



REVALVE

BY PKTBA SINCE 1962



PORTABLE UNIT FOR ON-SITE TESTING OF PRESSURE SAFETY VALVES

Model: PKTBA-D-14-2,0-EX
Max lifting force 2000kgf

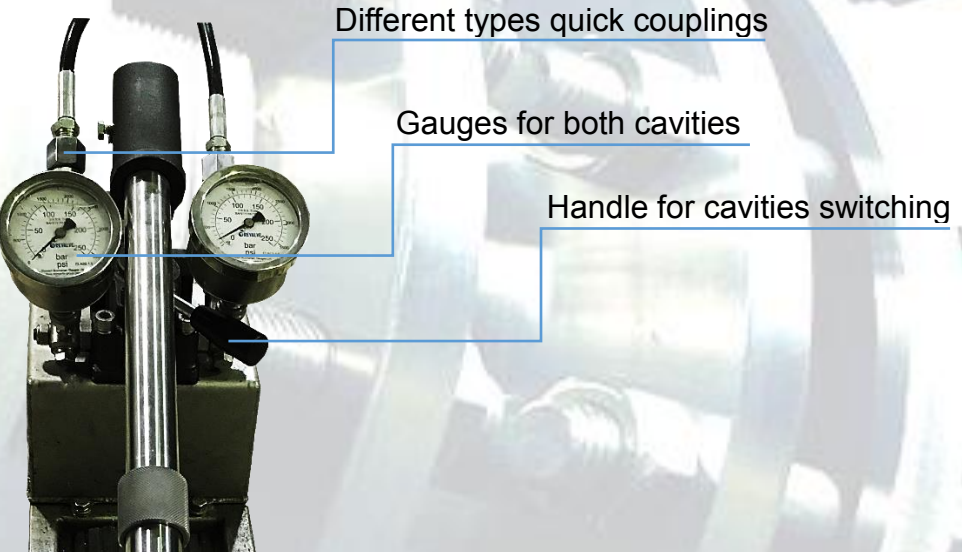
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PORTABLE UNIT FOR ON-SITE TESTING OF PRESSURE SAFETY VALVES

1	Name	Portable Unit for On-Site Testing of Pressure Safety Valves PKTBA-D-14-2,0-EX (Explosion proof edition with manual hydraulic pump)
 <p style="text-align: center;"><i>general view</i></p>		
2	Purpose	<p>The unit is designed for direct spring-loaded PSV on-site testing with recording of the following parameters:</p> <ul style="list-style-type: none"> • inlet pressure; • force applied to spring; • disc lift and positioning; • safety valve noise level. <p>After receiving the test data, unit is able to calculate exact PSV set pressure and create a test report where all key parameters are stated. The unit can be used at the Oil & Gas, Chemical hazardous facilities except underground mine works.</p>
3	Description and Composition	<p>PKTBA-D-14 is a unique device for PSV testing produced by RE-VALVE company. Preciseness, usability and safety were the main features during engineering and developing of this unit. D-14 was developed according to more than 10 years of successful experience. Due to careful and hardworking process REVALVE engineers have solved all the obstacles regarding the unit design during engineering process.</p> <p>Main parts of the unit:</p> <ol style="list-style-type: none"> 1. Explosion proof control box; <ul style="list-style-type: none"> • Control panel • Explosion proof metal cover • ON/OFF switch • Charging socket • Force sensor socket; • Lift sensor socket; • Pressure sensor socket; • Acoustic sensor socket • Charging and ON/OFF signal light

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		<ul style="list-style-type: none"> • Transportation case <p>2. Test rig</p> <ul style="list-style-type: none"> • Height-adjustable stainless steel frame • Force sensor; • Lift sensor; • Pressure sensor; • Acoustic sensor • Hydraulic cylinder with 2 cavities • Clutch for PSV stock holding <p>3. Hydraulic pump</p> <ul style="list-style-type: none"> • Oil tank • Pressure gauges • High-pressure hoses • Transportation case <p>4. Industrial tablet</p> <p>5. Set of cables</p>
4	Explosion proof components	<p>The device is mostly used on LNG's which are located in hazardous areas with high concentration of flammable gases. To prevent fire accidents all of the unit components have an ATEX zone 0 certification so it can be used without any risk.</p>
5	Emergency PSV closing	<p>Opposite cavity of the hydraulic cylinder is pressurized with the hydraulic pump. This feature allows to perform emergency PSV closing remotely. Also both cavities are equipped with 2 different types of quick couplings so it is no risk to connect them wrong.</p> <p>Hydraulic pump is equipped with 2 pressure gauges for both hydraulic cylinder cavities and special handle for switching between operated cavities. This feature allows to perform emergency PSV closing as fast as it needed.</p> 

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At **REVALVE** engineering department, during **laboratory researches** at the unit designing stage, we found, that market available industrial laptops with its operational systems **are not able to provide required sampling frequency**, for precise determination of PSV's set points, during its performance testing when whole test takes less than 30 milliseconds.

The only way to **exclude performance losses** of the operation system is to exclude laptops from test process control and calculations. To do so **REVALVE** have developed **unique control board**, that is able to control test process, and receiving test parameters form all connected sensors in real time with highest sampling frequency rate – 1000 per second. Control box is designed to provide convenient and quick sensor cables connection. This feature makes the testing process user friendly and don't require any special skills.

Implemented know-how, serves to deliver market **highest precise on-site PSV test** unit that correspond **latest API and ASME section standards**.

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Control box



Control board delivers registered data packages to the software for further visualization, and test reports creation.

Control panel of D-14 is built in Explosion proof rigid metal cover.

ON/OFF switch, charging socket and signal lights are placed in the middle part of the control board. Basic scope includes 2 types of charging devices. The first one is for common 220V socket and the second is for charging using car socket.



Explosion proof rigid metal cover with built-in control panel are placed into ergonomic transportation case with several locks, handles and wheels.

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Test rig

Main part of the unit is a stainless steel **test rig**. Test rig is designed for easy assembling without using any tools. It is mounting on top of the spring-loaded PSV for force disc opening. It is designed for creating of the force and applying it to the spring and disc of the PSV. The maximal lifting force applied is **2000 kgf (2 tons)**. Basic scope includes 2 force sensors – 1pcs for 200kgf and 1pcs for 2000 kgf. Sensors can be easily changed on site without using any tools according to the size of tested valve. Construction of the unit requires special clutch with a set of eye bars for different rod diameter up to 24mm (**9, 11, 14, 16, 18 mm – eye bars**).





Assembled stainless steel test rig provides **rigidity, stability** and **preciseness** of test results in any conditions and any sizes of safety valves if all operation and safety instructions are complied

The main part for force creation is **hydraulic cylinder** installed on the top part of the test rig. High pressure oil from the pump is used for its feeding. The cylinder is equipped with 2 quick connections for convenient attaching of HP oil hoses. Connections also reduce air amount inside of the oil circuit for better accuracy and force raising speed.


Disassembled test rig with a set of sensors and clutch with eye bars placed into ergonomic transportation case with rubber covered handle for convenient carrying.



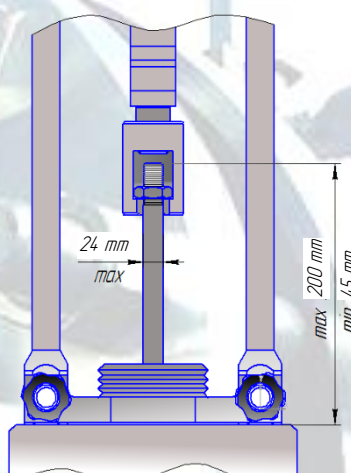
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8	Hydraulic pump	<p>For feeding of the hydraulic cylinder unit is equipped with robust, portable, small and effective hand-operated pump. This pump is light enough to transport it inside the case. Pump outlets are provided with quick connections for easy attaching to HP oil hoses.</p> <p>Pump is mounted on a solid stainless steel frame required to place it on the workshop floor or ground without any damage to inner parts. Small oil tank is mounted inside the frame.</p> <p>Like the other parts of the unit pump is also packed in rigid case with fold handles.</p>	
9	Industrial tablet	<p>One of the most important parts of the unit is an industrial tablet. The tablet is engineered to withstand drops, shocks, spills, vibration, dust, liquid, and more. Independently tested and certified to MIL-STD-810G and IP67 standards, the tablet is salt fog resistant. It is ideal to use in the harsh environments found on offshore oil platforms and oil fields, where a less-rugged device may not survive. For easy carrying and operating tablet is equipped with special ergonomic belt and stylus.</p> <p>All the testing reports are generated and saved on a tablet with option to be sent by e-mail or wi-fi. Software is user-friendly and do not require specific skills to run the system. To perform a test operator needs only to input PSV parameters and start testing.</p>	

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10	Transportation cases	<p>All cases are made in protective rigid design, with wheels and folding handles for easy and quick transportation of all devices to the testing site with only 2 persons involved.</p> 
11	Operation concept	<p>Under operational conditions the following forces are applied to the PSV disc:</p> <ul style="list-style-type: none"> • Force F_{av} from line pressure P_{av} under PSV disc, $F_{av} = \frac{\pi \cdot D_{av} \cdot P_{av}}{4}$ <p>→ D_{av} – average seat diameter of PSV</p> <ul style="list-style-type: none"> • PSV spring force F_{spring}, → if PSV is closed than F_{av} is less than <p>When the pressure of the medium under the valve disc raises to a value of P_{av}, at which the line opening force F_{av} is equal to spring force F_{spring} the opening of the valve begins. This increase of pressure may be substituted by external force F_{sup}, applied to the valve disc spring by the test rig and the hydraulic pump.</p> <p>If the force value applied to the PSV spring by test rig F_t and the average PSV seat diameter D_{av} are known, it is possible to determine the exact PSV set pressure P_o:</p> <ul style="list-style-type: none"> • PSV opening force formula: $\frac{\pi \cdot D_{av}^2 \cdot P_o}{4} = \frac{\pi \cdot D_{av}^2 \cdot P_{av}}{4} + F_t$ <ul style="list-style-type: none"> • Exact PSV set pressure P_o formula: $P_o = P_{av} + \frac{4 \cdot F_t}{\pi \cdot D_{av}^2}$ <p>If the average PSV seat diameter D_{av} is unknown, the software is still able to determine the set pressure, but only after 2 tests with different line pressure under the PSV disc.</p>
12	PSV database	<p>Sometimes it's difficult to measure the seat diameter of PSV. In case of this issue there are 3 ways to solve it</p>

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		<ul style="list-style-type: none"> • Measure it while performing PSV maintenance and disassembling; • Use PKTBA D-14 test with unknown test diameter. But to use this method two tests with different pipeline pressure are needed to be performed. So in most situation during on-site testing it's not an option to adjust the pipeline pressure; • Use PKTBA D-14 PSV database.
Technical characteristics		
1	Maximum force applied to PSV spring and disc	2000 kgf
2	Maximum set pressure determination tolerance	±3% According to international standards: API 526, API RP 576, ASME Section VIII
3	Line pressure measuring devices	4 pressure sensors: 16, 40, 100, 250 bar Accuracy class 0.25
4	Force measuring devices	2 force sensors: 2 and 20 kN Accuracy class 0.25
5	Lift measuring devices	1 lift sensor: 0-15 mm Accuracy class 0.25
6	Vibroacoustic measuring device	1 vibroacoustic sensor Detection frequency 100 to 600 kHz Accuracy class not less than 0.5
7	PSV maximum stock diameter and height	<p>Diameter: max 24mm Height: 45 – 200mm</p> <p>Height is calculated from the D-14 basement</p> 
8	Maximum allowed temperature in the line	100°C* If temperature is >100°C operator need to enter pressure level manually
9	Cable length	30 m
10	Average on-site setup time	5 min

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11	Continuous operating time without recharging	5 hours On one battery, at air temperature 20°C or higher
12	Protection level	<ul style="list-style-type: none"> • Test rig – IP54 • Control box – IP54 • Industrial tablet – IP67
13	Power supply for battery charging	230V/50Hz/0,17kW
14	Weight	<ul style="list-style-type: none"> • Test rig: 20 kg, depending on force sensor equipped • Control box: 15 kg
15	Dimensions	<ul style="list-style-type: none"> • Test rig: 220x200x390 mm • Control box: 690x380x358 mm
16	Operating conditions	Temperature range: from -10°C up to +50°C Air humidity: up to 80%
17	Warranty	12 months from the date of the putting into operation, but not more than 18 months from the date of the dispatch. Service life of the equipment - not less than 8 years
18	Documents and manuals	Passport (Quality certificate) Operation Manual Software manual CE Declaration

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General requirements

1	Ergonomics	<p>The design of the equipment should ensure free access to equipment for maintenance and repair.</p> <p>Where necessary, the design of the equipment must be capable of performing the convenience of the labor action with means of individual protection.</p> <p>The design of the equipment should provide the optimum distribution of functions between man and production equipment to ensure the safety and to limit severity and intensity of labor.</p>
2	CE Directives	<p>The equipment complies with European union technical regulation "On safety of machines and equipment" Directive 2006/42 CE;</p> <p>The equipment complies with European union technical regulation "On safety of low voltage equipment" Directive 2014/35 CE.</p>
3	Warranty	<p>The warranty period of equipment - 12 months from the date of commissioning or 18 months from the date of dispatch whatever is earlier.</p> <p>The total period of operation, taking into account proper service and the replacement of worn units - at least 8 years.</p>
4	Information plate language	Russian/English
5	Operating conditions	<p>Temperature: +10-50 °C</p> <p>Humidity: up to 90%</p>
6	Documents	<p>Passport / Quality certificate</p> <p>Calibration certificates for pressure sensors</p> <p>Operation / Maintenance Manuals</p> <p>Software manual</p> <p>CE Declaration</p> <p>ATEX certificate</p>

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Spare parts, consumables, additional services:

1. Set of spare parts and consumables for 2 years of operation.

Set of spare parts includes all necessary consumables for two years of normal operation of the equipment. Spare parts kit is included to the scope of supply and will be supplied along with equipment.

2. Factory acceptance, testing and supervision during installation and start-up. Training on customer site. Warranty and after sales service.

In accordance with internal QMS system (certified and based on ISO 9001-2015 requirements), our Quality Department will provide FAT program and corresponding agenda upon customer's request for participation in factory acceptance testing of the manufactured equipment before it's dispatch.

All the equipment stated above is certified in accordance with EN 60204-1, EN ISO12100:2010, EN 2006/42/EC, EN 2014/35/EC requirements, supplied with the EU Declaration of Conformity and has the CE Marking.

Upon request, qualified and experienced engineers of REVALVE can perform control over the installation and commissioning of the equipment.

Installation period should begin only after receiving the following confirmation:

- All the equipment is received at the installation site;
- All the installation requirements (procedures, equipment, accessories, qualified personnel etc.) are fulfilled (the list of requirements will be prepared in advance by REVALVE service team).

Under request, our qualified engineers can:

- Supervise the installation of the equipment and its launch;
- Perform the final preparation of the equipment assisting customer personnel.

Personnel training on customer's site:

We assign the utmost value to appropriate customer personnel user-training to ensure safe and efficient running and maintenance of the equipment. We consider that personnel user-training is sufficiently required, especially in cases where the personnel have no experience operating our precise equipment.

The proper study of equipment design features, safe operation requirements and maintenance methods increases the performance of the equipment, and prolongs its service life.

Training can be conducted both in Russian and in English languages.

The expected time period required for start-up supervision, commissioning and training will be determined in a due time upon request.

Warranty and after sales service.

REVALVE provides 18-month warranty after the equipment dispatch and 12-month warranty after the launch date of the equipment at customer site or 18 months since the date of dispatch. The assumed service life of our equipment is 8 years, at least.

REVALVE is a customer-centric company and our assistance policy is based on a long-term partnership with our customers.

We have a full-cycle in-house manufacturing:

- Designing.
- Raw materials preparation treatment;
- All types of machining procedures using high-duty CNC centers (our production facilities;
- account more than 200 machining units);

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- Spare parts supplied by the approved world-famous manufacturers;
- Full-cycle paint coating;
- Assembling and testing of manufactured equipment with load 1,5 times exceeding nominal;
- Installation and start-up supervision;
- Comprehensive user-training.

Our customer-centric approach to the support policy ensures a due time spare parts supply and support through all service life of the products.