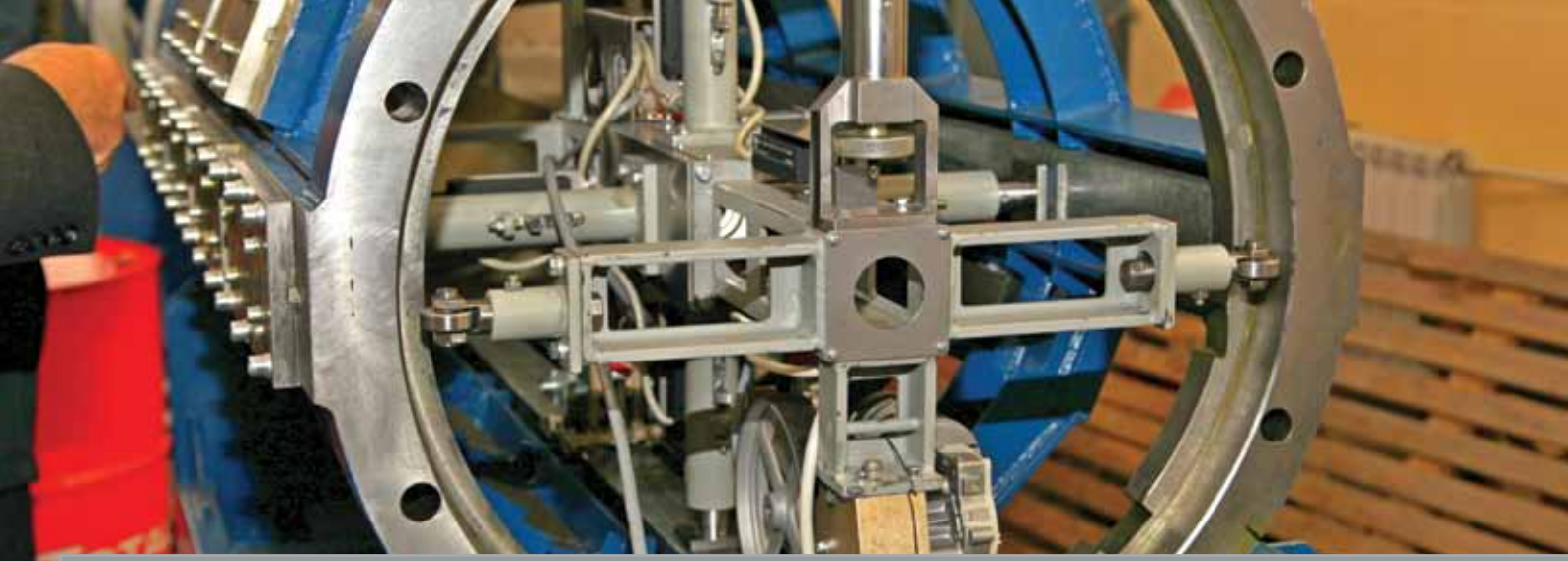


MULTIPURPOSE SET OF EQUIPMENT FOR REPAIR OF TORPEDO LAUNCHING TUBES

JOINT STOCK CORPORATION
SHIPBUILDING & SHIPREPAIR
TECHNOLOGY CENTER

JSC SSTC developed set of equipment to check geometric parameters of torpedo launching tubes to ensure passage of ammunition both in operational and practical use.

Equipment set includes:

- Stands for adjustment and calibration of automated devices UKT-53AME, UKT-53AE, RSH-53ME;
- Automated device UKT-53AME for checking the internal geometrical parameters of torpedo tube;
- Automated device UKP-53A for checking the internal geometrical parameters of groove of upper guide track of torpedo tube;
- Software and hardware system PTK-53M for control of geometrical parameters of torpedo tube (used as a set or together with UKT-53 AME or UKP-53AME;
- Expansion template RSH-53M for control of ammunition projection through torpedo tubes;
- Set of operational documents and process manual for each checkout device.

CALIBRATION STAND FOR UKT-53AME, UKP-53AE, RSH-53ME

Purpose

This stand maintains internal geometrical parameters (guide tracks spacing accuracy) of torpedo tube and renders primary adjustment and certification of main dimensions and regular calibration of special checkout devices UKT-53AME, UKP-53AE and RSH-53ME intended to ensure fault-free projection of ammunition from torpedo tubes after repair or modernization

Set of stand equipment includes devices for distance calibration between longitudinal and lower axes and between lateral and upper guide tracks:

- Machined plate, 630 x 1000, accuracy grade 1
- Plane-parallel end gages, set No.1, accuracy grade 1
- Optical quadrant QO-10
- Tooth-and-lever indicator, IRB type
- Magnetic based support for measuring heads of 0.01 mm division value, with low column, ShM-IIN type
- Ruler, LD-0-320 type
- Set of probes and 0.02-0.5 mm plates (set No.2)
- Block level 150-0.02
- Frame level 200-0.02
- Sighting and sounding tube PPS-11
- Adjusting gear comprising PPS-11 tube

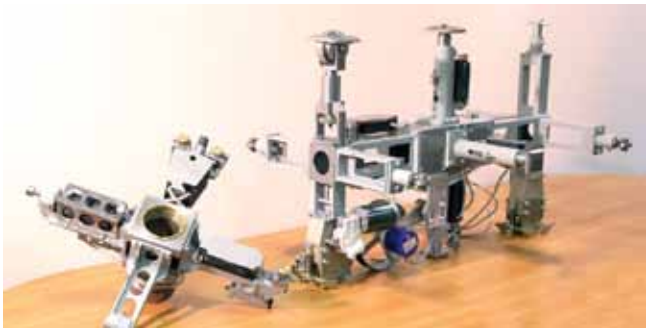
DEVICE FOR CHECKING FORM AND SPACE BETWEEN GUIDE TRACKS UKT-53 AME

Purpose

Device UKT-53AME is intended for automated checkout of internal geometrical parameters of torpedo tube (space between opposite guide tracks, their non-straightness, boring ovality of guide tracks, parameters of inscribed adjacent cylinder, etc.) upon fabrication, input check, calibration and all kinds of torpedo tube repairs.

Device UKT-53AME can be utilized onboard the ship at building berth, dry dock or afloat.

This device jointly operates with software-hardware complex PTK-53ME.



Configuration

- carriage equipped with target and measuring assemblies with LIR-DA13 sensors designed for automatic travel along torpedo tube being checked;
- declivity board with sighting tube OPTRO-PPS-031 and measuring assemblies with LIR-DA13 sensors;
- set of connection cables;
- stoppers;
- set of process inserts.

SPECIFICATIONS

Space between lateral guide tracks, mm	$536.0^{+0.1}$
Space between longitudinal axis of stand and working surfaces of guide tracks, mm - Lower and lateral - Upper (from both sides of the groove)	 $268.0^{+0.05}$ $268.0^{+0.10}$
Width of groove of upper guide track, mm	$25^{+0.04}$
Space between working surface of lower guide track and groove head of upper guide track, mm	$548^{+0.1}$
Lengthwise non-straightness of working surfaces of upper and lower stand guide tracks, mm	max. 0.15
Lengthwise non-straightness of base lateral surfaces of upper and lower guide tracks, mm	max.0.20
Lengthwise axial shifting of groove of upper guide track in relation to stand center line, mm	±0.05
Quantity of datum plates, pc.	4
Horizontal misalignment of working surfaces of datum plates, mm – in longitudinal direction – in transverse direction	 ± 5 ± 2
Horizontal misalignment of stand surface plate, mm – in longitudinal direction – in transverse direction	 ± 3 ± 2
Dimensions (length x width x height), mm	3520 x 775 x 1726
Weight, kg	2300

SPECIFICATIONS

Gaging bore diameter of guide tracks of torpedo tube, mm	$536.0^{+0.5}$
Maximum measured deviation of guide tracks of torpedo tube from rated position, mm	± 5.0
Maximum measured deviation of spaces between guide tracks, mm	0.1
Carriage positioning accuracy in longitudinal direction, mm	± 3.0
Supply voltage of target illuminating device, V	12
Supply voltage of primary converters (sensors) of linear motions, V	5
Overall quantity of measuring channels (including reference signal sensors)	13
Connection cables length, m: – between PTK-53ME and declivity board – between PTK-53ME and carriage	 15 20
Hauling ropes length, m: – aft – fore	 10 20
Dimensions, mm: – carriage – declivity board	 816 x 546 x 546 270 x 542 x 556
Weight, kg –carriage –declivity board	 35 14.5

SIGHTING TUBE OPTRO-PPS-031

Sighting tube OPTRO-PPS-031 is designed for high-precision measurement of non-straightness and coaxial misalignment at a distance of 50 m and below.

SPECIFICATIONS

Distance range for optical mark sighting, m	0.2—30
Tube bore diameter, mm	64
Deviation of reference plane from direction of CMOS sensor rows	max. 10
Convergence of deviations from sighting line at a distance of 2 m from lens pupil	max. ±5
Video camera supply voltage, V	5
Supply voltage of optical mark illuminating device, V	5
Dimensions of optoelectronic block, mm	500 x 150 x 120
Dimensions of step motor control unit, mm	224 x 146 x 106
Device weight, kg	5.4

CHECKOUT DEVICE FOR GEOMETRICAL PARAMETERS OF UPPER GUIDE TRACK GROOVE OF UKP-53AE DEVICE

Purpose

Device UKP-53AE is intended for automated measurement of internal geometrical parameters of upper guide track groove of torpedo tube (depth, width, transverse axial curve, width of “zero curvature” groove) upon fabrication, input check, calibration and repair of torpedo tube.

Device UKP-53AE can be utilized onboard the ship at building berth, dry dock and afloat.

This device jointly operates with software-hardware complex PTK-53ME.

Configuration

- carriage;
- plate to calibrate the theodolite for operation at elastic foundation;
- special mount with target to fix measuring base and reference vertical plane when placing the theodolite from the rear face of torpedo tube;
- theodolite with support and table (or special-purpose support);
- tape ruler;
- hauling ropes.

SPECIFICATIONS

Width of checked groove of upper guide track of torpedo tube, mm	$25^{+0,28}$
Maximum measured width of groove, mm	from 24.0 to 30.0
Depth of checked groove of upper guide track of torpedo tube, mm	12+1.0
Maximum measurement of depth, mm	± 3.0
Measuring tolerance of groove width and depth, mm	±0.02
Carriage positioning accuracy in longitudinal direction, mm	±3.0
Supply voltage of illuminating unit of ruler scale, V	12
Supply voltage of primary converters (sensors) of linear motions, V	5
Overall quantity of measuring channels (including reference signal sensor)	4
Length of connection cable between PTK-53ME and carriage, m	15
Hauling ropes length, m: – aft – fore	 10 20
Carriage dimensions, mm	546 x 540 x 500
Carriage weight, kg	35

SOFTWARE AND HARDWARE COMPLEX PTK-53ME

Purpose

PTK-53ME is intended to control various automated devices rendering automated measurements of geometrical shape and layout of torpedo tubes utilizing primary converters such as absolute linear motion sensors LIR-DA13.

Configuration

- industrial heavy-duty laptop Getak X500 with embedded interface board 485 of PCL-745S type, with mouse, card reader, 32Gb flash drive and carrying case;
- UPS SUA7501;
- laser printer;
- switching unit;
- interface cable and connectors;
- ground support cables;
- extenders.

PTK-53ME ensures: software scaling and zero point adjustment in all measuring channels of associated automated devices, software adaptation of equipment to alteration of external conditions (by implementing automatic correction) and computer-aided maintenance of sensors w/o usage of special-purpose hardware.
PTK-53ME ensures sequential automatic collection and processing of measurement data with 3-200 sensors connected simultaneously.

SPECIFICATIONS

Maximum quantity of measuring channels, pc.	200
Sensor range, mm	± 5
Sensor discreteness, μm	1
Maximum absolute measurement error per channel, mm	± 0.02
System supply voltage, V	220
Supply voltage frequency, Hz	50
Sensor supply voltage, V	5 ± 5 %
Maximum sensor current consumption, mA	100
Data output protocol	RS-485 standard
Data exchange protocol	RS-232.9 data bits
Sensor dimensions, mm	129 x 45 x 23
Sensor weight, kg	0.3
Dimensions and weight of PTK-53ME	depends on dimensions and weight of component parts

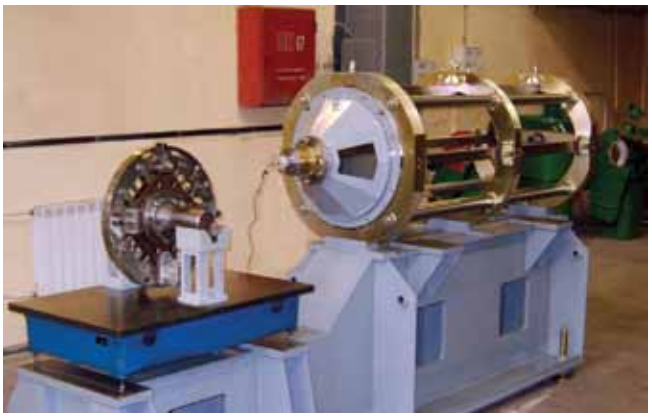
PASSAGE GAUGE EXPANSION TEMPLATE RSH-53M

Purpose

- verify that internal parts of torpedo tubes do not protrude beyond bore line of guide tracks;
- verify free passage of protruding ammunition parts above ground protection elements and through cut-outs of obturating rings of torpedo tube;
- monitor conditions for actuation of switch for rigid connection loss and trigger of safety-starting device for torpedo.

SPECIFICATIONS

Mounting diameter of cylindrical surfaces of device sectors upon fixation on working position, mm	537.1
Minimum radial motion (stroke) of sectors between maximum extended position and central hole axis, mm,	6
Dimensions, mm	Ø 544.9×304
Weight, kg	32



Additional machining devices for torpedo tube guide tracks upon onboard installation at construction, repair and modernization stages to ensure torpedo projection.

DEVICE UDD-24-53E

Purpose

Pneumatic device UDD-24-53E for additional machining of guide tracks as part of calibration procedure. Processing method: milling.

The device includes:

- device UDD-24-53E, intended for mechanical removal of excessive lining material of torpedo tube guide tracks;
- stand for adjustment, storage and accommodation of device upon transportation;
- SPTA;
- package box.

SPECIFICATIONS

Pneumatic drive capacity, kW	1.4
Air pressure, MPa	0.5
Milling head rotation speed, rpm	10000
Air consumption, m^3/min	1.7
Maximum milling width, mm	95
Radial projection of milling head per one rotation of adjustment screw, mm/rotation	0.21
Maximum radial travel of milling head, mm	4
Longitudinal projection, mm/rotation	from 0 to 0.1
Milling head work travel (longitudinal direction), mm	500
Milling head diameter (blade-wise), mm	81
Device dimensions, mm	1595×532×548
Device dimensions in stand, mm	1620×740×750
Maximum weight, kg	44
Maximum weight in stand, kg	102

BORING MACHINE RD-650M

Purpose

Processing of guide tracks linings by means of cutting upon repair or modernization of torpedo tubes whenever major removal of lining or full replacement of guide tracks is required.

SPECIFICATIONS

Processed material	brass, polyamide
Processing diameter, cm	53.0
Length of processed pipe	at Customer's request
Single-pass processing length, mm	1200
Processing method	boring
Machine positioning accuracy: - axis-wise, mm - length-wise, mm	 0.05 ±5
Maximum cutting depth, mm	1.0
Cutting speed, m/min	90
Cutting head projection, mm/rotation	0.35
Spindle rotation frequency, rotation/min	26±0.5
Rated capacity, kW	2.5
Power mains, V, Hz	three-phase 380 (+38; -57), 50±1
Dimensions, mm	3225 × 548 × 536
Overall weight, kg	7780

Configuration

- boring machine;
- bed;
- bed frame;
- electric cabinet;
- control console;
- loading section;
- loading section frame;
- boring section;
- boring section frame;
- loading device;
- SPTA.

GROOVE PROCESSING MACHINE

Purpose

The machine is intended for mechanized milling of grooves of upper guide tracks upon onboard installation or after repair. Processing of walls and upper part of groove of upper guide track to be performed after checking geometric parameters of the same with use of UKP-53AE device.

Configuration

- Portable milling machine;
- Calibration and supporting stand for loading the machine into the tube of article 24;
- Electric cabinet;
- Electric cables;
- Tools and appliances;
- SPTA.

SPECIFICATIONS

Distance between lower guide track and flange of processed groove, mm	548^{+1}
Width of processed groove, mm	$25^{+0.28}$, $28^{+0.28}$
Maximum processing depth of groove walls and flange, mm	2
Processed material	brass, polyamide
Maximum roughness of processed surface Ra, mm	3.2
Maximum longitudinal travel of milling head, mm	560
Supply mains: three-phase AC network with dead-grounded neutral and protective conductor, V, Hz	$380_{(+10\%;-15\%)}$, 50±1
Dimensions, mm: – machine – calibration stand – electric cabinet	 1590 x 536 x 515 1825 x 690 x 675 500 x 320 x 850
Milling machine weight, kg	85

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