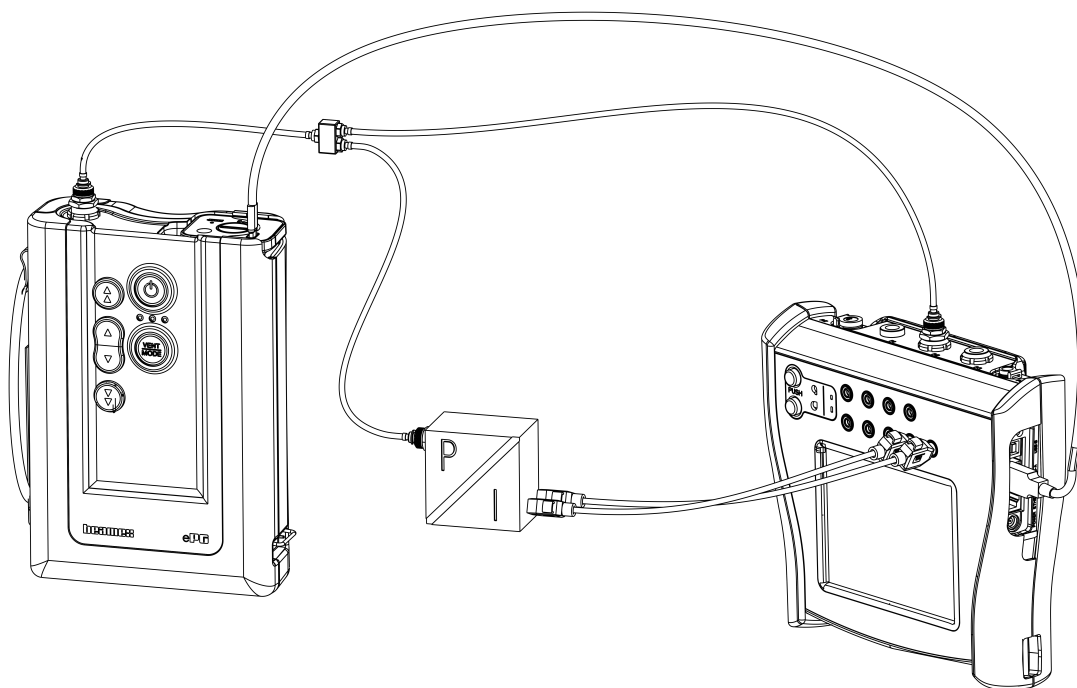
Figure 14: ePG and MC6 connected

To utilize this functionality, you have to complete the following steps:

- update your Beamex MC6 family calibrator firmware to version 4.30 or later
- buy and install the "Pressure controller communication, ePG" option to your Beamex MC6 family calibrator
- update the ePG firmware to version 2.00 or later. More info about the ePG firmware update can be found in Firmware update chapter and in the *ePG Firmware update instructions* leaflet.

Please notice that all ePG devices with a serial number 20220160 or higher have the firmware version 2.00 or later installed, when shipped from the factory.

More info about controlling ePG with Beamex MC6 family calibrator can be found in the *Quick-Reference Guide on using the ePG together with other Beamex products* or in Application notes.

Troubleshooting

System is not holding the set pressure.	
INDICATION	SOLUTION
Calibrator or external pressure measuring device indicates that there is a leak in the system.	Check that all pressure connections are tight enough and they are not leaking.

Pressure/Vacuum can not be generated.	
INDICATION	SOLUTION
1. Power button and the yellow LED flashing alternatively. The green LED is off.	**1.** ePG's internal temperature is under or over the limits. All functions to change the pressure towards 0 bar / 0 psi are available. Let the ePG temperature return to normal (only green LED lights up).
2. The yellow LED is blinking and the Power button is very bright.	**2.** There might be a major fault in ePG. Power the ePG off and on to check if the fault disappears. If the fault indication reappears, send your ePG to Beamex for service.

Output pressure changes in the wrong direction.	
INDICATION	SOLUTION
	Internal pressure sensor readjustment is needed. First connect the ePG to a pressure calibrator or a pressure indicator with a pressure hose or just plug the output connector. The internal pressure readjustment procedure is started by pressing and holding Vent / Mode button while powering ePG on. During the process, Green LED is blinking and it lights up when ePG is ready to use again. Please notice that this takes several minutes.

Battery Pack is not charged.	
INDICATION	SOLUTION
Green LED in the Battery Pack is off.	Wrong type of charger is connected. Use the charger that came with the ePG or make sure your charger meets the minimum requirements (see Table 1: Specifications table).

ePG does not start even if the battery is full.	
INDICATION	SOLUTION
ePG feels very warm.	Let the ePG temperature return to normal. When the internal temperature rises > 60 °C / 140 °F, the ePG stops working.

Maintenance

⚠️ **Warning:** If you have to open the back cover for maintenance, remove the Battery Pack.

ⓘ **Note:** Tools needed for service: TX8, TX9 and TX10 screwdrivers, flat-head screwdriver, 16 mm wrench, and 6 mm hex key.

Cleaning Instructions

- It is recommended that after heavy use*, ePG should be dried by pressing and holding Coarse Adjustment Up button for 1-2 minutes without the hoses/connectors connected. By doing so you can remove possible condensation from ePG and dry the system/device.

  ⓘ **Note:** Please notice that the ePG must be in the Pressure mode during drying procedure.

- If any parts of ePG require cleaning, use a cloth damped with a water-based or alcohol-based solvent. Alternatively, use low concentration of hydrogen peroxide or mild solution of mild soap water. Never use any strong detergents.
- If ePG does not increase pressure fast enough, you can open the device and the valve cover and blow some compressed air into the device. You can also clean the Non-return Valves with paper. Detailed instructions of basic maintenance are described in the following subchapters.

heavy use equals more than 10 up-down calibrations per day

⚠️ **Warning:** Be careful not to get any liquid into the connectors of the battery compartment. Without battery, the device is not water resistant and any liquid may damage the PCB boards or the Battery Pack. Please notice also that the Battery Pack is not water resistant when it is removed from the device.
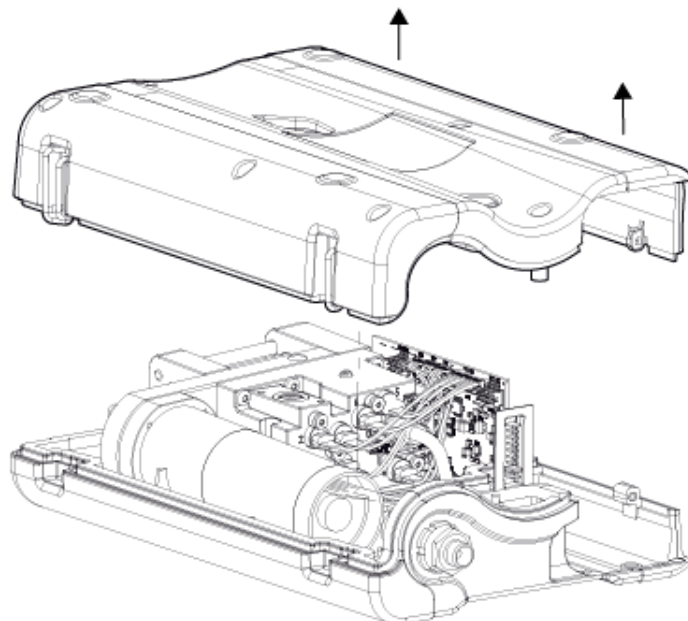
Cleaning the Out Valve

1. Unscrew all the screws from the back cover. Be aware of the one screw located in battery compartment (1).
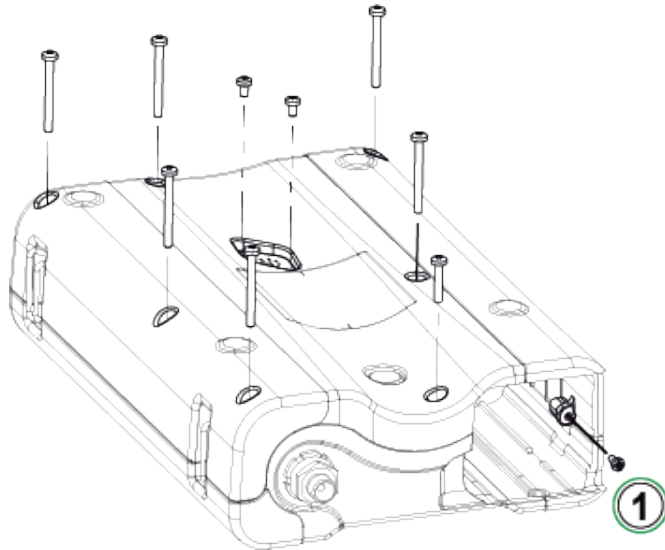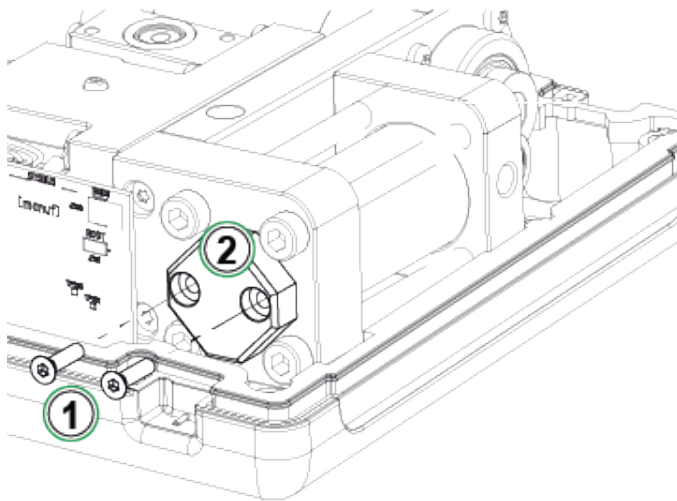

Figure 15: Step 1

2. Gently lift the back cover and make sure that the main PCB stays in its place in the front cover.
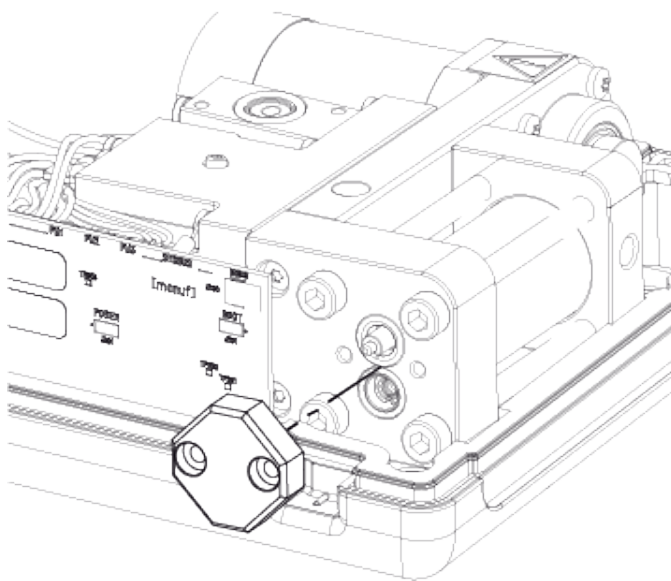

Figure 16: Step 2

3. Unscrew the two screws (1) from the valve cover (2).

Figure 17: Step 3

4. Remove the valve cover.

Figure 18: Step 4

5. Remove and clean the spring (1) and Out Valve (2). You can blow some compressed air in the In Valve (3). Before doing so you should manually turn the Piston Assembly in up position (piston as near the Non-return Valve package as possible) to prevent the In Valve from sliding inside the cylinder.
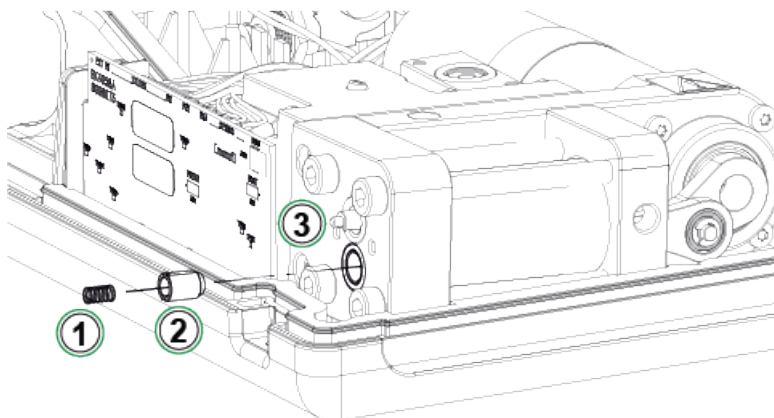
Figure 19: Step 5

Changing the Non-return Valve Package or Cylinder

ePG Non-return valve service kit is available (8006145).

ePG Cylinder service kit is available (8006140).

1. Remove the back cover (see steps 1-5 in chapter Cleaning the Out Valve).

2. Manually turn the Piston Assembly in lower position so that you can see the screw (1) behind the Cylinder Guiding End (2) and unscrew it.
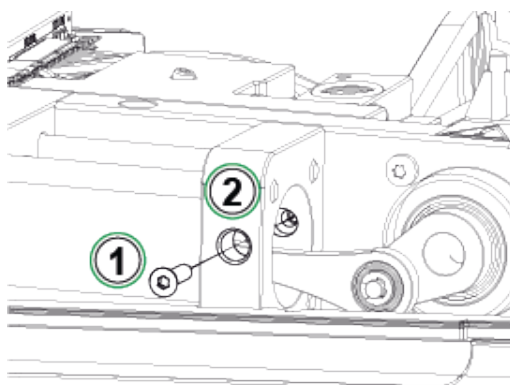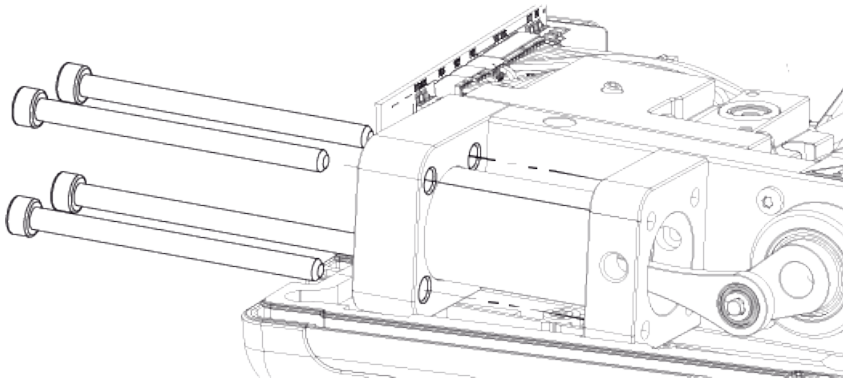

Figure 20: Step 2

3. Unscrew the following two screws (1) from the pump mechanism and lift the whole mechanism slightly up.
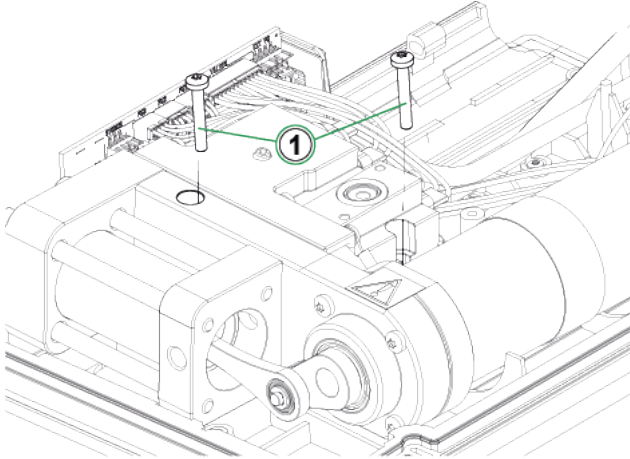
Figure 21: Step 3

4. Unscrew the four screws holding the cylinder ends together. When reassembling, tighten the screws with 2.5 Nm of torque.


Figure 22: Step 4

5. When the screws are unscrewed, lift the Guiding End and the cylinder (1). Before lifting the cylinder, push it slightly backwards and turn it a bit to the right so it can be easily lifted up. Be careful not to slide the cylinder downwards in a way that the piston seal comes visible from the top of the cylinder. If it happens, you first have to remove the piston seal (Figure 27: Step 4) and then remove the cylinder to get the piston back into the cylinder.
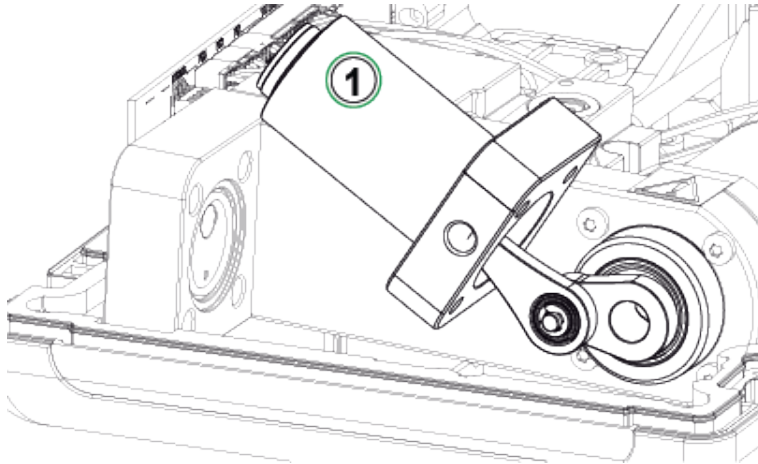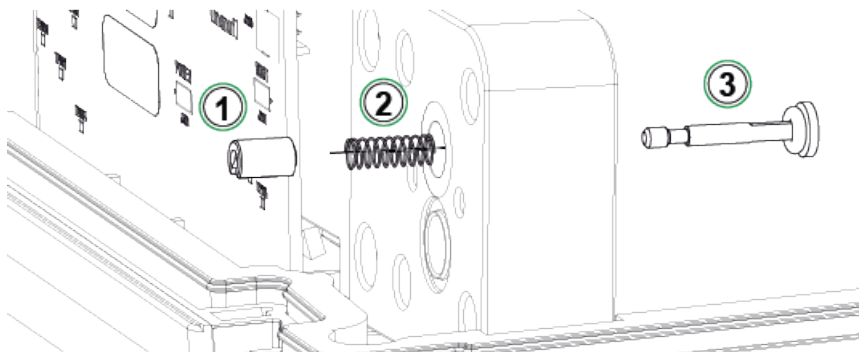

Figure 23: Step 5

6. Place the device sideways so that the In Valve (1) is facing upwards. Move the Valve Sleeve (2) aside so valve can come out from the cleft.
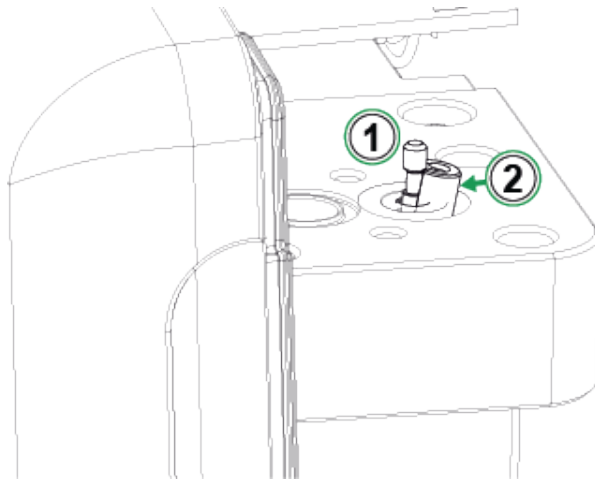
Figure 24: Step 6

7. Clean and change the In Valve Sleeve (1), spring (2) and In Valve (3). You can also clean and change the o-rings and the whole cylinder.


Figure 25: Step 7

8. For instructions on how to change the Out Valve, please see Step 5 in chapter Cleaning the Out Valve.

9. Assemble the device in the opposite order.

Changing the Piston Seals

ePG Piston Seal Service kit is available (8006130).

1. Remove the back cover (see instructions in chapter Cleaning the Out Valve).

2. Follow the steps 2 - 5 described in chapter Changing the Non-return Valve Package or Cylinder).

3. Remove guiding end and cylinder.
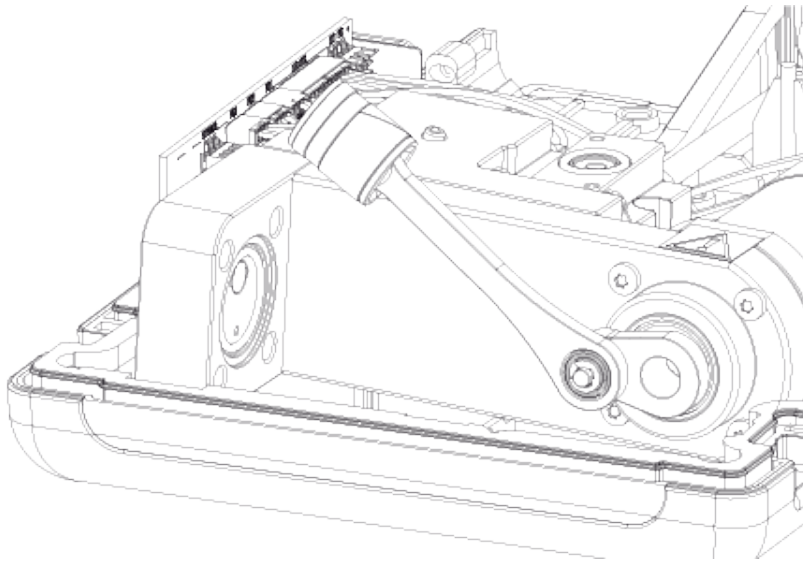
Figure 26: Step 3

4. Unscrew the M3x6 screw (1), remove the Piston Top, Piston Seal (2) and Guiding Ring (3). Open up or break the Guiding Ring for example with a screwdriver so that the Guiding Ring can be changed.
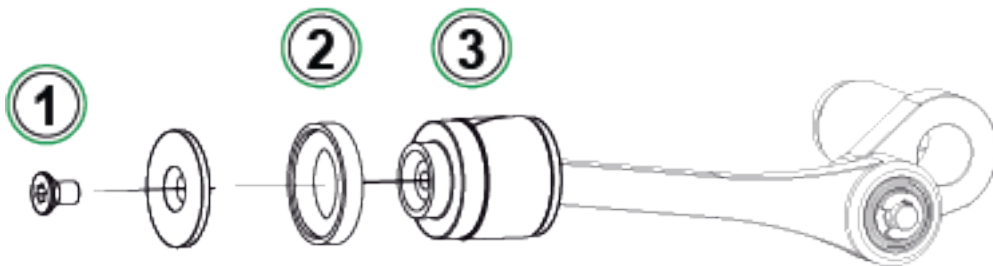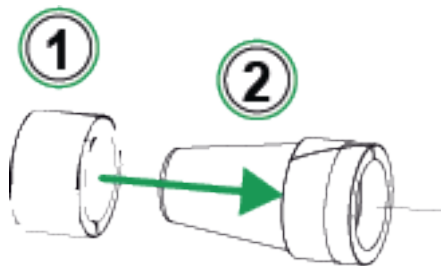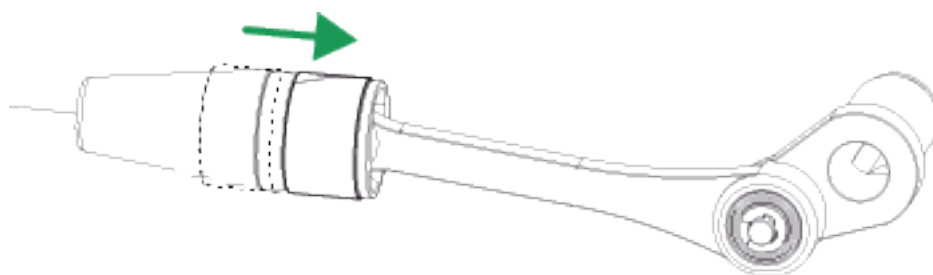

Figure 27: Step 4

5. All the parts removed.

Figure 28: Step 5

6. Push and slide the new Guiding Ring (1) over the replacement tool (2). The Guiding Ring is tight and because of that you need to use a tool to get it in place.
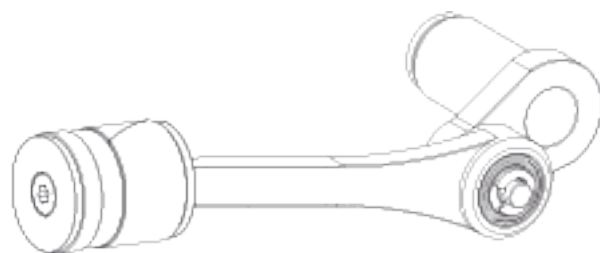

Figure 29: Step 6

7. Push the Guiding Ring and the replacement tool against the piston. Then push the Guiding Ring over the piston into place.

Figure 30: Step 7

8. Take a new o-ring and a new Piston Seal (see part (2) in Figure 27: Step 4). Slide them into place and tighten with Piston Top and new M3x6 screw.


Figure 31: Step 8

Changing the Adhesive Vent

Set of Adhesive Vents (8006165, 3 pcs).

Adhesive Vents equalize pressure inside sealed enclosures. ePG's Adhesive Vent can be found on the bottom of the battery compartment. Adhesive Vent should be replaced when it has become loose or dirty.

1. Remove the back cover (see steps 1-2 in chapter Cleaning the Out Valve) and then turn the cover upside down.

2. Peel off the used Adhesive Vent and clean the surface.

3. Attach the new Adhesive Vent. Press it firmly with finger from the edges to ensure that the entire Adhesive Vent is pressed against the surface. Please wait 24 hours before using the device.

> **Note:** Avoid direct contact with the active (center) area of the Adhesive Vent.
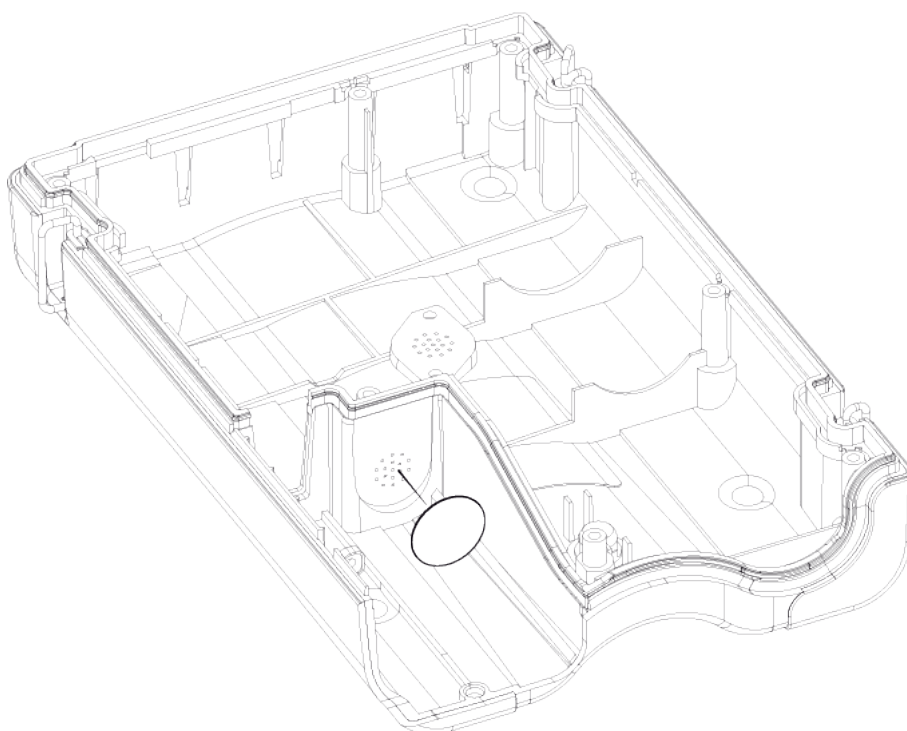

Figure 32: Step 3

Cleaning or changing the Mesh Filter

Set of Mesh filters (8006160, 5 pcs).

A Mesh Filter prevents impurities from getting into the ePG during venting.

Mesh Filter might require cleaning or changing from time to time. It can be found under the output connector.

To clean the Mesh Filter, remove the output connector (with a 16 mm wrench) and disconnect the Mesh Filter with a flat-head screwdriver. If these steps do not help/solve the problem, you can order a service kit from Beamex.
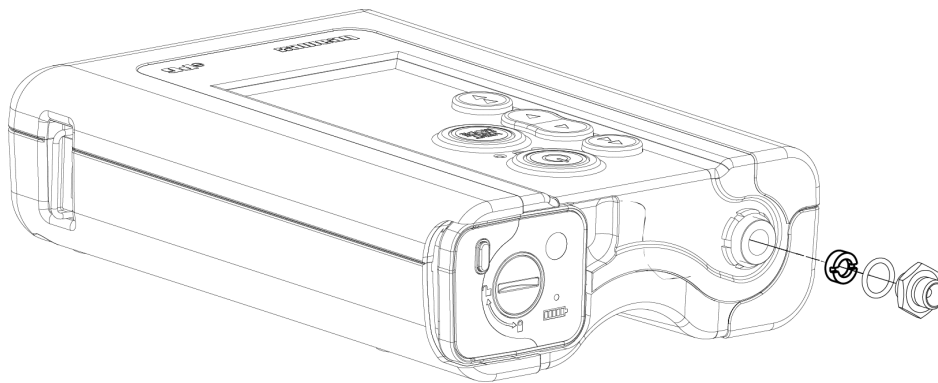
Figure 33: Cleaning or changing the Mesh Filter

Firmware update

Check for ePG firmware updates at the Download Center (https://www.beamex.com/download%20center). Please read the instructions and the accompanying release note carefully. Follow the instructions to update the firmware version.

Related Products

There is an increasing number of devices that can be used together with ePG. The following list includes devices that are already available (valid when this manual was printed):

- Beamex MC2/4 family calibrators
- Beamex MC6 family calibrators
- Beamex EXT External Pressure Modules

Disposal of Waste Electrical and Electronic Equipment

Beamex and WEEE

Beamex is an environmentally conscious company developing products with a view to ensure that they are easy to recycle and do not introduce hazardous materials into the environment.

In the European Union (EU) and other countries with separate collection systems, waste from electrical and electronic equipment (WEEE) is subject to regulations.

EU WEEE Directive 2012/19/EU (the WEEE Directive) requires that producers of electronic equipment are responsible for the collection, reuse, recycling and treatment of WEEE which the Producer places on the EU market after August 13, 2005. The objective of this regulation is to preserve, protect and improve the quality of the environment, protect human health, and conserve natural resources.

The symbol visible above is printed on the product's rear cover sticker. It indicates that this product should be handed over to applicable collection point for the recycling of electrical and electronic equipment.

For more detailed information about recycling of this product, please contact your local representative or your waste disposal service.

Service and transportation instructions

You can perform basic maintenance (e.g. changing the seals and non-return valves) by yourself. More complex maintenance and repairs must only be performed by Beamex's service team or an authorized representative.

When sending ePG for service, place it in its original package, as received upon the delivery from Beamex.