

# Instrument calibration sheet

Certificate N°	000039/2021	Date of issue	13.12.21
Client	ENEL Produzione	Work order	8000000591

## Instrument specification

Type	Turbidity meter	Manufacturer	Endress-Hauser	Serial number	E3087305G00
Min capacity	0	Max capacity	80	Model	Liquiline CM442
Readability At 0	0,1	Readability	0,1	Unit of measure	FNU
Description	C1 Itar Turbidity meter			Next Calibration	28.12.21

## Test ambient conditions

Location	ENEL - C1 Itar			Date of test	13.12.21	00:00
Temperature	243	Humidity	78	Pressure	1020hPa	

## Standard certificates used

Name	Number	Issuer	Date of issue
Turbidity	852	DPG	24.05.19

## Calibration summary

Test	Certificate name	Uncertainty	Temperature	Humidity	Pressure
Repeatability	Turbidity	0,707696FNU	243	78	1020hPa
Linearity	Turbidity	0,719954FNU	24,3	78	1020hPa

**Expanded uncertainty** **1,439907FNU**

## Notes

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### Repeatability

Measure	Nominal value	Conventional value	Read value	Deviation
1	15	14,95	15	0,05
2	15	14,95	15	0,05
3	15	14,95	14	-0,95
4	15	14,95	15	0,05
5	15	14,95	16	1,05

### Standard reference

Serial	Uncertainty	OIML
HI9873-20	0,1	
HI9873-20	0,1	
HI9873-20	0,1	
HI9873-20	0,1	
HI9873-20	0,1	

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**Linearity**

Measure	Nominal value	Conventional value	Read value	Error	Uncertainty of error	Standard reference	
						Uncertainty	OIML
1	15	14,95	14	-0,95	0,719954	0,1	

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## Formulas

### Repeatability

The test consists in the repeated measure of the same reference value, under identical conditions of handling the reference and the instrument, and under constant test conditions, both as far as possible

Standard deviation is computed to allow an appraisal of the instrument's performance.

$$s(I) = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (I_i - \bar{I})^2} \quad \bar{I} = \frac{1}{n} \sum_{i=1}^n I_i$$

Repeatability standard uncertainty has been computed with the following formula, taking into account instrument's scale interval (d)

$$u_{rep} = \sqrt{s(I)^2 + \left(\frac{d_I^2}{12}\right)}$$