

# Contents

1 Purpose .....	2
2 Specifications .....	2
3 Delivery set .....	2
4 Design and principle of operation.....	4
5 Safety measures.....	5
6 Preparation for operation .....	6
7 Operation order.....	7
8 Technical maintenance .....	9
9 Storage.....	7
10 Possible troubles and their elimination.....	8
11 Warranty .....	8
12 Data on claims .....	8
13 Acceptance certificate.....	11
14 Packing certificate .....	11
15 Note.....	11

## 1 Purpose

1.1 Comparison Calibrating Hydraulic Device (GUSK) consists of a manual pump, which allows generating gauge pressure. The device is designed for calibrating elastic element manometers and other measuring instruments, including oxygen manometers, by means of verifying against pressure reference standards.

1.2 GUSK is not a measuring instrument, so reference standards shall be chosen based on the calibrating technique used for calibrating units under test. Reference standards are not included into GUSK basic scope of supply (can be supplied optionally).

1.3 Comparison Calibrating Hydraulic Device is designed for operation in laboratory conditions at ambient temperature 10-30°C with relative humidity not exceeding 80%.

## 2 Specifications

Limit of generated pressure

upper .....	100 MPa, 1000 kgf/cm <sup>2</sup>
lower .....	0 <sup>1</sup> MPa, 0 <sup>1</sup> kgf/cm <sup>2</sup>
Number of connections for units under test .....	2 pcs
Bowl capacity .....	130 ml
Device weight .....	18 kg
Overall dimensions (L×W×H), maximum .....	495×365×295 mm
Working medium .....	oil <sup>2</sup> , water <sup>3</sup> , ethanol <sup>4</sup>

## 3 Delivery set

Basement with pressure generator .....	1
Connecting nut	
M20×1.5 .....	3
M12×1.5 .....	2
G <sup>1</sup> / <sub>2</sub> .....	2
G <sup>1</sup> / <sub>4</sub> .....	2
Plug .....	1
Support .....	4

<sup>1</sup> It's not recommended to use GUSK with measuring instruments with upper measurement limit lower than 0.1 MPa.

<sup>2</sup> Transformer fluid GOST 982-80, GOST 10121-76;

<sup>3</sup> Distilled water GOST 6709-72.

<sup>4</sup> When ordering GUSK, indicate whether ethanol medium option is required (the device is to be equipped with additional systems).

Steering wheel lever .....	3
Manual pump lever.....	1
Pressure release valve.....	1
Bowl.....	1
Bowl cover.....	1
Operating manual, technical datasheet .....	1
Connecting nut handwheel .....	3
<i>Spare parts, tools and accessories:</i>	
Manometer rubber-metal seal .....	20
Sealing insert of fluid drain screw .....	1
Bowl base sealing ring 042-046-25-2-2 (GOST 9833-73) .....	1
Bowl sealing ring 065-070-25-2-2 (GOST 9833-73).....	1
Manual pump seal S02-PD 8x14x5 .....	1
Sealing ring of manual pump and stem assembly.....	2
Stem seal S02-PD 10x18x6.3.....	1
Sealing ring of pressure release valve seat .....	1
Hex wrench S 5.....	1
Hex wrench S 6.....	1

*Design and operating principle on next page →*

## 4 Design and operating principle

The device exterior is shown in Fig. 1.

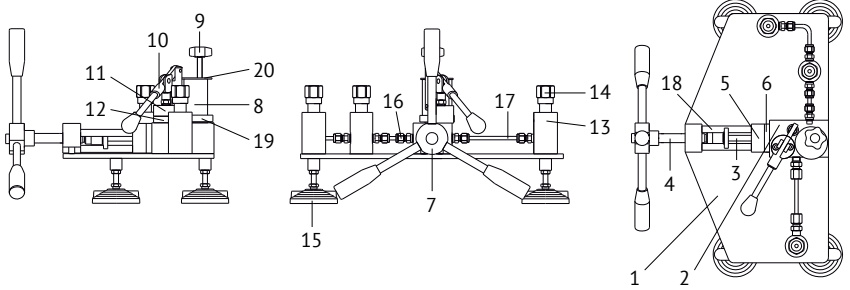


Fig. 1 Comparison calibrating hydraulic device:

- 1 – basement; 2 – basement with pressure generator; 3 – stem;
- 4 – screw; 5 – stem guide bush; 6 – stem seal assembly; 7 – steering wheel;
- 8 – bowl; 9 – pressure release valve; 10 – manual pump;
- 11 – manual pump guide bush; 12 – manual pump seal assembly;
- 13 – stand; 14 – connecting nut; 15 – support; 16 – fitting;
- 17 – high pressure tube; 18 – stud; 19 – bowl base; 20 – bowl cover;
- 21 – fluid drain screw.

4.1 Basement of the device represents steel plate 1 (Fig. 1), with four adjustable supports 15. Basement with pressure generator 2 is designed as a steel rectangular block with internal cavities for main stem, manual pump and all necessary bores and valves. On top of the basement with pressure generator the following equipment is mounted: manual pump 10, bowl base 19, bowl for working fluid 8 and pressure release valve 9. Main stem assembly is installed on the front side of the basement. Stands 13 with nuts 14 are located on both sides of the basement with pressure generator; they are used for connecting the reference standard (right stand) and one or two units under test (left stands). In case of one unit under test a plug is installed into the free stand. The basement with pressure generator and stands are connected to each other by fittings and high pressure tubes. A separate screw 21 (Fig. 21) and 1 (Fig. 1), with a special seal located at the bottom of the basement with pressure generator is provided for draining working fluid from the device. Screw 2 (Fig. 2) is used for draining working fluid from the manual pump cavity.

4.2 Using manual pump 10 (Fig. 1) working medium is pumped from the bowl 8 to the cavities of the main stem and the stands 13 with measuring

instruments. Manual pump is required for pre-compressing the air remaining in connected measuring instruments to reduce its volume. The amount of manual pumping depends on measurement range of the installed measuring instruments, but it shall not exceed 3 MPa. Then, via turning the steering wheel 7 clockwise and the screw 4, which drives the stem 3, required pressure is slowly generated. In order to reduce pressure the steering wheel shall be turned to the opposite direction. Pressure release valve 9 is provided for releasing the residual pressure in the system.

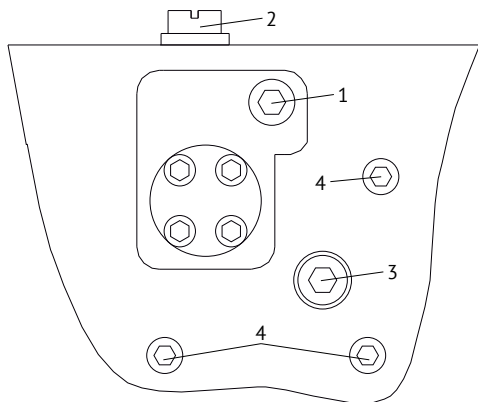


Fig. 2 Position of operating screws:

- 1 – screw for working fluid drain from the main stem cavity;
- 2 – screw for working fluid drain from the manual pump cavity;
- 3 – service screw; 4 – fixing screw of the basement with pressure generator.

## 5 Safety measures

### Attention

This section is aimed to assuring personnel safety during operation and preventing damage of GUSK and pressure measuring instruments used with this device.

5.1 *Never* use this device for other purposes than those specified in this operating manual.

5.2 Before installation of units under test make sure that connecting nozzles are clean and free of damage.

5.3 Use only standard sealing rings.

5.4 Tighten the connecting nuts manually up to the definite stop.

5.5 Make sure that connecting nuts are screwed up to the entire thread on both stand side and unit under test side.

5.6 Tighten pressure release valve with a small torque up to the definite stop.

5.7 *Never* exceed pressure value specified in the operating manual for the instrument.

5.8 Measuring instruments can be dismantled from the device only when pressure is completely released..

## **6 Preparation for operation**

6.1 Unpack the device and wipe it with clean cloth.

6.2 Install the device on a table and, if required, secure it using screws (not included into the scope of supply).

6.3 Install the bowl 8 into the bowl base 16 having applied some amount of working fluid to the sealing ring and internal surface of the bowl base.

6.4 Move the main stem out via turning the steering wheel counter clockwise up to the stop.

6.5 Fill the bowl with working fluid to the level not exceeding maximum (Fig. 3). Do not install the pressure release valve.

6.6 Loosen the screw 7 (Fig. 4) by ½ turn. Slowly operate manual pump until air stops bleeding from under the screw 7. Tighten the screw 7 with a small torque.

6.7 Slowly operating the manual pump, deliver working fluid to the system until it starts to come out through the holes in the stands for units under test, while continuously controlling its level in the bowl. Pump working fluid until air stops bleeding from the bush of the pressure release valve.

6.8 Install rubber-metal seal on the stands and screw on connecting nuts (left-handed thread).

6.9 Install the plug (if required).

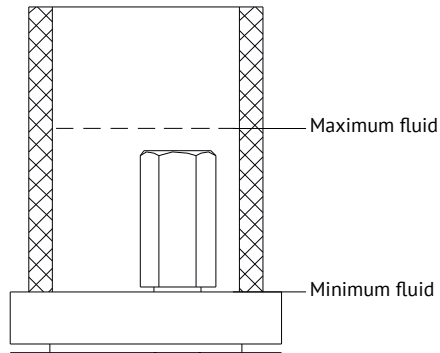


Fig. 3 Level of filling the bowl with working fluid

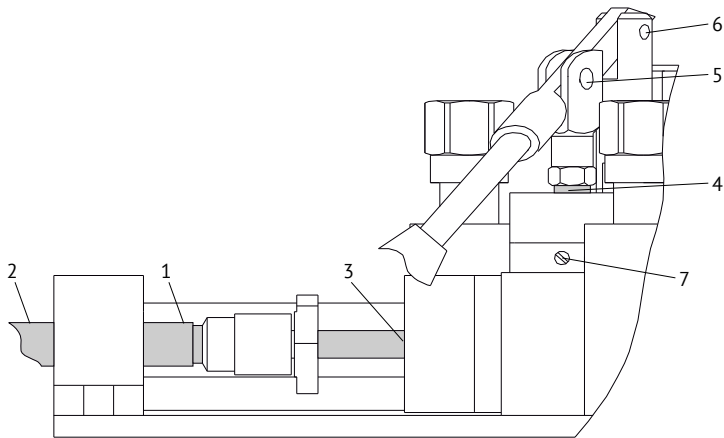


Fig. 4 Preparing to operation

## 7 Operation order

7.1 Measuring instruments calibrating shall be carried out in accordance with calibrating techniques specified for the units under test.

7.2 Check the accuracy of rubber-metal seal installation.

7.3 Install the reference standard and the measuring instrument into their positions on the device by rotating the connecting nuts manually counter clockwise until all the instruments are pressed against the sealing rings. Install the plug (if required). Tighten the connecting nuts manually.

7.4 System final flushing (carried out once after pumping up working fluid into the system and when required). Repeat steps in para. 6.7 (with measuring instruments installed), but operate the pump faster, with 2-4 minutes breaks, until air stops bleeding from the bush of the pressure

release valve.

7.5 Install the bowl cover and pressure release valve.

7.6 Close the pressure release valve 9. This valve is to be closed with a little force applied.

7.7 Slowly operating the manual pump, perform pumping. The amount of pressure generated via manual pumping depends on measurement range of the installed measuring instruments, but it shall not exceed 3 MPa. During pumping the level of working fluid in the bowl will lower. Keep the level of fluid in the bowl under control: it shall not fall below minimum. (Fig. 3)

7.8 Via turning the steering wheel 7 clockwise slowly increase pressure up to the required value. While increasing pressure, check closing degree of the pressure release valve 9.

**Attention**

The air remaining in measuring instruments is heated during compression, and pressure in the system rises. When pressure stops rising, air starts cooling down to the room temperature, and along with that its volume reduces, as well as pressure in the system. It's important to take this into account and wait until the system gets into the thermodynamic equilibrium.

7.9 In order to reduce pressure turn the steering wheel counter clockwise.

**Attention**

When pressure reduces rapidly, the air remaining in measuring instruments cools, and pressure in the system reduces. When pressure stops falling, air starts heating up to the room temperature, and along with that its volume increases, as well as pressure in the system. It's important to take this into account and wait until the system gets into the thermodynamic equilibrium.

7.10 Reduce pressure via turning the steering wheel up to the stop. Residual pressure can be released using the pressure release valve.

7.11 Dismantle the units under test.

7.12 It's recommended to keep the pressure release valve in open position between calibrating operations.



## **Attention**

When you need to calibrate manometers with low upper limit ( $< 6$  MPa), use the manual pump in combination with the steering wheel to increase pressure, and the pressure release valve in combination with the steering wheel to reduce pressure.

## **8 Technical maintenance**

8.1 In order to keep the device in good operating condition it's required to carry out daily and routine maintenance.

8.2 Daily maintenance includes visual inspection and cleaning from dust and dirt with dry clean cloth. Check the presence of working fluid on the surface of stems 3 and 4, and grease on the surface of screws 1 and 2 and on rotation axes 5 and 6 (Fig.4). In case of no or insufficient amount of working fluid or grease on these elements respectively, lubricate the surfaces of screws 1 and 2, and axes 5 and 6 with grease LITOL-24 GOST 21150-87, and apply working fluid to the surfaces of stems 3 and 4.

8.3 During routine maintenance change working fluid after flushing the system according to the following procedure:

8.3.1 Place a proper container under the device and unscrew completely the screw 1 (Fig. 2).

8.3.2 Unscrew and remove pressure release screw.

8.3.3 Operate manual pump until working fluid is completely drained (stops flowing out).

8.3.4 Fill the bowl with clean working fluid.

8.3.5 Repeat steps in paras. 8.6 and 8.7 until the fluid flowing out of the drain hole becomes clean.

8.3.6 Screw up the screw 1 with special seal applying a small torque, only sufficient to prevent accidental losing (leak-tightness of the special seal doesn't depend on torque).

8.3.7 Fill the system with clean working fluid.

8.3.8 Remove dirty and apply clean grease on the surfaces of screws 1 and 2 and rotation axes 5 and 6; lubricate the surfaces of stems 3 and 4 with working fluid.

8.4 Routine maintenance shall be performed as required, but at least every 3 months.

## 9 Storage

9.1 Storing GUSK in laboratory conditions. For storage in laboratory conditions GUSK shall be wiped with clean cloth and covered with a plastic hood.

9.2 Storing GUSK in warehouse. Before putting GUSK into storage wipe it with clean cloth, perform routine maintenance following the steps in paras. 8 – 8.9, 8.11 and pack it into the original package (or similar). The device shall be stored in dry heated room at ambient temperature not lower than +5°C with relative humidity not exceeding 80%.

## 10 Possible troubles and their elimination

<b>Trouble</b>	<b>Cause</b>	<b>Elimination</b>
Manual pump doesn't generate pressure	Sealing ring under the manometer is damaged or not installed	Replace or install the sealing ring
	Butt end of the manometer nozzle is damaged	Replace or repair the manometer
	Manual pump seal is damaged	Replace the valve
	Check valve of the manual pump is faulty	Consult an expert engineer
	Check valve of the manual pump is faulty	Consult an expert engineer
Leakage from under the stem of the manual pump	Manual pump seal is damaged	Replace the seal
Leakage from under the main stem	Main stem seal is damaged	Replace the seal

## 11 Warranty

11.1 The manufacturer guarantees proper functioning of GUSK, when the conditions of operation, storage and transportation are observed.

11.2 Guaranteed service life – 18 months.

11.3 Guaranteed warehouse storage life – 6 months.

11.4 Average lifetime – not less than 8 years.

## 12 Data on claims

In the case of gauge deadweight tester fault, the user should draw up a report about the necessity in repair and about its dispatch to the Manufacturer's address: 2nd Paveletskaya st., 36, Chelyabinsk, 454047, Russia Federation, Alfapascal, phone: +7 (351) 725-74-50, e-mail: q@alfapascal.ru.

### 13 Acceptance certificate

Comparison calibrating hydraulic device (GUSK) serial number \_\_\_\_\_  
complies with Tech.Spec. 4212-001-91357274-2012 and has been accepted  
for operation.

Date of manufacturing

Responsible person

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Surname

Stamp

### 14 Packing certificate

Comparison calibrating hydraulic device (GUSK) serial number \_\_\_\_\_  
was packed at Alfapascal in accordance with Tech.Spec. 4212-001-91357274-  
2012.

Packing date

Responsible person

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Surname

Stamp

#### Note

The manufacturer reserves the right to make alterations in the  
design of the device.

