



Contents

1. Information on This Operating Instruction	1
1.1 Pictographs Used	2
1.2 Exclusion of Liability	2
2. Safety Instructions	2
3. Device Description	3
3.1 Intended Use	4
4. Technical Data	4
5. Preparation, Functions and Measuring Process	5
6. Maintenance / Cleaning, Storage and Transport	6
7. Dismounting and Disposal	7
8. Declaration of Manufacturer	8

1. Information on This Operating Instruction

- The manual is aimed at specialists and semi-skilled personnel.
- Please read the instructions carefully before carrying out any operation and keep the specified order.
- Thoroughly read and understand the information in chapter 2 "Safety Instructions".

If you have any problems or questions, please contact your supplier or contact us directly at:

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Operating Instructions

Comparison Pumps PS 60-P / PS 600-P

1.1 Pictographs Used

In this manual, pictographs are used as hazard warnings.

Particular information, instructions and restrictions designed for the prevention of personal or substantial property damage:



WARNING! Is used to warn you against an imminent danger that may result in personal injury or death.

IMPORTANT! Is used to warn you against a possibly hazardous situation that may result in personal, property or environmental damage.

CAUTION! Is used to draw your attention to important recommendations to be observed. Disregarding them may result in property damage.



The following symbol highlights **actions** you have to conduct or **instructions** that have to be strictly observed.

1.2 Exclusion of Liability

We accept no liability for any damage or malfunction resulting from incorrect installation, inappropriate use of the device or failure to follow the instructions in this manual.

2. Safety Instructions

Please read this operating instruction thoroughly before operating the comparison pump.

Disregarding the containing warnings, especially the safety instructions, may result in danger for people, the environment, and the device and the system it is connected to.

The comparison pump corresponds with the state of engineering at the time of printing. This concerns the operating mode and the safe operation of the device.

In order to guarantee that the device operates safely, the operator must act competently and be conscious of safety issues.

The ARMANO Messtechnik GmbH provides support for the use of its products either personally or via relevant literature. The customer verifies that our product is fit for purpose based on our technical information. The customer performs customer and application specific tests to ensure that the product is suitable for the intended use. With this verification, all hazards and risks are transferred to our customers. Our warranty expires in case of inappropriate use.



Qualified personnel:

The personnel that is charged for the installation, operation and maintenance of the comparison pump must hold a relevant qualification. This can be based on training or relevant tuition. The personnel must be aware of this manual and have access to it at all times.



General safety instructions:

- In all work, the existing national regulations for accident prevention and safety at the workplace must be complied with. Any internal regulations of the operator must also be complied with, even if these are not mentioned in this manual.
- Use the comparison pump in its perfect technical condition only. Damaged or defective instruments need to be checked immediately and replaced if necessary.
- Only use appropriate tools for mounting, connecting and dismantling the comparison pump.
- Nameplates or other information on the device shall neither be removed nor obliterated, since otherwise any warranty and manufacturer responsibility expires.



Special safety instructions:

Warnings, which are specifically relevant to individual operating procedures or activities, are to be found at the beginning of the relevant sections of this operating instruction.

Operating Instructions

Comparison Pumps PS 60-P / PS 600-P

3. Device Description

The comparison pump models PS 60-P and PS 600-P are pressure generators and used for comparative measurements. They are suitable for testing and adjusting pressure measuring devices.

Model PS 60-P is applicable for pressure ranges from 0 to 60 bar and model PS 600-P is applicable for pressure ranges from 0 to 600 bar. For testing, acid-free, thin oil or distilled water (for the special versions) is used as medium.

The spindle pump serves to generate the pressure. The test item is compared to a pressure measuring device with higher accuracy (e.g. model overview 2000 Test Gauges, model overview 10000 Calibration Technology).

Comparison pumps on a base plate are small, lightweight, handy and can be mounted easily on a workbench or applied mobile on site.

Components:

- ① Pump system (piston with spindle – turnable via handwheel – for pressure generation, cylinder serving as pressure chamber)
- ② Base plate
- ③ Connection for test item
- ④ Connection for reference device
- ⑤ Reservoir for the medium with stop valve ⑥
- ⑦ Stop valve with clamping sleeve for test item
- ⑧ Stop valve with clamping sleeve for reference device

All parts are mounted on a base plate ② and connected by tubing.

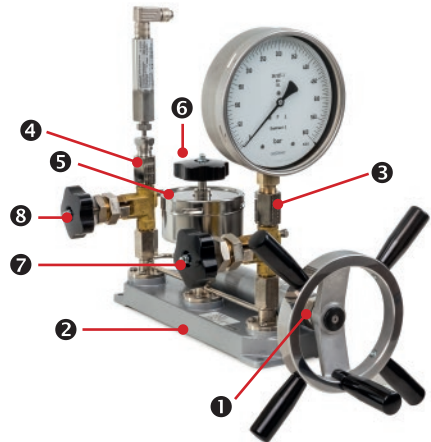
Nameplate and label:

The nameplate is placed on the back of the comparison pump. It contains the most important technical data and information.

Scope of delivery:

The delivery includes – in addition to the comparison pump:

- 1 operating instruction
- 1 l special oil or
 - 1 l distilled water (for the special versions)
- 2 special gaskets for connections, with 2 encased O-rings (mounted)
- 4 O-rings as spare parts
- 2 clamping sleeves G ½ (mounted)
- 2 clamping sleeves M20x1.5



Operating Instructions

Comparison Pumps PS 60-P / PS 600-P

3.1 Intended Use

The comparison pump shall only be used for generating pressure in order to carry out comparative measurements for testing and adjusting pressure measuring devices.

Do not use the comparison pump beyond its specification or contrary to the operating instructions.

The operational safety of the device supplied is only guaranteed by intended use. The specified limit values (⇒ chapter 4 "Technical Data") must not be exceeded. This particularly applies for the adherence to the permissible full scale value and the permissible temperature range.



IMPORTANT! Risk of injury or material damage due to overpressure!

Exceeding the maximum overload values may lead to material failure of the comparison pump. This may also cause serious damage to health.

→ Ensure that the overload values are never exceeded.

Please check if the comparison pump is suitable for your application before ordering and installation.

4. Technical Data

Model	PS 60-P	PS 600-P
Construction type	plate version	
Medium	acid-free, thin oil distilled water ¹⁾	
Standard Special versions		
p_{\min} (operating volume ≤ 0.1 litre)	0 bar	0 bar
p_{\max} (operating volume ≤ 0.1 litre)	60 bar	600 bar
Standard connection	2 connections male G ½ LH, each with 2 clamping sleeves on G ½ right or M 20x1.5 right, incl. double sealing	
Base plate	all parts mounted on aluminum, grey enamelled, 4 mounting orifices $\varnothing 8.5$ mm (0.33")	
Piston and spindle	stainless steel	
Cylinder	brass, grey enamelled blue enamelled ²⁾	
Weight	approx. 7 kg (15.43 lb)	
Temperature range	10 °C to 50 °C (50 °F to 122 °F)	

¹⁾ for the special version for oxygen: wetted parts are free of grease and oil

²⁾ for the special version for oxygen

Operating Instructions

Comparison Pumps PS 60-P / PS 600-P

5. Preparation, Functions and Measuring Process

Before commissioning:

Before putting into operation, the comparison pump should be firmly mounted on the workbench via the 4 mounting orifices in the base plate **2**. Additionally, a visual inspection shall be carried out to check the integrity of the pressure-bearing connection elements.

Initial setting:

For the initial position, ensure that the piston is screwed entirely into the cylinder and that all valves are closed.

Preparation:

The medium reservoir **5** must be filled before commissioning. For filling, open the stop valve **6** and screw out its valve spindle entirely. Now, remove the lid of the medium reservoir and fill the reservoir with medium. Then, close the reservoir again by screwing on the lid. After the filling process, the valve spindle must be screwed in slightly (Do not close valve **6**!).

Now, the pump system **1** is to be filled with the medium. By turning the handwheel counterclockwise, the piston with spindle is screwed out of the cylinder and medium is drawn into the comparison pump. In order to use the entire piston stroke, screw the spindle out as far as possible. The filling process should be executed slowly, otherwise too much air is drawn into the system.

When the filling process is completed, wait 2–3 minutes for the air particles to settle in the medium. To check if the comparison pump is ready for operation, close valve **6** and turn the handwheel slightly clockwise. Open valves **7** and **8** and observe the level in the connections of the valves **7** and **8**.

If any air bubbles are emerging, the filling process is not yet completed. Continue with the clockwise turning of the handwheel until the medium is at the sealing face in the connections of the valves and no air bubbles are emerging anymore.

Now, tightly screw test item and reference device into the connections of the valves **7** and **8**.



IMPORTANT! Attention must be paid to thorough sealing! Please use an appropriate wrench and the designated wrench flat. During screwing in, the pressure measuring devices should never be held at the case!

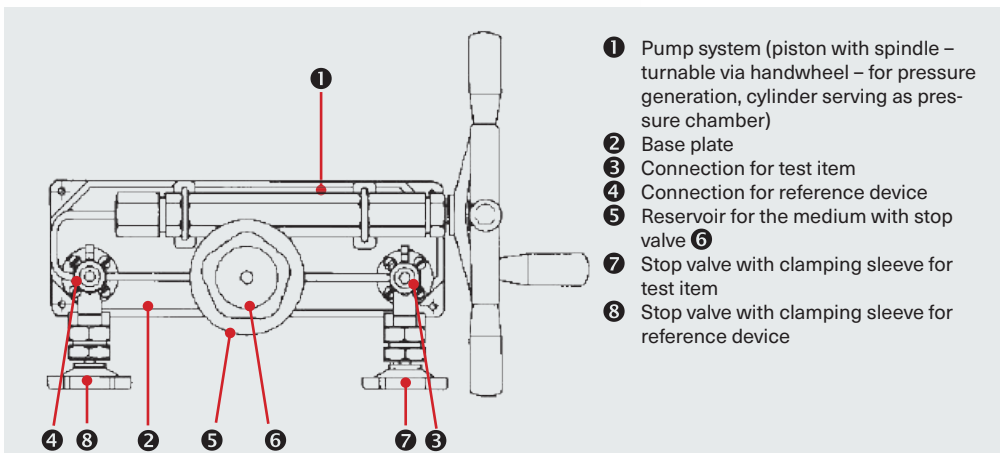


Fig. schematic drawing

Operating Instructions

Comparison Pumps PS 60-P / PS 600-P

Measuring process:

The required test pressure is generated by turning the handwheel clockwise (i.e. the piston is screwed into the cylinder) while valve ⑥ is closed and valves ⑦ and ⑧ are open.



CAUTION! The total travel of the spindle pump is approximately 42 revolutions. At the lower and the upper end a distinct stop is noticeable. Do not attempt to turn beyond those points forcibly! Otherwise, the spindle pump will be damaged!

The generated pressure is indicated on the pressure measuring devices.

The fine adjustment of the pressure is ensued via the stop valves.

The pressure might decrease slightly in case of a prolonged period of testing since small amounts of air particles might be left inside the system.



IMPORTANT! Never open any pressure-bearing connection as long as there is any pressure left in the system!

In particular, do not screw out the test item. Please vent the entire system always completely until no pressure is left in the system!

Refilling the medium reservoir:

If it becomes visible in the window of the medium reservoir that the medium level has fallen, the medium included in the delivery must soon be refilled.

For refilling, open the stop valve ⑥ and screw out its valve spindle entirely. Now, remove the lid of the medium reservoir and fill the reservoir with medium. Then, close the reservoir again by screwing on the lid. After the filling process, the valve spindle must be screwed in slightly.

6. Maintenance / Cleaning, Storage and Transport



CAUTION! Material damage and loss of warranty!

Any modifications or interventions in the device, made by the customer, might damage important parts or components. Such intervention leads to the loss of any warranty and manufacturer's responsibility!

→ Never modify the device or perform any repairs yourself.

Maintenance:

The maintenance is limited to occasional lubrication of the unscrewed spindle with instrument grease (for the special version for oxygen with special grease).

The instrument cannot be repaired by the operator. In case of faults, which cannot be eliminated without interference in the device, please return the instrument to the manufacturer for repair. Any arising repairs may only be executed by the manufacturer.

Cleaning:

- Clean the comparison pump with a dry or slightly dampened lint-free cloth.
- Do not use any sharp objects or aggressive agents for cleaning.

Storage and transport:

- Use the original packaging or comparable packaging for transport.
- Avoid impacts or strong vibrations.
- Protect the device against moisture.

Operating Instructions

Comparison Pumps PS 60-P / PS 600-P

7. Dismounting and Disposal

Before dismounting:

The test item must be unpressurised before dismounting! For this purpose, open the valves **6**, **7** and **8** and let the liquid flow back into the medium reservoir. If necessary, the spindle can be screwed out carefully.

Disposal:



NO DOMESTIC WASTE!

The comparison pump comprises various materials. It shall not be disposed of together with domestic waste.

→ Bring the comparison pump to your local recycling plant

or

→ send the comparison pump back to your supplier or to the ARMANO Messtechnik GmbH.

8. Declaration of Manufacturer

Herstellererklärung

Declaration of Manufacturer

Für die nachfolgend bezeichneten Erzeugnisse

We hereby declare for the following named goods

VERGLEICHS-PRÜFPUMPEN

Typ PH 60-P gemäß Datenblatt 10151
Typ PS 60-P/PS 600-P gemäß Datenblatt 10155
Typ PS 60-G/PS 600-G gemäß Datenblatt 10156

COMPARISON PUMPS

Model PH 60-P according to data sheet 10151
Model PS 60-P/PS 600-P according to data sheet 10155
Model PS 60-G/PS 600-G according to data sheet 10156

und

and

KOLBEN-MANOMETER

Typ PD 1 gemäß Datenblatt 10311
Typ PD 6 gemäß Datenblatt 10312
Typ PD 10/PD 25 gemäß Datenblatt 10313
Typ PD 60/PD 100 gemäß Datenblatt 10315
Typ PD 600/PD 1000 gemäß Datenblatt 10316

DEAD WEIGHT TESTERS

Model PD 1 according to data sheet 10311
Model PD 6 according to data sheet 10312
Model PD 10/PD 25 according to data sheet 10313
Model PD 60/PD 100 according to data sheet 10315
Model PD 600/PD 1000 according to data sheet 10316

Gemäß den Bestimmungen der Richtlinie

According to the regulations of the directive

2014/68/EU (Druckgeräte-Richtlinie)

2014/68/EU (Pressure Equipment Directive)

fallen diese Geräte nicht unter diese Richtlinie und werden weder einem Konformitätsbewertungsverfahren unterzogen noch mit einer CE-Kennzeichnung versehen.

these instruments are not subject to this directive and neither do undergo a conformity assessment procedure nor do they bear the CE mark.

Die Geräte werden nach geltender guter Ingenieurpraxis ausgelegt und gefertigt.

The instruments are designed and manufactured according to sound engineering practice.

124_Herstellerklärung_Vergleichs-Prüfpumpen_Kolben-Manometer_Ausg. 09/18

Diese Erklärung wird verantwortlich für den Hersteller:

This declaration is issued under the sole responsibility of the manufacturer.

ARMANO Messtechnik GmbH

abgegeben durch / by
Grünhain-Beierfeld, 2018-09-21

Bernd Vetter
Geschäftsführender Gesellschafter / Managing Director

ARMANO

ARMANO Messtechnik GmbH

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