SNK KP-8.3

OKOndt GROUP

System of Complex Inspection of Railway Car Wheelsets

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The System for complex non-destructive testing of the rail car wheelsets SNK KP-8.3 is designed for automated non-destructive testing of the railway freight car wheelsets by the ultrasonic method (UT) and eddy current method (ET) in order to detect defects such as metal inhomogeneity, cracks of various orientations, surface defects as per PR NK V.2. The System is of a stationary type.

The System provides for a comprehensive automated NDT of the rail car wheelsets elements of such types as RU1-957, RU1Sh-957 and RV2Sh-957. Wheel tread diameter is not more than 964 mm for new wheels and not less than 850 mm for the wheels with maximum wear.

COMPOSITION AND FEATURES OF THE SYSTEM

Testing Stand is composed of the following units:

- Load Station
- Test Station No.1
- Test Station No.2
- Unload Station.

Load and Unload stations of the wheelsets are of a service nature and are intended to ensure the safety of people and equipment during the supply and removal of wheelsets from a Test Station. These stations are compulsory at any supply set composition of the System.

At the Load Station, there is a device of automatic bearing box condition assessment (with the rings and without the rings) and wheel tread diameter measurement. The System has a modular structure, includes the following mechanical and electronic modules:

When using the automated NDT System for wheelsets, the productivity of inspection becomes several times higher. IT is due to simultaneous operation of many testing channels, and the reliability's higher due to the increased number of channels. During the testing, the System provides for full documenting of not only detected defects but also the entire process of testing (that excludes the human error and gives a possibility to perform a detailed analysis of the results at all times).

WHEELSET MOVEMENT AND ROTATION MODULE that is composed, in its turn, of the following devices:

- Damping device of the wheelsets storage located before the Load Station.
- Wheelset rejection devices located at the first and last positions of the Stand.
- Wheelset supply (pusher) device to the following Station.
- Device of the wheelset reception to the Test Station No.1.
- Device of the wheelset rotation at the Test Station No.1.
- Device of the wheelset removal from the Test Station No.1.
- Device of the wheelset reception to the Test Station No.2.
- Device of the wheelset rotation at the Test Station No.2.
- Device of the wheelset U-turn at the Test Station No.2.
- Device of the wheelset removal from the Test Station No.2.

ll devices of this module are built into the section of the rail track, slightly inclined in the direction of movement of the wheelset along the stand, and are designed to move the wheelset along the stand, turn it around, rotate to the test station and remove it from the station.

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WEELSET WHEEL UT MODULE

UT module of the wheel consists of:
• Wheel rim UT scanner.
• Scanner supply and removal device.
The module ensures testing of the following areas:
— Main section of the wheel rim, outer and inner faces of the rim. Pulse echo and echo shadow techniques are implemented with the straight and angle beam 40˚ transducers (in accordance with PR NK V.2) in both directions.
— Wheel flange and wheel active face.

WHEELSET AXLE UT MODULE

UT module of the wheelset axle consists of:
• Two devices of the corresponding scanners positioning.
• UT end scanner of the axle (implements all the AR methods as per PR NK V.2).
• UT scanner from the axle pre-wheel-seat (implements all the BR methods as per PR NK V.2, without bearing box dismantling).

WHEELSET RIM ET MODULE

Wheelset rim ET module consists of the eddy current scanner of the wheel rim and a positioning device. The module allows for the detection of the cracks of various orientation on either inner or outer lateral surfaces of the rim at the wheel stamp zone (as per PR NK V.2 requirements).

WHEELSET WHEEL FILLETS ET MODULE (NEAR-RIM AREA)

The ET module of the near-rim zones of the wheel disc (fillet) consists of a scanning device and a positioning mechanism. The scanner ensures testing of outer and inner surfaces of the wheel disc zones to the wheel rim (as per PR NK V.2). The module allows to detect cracks of any orientation that come to the surface of the tested area.

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WHEELSET AXLE BODY ET MODULE

The module consists of:
• Device of bringing the scanner to the testing position.
• Device of the scanner positioning.
• Eddy current scanner of the axle body.
The module is designed to carry out the testing of the whole axle body surface and detect cracks of any orientation which come to the surface.

WHEELSET JOURNAL ET MODULE CONSISTING OF:

• Device of bringing the scanner to the testing position.
• Device of the scanner positioning.
• ET scanner of the axle journal and pre-wheel-seat part.
The module is designed for testing of the whole axle journal surface, fillets, pre-wheel-seat part and allows to detect cracks of any orientation that come to the surface. The testing with this module is applicable only if there are no bearing rings on the axle journal.

BEARING BOX INNER BEARINGS ET MODULE CONSISTING OF:

• Device of bringing the scanner to the testing position.
• Device of the scanner positioning.
• ET scanner of the inner rings.
The module is designed for testing of the entire outer cylindrical surface of the inner rings fitted on the axle journal, the surface of the shoulder of the first ring and allows to detect cracks of any orientation that come to the surface. Testing by the specified module is applied only if there are bearing rings on the axle journal.

DATA COMMUNICATION MODULES

These modules represent multi-channel electronic units OKO-22M and transfer the data in a real time mode to the data processing and visualization module.

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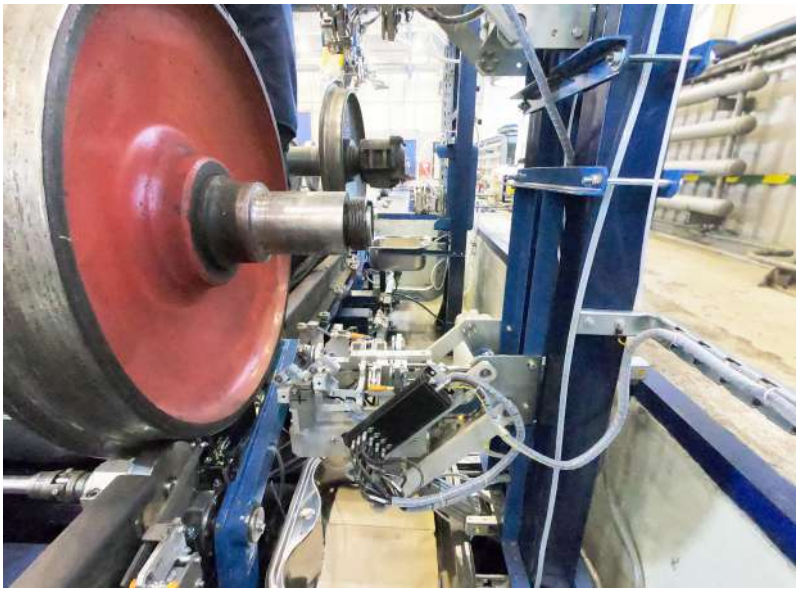
WHEEL TREAD EMA MODULE



Components of the module:
• Two independent scanner positioning devices for each wheel.
• Two EMA scanners of the wheel tread surface testing.
The module is designed for the ultrasonic testing of the wheel tread surface using the electromagnetic acoustic transducers (EMAT), and allows for detection of transverse cracks on the wheel tread surface and subsurface discontinuities at a depth of up to 10 mm.

DATA PROCESSING AND VISUALIZATION MODULE

This module represents an industrial computer consisting of two system blocks connected by a local network, 2 LCD monitors and installed special-purpose software for data processing, visualization, reports creation, archiving the testing results, and mechanical units management of the System.

The software interface is designed in an intuitive form. The Operator needs to press the “Testing” button, while the wheelset starts step-by-step movement around the stand, information about the operations performed by the System is displayed on the computer screen. During the wheelset supplying to the Test Station No.1, the Operator needs to enter the information about this wheelset and press the corresponding button to start the testing itself. All information about the inspection of the wheelset is stored in the database and is available for further analysis and visualization. The operator, using the program for viewing the testing results, can perform such operations as: filtering information about the wheelset by date, axle manufacturer, operator name etc, review the test results of previously tested wheelsets, all wheelsets testing protocols systematizing and storing.

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Major technical characteristics:

- Number of UT and EMA channels:

for all-rolled wheel testing – 7
for wheelset axle testing – 10

- Number of ET channels:

for wheel rim lateral surfaces testing-16
for wheel hub testing – 4
for disc to rim fillet and rim to hub fillet testing – 12
for wheelset axle testing – 8

- Value of the UT oscillations frequencies: 0.4 MHz, 2.5 MHz and 5 MHz. Relative deviation of ultrasonic oscillations frequencies from nominal values are within 10 %.
- Probe angles values are from 0 to 90°.
- Frequency of ultrasonic pulses is set by the encoder.
- Testing areas ranges: wheelset wheel – from 0 to 130 mm by angle beam probe, from 5 to 125 mm for straight beam probes; wheelset axle – from 100 to 1900 mm straight single crystal probe, from 200 to 1020 mm for angle beam probes.
- Sensitivity setting level during the eddy current testing at the SOP-2353.08 Reference Block with artificial defects of the saw-cut type: depth – 0.5 mm; width – 0.1-0.3 mm.
- Sensitivity setting level during the UT at the Reference Block with artificial defects of the “saw-cut” and “drill” type in accordance with the PR NK V.2.
- Wheelset rotation frequency is set within the range of 2.0 to 5.0 rpm.

- The System provides for the following service functions:

• Recording and storing of the testing results
• Forming of the testing protocol in electronic variant and a possibility to print it out.

- The System ensures test productivity of not less than 10 wheelsets per hour, provided that they are rhythmically supplied to the Test Station and they are flaw-less.

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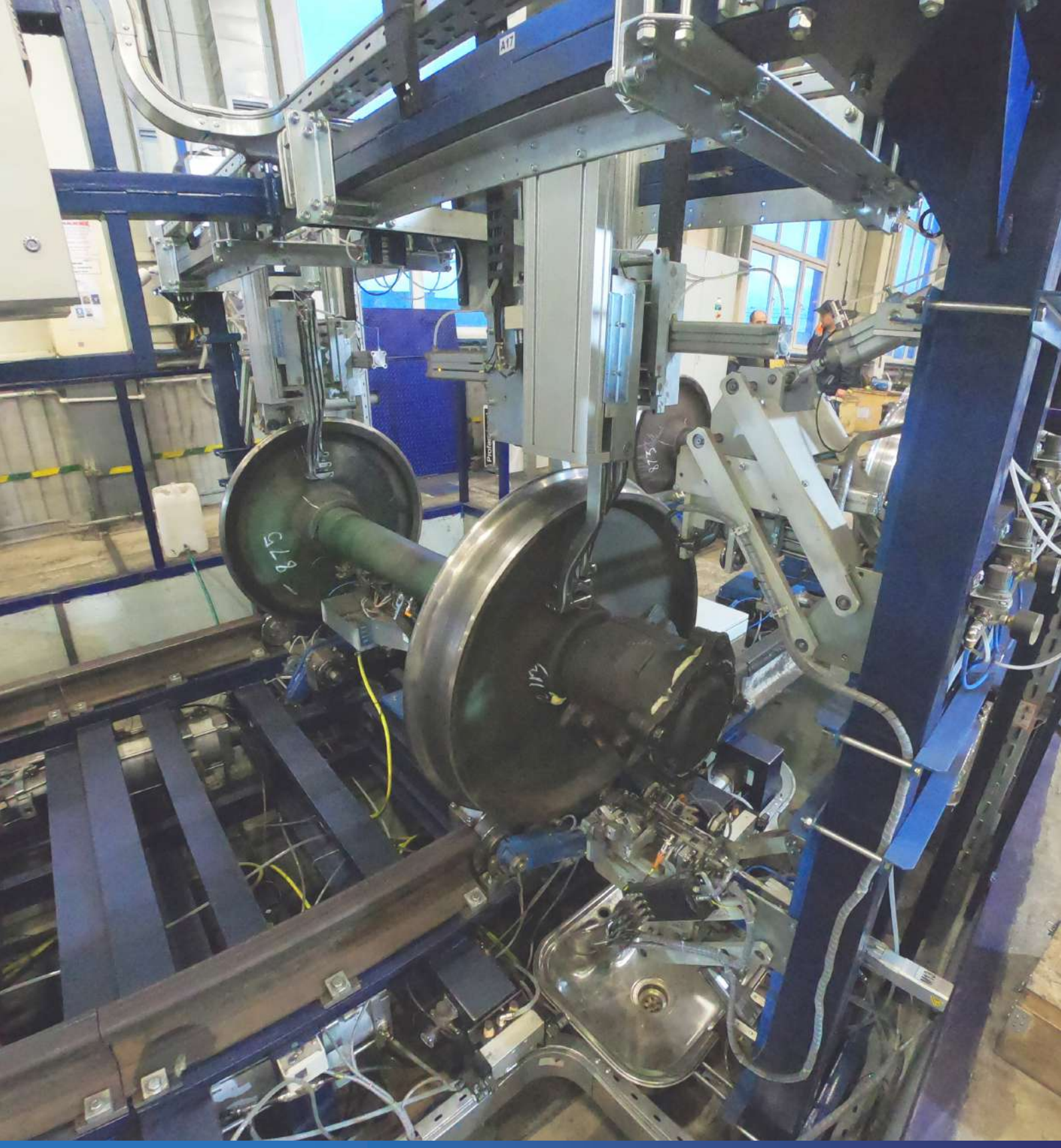

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