

Certificate N°	000003/2021	Date of issue	31.03.21
Client	ENEL Produzione	Work order	8000000591

Instrument specification

Type	Conductivity meter	Manufacturer	Endress-Hauser	Serial number	E3087205G00
Min capacity	0	Max capacity	14000	Model	Liquiline CM442
Readability At 0	1	Readability	1	Unit of measure	µS/cm
Description	C1 Itar Conductivity meter			Next Calibration	30.06.21

Test ambient conditions

Location	ENEL - C1 Itar			Date of test	31.03.21	00:00
Temperature	23,5°C	Humidity	70%	Pressure	1020hPa	

Standard certificates used

Name	Number	Issuer	Date of issue
Conductivity	18L93	Hanna Instruments	27.07.20

Calibration summary

Test	Certificate name	Uncertainty	Temperature	Humidity	Pressure
Repeatability	Conductivity	0,885061µS/cm	18°C	71%	1019hPa
Linearity	Conductivity	0,974761µS/cm	18°C	69%	1020hPa
Expanded uncertainty					1,949521µS/cm

Notes

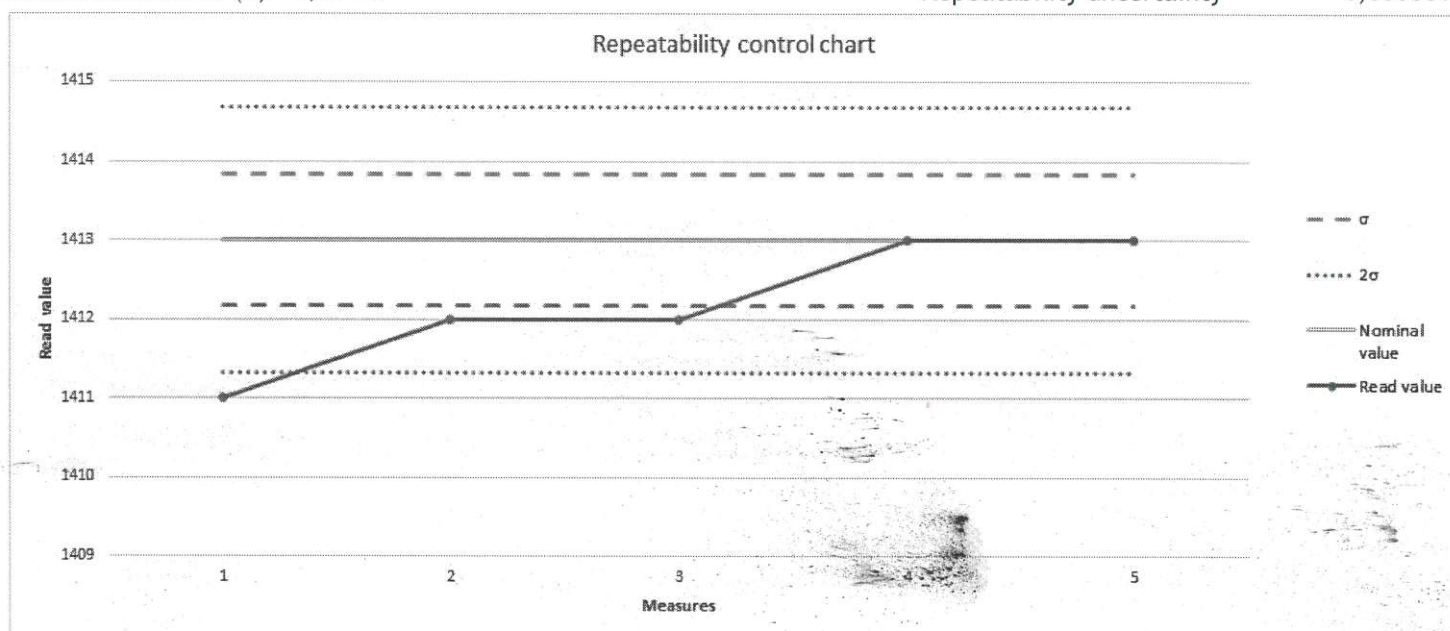
Dipietro Group S.r.l.
 Il Traversaia V.le Garrone, 6
 96010 Città di Giussano (SR)
 P. IVA 01112700891

Instrument

Conductivity meter - Liquiline CM442 - E3087205G00

Repeatability					Standard reference		
Measure	Nominal value	Conventional value	Read value	Deviation	Serial	Uncertainty	OIML
1	1413	1412	1411	-1	51100533	0,01	
2	1413	1412	1412	0	51100533	0,01	
3	1413	1412	1412	0	51100533	0,01	
4	1413	1412	1413	1	51100533	0,01	
5	1413	1412	1413	1	51100533	0,01	

Min value 1411 Max value 1413 Average value 1412,2

Standard deviation (σ) 0,83666 Repeatability uncertainty 0,885061


Technician
Il. Tr. s. a. Vile Garrone, 8
80040 Citta' Giardino (SI)
P. IVA 01112700891

Instrument

Conductivity meter - Liquiline CM442 - E3087205G00

Linearity						Standard reference	
Measure	Nominal value	Conventional value	Read value	Error	Uncertainty of error	Uncertainty	OIML
1	84	83,5	84,1	0,599998	0,974761	0,01	
2	1413	1412	1412	0	0,974761	0,01	
3	12880	12892	12880	-12	0,974761	0,01	

Min value 84,1

Max value 12880

Average value

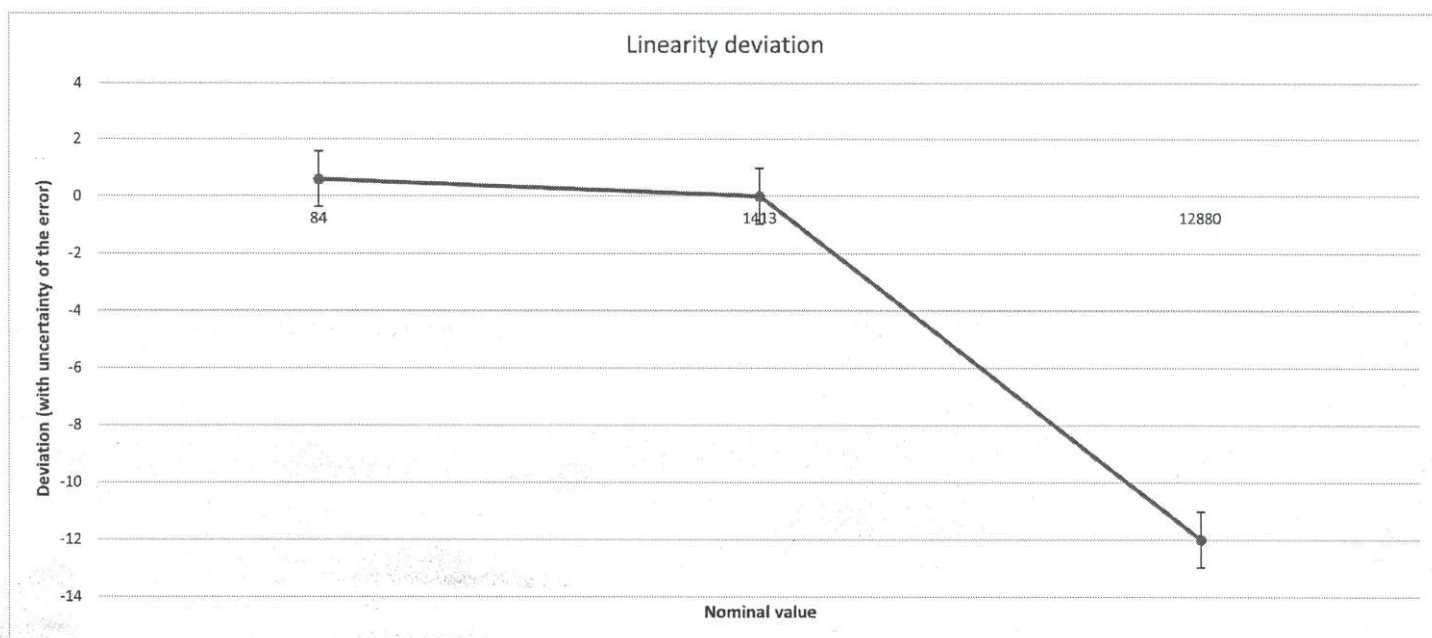
4792,033

Standard deviation 12

k-Factor: 2 (95,45%)

Expanded uncertainty

1,949521



Dipietro Group S.r.l.
Il Traverso a V.le Carrone, 6
96010 Citta' Giardin - Melilli (SR)
P. IVA 01112700891

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)

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

Linearity

This test is performed with different test values distributed fairly evenly over the normal measuring range. The purpose of this test is an appraisal of the performance of the instrument over the whole measuring range.

The uncertainty of the error is computed with the following formula and takes into account repeatability and eccentricity uncertainty when applicable:

$$u(E) = \sqrt{u^2(I_{dig0}) + u^2(I_{dig1}) + u^2(I_{rep}) + u^2(I_{ecc}) + u^2(I_{mc}) + u^2(I_{mb}) + u^2(I_{md}) + u^2(I_{mconv})}$$

The terms relative to air buoyancy (mb) and convection effects (mconv) are considered negligible due to enough acclimatisation allowed to the instrument.

Expanded uncertainty has been computed with the following formula:

$$U = u(E)_{max} k$$

For this report a coverage factor of 2 as been considered giving an overall confidence level of 95,45%