

# Instrument calibration sheet

Certificate N° 000163  
Client ENEL Produzione

Date of issue 09/12/2019  
Work order 8000000591

## Instrument specification

Type	Flowmeter	Manufacturer	Siemens	Max capacity	300
Model	PT878	Serial number	2554	Readability	1
Description	C1 Itar Flowmeter			Unit of measure	m3/h

## Test ambient conditions

Location	ENEL - C1 Itar			Date of test	09/12/2019	11:30
Temperature	23°C	Humidity	75%	Pressure	1021hPa	

## Standard certificates used

Name	Number	Issuer	Date of issue
Flowmeter PT878	56525	GE	31/07/2015

## Calibration summary

Test	Certificate name	Uncertainty	Temperature	Humidity	Pressure
Repeatability	Flowmeter PT878	3,538819l/m	23°C	75%	1021hPa
Linearity	Flowmeter PT878	3,875982l/m	23°C	75%	1021hPa
Expanded uncertainty					7,751965l/m

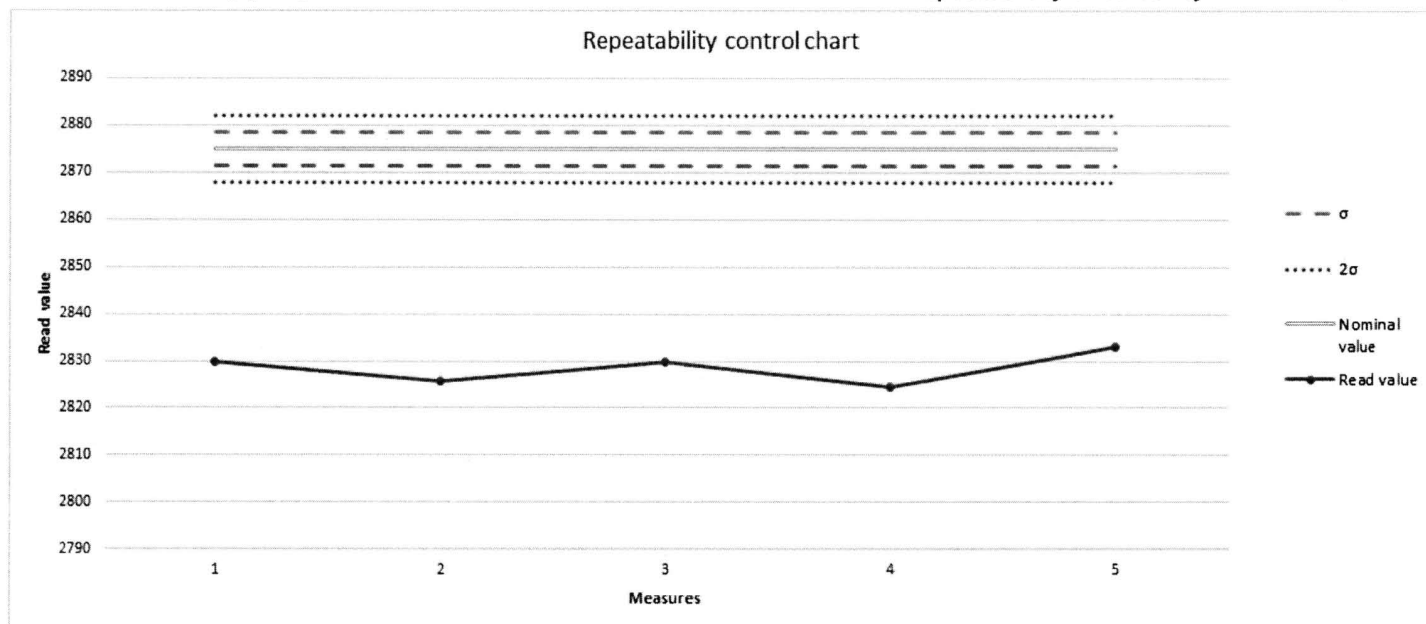
## Notes

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Repeatability					Standard reference		
Measure	Nominal value	Conventional value	Read value	Deviation	Serial	Uncertainty	OIML
1	2875	2846,25	2830	-16,25	57E/01121267/01	1	
2	2875	2846,25	2825,7	-20,550049	57E/01121267/01	1	
3	2875	2846,25	2829,92	-16,330078	57E/01121267/01	1	
4	2875	2846,25	2824,45	-21,800049	57E/01121267/01	1	
5	2875	2846,25	2833,12	-13,129883	57E/01121267/01	1	

Min value 2824,45      Max value 2833,12      Average value 2828,638

Standard deviation ( $\sigma$ ) 3,527025      Repeatability uncertainty 3,538819



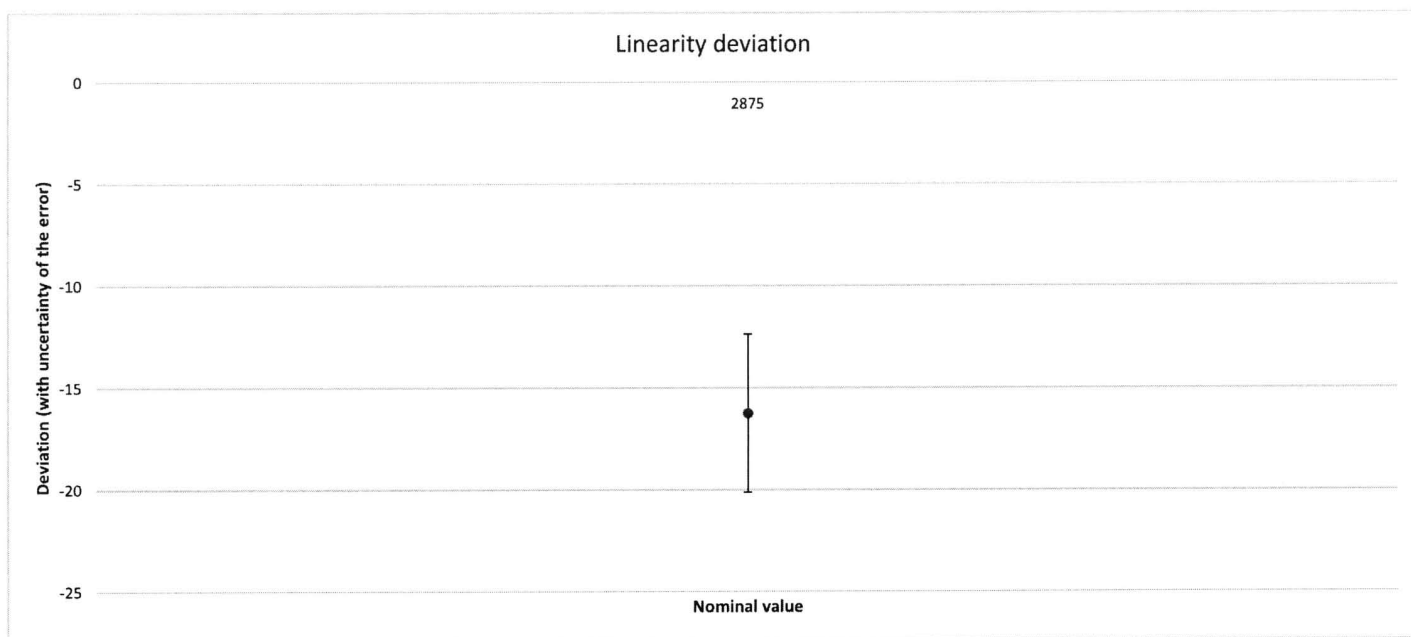
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## Linearity

Measure	Nominal value	Conventional value	Read value	Error	Uncertainty of error	Standard reference	
						Uncertainty	OIML
1	2875	2846,25	2830	-16,25	3,875982	1	

Min value 2830 Max value 2830 Average value 2830

Standard deviation 16,25 k-Factor: 2 (95,45%) Expanded uncertainty 7,751965



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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)

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

### 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%