NOVOTEST

NONDESTRUCTIVE TESTING

COATING THICKNESS GAGE NOVOTEST TP-1

MANUAL

2015

CONTENTS

The following operation manual explains the preparation, setup, principles of operation, usage, and troubleshooting of the Coating Thickness Gage (NOVOTEST TP-1), the Device thereafter.

1 General instructions

1.1 Purpose of the Device

The device is designed for measuring:

The thickness of:

- ✓ dielectric and conducting non-ferromagnetic, except for nickel, electrolytic covering on conducting ferromagnetic base material with the use of inductive converters ***F***;
- ✓ thick dielectric (bituminous, mastic and the others) on ferromagnetic and non-ferromagnetic base materials with use of parametric converters ***M***;
- ✓ dielectric covering on conductive non-ferromagnetic base materials with use of parametric converters ***NF***;
- ✓ conductive non-ferromagnetic coverings on conductive non-ferromagnetic base materials with use of converters ***NF***;

Environmental conditions:

- ✓ temperature of metal surface with the use of the converter ***ST***;
- ✓ temperature of air, air moisture, dew-point with use of the converter ***STMD***;

✓ Also for the slot dept measuring, and estimation of the surface roughness with the use of converters ***SR***.

1.2 Working conditions

temperature of the air	from -5 to +40C
temperature for the converters	-20 to +40C
relative air moisture	- 98% at the temperature of + 35C

2 Specifications

2.1 Measuring range of the surface thickness

- The inductive converters ***F*** (non-ferromagnetic surfaces on ferromagnetic base materials):

Type of the sensor	Measuring range, μm
F-0,5	0-500
F-2	0-2000
F-5	0-5000

- The parametric converters ***NF*** (dielectric coverings on the conductive non-ferromagnetic base materials):

Type of the sensor	Measuring range, μm
NF-0,5	0-500
NF-2	0-2000

- The parametric converters ***M*** (dielectric coverings on the conducting ferro- and non-ferromagnetic base materials):

Type of the sensor	Measuring range, μm
M12	0-12000
M30	0-30000

2.2 Measuring range of the slot depth and estimation of the surface roughness:

Type of the sensor	Measuring range, μm
SR1	0-300

2.3 Measuring range of the temperature, moisture and the dew-point:

- Temperature indication of the metal surface:

Type of the sensor	Measuring range, °C
ST	-50…+125 °C

- Temperature indication of the air, air moisture, and the dew-point:

Type of the sensor	Measuring range
STMD	air moisture: 0 - 100% temperature:-50…125°C dew-point: -15 - +40°C

2.4 Error limits of the covering thickness measuring with the roughness of surface Ra≤1±0,1 μm:

Type of the sensor	Error, mm
F-0,5	±(0,03h + 0,001)
F-2	±(0,03h + 0,002)
F-5	±(0,03h + 0,002)
NF-0,5	±(0,03h + 0,001)
NF-2	±(0,03h + 0,002)
M12	±(0,03h + 0,01)
M30	±(0,03h + 0,02)

h – rated value of the depth , mm

2.5 Limits of the tolerable error of the slot depth measuring and estimation of the surface roughness:

Type of the sensor	Error, mm
DR1	±(0,03h + 0,002)

h – rated value of the slot depth, mm

2.6 The additional error limits of measuring the covering thickness at temperature ranging from -10°C to + 40°C:

Type of the sensor	Error, mm
F-0,5	±(0,02h + 0,002)
F-2	±(0,02h + 0,002)

F-5	±(0,02h + 0,002)
NF-0,5	±(0,02h + 0,002)
NF-2	±(0,02h + 0,002)
M12	±(0,02h + 0,1)
M30	±(0,03h + 0,1)

h – rated value of the thickness, mm

2.7 The additional error limits of the slot depth measuring and estimation of the surface roughness at temperature ranging from -10°C to + 40°C:

Type of the sensor	Error, mm
SR	±(0,03h + 0,002)

h – rated value of the slot depth, mm

2.8 Overall dimensions:

Name	Overall dimensions, mm
Information processing unit	120x60x25
F-0,5	Ø10x35
F-2	Ø12x40
F-5	Ø18x40
NF-0,5	Ø15x60
NF-2	Ø15x60
M12	Ø18x40
M30	Ø25x60
SR	Ø18x40

2.9 Weight:

Name	Weight, kg
Information processing unit	0,25
Probes	0,1

2.10 Power supply and the time of the continuous operation:

2.10.1 Power supply is provided by 2 NiMH rechargeable batteries or cells with the voltage rating 1,5V.

2.10.2 Time of the continuous operation from recharged batteries, no less than 20 hours.

2.10.3 The device is turned off automatically 1 minute after the last measurement was made.

3 Packing list:

3.1 Information processing unit – 1 ps.

3.2 Probes:

Type	Number	Measuring range of the thickness	Purpose
F-0,5		0-500 μm	Control of the paint and galvanic covering
F-2		0-2000 μm	Control of the paint and galvanic covering
F-5		0-5000 μm	Control of the paint and mastic covering

NF-0,5		0-500 μm	Control of the anodic-oxide films and paint and galvanic coverings on low-sized and short radius parts
NF-2		0-2000 μm	Control of the anodic-oxide films and paint and galvanic coverings
M12		0-12 μm	Control of the mastic covering
M30		0-30 μm	Control of the mastic covering
SR		0-300 μm	Control of the surface roughness after sanding and bead-bloating
ST		-50…+125 °C	Control of the temperature
STMD		moisture: 0 - 100% temperature: -50…125°C dew-point: -15 - +40°C	Control of the temperature, moisture and the dew-point

3.3 Set of reference thickness samples – 1 ps.
3.4 Rechargeable battery – 2 ps.
3.5 Charger – 1 ps.
3.6 Manual.

4 Labeling and packaging

The following information is on the case:

- Manufacturer name and logo;
- Serial number and the manufacturing date located on the back cover plate.

The information processing unit and the probes are kept in a case that protect from transformation damage.

5 The circuit diagram, principles of operation, indicators and controls

5.1 Block-diagram

The device includes the electronic module and sensor, attached with the connector. Detachable connector is on the upper front surface of the case. Navigation buttons are on the front panel, as well as the graphic indicator. The battery located in the lower back spot of the case under the cover in the compartment for batteries.

5.2 Operation principles

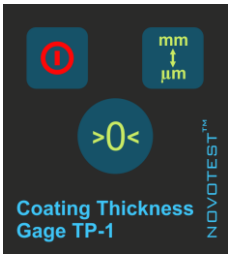
Operation of the device is based on measuring oscillator frequency with coil of eddy current parametric converter in the circuit. The frequency of the oscillation depends on covering thickness. The result of the measuring is indicated on the display.

5.3 Device display

Display indicates the measured thickness of coating in mm or μm. The charging level of batteries and the type of the connected sensor also shown on the display.

5.4 Device keyboard

Keyboard:



Keys function:

5.4.1.1  - turn on/off.

5.4.1.2  - set zero.

5.4.1.3  - the measuring scale options.

6 Device Usage
6.1 Preparation for use
6.1.1 Work with batteries

Connect the sensor to the connector on the panel of the information processing unit.

1. Install battery in the battery compartment using polarity.
2. For checking the charge of the battery press and hold the button  .
3. The Level of the battery charging is shown on the left upper corner of the display as a small battery icon. The dark battery color means the battery is fully charged. During discharging the battery icon segments disappear consecutively, from left to the right. One dark segment or absence of segments means that the battery needs recharging. The battery icon is present on the display in any mode of the device operation.
4. For charging the battery turn off the device pressing the button  After that take off the battery from the battery compartment and charge it according to p.6.1.2.
5. After installing the recharged battery in the battery compartment turn on the device.

6.1.2 Charging the battery

For charging the batteries:

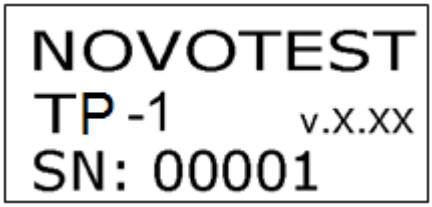
- install the battery to the charger;
- connect the charger to the mains power supply.

The battery will be fully charged in approximately 14 hours. It is forbidden to leave the charger alone during charging. After long storage period the battery needs recharging once every 2 months, even if it was not used.

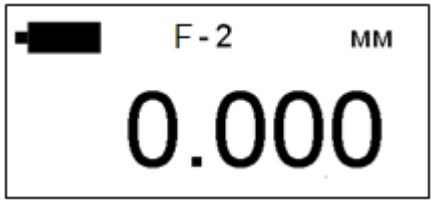
6.2 Turning on the device

Prepare the device for use according to p.6.1 and turn on it pressing the button  .

Logo appears on the display after pressing the button:



After that the device is ready for operation and on the display the following information will appear:



F-2 — type of sensor
0,000 —thickness of the covering value
The device is ready for measurements.

6.3 Measurements

6.3.1 Prepare the device to work in accordance with p.6.1. and turn on the device in accordance with p.6.2.
6.3.2 Install the sensor perpendicularly on the surface and press it steadily.
6.3.3 Wait for constant value of thickness of the covering on the display.
6.3.4 Lift the sensor from the surface and raise it in air.
6.3.5 After lifting the sensor in the air the display will indicate the last result of the thickness of the covering, which will be changed just after the next measurement.
6.3.6 Indication of the name of the sensor becomes inverted. The following measurement will be possible after indication of the name of the sensor takes the usual style.

Note: Zero setting is recommended for the sensor according to p.6. 5. in the case of changing conditions of use (considerable change of the temperature, conduction of the material) at first activation of the sensor.

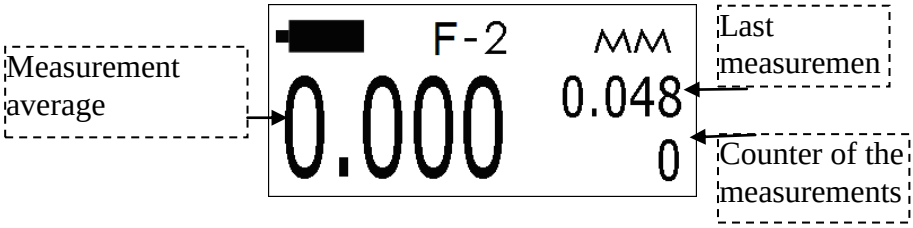
6.4 Measurements of average values

The automatic averaging mode provides a default calculation of final measurement result in the arithmetic mean value together with the last measurements.

6.4.1 For switching on the mode of averaging press and hold button 

, for more than 2 seconds.

6.4.2 On display the following information will appear:



6.4.3 For resetting measurement average and beginning new series of measurements press button 

.

6.4.4 To return from mode with averaging press and hold button 

for more than 2 seconds. The device will return to the usual mode.

6.5 Scales of the measured value

6.5.1 For choosing the scale of the measured value (mm or µm) press 

.

6.5.2 The chosen scale will be indicated on the display.

6.6 Calibration

To provide an adequate measurement with the device of the real thickness of the covering calibrate the device. For it you need to prepare a sample of the tested part similar or close in geometric, electrophysical properties and in the type of mechanical treatment of the tested product.

6.6.1 Setting zero

6.6.1.1 Install the sensor perpendicularly on prepared sample without covering normal to the surface and press it steadily.Wait for indications to remain constant.

6.6.1.2 Press button 

, after that figures: 0.000; 00.00; 000.0; or 0 will appear on the display depending on the type of the sensor and used scale.

6.6.1.3 For checking the accuracy of the setting zero make repeated measurements on the prepared sample without covering. Reading must be within the range of 0±2 μm.

Note: Zero setting is recommended for the sensor according to p.6. 5. in the case of changing conditions of use (considerable change of the temperature, conduction of the material) at first activation of the sensor.

6.6.2 One-point correction

6.6.2.1 Switch the mode of the measurements with averaging in accordance with p.6.4.

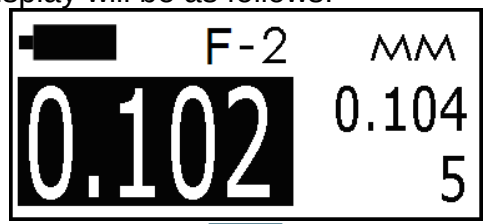
6.6.2.2 Prepare the sample for calibration, for it put the sample of the reference thickness tightly against the smooth base.

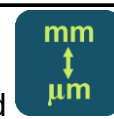
6.6.2.3 Make no less than 3 measurements.

6.6.2.4 Switch the mode of correction. For it press twice button  , after that two quick presses 

, and after that again press  twice.

6.6.2.5 Indication of averaged value of the thickness of the covering will become inverted. Display will be as follows:



6.6.2.6 Use buttons  and 

for setting adequate average measurements to the rated value of the thickness of the covering.

6.6.2.7 Press button 

for ending one-point correction.

6.6.2.8 The inverted indication of the value in the right part of the display means that the device use settings with one-point correction.

6.6.2.9 After above procedures make several test measurements. If inaccuracy does not exceed value specified in p.2.4. the device is ready for use, otherwise repeat the calibration.

Note: After changing a part for measurements for a part with significant difference in properties, calibrate the device for the new part again.

6.6.3 Resetting one-point correction

6.6.3.1 In case of wrong calibration for resetting the sensor make measurement on a sample or a part without covering, and after that press and hold button 

for more than 5 seconds.

6.6.3.2 Indication of the scale in the right part of the display will cease to be inverted.

6.7 Turning off the device

6.7.1 For turning off the device press and hold button  .

6.7.2 If measurements were not made during 1 minute, the device would switch off automatically.

7 Safety precautions

7.1 Use of the device is allowed only after reading the operation manual.
7.2 Minor malfunction the device may be fixed after its turning off, repair is done only by NOVOTEST.

8 Transportation and storage

8.1 The device must be kept at the ambient temperature from +5 to +40° C and atmospheric moisture below 80% at the temperature 25° C.
8.2 The storage place must be free off dust, acid vapor, alkalis and aggressive gas.
8.3 Transportation of the device can be done by any type of transport, in accordance with rules of transportation.
8.4 During transportation, loading and keeping at the storehouse the device must be protected against shocks, push and moisture.

9 Device testing

9.1 The device testing must be done no less than once a year.
9.2 The device testing can done only in Metrologic and standards center in according with methodological instructions applied.

10 Testing certificate

The covering thickness gage NOVOTEST TP-1 № _____ is made and accepted in accordance with obligatory requirements state standard, acting technical documentation and is suitable for use.

Date of manufacturing

_____ **Signature**

Date of sale

_____ **Signature**

Note: The design of the covering thickness gage is subject to change without private notification the changes having negative effect on its operations and measuring specification.