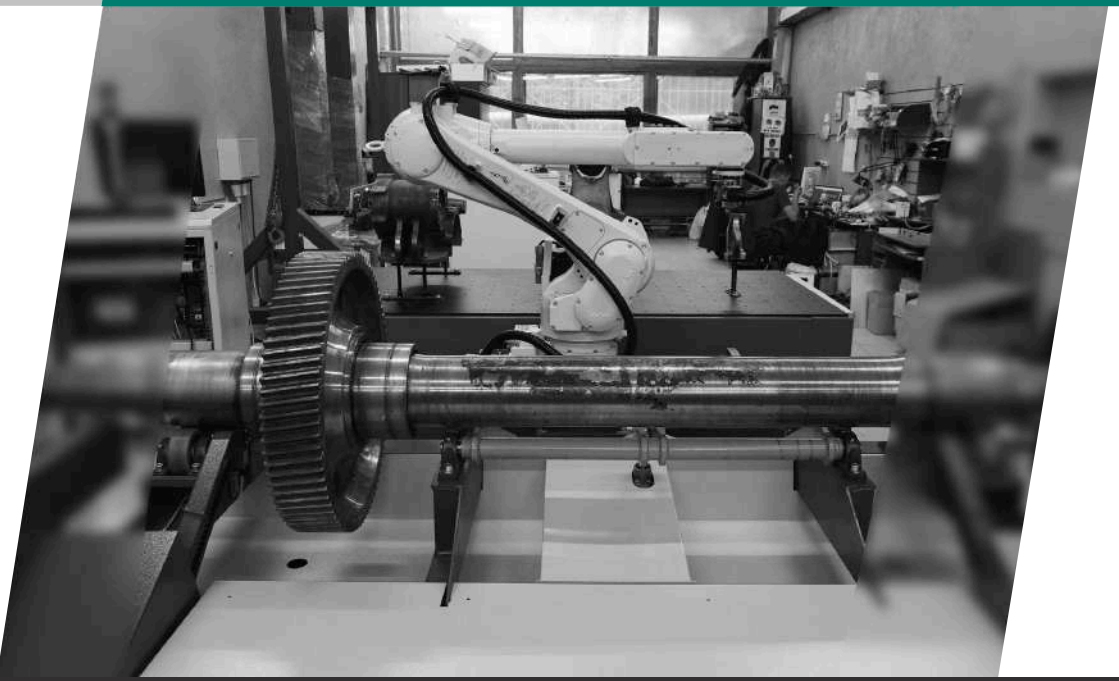
ROBOSCOP VTM-5000/OR

LASER SCANNING AND FLAW DETECTION TEST BENCH

for pressed-off axles and wheel sets



1 APPLICATION

Roboscope VTM-5000/OR-M laser scanning and flaw detection test bench (hereinafter **Roboscope VT-5000/OR-M**) is designed for automated measurement of geometric parameters and complex non-destructive testing (NDT) of pressed-off wheelset axles of metro cars.

Roboscope VTM-5000/OR-M provides the following methods of non-destructive testing:

- geometric parameters laser measurement;
- ultrasonic NDT;
- eddy current testing.

2 TECHNICAL FEATURES

Roboscope VTM-5000/OR-M is an automated software and hardware complex capable to operate autonomously or to be integrated into technological chain of subway cars maintenance and repair. General view and dimensions of **Roboscope VTM-5000/OR-M** are shown in **Fig.1**

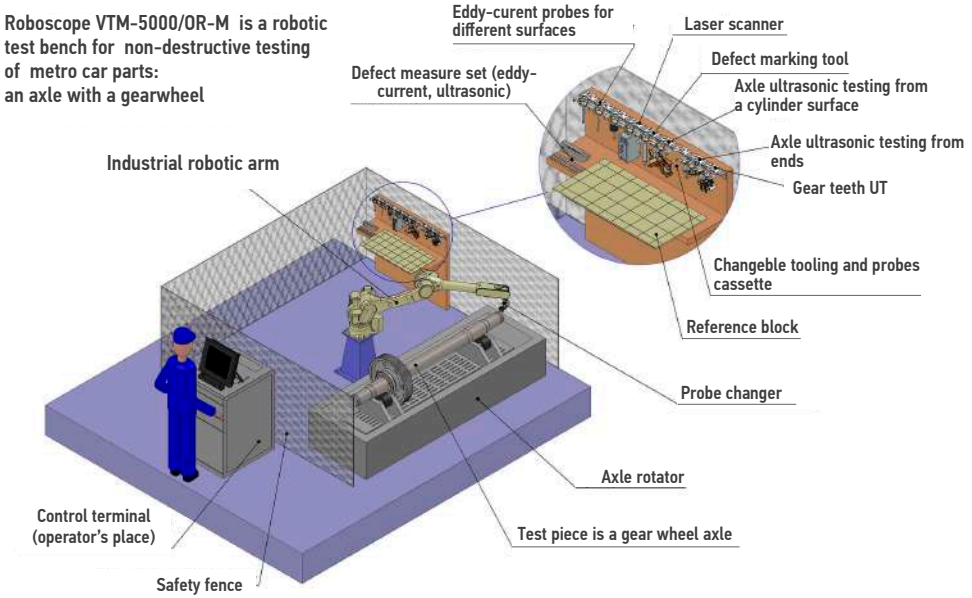


Fig.1

2.1 General specifications of **Roboscope VTM-5000/OP-M** are shown in **Table 1**.

Table 1

Feature	Value
Power supply - mains voltage, V - frequency, Hz	 380 ± 20 50 ± 1
Maximum power consumption, kVA	6
Time of operating mode setting, min, not more	10
Supported simultaneously NDT methods: geometrical parameters laser measurement, ultrasonic, eddy current	+
Full cycle test time, min, no more	10
Continuous operation time, hours, at least	24
Axle rotation speed, rpm	0 ÷ 20
Probe velocity on a test piece, m/c	0 ÷ 1,0
Mean time between failures, h, not less	20000
Test piece maximum dimensions, mm	1500x1500x3000
Total weight of all equipment, kg, not more	1500
Test cabinet overall dimensions of a (length, width, height), mm	800x600x1500
Mechanical part overall dimensions of a (length, width, height), mm	3000x3000x2000
Control, display and information processing tools (industrial computer, general control terminal, touch display of information processing)	+
Self-diagnosis system	+
Sound and light defect detection alarming	+
Automatic probe change	+

Feature	Value
Couplant	aqueuos solution
Automatic couplant supply system	+
Operating temperature, °C	от +10 до +40
Relative humidity (at 35 °C), %, not more	80
Safety barriers	+

2.2 The features of laser scanning module **Roboscope VTM-5000/OR** are presented in **Table 2**.

Table 2

Features	Value
Operating range of measured distances in the direction of a laser beam, mm	100÷350
Absolute tolerance, mm	±0,01
Basic coordinate system (axis number)	XoZ (2)
Wave length, nm	660
Frequency of data updates, profiles/sec, not less	1200

2.3 The features of **Roboscope VTM-5000/OR** NDT system are presented in **Table 3**.

Table 3

Features	Value
Ultrasonic testing of axles is managed by contact method from cylindrical surface of a journal and an axle end (ultrasonic input angles 00, 500)	+
Ultrasonic inspection of the large gear wheel (LGW) is carried out by contact method 2.5 MHz 90 G by sector.	+
Automatic gain control (AGC) to maintain the required level of sensitivity of ultrasonic channels	+
Automatic acoustic contact check mode	+

Наименование характеристики	Значение
Measuring range of signal amplitudes at a receiver input, dB	67÷107
Absolute tolerance limit of signal amplitudes measurement at a receiver input, dB	±0,5
Absolute tolerance of signal amplitudes measurement at a receiver input, dB	±0,3
Absolute tolerance of threshold indicator setting (dead zone), dB	±0,5
Time full automatically re-set, min, not more:	1
Nominal values of excitation pulse amplitude at resistance of 50 Ohms, V	75; 150; 225
Reference tolerance of amplitude pulse setting, %	±20
Half-wave duration of the excitation pulse generator (EPG), ns	25÷1250
Referense tolerance setting of EPG half-wave duration, %	±10
Discreteness of pulse duration EPG setting, ns	12,5
Pulse repetition frequency of EPG, Hz, not less than	1000
Maximum sensitivity at a frequency of 5 MHz at a signal/ noise ratio of 6 dB, mV	150
Receiver bandwidth should be at minus 3 dB, MHz	1÷10
Receiver sensitivity adjustment range, dB, not less than	90
The number of points to fit a distance-amplitude compensation (DAC) curve	250

2.4 The features of **Roboscope VTM-5000/OR** eddy current scanning module are presented in **Table 4**

Table 4

Feature	Value
Eddy current testing for surface and subsurface defects along the entire length of axle (near zone, middle zone, far zone, seat part)	+

Feature	Value
EPG operating range, kHz	(1÷1000) ±10%
Pulse repetition frequency of the generator, Hz, not less	1000
Nominal amplitude of excitation pulses at an equivalent load of 150 Ohms, V	9±2
Minimum depth of a detectable defect, mm	0,15
Full automatic reconfiguration time, min., max.	1
Gain control range, dB	0÷50
Signal representation methods of	1) on a complex surface, 2) amplitude-time
Separate signal scaling	by OX and OY axis
Supported modes	1) static 2) dynamic
Types of displaying of automatic defect alarm (ADA) zone	1) horizontal gate 2) ring sector

2.5 TECHNICAL FEATURES

Technical features of **Roboscope VTM-5000/OR** main components:

2.5.1 Industrial robotic arm

- axis number.....6
- movement accuracy, mm.....±0.03
- maximum tool travel speed, m/s.....9,3
- manipulator body protection class.....IP67, IP65
- working area radius, mm.....903
- power supply:
  - voltage, V.. 220
  - frequency, Hz 50
  - power, kW.....3.00

2.5.2 Pressed-off axle rotator

- load capacity, kN.....10,00
- rotation frequency, Rev/min.....0 ÷ 20
- engine power supply:
  - voltage, V.....80
  - frequency, Hz.....50
  - power, kW.....1,5

2.5.3 Control terminal (the operator's place):

- NDT tools;
- touchscreen display;
- **Roboskope VT-5000/OR** component servo controllers;
- emergency power off facility.

3 SUPPLY SET

- industrial robotic arm, pcs. 1
- pressed-off axle rotator, pcs..... 1
- control terminal, pcs.....1
- cassette set (UT, ET) NDT probes, pcs 1
- duplicating eddy-current transducer, pcs 1
- calibration table with measures of defects and standard blocks, kit.....1
- operation literature, kit.....1

4 RELIABILITY

Life span is not less than **10 years**.
Average life of equipment before an overhaul (update) is not less than **5 years**.

5 WARRANTY

Warranty period - **18 months** from delivery date, excluding consumables (connecting cables and probes).
Warranty storage period – **6 months**.