Contents

1 Purpose

1.1 Gauge deadweight tester with simple piston directly loaded with weights available in models MP-6, MP-60, MP-100, MP-250, MP-400, MP-600 is designed for development and accurate measurement of guagpressure of fluids.

1.2 Deadweight tester is used as a standart at calibrating of gauge pressure measuring instruments, transducers, reference deadweight testers, other measuring instruments as well as metering deadweight testers of lower class of accuracy in special version used under lab conditions at ambient air temperature of 15-30°C and maximum relative air humidity of up to 80%.

1.3 Atcalibrating of oxygen-version measuring instrument it is required to use separation devices.

2 Specifications

Table 1. Specifications deadweight tester

	MP-6	**MP-60**	**MP-100**	**MP-250**	**MP-400**	**MP-600**
Upper measurement limit, MPa *kgf/cm²*	0,6 *6*	6 *60*	10 *100*	25 *250*	40 *400*	60 *600*
lower[2] measurement limit, MPa *kgf/cm²*	0,04 *0,4*	0,02 *0,2*	0,02 *0,2*	0,02 *0,2*	0,02 *0,2*	0,2 *2*
Main measurement range, MPa *kgf/cm²*	0,06...0,6 *0,6...6*	0,6...6 *6...60*	1...10 *10...100*	2,5...25 *25...250*	4...40 *40...400*	6...60 *60...600*
Maximum permissible error in the main measurement range, %, of measured value						
accuracy class 0,005			± 0.005			
accuracy class 0,01			± 0.01			
accuracy class 0,02			± 0.02			
accuracy class 0,05			± 0.05			
Extra measurement range, MPa *kgf/cm²*	0,04...0,06 *0,4...0,6*	0,02...0,6 *0,2...6*	0,02...1 *0,2...10*	0,1...2,5 *1...25*	0,1 ...4 *1...40*	0,2...6 *2...60*
Maximum permissible error in supplementary measurement range, %, of upper limit of supplementary measurement range						
accuracy class 0,005			± 0.005			
accuracy class 0,01			± 0.01			
accuracy class 0,02			± 0.02			
accuracy class 0,05			± 0.05			
Rate of fall of piston, mm/min, max						
accuracy class 0,005	0.2	0.1	0.2	0.2	0.2	0.2
accuracy class 0,01	0.3	0.2	0.3	0.3	0.3	0.3
accuracy class 0,02	0.4	0.2	0.3	0.3	0.3	0.3
accuracy class 0,05	0.6	0.4	0.5	0.5	0.5	0.5

Continued table 1. Specifications deadweight tester

	MP-6	MP-60	MP-100	MP-250	MP-400	MP-600
Piston free rotation duration, min, not less						
accuracy class 0,005	6	10	12	12	12	12
accuracy class 0,01	4	6	6	7	6	10
accuracy class 0,02	4	5	6	6	6	10
accuracy class 0,05	3	4	5	5	5	8
Discrimination threshold, Pa, max						
accuracy class 0,005	3	30	50	125	200	300
accuracy class 0,01	6	60	100	250	400	600
accuracy class 0,02	12	120	200	500	800	1200
accuracy class 0,05	30	300	500	1250	2000	3000
Nominal area of piston, cm^2 1		0.5	0.5	0.1	0.1	0.05
Piston-cylinder unit effective area deviation from nominal, %			1			
Working stroke of the piston, min, mm			10			
Material of cylinder and piston of measurement system			Tungsten carbide			
Working medium			Transformer oil[1]			
Departure from perpendicularity of receptacle bearing surface to piston axis, not over			5’			
Working fluid volume, cm^3, not over			250			
Overall dimensions, L×W ×H, mm, max			500×400×300			
Overall dimensions, L×W ×H, mm, max, for special version			570×400(570)[3]×300			
Weight without set of weights, max, kg			25			
Weight without set of weights, kg, max, for special version			27			

[1] For classes 0.05, 0.02, 0.01 transformer oil GOST 982-80, GOST 1012176, TU 38.1011025-85 with amend 1-5 (hereinafter referred to as transformer oil) is recommended: for class 0.005 recommended are: for MP-6—50% of kerosene +50% of transformer oil; for MP-60…100—kerosene; for MP-250..400—transformer oil; for MP-600—transformer oil (commercial glycerin may be used).

[2] Approximate magnitude. Accurate pressure magnitude of measurement lower limit is calculated on the basis of the measurement system piston actual weight.

[3] Without/with statoscope.

3 Delivery set

Basement with pressure generator 1
Piston-cylinder assembly (PSA) 1
Set of weights with actual weight values, kg *(accuracy class 0.01)*[4] .....
Coupling nut
- M20×1.5 1
- M12×1.5 1
- G½ 1
- G¼ 1

Steering wheel lever 3
Hand pump lever 1
Hex wrench
- S5 1
- S6 1

Rubber-metal seal of tested measuring instrument
- basic version 15
- special version 8

Adapter ..... 2[5]
Special seal (set) 1
Set of rubber rings 1
Plug 1
Operating instructions 1
Test certificate 1

By order: 1) Set of weights reduced to: weight—kg, pressure—MPa (kPa), kgf/cm^2, bar. 2) Transition weight. 3) Piston position control device.

4 Design and principle of operation

4.1 Appearance of deadweight testers MP-6, MP-60, MP-100, MP-250, MP-400, MP-600 in common and special versions is shown in Figs. 1-4.
Deadweight tester runs on the principle of unsealed piston to balance the measured pressure acting at the piston bottom end by the total weight of piston, receptacle and weights set thereat.

[4] Weights are made with mass according to the main range (0.05, 0.1, 0.25, 0.5, 0.8, 2.5 kg) with error corresponding to the piston-type pressure gage of accuracy class 0.02 to be indicated in protocol of their actual weight to accuracy of 0.002% of their mass.

[5] Depending on piston-type pressure gage version.

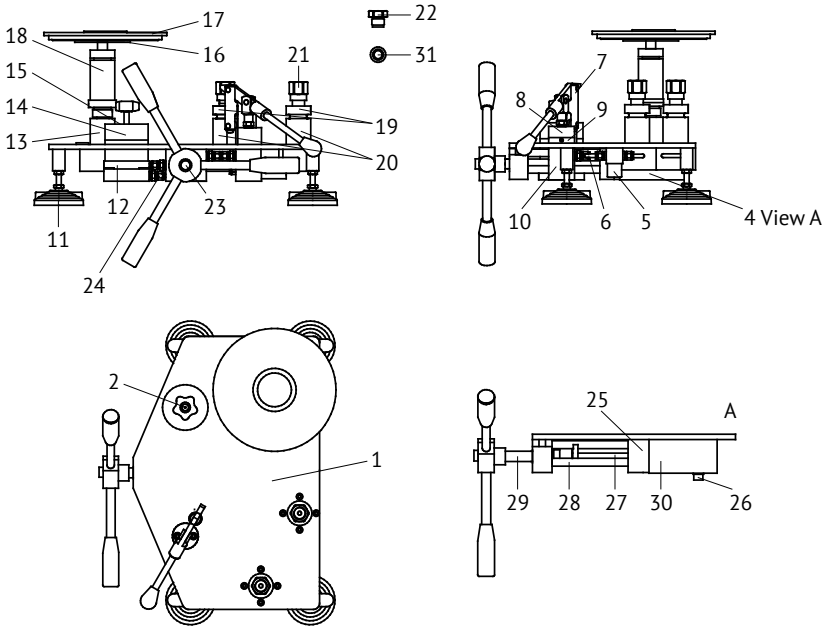

Fig. 1. Deadweight tester MP-6 in common version:
1 — base; 2 — pressure release valve; 3 — level; 4 — main rod assy (view A);
5 — filter; 6 — connection tube; 7 — hand pump; 8 — hand pump guide bush;
9 — hand pump seal washer; 10 — hand pump body; 11 — adjustable support;
12 — barrel base; 13 — PSA post; 14 — barrel; 15 — barrel cup; 16 — receptacle
plate; 17 — weight; 18 — PSA; 19 — adapter; 20 — support for tested measuring
instruments; 21 — coupling nut; 22 — plug; 23 — flywheel; 24 — fitting;
25 — main rod guide bush; 26 — fluid drain screw; 27 — main rod; 28 — stud;
29 — screw; 30 — main unit; 31 — special seal

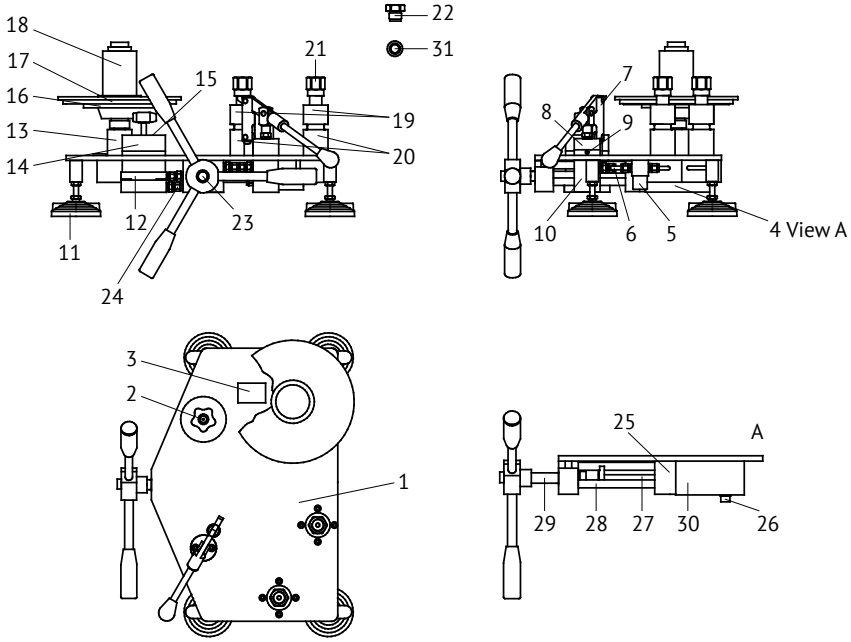

Fig. 2. Deadweight tester MP-60, MP-100, MP-250,
MP-400 and MP-600 in common version:
1 — base; 2 — pressure release valve; 3 — mirror; 4 — main rod assy (view A);
5 — filter; 6 — connection tube; 7 — hand pump; 8 — hand pump guide bush;
9 — hand pump seal washer; 10 — hand pump body; 11 — adjustable support;
12 — barrel base; 13 — PSA post; 14 — barrel; 15 — barrel cup; 16 — receptacle
plate; 17 — weight; 18 — PSA; 19 — adapter; 20 — support for tested measuring
instruments; 21 — coupling nut; 22 — plug; 23 — flywheel; 24 — fitting;
25 — main rod guide bush; 26 — fluid drain screw; 27 — main rod; 28 — stud;
29 — screw; 30 — main unit; 31 — special seal

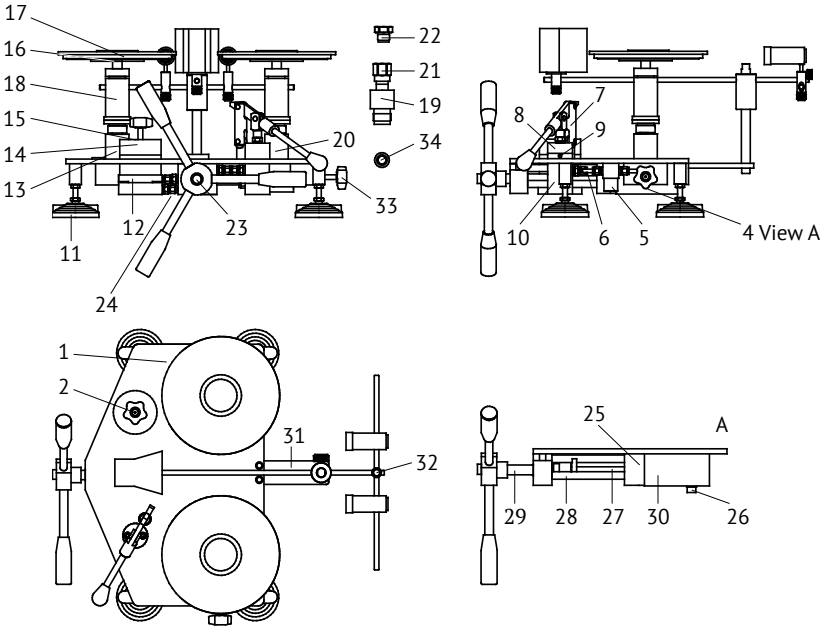

Fig. 3. Deadweight tester MP-6 in special version:
1 — base; 2 — pressure release valve; 3 — level; 4 — main rod assy (view A);
5 — filter; 6 — connection tube; 7 — hand pump; 8 — hand pump guide bush;
9 — hand pump seal washer; 10 — hand pump body; 11 — adjustable support;
12 — barrel base; 13 — PSA post; 14 — barrel; 15 — barrel cover; 16 — receptacle plate; 17 — weight; 18 — PSA ; 19 — adapter; 20 — adjustable post;
21 — coupling nut; 22 — plug; 23 — flywheel; 24 — fitting; 25 — main rod guide bush; 26 — fluid drain screw; 27 — main rod; 28 — stud; 29 — screw;
30 — main unit; 31 — piston(s) position controller base; 32 — piston(s) position controller; 33 — shutoff valve; 34 — special seal

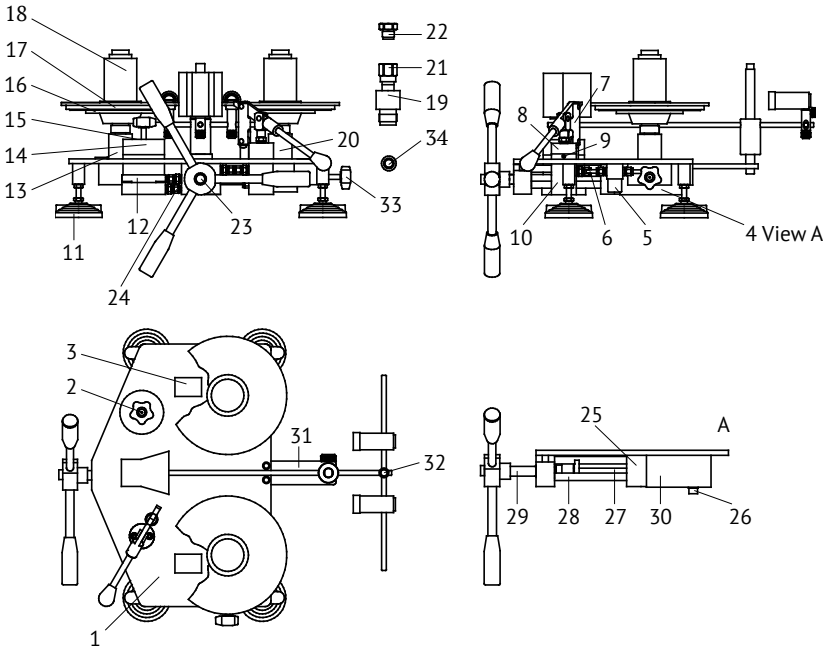

Fig. 4. Deadweight tester MP-60, MP-100, MP-250,
MP-400 and MP-600 in special version:
1 — base; 2 — pressure release valve; 3 — mirror; 4 — main rod assy (view A);
5 — filter; 6 — connection tube; 7 — hand pump; 8 — hand pump guide bush;
9 — hand pump seal washer; 10 — hand pump body; 11 — adjustable support;
12 — barrel base; 13 — PSA post; 14 — barrel; 15 — barrel cover; 16 — receptacle plate; 17 — weight; 18 — PSA ; 19 — adapter; 20 — adjustable post;
21 — coupling nut; 22 — plug; 23 — flywheel; 24 — fitting; 25 — main rod guide bush; 26 — fluid drain screw; 27 — main rod; 28 — stud; 29 — screw; 30 — main unit; 31 — piston(s) position controller base; 32 — piston(s) position controller;
33 — shutoff valve; 34 — special seal

4.2 Deadweight tester is composed of three parts, i.e. pressure development device, Piston-cylinder assembly and set of weights. Deadweight tester base is composed of a steel plate 1 (Figs. 1-4) provided with four adjustable supports 11. Main rod assy consists of guide bush 25, main rod 27, fluid drain screw 26, studs 28, screw 29 and main unit 30. Hand pump 7 is made as a separate unit and consists of case 10, guide bush 8, seal washer 9 and the system of levers. Hand pump is connected with deadweight tester hydraulic system via tubes. Barrel 14 for working fluid is arranged from the left side, as well as pressure release valve 2. PSA is fitted at the left post (PSA post) while tested measuring instruments are set at either adjusted posts 20 (Figs. 3, 4) directly or via adapter 19 (at special-version devices), or at post(s) 20 (Figs. 1, 2) for tested measuring instruments with preliminary fitted adapter 19 at common-version instruments by means of coupling nut 22. Reference PSA vertical position is adjusted by supports 11, while adjustable post vertical position (on special version measuring instruments) is adjusted by screws that attach the adjustable post to the plate. Pressure smooth adjustment is effected by flywheel 23. Oil is fed to assemblies via tubes 6 jointed by fittings 24. Fine filter 5 is connected in hydraulic circuit to up reliability and to prevent device damage.

Main unit lower part has adjusting screw 26 to drain working fluid. Basement with pressure generator can be connected with extra post (ordered specially) by means of special fitting to be placed at one of posts above the plate. Plug is fitted in the fitting in standard version.

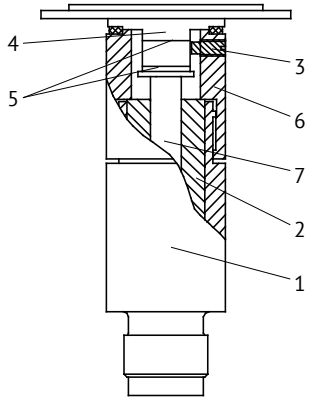

Fig. 5. PSA for MP-6:
1—PSA body; 2—cylinder; 3— lock screw; 4—piston with receptacle; 5— marks

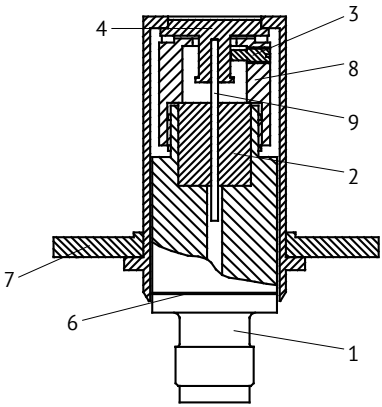

Fig. 6. PSA for MP-60, MP-100, MP-250, MP-400 and MP-600:
1 — PSA body; 2 — cylinder; 3 — lock screw; 4 — receptacle; 5 — bell body;
6 — mark; 7 — bell plate; 8 — nut; 9 — piston

PSA consists of the body, cylinder, lock screw, receptacle, nut and piston. Nut may be used without lock screw. Piston stroke is limited by a hole shifted relative to the PSA axis.

To determine the piston equilibrium, a mark is made at the body lower part (in the case of МП-6, this mark is applied on receptacle lower section). PSA design is shown in Figs. 5 and 6. Weights are flat rings and disks of different diameters.

4.3 Deadweight tester operates as follows. Oil is transferred by hand pump from the barrel via filter in the main unit and posts with measuring instruments fitted in place. Hand pump is required for air precompression in connected measuring instrument for reduction of its volume. Duration and magnitude of hand pumping depend on used measuring instrument and may not exceed 3 MPa. Then, flywheel and moving rod screw are turned clockwise to develop the required pressure. Developed pressure magnitude is defined by the sum of weights placed at PSA receptacle with die allowance for pressure developed by the receptacle. To determine the PSA equilibrium, a mark is made at the body lower part (in the case of МП-6, this mark is applied on receptacle lower section). Mark is observed via the mirror of the device set (МП-6 does not have the mirror because the mark is observed without mirror and other extra means). To reduce pressure, turn the flywheel in opposite direction. To release residual pressure, use the pressure release valve.

5 Safety measures

Attention

5.1 This section serves to provide safe operation of personnel, integrity of the measuring instrument and measuring instruments used therewith.

5.2 It is prohibited to develop pressure above upper measurement limit.

5.3 Protect cargos against mechanical damages.

5.4 Protect PSA against pushes and shocks.

5.5 Use the deadweight tester for designed purpose only.

5.6 Use standard O-rings only.

Attention

Piston-cylinder assembly (PSA) and adapter, if any, are to be tighten by wrench by minor force sufficient for system stable position.

5.7 Other measuring instruments are to be placed at the adapter with the help of coupling nut that should be tightened by hand to tangible force.

5.8 Pressure release valve and shutoff valve (available only in special versions) are to be tightened to tangible force.

5.9 At degreasing and processing of separate parts with gasoline (Б 70 — TU 38.101913-82, Galosha — TU 38.401-67-108-92, oil solvent — GOST 8505-80), exercise care in gasoline handling.

5.10 Place the cargoes on solid and even surface nearby deadweight tester.

5.11 Remove and place the weights at the measuring instrument one by one, by two hands

Attention

5.12 *Never* place the weights on adapter plate, the total weight of which is larger than the bell weight.

6 Preparation for operation

6.1 Unpack the deadweight tester and wipe it with clean rags

6.2 Set the measuring instrument on the table and lock, if required, by screws (not included in the delivery set).

6.3 Dismantle the PSA. For this, proceed as follows. Screw out the lock

screw to withdraw piston with receptacle and cylinder. Screw out nut 6 (Figs. 5, 6) without lock nut 3, detach it with piston and receptacle. Then, withdraw the cylinder and nut from the piston..

Attention guard PSA parts against damages.
Then, wash PSA parts in pure gasoline (B70—TU 38.101913-82, Galosha — TU 38.401-67-108-92, oil solvent — GOST 8505-80) and dry them. Using coarse calico moistened in pure ethanol (GOST 18300-72), wipe working surfaces of piston and cylinder and then dry them with clean coarse calico. Check the cylinder and piston channel surface to make sure there are no traces of frieze, remove it with a cotton wad, if required. Feed piston in the cylinder without excessive force for it, the piston should move without friction. In case of piston move features with no ease, wash the piston pair again. Then, assembly the PSA in reverse sequence as indicated in item 6.3.

6.4 Fit special seal at the PSA post.

6.5 Fit the PSA body with cylinder on PSA post and tighten by wrench with force sufficient for its stable position.

6.6 Pull the main rod, turning the flywheel counterclockwise against the stop to tighten the shutoff valve 33 (Figs. 3, 4) (special version).

6.7 Fill oil in the barrel to the level not over the maximum one (Fig. 7). The pressure release valve should not be incorporated therewith.

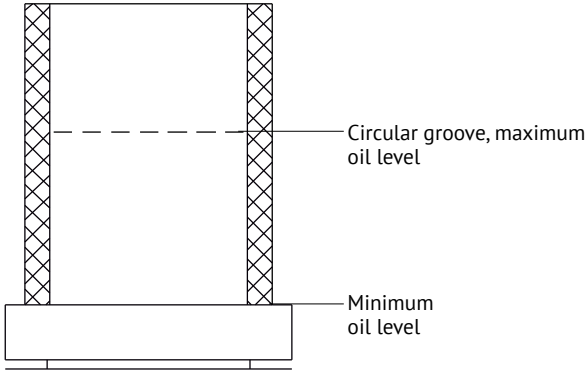

Fig. 7. Oil fill level in barrel

6.8 Loose screw 1 (Fig. 8) by ½ turn. Smoothly work by hand pump unless

air bubbles stop running from under the thread of screw 1. Then, tighten screw 1 by minor force.

6.9 Set and close the pressure release valve.

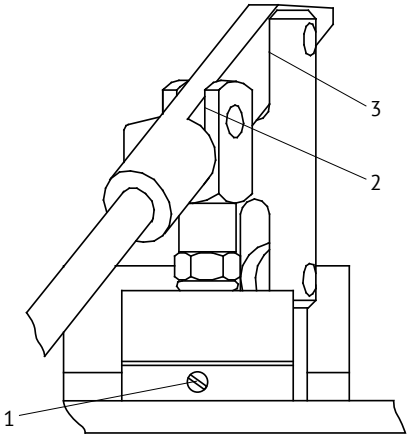

Fig. 8. Hand pump assy

6.10 At the posts for tested measuring instruments fit adapters (for common version models) or the tested PSA body (adapter) after shutoff valve is opened (for special version models).

6.11 Use smooth pumping to force oil in the system so that oil does not splash out from the PSA body and adapter holes (of tested PSA body) and continuously control the oil level in the barrel (add, if required). When oil level in adapter holes lifts to top edge, coupling nuts are to be fitted in adapters, as well as rubber-metal seals and plugs (at deadweight tester in common version and special version at the use of adapter at post 20 (Figs. 3, 4)). Force oil unless it appears in the PSA cylinder channel.

6.12 Turn the flywheel to up the oil level in the PSA to the cylinder top surface with minor outflow so that oil rises a bit above its surface.

6.13 Grease the PSA cylinder with oil and move the cylinder lower end to cylinder hole and accurately fit it therein. In case the nut has not lock screw, fit first the piston in the shifted opening of nut 6, Figs. 5, 6.

Attention

Do not apply force to the piston at fitting it in the cylinder because oil in the cylinder channel impedes it. Use the flywheel to slightly down the level in cylinder channel lowering the piston at a time, so that air intake does not occur.

In special version deadweight tester, the piston is first fitted in the same PSA body where oil appears without manipulation with flywheel, and then, set the second piston in compliance with item 6.13.

After that, tighten the lock screw at the PSA body or the same nut (in the version without lock screw).

6.14 Open pressure release valve and smoothly pump the deadweight tester unless air bubbles disappear from the barrel.

Attention

Check that the PSA receptacle does not go up or down at pumping (put the standard weight on receptacle if it goes up).

6.15 Adjust the PSA post vertical position. For this, set the level on the PSA receptacle to adjust its vertical position with the help of sliding adjustable supports 11 (Figs. 1-4). Then, adjust the vertical position of the second post (special version) by adjusting screws, first, in one plane, and then in another one by slackening one screw by half the turn and tightening the opposite screw.

6.16 After that, plugs maybe removed from the adapters.

6.17 Assemble the bell by screwing the bell plate on the bell body (if available in the deadweight tester delivery set).

6.18 Assemble piston position control device, if available in the deadweight tester delivery set.

6.19 Place base 31 (Figs. 3, 4) of the piston position control device on deadweight tester base.

6.20 Screw post 5 (Fig. 9) on the rear part of the piston position control device base.

6.21 6.21 Lock bush 6 (Fig. 9) at post 5.

6.22 6.22 Screen 1 is to be secured at one edge of rod 3 (Fig. 9) while rod 4 with illuminators is to be fitted at the opposite edge as shown in Fig 9. The position of illuminators should be adjusted so that outline of weights

is seen at the scale of screen 4.

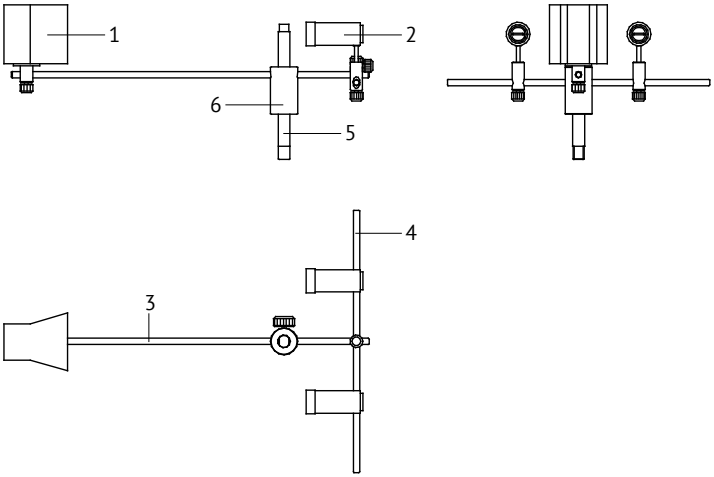

Fig. 9. Piston position control device:
1 — screen; 2 — illuminator; 3, 4 — guide bards; 5 — post; 60 — bush

Attention
Piston position control device may be used only at deadweight testers of special version and is supplied to special orders.

7 Operation procedure

7.1 Deadweight tester may be used for adjustment of the PSA only in special version.

7.1.1 PSA should be tested in compliance with appropriate procedure for particular PSA.

7.1.2 Do not fail to master the safety measures in operation with deadweight tester (section 5).

7.1.3 Prepare deadweight tester for operation in compliance with section 2.2.

7.1.4 Disassemble and flush tested PSA in compliance with its instructions.

7.1.5 Fit special seal and tested PSA body on adjustable post. PSA body to be tightened up by wrench by small force. Then, open the shutoff valve.

7.1.6 Close the pressure release valve (by small force applied by hand) and up the oil level (by flywheel or hand pump) in tested PSA to the

cylinder top edge with minor outflow, that is, oil should be located above cylinder surface by surface forces. Fit piston therein..

Attention

Do not apply force to the piston at fitting it in the cylinder because oil in the cylinder channel impedes it. Use the flywheel to slightly down the level in cylinder channel lowering the piston at a time so that air intake does not occur.

7.1.7 Adjust the vertical position of adjustable post. For this, set the level on the tested PSA receptacle plate and adjust its vertical position by screws designed for attachment of adjustable post to the PSA base. Adjustment is performed in two planes by tightening and loosening of opposite screws by identical magnitude.

7.1.8 Depending on measurement range, it is required to place the bell (Fig. 6) or adapter aluminium plate. In the case МП-6 the weights are fitted directly on receptacle irrespective of developed pressure.

Attention

Do not set nor remove the weights during their rotation to prevent damaging of the PSA. Set and remove the weights only at pressure reduction in the system by magnitude larger than that of removed weight to prevent damaging of the PSA.

At placing the weights at the PSA, first, place heavier weights and, then, light ones. If required, remove light weights, place heavier ones and, then, light ones again.

At application of standard weights, they should be fitted in symmetry, nearby the PSA rotational axis. Total mass of standard weights may not exceed mass of minimum weight of the set of weights of this deadweight tester.

Useful info

Never foul the weights and receptacle.

In case the weights of the device set do not allow setting of test pressure, it is permitted to fit standard weights as per GOST 7328-2001 of F2 accuracy class. Thereat, the developed pressure magnitude will be calculated by the formula specified in Appendix A.

7.1.9 Turn the flywheel clockwise to up the pressure and counterclockwise to down the pressure unless pistons of both PSA refloat. Then, touch the weights by two hands and slightly drive them clockwise at the rate of about 30 rpm.

7.1.10 After measurements at this point turn the flywheel to down the receptacle with weights at the lower thrust.

7.1.11 To set the next test pressure, repeat points 7.1.8-7.1.10, respectively.

Attention

Do not apply asymmetric loads to loaded PSA to avoid its damaging.

Prevent shocks of the measuring instrument receptacle against top or bottom thrusts caused by abrupt change in developed pressure since it can cause the PSA damage..

7.1.12 After all measurements with the tested PSA it is necessary to turn flywheel completely counterclockwise to decrease pressure to zero with the help of pressure release valve.

7.1.13 Between measurements, it is recommended to keep the pressure release valve open.

7.1.14 Withdraw the tested PSA.

7.2 Operation of deadweight tester at testing of elastic-element pressure gages, pressure transducers, etc.:

7.2.1 Check the pressure measuring instruments (elastic-element pressure gages, pressure transducers, etc.) in compliance with test procedures for particular measuring instrument.

7.2.2 Do not fail to master the safety measures in operation with deadweight tester (section 5).

7.2.3 Prepare deadweight tester for operation in compliance with section 2.2. Fit special seal at adjustable post of deadweight tester in special version, tighten the adapter and open the shutoff valve.

7.2.4 Close the pressure release valve by application of low force by hand and up the oil level by hand pump and flywheel in the adapter to top edge and fit rubber-metal seal for tested measuring instrument.

Attention

Control the accuracy of fitting rubber-metal seal in place.

7.2.5 Set tested measuring instrument at the adapter by means of coupling nut.

Attention

Tighten the coupling nut by hand. Joint is sealed by rubber-metal seal and does not depend on tightening force.

7.2.6 Depending on measurement range, it is required to place the bell (Fig. 6) or adapter aluminium plate. In the case MP-6 the weights are fitted directly on receptacle irrespective of developed pressure.

Attention

At placing the weights at the PSA, first, place heavier weights and, then, light ones. If required, remove light weights, place heavier ones and, then, light ones again.

At application of standard weights, they should be fitted in symmetry, nearby the PSA rotational axis. Total mass of standard weights may not exceed mass of minimum weight of the set of weights of this deadweight tester

Do not set nor remove the weights during their rotation to prevent damaging of the PSA. Set and remove the weights only at pressure reduction in the system by magnitude larger than that of removed weight to prevent damaging of the PSA.

Useful info

Never foul the weights and receptacle.

In case the device set of weights does not allow to set the required test pressure it is permitted to fit standard weights as per GOST 7328-2001 of F2 accuracy class for accuracy classes 0.05 and 0.02 and weights F1 for accuracy classes 0.01, 0.005. At that, the developed pressure magnitude will be calculated by the formula specified in Appendix A.

7.2.7 Use hand pump for primary pumping of the system by smooth motions, without shocks or jerks. Magnitude of primary pumping depends on measurement range and structural features of mounted measuring instruments but may not exceed 3 MPa. During primary pumping of the system, oil level in the barrel will be decreased. Check that oil level does not drop below minimum mark (if required, add oil into the barrel).

7.2.8 Turn the flywheel clockwise to up the pressure and counterclockwise to down the pressure unless pistons of both PSA refloat. Then, touch the weights by two hands and slightly drive them clockwise at the rate of about 30 rpm..

Attention

Do not apply asymmetric loads to loaded PSA to avoid its damaging. At turning the weights by flywheel, the PSA should be properly balanced. Balanced position of the measuring instrument is defined by the mark applied at the receptacle lower part (at МП-6 model) or applied at the PSA body lower part (at models МП-60, МП-100, МП-250, МП-400 and МП-600).

Prevent shocks of the PSA receptacle against top or bottom thrusts caused by abrupt change in developed pressure since it can cause the PSA damage.

Useful info

After termination of flywheel rotation and hand pump operation it is necessary to wait for termination of transition thermodynamic processes in the system related with availability of residual air. After stable pressure is set in the system, set the final pressure by smooth rotation of flywheel. Pressure in the system corresponds to set weights. Now, readings of tested measuring instruments may be fixed.

7.2.9 After measurements at this point, turn the flywheel to down the receptacle with weights at the lower thrust.

7.2.10 To set the next test pressure, repeat points 7.2.6-7.2.9, respectively.

7.2.11 After all measurements it is necessary to turn flywheel completely counterclockwise to degrease pressure to zero with the help of pressure release valve.

7.2.12 Between measurements, it is recommended to keep the pressure release valve open.

8 Servicing

8.1 To keep deadweight tester in good working order, it is necessary to carry out daily and current maintenance.

8.2 At daily servicing visual inspection is performed, foul and dust are removed by clean dry rags (if necessary, moistened with pure gasoline

(Б 70 — TU 38.101913-82, Galosha — TU 38.401-67-108-92, oil solvent — GOST 8505-80). Availability of grease is checked at hand pump rod surface, revolving parts and screw surface. If there is no grease or in insufficient amount, screw and hand pump revolving parts are to be greased with LITOL-24 as per GOST 21150-87, while rod surfaces of hand pump rod are greased with transformer oil used in the device.

8.3 At current servicing it is required to change oil with preliminary flushing.

8.4 Screw out completely the drain screw by hex wrench S 6 after deadweight tester is placed at the wood supports sized to 100×100 and 50-100 mm in height, low vessel being placed thereunder (not included in delivery set).

8.5 Tighten the pressure release screw. In the case of deadweight tester in special version it is necessary to preliminary open the shutoff valve.

8.6 Use hand pump to force oil unless complete discharge.

8.7 Fill in the barrel with pure oil.

8.8 Repeat 8.6 and 8.7 unless pure oil flows from the drain hole.

8.9 Tighten the drain screw with rubber-metal seal by low force to tangible thrust sufficient for prevention of spontaneous loosening (tightness of rubber-metal seal does not depend on tightening torque).

8.10 Flush the measuring instrument in compliance with item 6.3.

Screw out cover 2 (Fig. 10) at filter 5 (Figs. 1-4) to withdraw filtering element 4. Flush filtering element, filter cover and wipe the filter inner surface using coarse calico moistened in pure gasoline (Б 70 — TU 38.101913-82, Galosha — TU 38.401-67-108-92, oil solvent — GOST 8505-80) and dry them. Now, fit filtering element, rubber seals and filter cover in reverse order (if required, replace rubber seals and filtering element).

8.11 Fit special seal in the PSA post.

8.12 Fit the PSA body with cylinder on measuring instrument post and tighten by wrench at force sufficient for its stable position and tighten the shutoff valve 33 (Figs. 3, 4) (special version).

8.13 Pull out main rod by turning the flywheel counterclockwise against the stop.

8.14 Fill oil in the barrel to the level not over the maximum one (Fig. 7). Open the pressure release valve.

8.15. Screw out screw 1 (Fig. 8) by ½ turn. Smoothly work the hand pump unless air bubbles stop running from the thread of screw 1. Then, tighten screw 1 to minor force.

8.16 Close the pressure release valve.

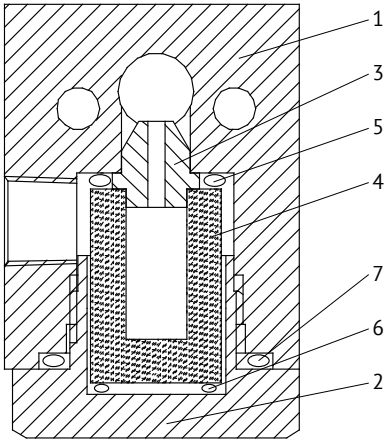

Fig. 10. Filter:
1 — filter case; 2 — cover; 3 — centering bush; 4 — filtering element;
5,7 — O-rings; 6 — tightening rubber ring.

Attention

Filter cover is to be screwed by low force till its contact with filter case. Tightening occurs due to compression of rubber rings and does not depend on tightening torque.

Rubber ring 6 fitted under filtering element should be split.

8.17 Make the jobs in compliance with items 6.10-6.15.

8.18 Grease the surface of screw, revolving parts and surfaces of the main rod and hand pump rod with greases listed above.

8.19 Current servicing to be effected at least once a month.

9 Storage

9.1 Deadweight tester storage in lab conditions.

9.1.1 At storage of deadweight tester in the lab, it is required to wipe it with clean rags and cover with PE cap.

9.2 Storage of deadweight tester in a store room.

9.2.1 Before placing the deadweight tester to storage, it is necessary to perform the servicing in compliance with items 8.4-8.10 and 8.18.

9.2.2 Wipe deadweight tester with clean rags and pack it in Manufacturer's package, or the like.

9.2.3 Keep the box with deadweight tester in compliance with applied

manipulation marks.

9.2.4 Deadweight tester should be kept in dry, heated room, at the temperature not lower than +5°C and relative humidity 60±20%.

9.2.5 Once in six months it is to be represerved (unpack, fill in clean oil, flush, drain oil, grease and pack).

10 Possible troubles and their elimination

Trouble	Cause	Elimination
Hand pump does not develop pressure	Damaged or improperly fitted seal ring under PSA or other measuring instrument	Replace or rearrange seal ring
	Damaged end surface of PSA or measuring instrument union	Eliminate the damage or replace measuring instrument
	Damaged seal of hand pump	Replace seal
	Faulty check valve of hand pump	Call the specialist
	Faulty check valve of the main unit	Call the specialist
	Intake of air into the pump	Fulfill item 6.8
Leaks from under the hand pump rod	Damaged seal of hand pump	Replace seal
Leaks from under the main rod	Damaged seal of the main rod	Replace seal

11 Verification procedures

11.1 In accordance with OIML R110.

12 Warranty

12.1 Manufacturer guarantees the compliance of gauge deadweight tester with the requirements of TU 4212-006-91357274-2011 provided proper transportation, storage and operation conditions are met.

12.2 Warranty lifetime makes 18 months after the date of dispatch of the deadweight tester to the user.

12.3 Mean lifetime — at least 8 years.

12.4 Warranty does not cover all seals and defects caused by intensive application.

13 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 LLC, phone: +7 (351) 725-74-50, e-mail: q@alfapascal.ru.

14 Acceptance certificate

Deadweight tester MP_____ accuracy class_____ version _____ № _____ complies with the requirements of TU 4212-006-91357274-2011 and is considered apt for service

Date of manufacturing

Responsible person _____ _____ Stamp

Signature Surname

15 Packing certificate

Deadweight tester MP_____ accuracy class_____ version _____ № _____ is packed in compliance with the requirements of TU 4212-006-91357274-2011

Date of manufacturing

Responsible person _____ _____ Stamp

Signature Surname

Remarks

The manufacturer reserves the right to introduce modifications in the device design not affecting the primary characteristics without extra notification.

Additional data on the device can be found at the site alfapascal.com/products/mp