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**RAILWAY INDUSTRY STANDARD OF THE
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Ultrasonic testing detector for rail

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(English Translation)

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1 Scope

This Standard specifies the terms and definitions, technical requirements, inspection methods, inspection rules, marks, package, transportation, storage etc. of the multi-channel ultrasonic testing detector for rail (hereinafter referred to as the detector)

This Standard applies to multi-channel ultrasonic testing detector for rail.

2 Normative references

The following documents are indispensable for application of this document. For the dated documents so quoted, only the dated versions apply to this document. For the undated documents so quoted, the latest versions (including all modification sheets) apply to this document.

GB/T 2423.1 Environmental testing for electric and electronic and electronic products -

Part 2.Test methods - Test A. Cold (GB/T 2423.1-2008, IEC 60068-2-1.2007,

Environmental Testing - Part 2-1.Tests A. Cold, IDT)

GB/T 2423.2 Environmental testing for electric and electronic and electronic products -

Part 2.Test methods - Test A. Heat (GB/T 2423.2-2008, IEC 60068-2-2.2007,

Environmental Testing - Part 2-2.Tests B. Dry heat, IDT)

GB/T 2423.3 Environmental testing for electric and electronic products - Part 2.Test method
- Test Cab. Damp heat Steady state (GB/T 2423.3-2006, IEC 60068-2-78.2001,

Environmental Testing - Part 2-78.Tests Cab. Damp heat, steady state, IDT)

GB/T 2423.7 Environmental testing for electric and electronic products Part 2.Test methods
- Test Ec and guidance. Drop and topple Primarily for equipment-type specimens (GB/T
2423.7-1995, IEC 60068-2-31.1982, IDT)

3 Terms and definitions

Following terms and definitions apply to this document.

3.1

Multi-channel ultrasonic testing detector for rail

It can be used for the defect detection operation of in-service rail. It is the entirety of multi-channel ultrasonic testing detector displayed by the defect detection oscilloscope, including the instrument (including power), probe, water tank with coupling liquid, and trolley that can be pushed-travelled on the track.

3.4

Amplifier bandwidth

The bandwidth between the high cutoff frequency and low cutoff frequency. This Standard sets the points where the amplifier gain is 3 dB below the peak value as the limits (see

Figure 1).

Figure 1 Amplifier bandwidth

3.5

Dynamic range

The amplitude ratio between the maximum signal and the minimum signal the ultrasonic device can show. The minimum signal may be restricted by the system noise and the maximum signal may be restricted by the saturation of the amplifier or the maximum attenuation that induces large signal into the screen.

Note: modify the definition 7.4 in GB/T 12604.1-2005.

3.6

Time base-linearity

The degree of proportional relation BETWEEN the input signal provided by calibrated time

generator or provided by multiple reflections of known-thickness plate AND the signal location indicated on the time base-line.

[Definition 7.2 in GB/T 1604-2005]

4.1 General rules

4.1.1

The detector shall be able to apply to the automatic defect detecting operation for in-service rail with 43 kg/m-75 kg/m.

4.1.4

Each channel of the detector shall be equipped with sound alarm device; the sound in each channel shall be easy to distinguish.

4.1.5

The detector shall be equipped with an attenuator.

4.1.6

The detector shall be powered by storage battery; the capacity of the battery shall be able to meet the requirement that the detector continuously operates for 8 hours.

4.1.10

The detector shall be no damage on its surface; there is no damage on the devices and components. The performance of each switch shall be stable; the display of indicator light, oscilloscope tube or display screen and others shall be normal.

4.1.11

The components of detector of the same model shall be exchangeable.

4.1.12

The digital detectors shall have functions such as measuring speed, data replaying, over-speed alarming, and delivering data according to specified data format.

4.2.1 General rules for probes

4.2.1.1

The surface of the probe shall be no damage. the probe wiring shall be flexible; the plug-in of connector shall be reliable; the shield shall be good.

4.2.1.2

The connectors of the probe shall meet the requirements of superior product or first grade class product in standard SJ/T 9562.2-1993.

4.2.2.1 Physical properties

For flat probes, the flatness tolerance on the probe coupling surface shall not be more than 0.05 mm.

4.2.2.2 Echo frequency

Transverse-wave probes. 2 MHz~2.5 MHz; longitudinal wave transducers. 3.5 MHz~5 MHz or 2 MHz~2.5 MHz.

4.2.2.7 Attenuation value of protection boots (film)

The attenuation value of protection boots (film) shall be less than or equal to 8 dB.

4.2.2.8 Resolution

The resolution R of 0° probe shall be ≥ 18 dB; the resolution R of offset-angle probe shall be ≥ 14 dB.

4.2.2.9 Sensitivity margin

The high and low sensitivity of probes is expressed by the sensitivity margin after the probe has been combined with instruments; the specified value of sensitivity margin S is.

4.3.3 Dynamic range

Minimum limitation. It shall not be less than 16 dB. Maximum limitation. 2 dB~6 dB.

4.3.4 Amplifier frequency response

The central frequency obtained by $f_0 = (f_u \times f_l)^{1/2}$ shall be within $\pm 10\%$ of nominal value.

The amplifier bandwidth Δf (3 dB lower-point) obtained by $\Delta f = f_u - f_l$ shall be within $\pm 10\%$ of nominal value of bandwidth, and shall not be less than 40% of the nominal central frequency of the probe.

4.3.9 The effects of operation voltage on the wave height of detector echo and the sensitivity of detection (alarm)

Within the rated operation voltage, the position of the detector gate and alarm electrical level shall have no significant change; the change ΔN_d of echo amplitude and the detection (alarm) sensitivity change ΔS_d shall not be larger than 1dB respectively.