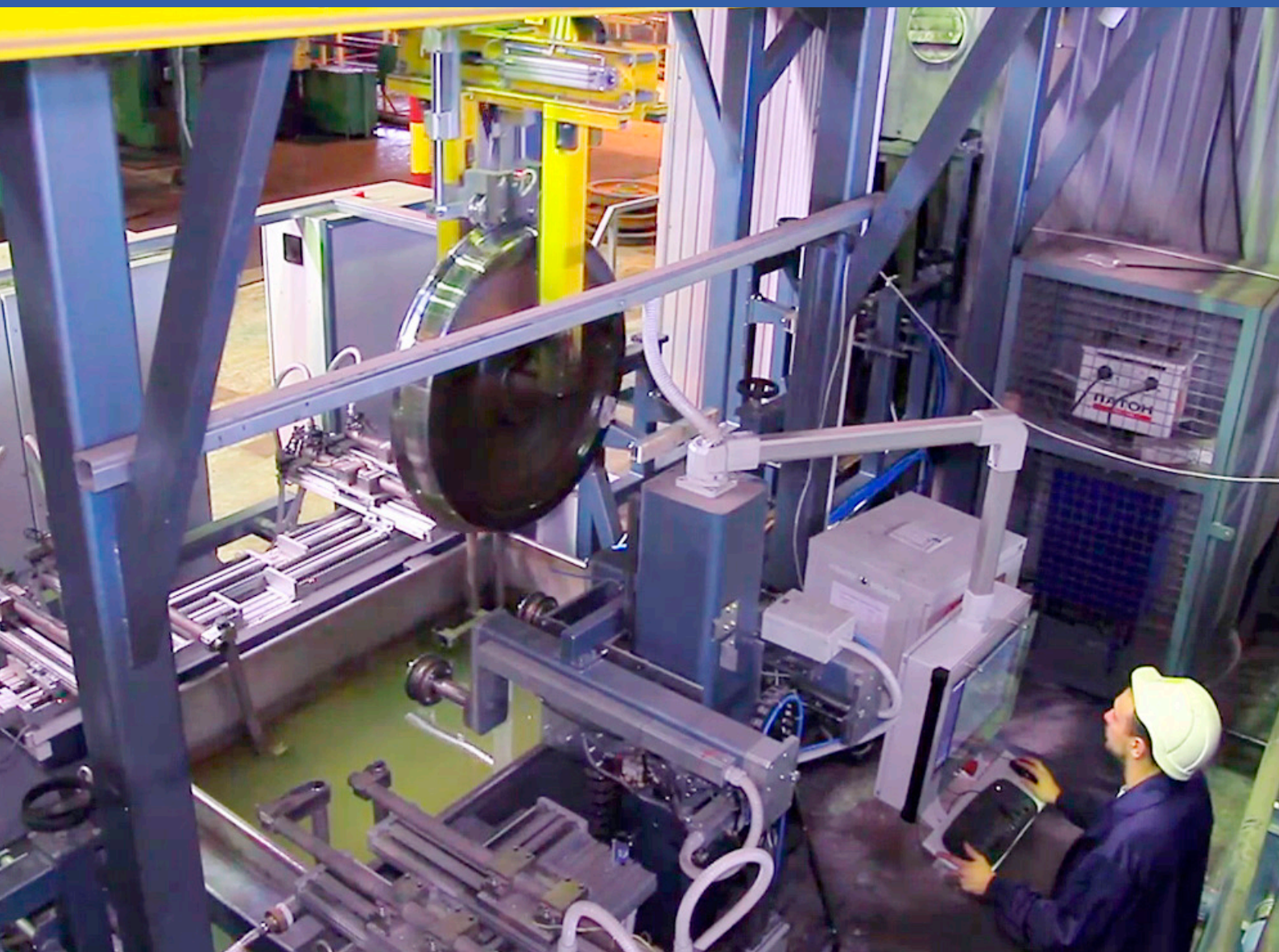


SAUZMPK-YUG



OKOndt GROUP

**Magnetic Particle and
Ultrasonic Inspection
System for Railway
Wheels**

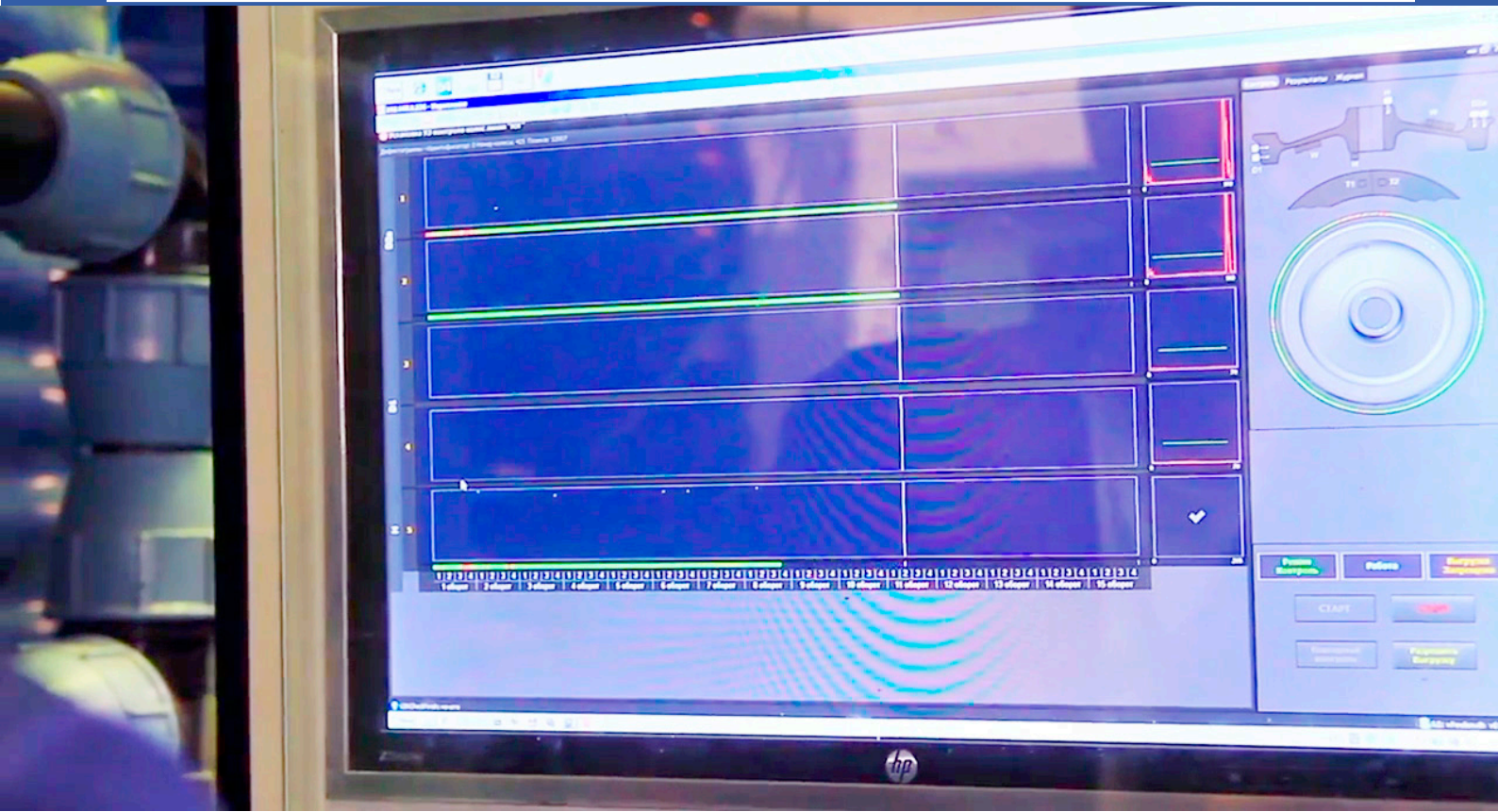
SAUZMPK-YUG

Magnetic Particle and Ultrasonic Inspection System for Railway Wheels

The System is designed for non-destructive testing of the railway wheels at their production for presence of surface defects by the magnetic fluorescent method and for internal defects – by the immersion ultrasonic method in accordance with a technical task and EN 13262, ISO 6933, ISO 5948, AAR M107, RD 32.144-2000, GOST 10791-2011, DSTU GOST 10791 standards requirements. The System ensures an automatic quality assessment of the railway wheels by non-destructive techniques and detection of the inner defects of metal as well as surface technological defects.

Finished, mechanically treated by all the elements or pre-machined railway wheels with the diameter of 800 to 1100 mm and main dimensions as listed in the table 1 below are subject to testing by the System.

Dimension	Value
Minimum wheel diameter (over the wheel tread), mm	800
Maximum wheel diameter (over the wheel tread), mm	1100
Minimum wheel weight, kg	150
Maximum wheel weight, kg	1000
Minimum wheel hub length, mm	100
Maximum wheel hub length, mm	300



Major technical features of the System

The System ensures detection of the surface crack-type defects of various orientation, overlaps with minimum conditional length of 2 mm – on the finished surface, and 6 mm – on the rough (pre-machined) surface – by the magnetic particle method. Testing of all the surfaces of a wheel, except for wheel hub bore surface, is carried out by wet magnetic fluorescent method (minimum opening width of the defect — 10 µm).

The System employs the ultrasonic method of wheels testing to ensure detection of inner metal defects equivalent in their reflectivity to the following artificial reflectors:

- In the wheel rim in radial and axial directions – minimum detectable reflector in the form of flat-bottom hole of Ø 1 mm.
- In the wheel disc in axial direction – minimum detectable reflector in the form of flat-bottom hole of Ø 3 mm.
- In the wheel hub in axial direction – minimum detectable reflector in the form of flat-bottom hole of Ø 3 mm.
- In the wheel flange area — in correspondence to the «All-Rolled Wheels and Wheelset Rims of the Rolling Stock. Non-Destructive Testing Methods» GOST project requirements – the flange testing from its inner side surface (from the lateral face of the rim from the wheel's inner side) by the transverse waves in circular direction, or other regulatory document as per Customer's requirements.





Magnetic Particle and Ultrasonic Inspection System for Railway Wheels

Main parameters of the System

The conclusion on the conformity of the tested wheel with the quality standards for magnetic particle inspection is taken by the MPI operator, for ultrasonic testing - is taken automatically by the ASD systems of the ultrasonic testing (UT) unit.

The System ensures maximum inspection productivity of not less than 25 wheel per hour (for wheels of Ø 964 mm, without UT of the disc); time assigned to the MPI Operator to interpret the indicator pattern — not more than 90 s; time of the UT carrying out - 60 s.

The UT equipment of the System ensures the wheel rim, disc, and hub sounding by the pulse echo and echo shadow methods (in two directions), as well as wheel flange from its inner side (from the lateral face of the rim from the wheel's inner side) by the transverse waves in circumferential direction. The System provides for reliable detection of defects in rims of finished mechanically treated by all the elements wheels, and such defects are equal in their reflectivity to the flat-bottom hole of 1-mm diameter (as per ISO 5948 requirements). After the testing, the System allows for the wheels sorting out by their validity according to different rejection criteria. Sensitivity of testing is set by the Operator using the DAC or AVG diagrams; quick sensitivity calibration is carried out in automatic mode using the Reference Block with artificial defects (included in the supply set of the System).

The MPI equipment of the System provides for reliable detection of surface defects by the technique of applied field, magnetic field strength during the testing on all tested wheel surfaces is not less than 32 A/cm. Examination and interpretation of the indicator pattern is carried out by the Operator under the UV light with the wave length of 365 nm, and its intensity on the tested surface of at least 1000 $\mu\text{W}/\text{sm}^2$.

