



**INSTITUTE FOR TESTING AND CERTIFICATION, a.s.**

Testing Laboratory of Electrical products  
Sokolovská 573  
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Czech Republic



**TESTING LABORATORY No. 1004.3**

Accredited by the Czech Institute for Accreditation, o. p. s  
According to CSN EN ISO/IEC 17025:2018

**Test Report No: 414105232AM1**

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## TEST REPORT

**about the test**

**on transducers AC24/R, PXN/R, PX24/R, PXN30/R, PX310/R**



.....  
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.....  
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The test results mentioned below relate solely to the Equipment under Test as received.

The laboratory disclaims any responsibility for the information provided by the applicant.

## 1 GENERAL SPECIFICATIONS

### 1.1 Equipment Under Test (EUT)

Five samples of transducers

1	AC24/R	AC current and voltage transducer designed for rail vehicles.	No: 4302715
2	PXN/R	DC voltage and current transducer with galvanic isolation designed for rail vehicles.	No: 4304326
3	PX24/R	DC current transducer with galvanic isolation designed for rail vehicles.	No: 4304676
4	PXN30/R	Programmable transducer with galvanic isolation and active output designed for rail vehicles.	No: 4304067
5	PX310/R	Programmable DC signals transducer with galvanic isolation designed for rail vehicles.	No: 4304052

were delivered to Institute for testing and certification on 2023-05-02 for execution of the tests. ATL 1004.3 started the requested tests under Job No. 414105232.

Picture 1.1.A – AC24/R



Picture 1.1.B – PXN/R



Picture 1.1.C – PX24/R



Picture 1.1.D – PXN30/R



Picture 1.1.E – PX310/R



## 1.2 Applicant

Rawet s.r.o.  
Čapkova 22  
678 01 Blansko  
Czech Republic

Company ID: 47901411  
Tax ID: CZ47901411

Order No:  
as of 2023-03-08

## 1.3 Manufacturer

Rawet s.r.o.  
Čapkova 22  
678 01 Blansko  
Czech Republic

## 1.4 Test Period

Started on: 2023-07-24  
Finished on: 2023-08-04

## 1.5. Place of Tests

Accredited testing laboratory 1004.3  
Sokolovská 573  
686 01 Uherské Hradiště  
Czech Republic

**1.6 Test Condition**

Ambient temperature (+15 up to +25) °C, (+59 up to +77) °F  
Barometric pressure (86 up to 106) kPa, (25.4 up to 31.3) inHg  
Relative humidity (25 up to 75) %

**1.7 Specification of Used Regulations**

<i>i</i>	<i>Regulation used</i>	<i>As Czech implementation of</i>
1	ČSN EN 50155 ed.4:2018	EN 50155:2017
2	ČSN EN 60068-2-1 ed. 2:2008	EN 60068-2-1:2007
3	ČSN EN 60068-2-2:2008	EN 60068-2-2:2007
4	ČSN EN 60068-2-30 ed. 2:2006	EN 60068-2-30:2005

**1.8 List of Used Instruments and Equipment**

<i>i</i>	<i>Instrument / Equipment</i>	<i>Identification Nr.</i>	<i>Calibration date</i>	<i>Calibration due</i>
1	Climatic chamber VCV 7060-5	S/N: 58566095750010	2021-11-11	11/2023
2	Power supply source 2x40V/4A	Reg. No: QD 5096	-	-
3	Digital multimeter Metex ME-31	S/N: 925639	2023-05-18	05/2025
4	Dielectric strength tester SEFELEC 506-H	S/N: 2048579	2022-12-16	12/2024
5	Insulation resistance meter PU 296	S/N: 32219902	2023-01-12	1/2025
6	Multimeter Keithley 2700	S/N: 1130532	2022-09-01	09/2023
7	Multimeter clamp Metrix MX2040	S/N: 72301613	2020-12-18	12/2023

All listed equipment subjected calibration have been duly calibrated and passed a regular metrological inspection.

## 2 RESULTS OF INDIVIDUAL TESTS AND EVALUATION

### 2.1 Cold test (ČSN EN 50155 ed. 5, article 13.4.4)

The test was performed according to ČSN EN 60068-2-1 ed.2, Test Ad.

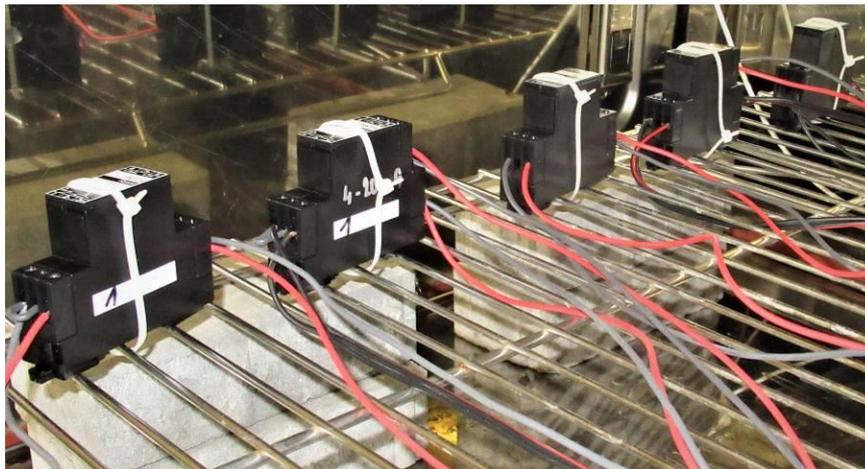
EUTs were inserted into the climatic chamber.

The functional check was performed, according to Test specification. EUTs were switched off.

Input current, voltage or resistance see Table 2.1. The temperature inside was set to  $-40^{\circ}\text{C}$ .

When the required temperature was reached, the acclimatization was performed for the period of 2 hours. After the end of this time, EUTs were switched on and the functional check was performed, according to Test specification. EUTs were removed from the chamber and exposed to the room temperature for time period of 1 hour. The functional check was performed again.

Picture 2.1.1.A – EUTs in the climatic chamber before tests



No damage or malfunction was occurred.

Temperature cycle profile:

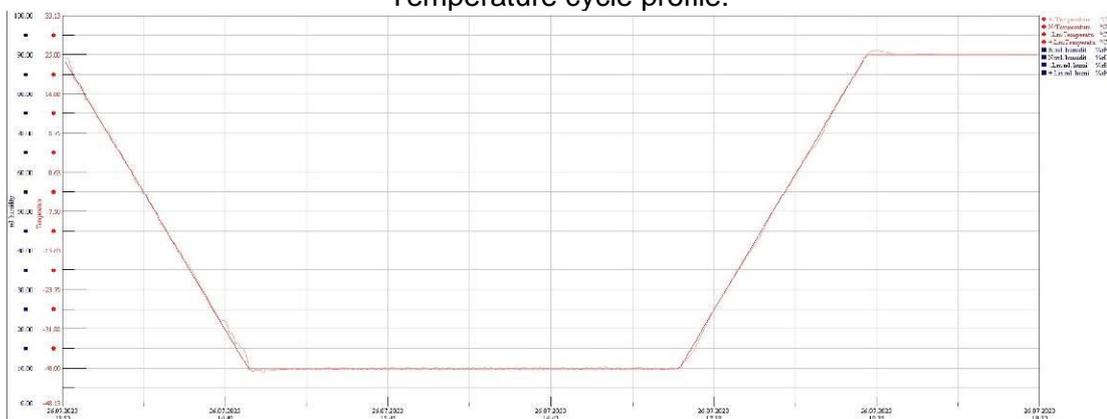


Table 2.1 - Measured values of current of output current loop:

Sample:	Current at temperature +25°C during 1 <sup>st</sup> hour	Current at temperature -40°C after 2 hours	Current at temperature +25°C after the cold test
<b>AC24/R</b> , Input: 4,0A AC	<b>17,22 mA</b>	<b>17,81 mA</b>	<b>17,27 mA</b>
Battery of current loop	25,63 V	25,63 V	25,63 V
<b>PXN/R</b> , Input: 9,89 V	<b>19,79 mA</b>	<b>19,81 mA</b>	<b>19,79 mA</b>
Supply voltage :6, :7	24,05 V DC	24,05 V DC	24,05 V DC
<b>PX24/R</b> , Input: 9,89 V	<b>19,79 mA</b>	<b>19,79 mA</b>	<b>19,79 mA</b>
Supply voltage of current loop	24,06 V DC	24,06 V DC	24,06 V DC
<b>PXN30/R</b> , Input R: 150Ω	<b>15,97 mA</b>	<b>15,98 mA</b>	<b>15,98 mA</b>
Supply voltage :7, :8	24,05 V DC	24,05 V DC	24,05 V DC
<b>PX310/R</b> , Input R: 150Ω	<b>15,96 mA</b>	<b>15,96 mA</b>	<b>15,96 mA</b>
Supply voltage of current loop	24,06 V DC	24,06 V DC	24,06 V DC

Measurement uncertainty is: 1,4°C; 0,01 V; 0,11 mA

## 2.2 Dry heat test (ČSN EN 50155 ed. 5, article 13.4.5, Test cycle A)

The test was performed according to ČSN EN 60068-2-2, Test Bd.

EUT was inserted to the climatic chamber, see picture 2.1.1.A.

The functional check was performed, according to Test specification.

Input current, voltage or resistance see Table 2.2.

The temperature in the climatic chamber was set to +70 ° C (the rate of change: 1K/min.).

When the required temperature was reached, the acclimatization was performed for the period of 2 hours. After this period, the sample was left in the chamber for the period of 6 hours.

The functional test was performed during this period.

The temperature was decreased to +25 ° C (1K/min.)

At the end of the test (after one hour), the functional check was performed again.

No damage or malfunction was occurred.

Measurement uncertainty of temperature: 1,4°C

Temperature cycle profile:

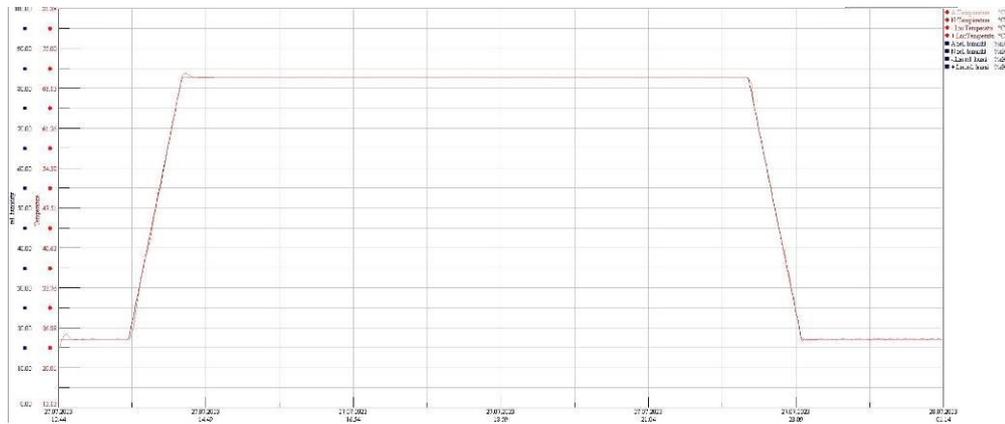


Table 2.2 - Measured values of current of output current loop:

Sample:	Current at temperature +70°C after 2 hours	Current at temperature +70°C after 4 hours	Current at temperature +25°C after dry heat test
<b>AC24/R, Input: 4,0A AC</b>	<b>16,68 mA</b>	<b>16,54 mA</b>	<b>17,08 mA</b>
Battery of current loop	25,59 V	25,59 V	25,59 V
<b>PXN/R, Input: 9,89 V</b>	<b>19,82 mA</b>	<b>19,82 mA</b>	<b>19,79 mA</b>
Supply voltage :6, :7	24,05 V DC	24,05 V	24,05 V
<b>PX24/R, Input: 9,89 V</b>	<b>19,79 mA</b>	<b>19,79 mA</b>	<b>19,79 mA</b>
Supply voltage of current loop	24,06 V DC	24,06 V DC	24,06 V DC
<b>PXN30/R, Input R: 150Ω</b>	<b>15,99 mA</b>	<b>15,99 mA</b>	<b>15,99 mA</b>
Supply voltage :7, :8	24,05 V DC	24,05 V DC	24,05 V DC
<b>PX310/R, Input R: 150Ω</b>	<b>15,95 mA</b>	<b>15,95 mA</b>	<b>15,95 mA</b>
Supply voltage of current loop	24,06 V DC	24,06 V DC	24,06 V DC

Measurement uncertainty is: 1,4°C; 0,01 V; 0,11 mA

### 2.3 Insulation test (ČSN EN 50155 ed. 5, article 13.4.7)

The test was performed according to ČSN EN 50155, article 13.4.7.1.

Table 2.3.1 - Measured values before the damp heat cyclic test according to applicant's specification

Insulation res. min. 20 MΩ	Insulation res. before	Withstand voltage	Insulation res. after
Test voltage	500V DC	4000V/50Hz/1min.	500V DC
AC24/R input – output :1+2 against :3+4	1,999 TΩ	OK	1,999 TΩ
Uncertainty:	-	75 V	-
PXN30/R input – output+power supply :1+2+3 against :5+6+7+8	1,999 TΩ	OK	1,999 TΩ
PXN30/R output – power supply :1+2 against :3+4	1,999 TΩ	OK	1,999 TΩ
Uncertainty:	-	75 V	-
PX310/R input – output :1+2+3 against :4+5	1,999 TΩ	OK	1,999 TΩ
Uncertainty:	-	75 V	-
PXN/R output – power supply :4+5 against :6+7	1,999 TΩ	OK	1,999 TΩ
Uncertainty:	-	75 V	-
PXN/R input – output+power supply :1+3 against :4+5+6+7	1,999 TΩ	OK	1,999 TΩ
Uncertainty:	-	75 V	-
Test voltage	500V DC	5000V/50Hz/1min.	500V DC
PX24/R input – output :1+2 against :3+4	1,999 TΩ	OK	1,999 TΩ
Uncertainty:	-	92V	-

Measurement uncertainty for value 1,999 TΩ is undefined.

Table 2.3.2 - Measured values of current of output current loop after insulation test:

Sample	Current of current loop
<b>AC24/R</b> , Input: 4,0A AC	<b>17,00 mA</b>
Battery of current loop	25,59 V
<b>PXN/R</b> , Input: 9,89 V	<b>19,81 mA</b>
Supply voltage :6, :7	24,05 V DC
<b>PX24/R</b> , Input: 9,89 V	<b>19,80 mA</b>
Supply voltage of current loop	24,06 V DC
<b>PXN30/R</b> , Input R: 150Ω	<b>15,97 mA</b>
Supply voltage :7, :8	24,05 V DC
<b>PX310/R</b> , Input R: 150Ω	<b>15,96 mA</b>
Supply voltage of current loop	24,06 V DC

Measurement uncertainty is: 0,01 V; 0,11 mA

Insulation resistance complies requirements of the test specification. During the withstand voltage test breakdown was not observed. After it the function test was performed with positive result.

#### **2.4 Damp heat test, cyclic (ČSN EN 50155 ed. 5, article 13.4.8)**

The test was performed according to ČSN EN 60068-2-30 ed.2, Test Db, Variant 2.

Insulation resistance test and withstand voltage tests were performed before the test. See Table 2.4.1.

Temperatures: +25 °C (lower), +55 °C (upper).

Number of cycles: 2 (2x24 hours)

EUT was inserted to the climatic chamber, picture 2.1.1.A.

The functional check was performed, according to test specification. See Table 2.3.2.

Input current, voltage or resistance see Table 2.4.1.

Description of 24 hours cycle:

After the temperature stabilization at 25°C, relative humidity was increased to 95%.

After one hour, the temperature was increased to +55 °C (within 3 hours).

Constant temperature and humidity were maintained for the period of 9 hours.

After that the temperature was decreased to +25 °C (within 6 hours), for the period until the end of the cycle.

EUT was switched on at the beginning of the second cycle for execution of the functional check (when temperature is increasing to +35 °C).

At the end of second cycle relative humidity was decreased to 75%. After three hours, the functional check was performed.

At the end of the test, the functional check was performed again. See Table 2.4.3.

No damage or malfunction was occurred. See Table 2.4.1.

Insulation resistance test and withstand voltage tests were performed after the damp heat test, cyclic, see Table 2.4.2.

Measurement uncertainty of temperature: 1,4°C

Measurement uncertainty of relative humidity: 3,6%

Temperature and humidity cycles profile:

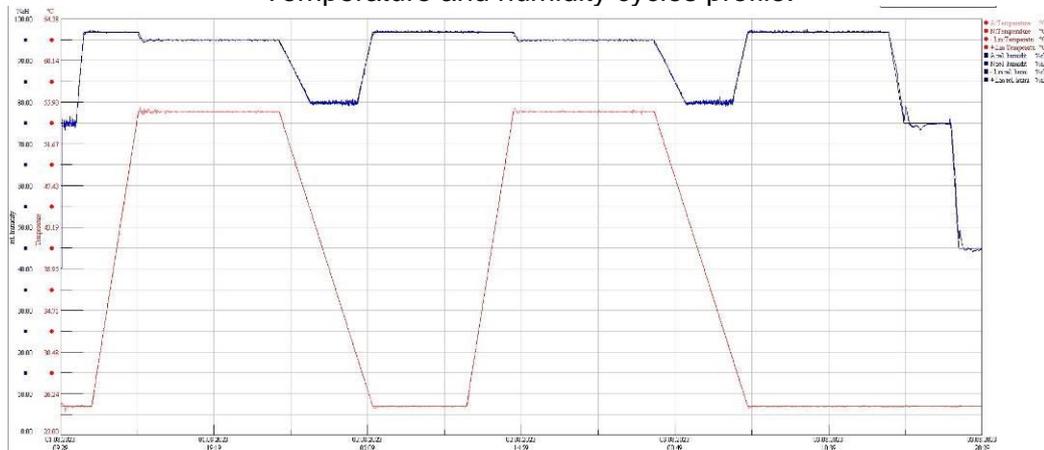


Table 2.4.1 - Measured values of current of output current loop:

Sample:	Current before damp heat test cyclic	Current at temperature +35°C beginning 2.cycle	Current at temperature +25°C after damp heat test
<b>AC24/R</b> , Input: 4,0A AC	<b>17,00 mA</b>	<b>16,96 mA</b>	<b>17,24 mA</b>
Battery of current loop	25,59 V	25,59 V	25,59 V
<b>PXN/R</b> , Input: 9,89 V	<b>19,81 mA</b>	<b>19,78 mA</b>	<b>19,78 mA</b>
Supply voltage :6, :7	24,05 V DC	24,05 V DC	24,05 V DC
<b>PX24/R</b> , Input: 9,89 V	<b>19,80 mA</b>	<b>19,77 mA</b>	<b>19,77 mA</b>
Supply voltage of current loop	24,06 V DC	24,06 V DC	24,06 V DC
<b>PXN30/R</b> , Input R: 150Ω	<b>15,97 mA</b>	<b>15,98 mA</b>	<b>15,98 mA</b>
Supply voltage :7, :8	24,05 V DC	24,05 V DC	24,05 V DC
<b>PX310/R</b> , Input R: 150Ω	<b>15,96 mA</b>	<b>15,96 mA</b>	<b>15,96 mA</b>
Supply voltage of current loop	24,06 V DC	24,06 V DC	24,06 V DC

Table 2.4.2 - Measured values of insulation test after the damp heat cyclic test:

Insulation res. min. 20 MΩ	Insulation res. before	Withstand voltage	Insulation res. after
Test voltage	500V DC	4000V/50Hz/1min.	500V DC
AC24/R input – output :1+2 against :3+4	1,999 TΩ	OK	1,999 TΩ
Uncertainty:	-	75 V	-
PXN30/R input – output+power supply :1+2+3 against :5+6+7+8	8,84 GΩ	OK	13,38 GΩ
PXN30/R output – power supply :1+2 against :3+4	18,02 GΩ	OK	19,33 GΩ
Uncertainty:	0,52 GΩ / 4,17 GΩ	75 V	3,09 GΩ / 4,47 GΩ
PX310/R input – output :1+2+3 against :4+5	2,85 GΩ	OK	4,58 GΩ
Uncertainty:	0,17 GΩ	75 V	0,27 GΩ
PXN/R output – power supply :4+5 against :6+7	1,999 TΩ	OK	1,089 TΩ
Uncertainty:	-	75 V	-
PXN/R input – output+power supply :1+3 against :4+5+6+7	172,4 GΩ	OK	0,594 TΩ
Uncertainty:	-	75 V	-
Test voltage	500V DC	5000V/50Hz/1min.	500V DC
PX24/R input – output :1+2 against :3+4	1,999 TΩ	OK	1,999 TΩ
Uncertainty:	-	92V	-

Uncertainty for values higher than 100 GΩ is undefined.

Table 2.4.3 - Measured values of current of output current loop after damp heat cyclic test and insulation test:

Sample	Current of current loop
<b>AC24/R</b> , Input: 4,0A AC	<b>17,18 mA</b>
Battery of current loop	25,59 V
<b>PXN/R</b> , Input: 9,89 V	<b>19,77 mA</b>
Supply voltage :6, :7	24,05 V DC
<b>PX24/R</b> , Input: 9,89 V	<b>19,77 mA</b>
Supply voltage of current loop	24,06 V DC
<b>PXN30/R</b> , Input R: 150Ω	<b>15,98 mA</b>
Supply voltage :7, :8	24,05 V DC
<b>PX310/R</b> , Input R: 150Ω	<b>15,96 mA</b>
Supply voltage of current loop	24,06 V DC

Measurement uncertainty is: 0,01 V; 0,11 mA



Insulation resistance complies requirements of the test specification at all tested samples.  
During the withstand voltage test breakdown was not observed at all tested samples.  
Performance test was successfully performed at all tested samples.

### **3 CONCLUSIONS**

**The transducers AC24/R, PXN/R, PX24/R, PXN30/R, PX310/R were tested according to the following regulations to the extend described in point 2 of the Test report:**

- **EN 50155:2021 cl.13.4.4, 13.4.5, 13.4.7, 13.4.8.**
- **EN 60068-2-1:2007**
- **EN 60068-2-2:2007**
- **EN 60068-2-30:2005**

**There was no damage. The transducers AC24/R, PXN/R, PX24/R, PXN30/R, PX310/R were fully functional.**

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END OF THE TEST REPORT