

Instrument calibration sheet

Certificate N°	000016/2021	Date of issue	04.08.21
Client	ENEL Produzione	Work order	8000000591

Instrument specification

Type	Flowmeter	Manufacturer	Siemens	Serial number	2554
Min capacity	0	Max capacity	300	Model	Siemens II
Readability At 0	1	Readability	1	Unit of measure	m3/h
Description	C1 Itar Flowmeter	Next Calibration	17.12.21		

Test ambient conditions

Location	ENEL - C1 Itar			Date of test	21.06.21	00:00
Temperature	29,5°C	Humidity	78%	Pressure	1023hPa	

Standard certificates used

Name	Number	Issuer	Date of issue
Flowmeter PT878	56525	GE	01.09.20

Calibration summary

Test	Certificate name	Uncertainty	Temperature	Humidity	Pressure
Repeatability	Flowmeter PT878	2,518532m3/h	29,5°C	78%	1021hPa
Linearity	Flowmeter PT878	2,973719m3/h	29,5°C	78%	1020hPa

Expanded uncertainty **5,947438m3/h**

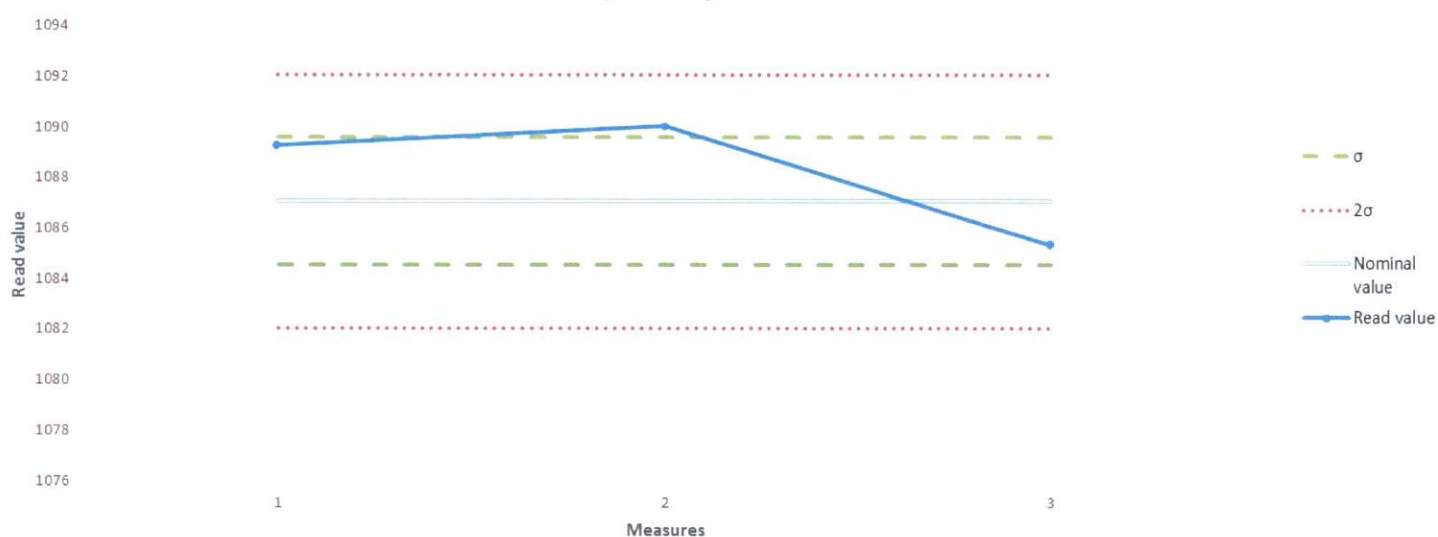
Notes

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Repeatability

Measure	Nominal value	Conventional value	Read value	Deviation	Standard reference		
					Serial	Uncertainty	OIML
1	1087,074	1075,656	1089,25	13,594	-7057E/01121267	1	
2	1087,074	1075,656	1090,015	14,359015	-7057E/01121267	1	
3	1087,074	1075,656	1085,35	9,693976	-7057E/01121267	1	
Min value		1085,35	Max value		Average value		1088,205
Standard deviation (σ)		2,501934		Repeatability uncertainty		2,518532	

Repeatability control chart



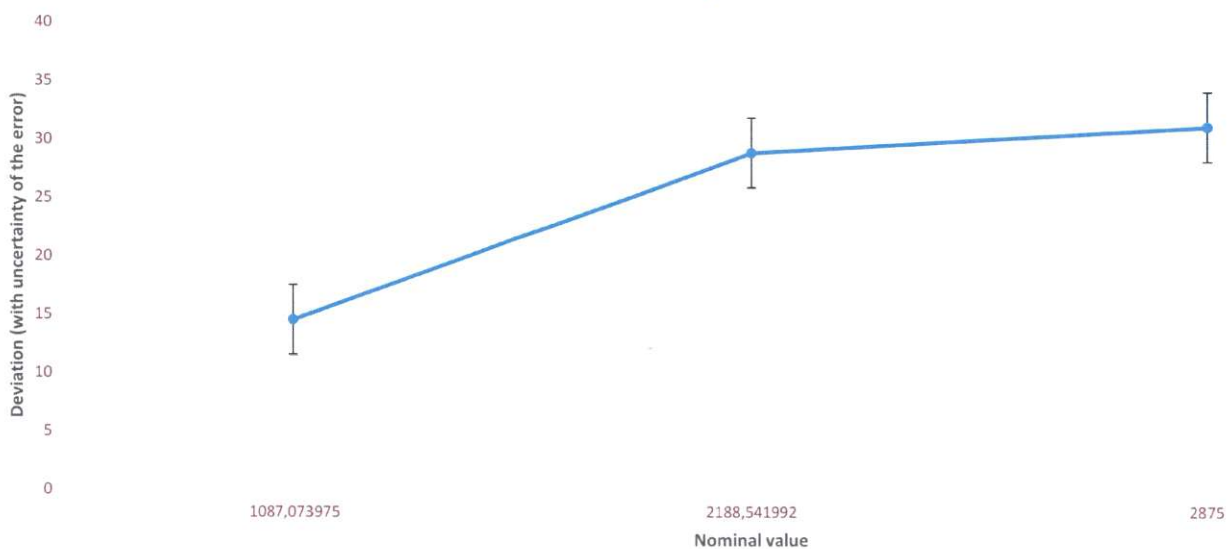
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Linearity

Measure	Nominal value	Conventional value	Read value	Error	Uncertainty of error	Standard reference	
						Uncertainty	OIML
1	1087,074	1075,656	1090,15	14,494024	2,973719	1	
2	2188,542	2166,276	2195,01	28,73401	2,973719	1	
3	2875	2846,25	2877,2	30,949951	2,973719	1	

Min value	1090,15	Max value	2877,2	Average value	2054,12
Standard deviation	30,94995	k-Factor:	2 (95,45%)	Expanded uncertainty	5,947438

Linearity deviation



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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%

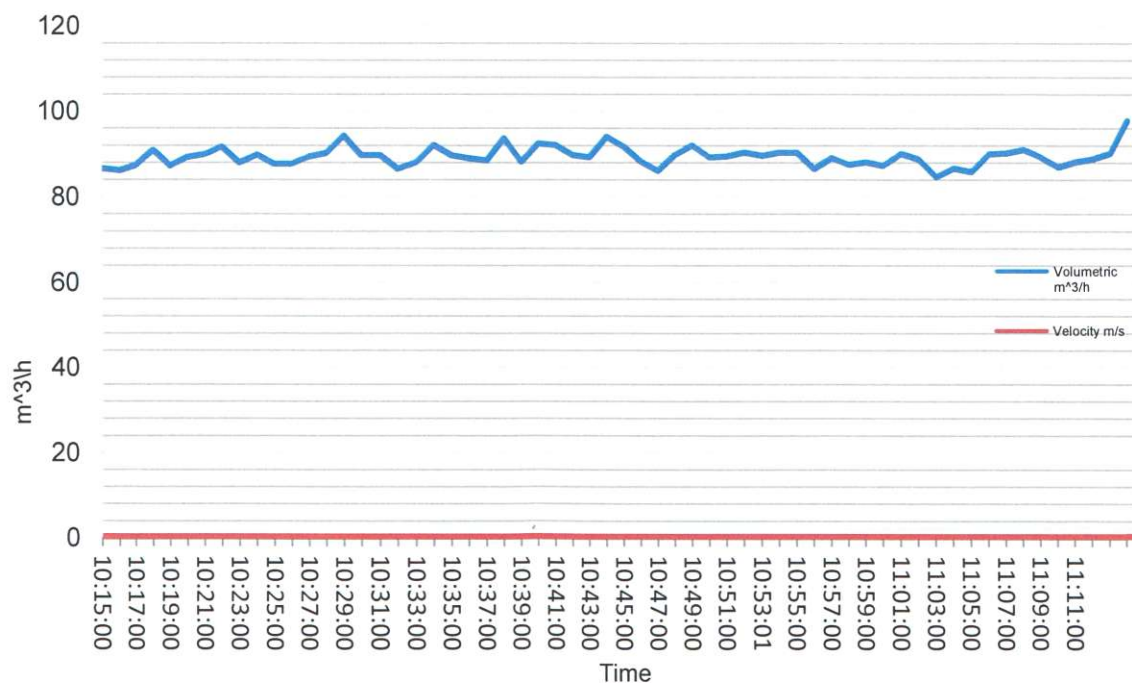
Verifica misure di portata del 21/06/2021

In data 21/06/2021 la DiPietroGroup s.r.l. è stata incaricata di effettuare verifiche di portata pozzetto "C1" ITAR presso la CENTRALE TERMOELETTRICA "ARCHIMEDE" U.B. SICILIA ORIENTALE - PRIOLO GARGALLO.

L'attività è stata svolta utilizzando strumentazione con sensori ad ultrasuoni, nello specifico la DiPietroGroup s.r.l. ha utilizzato strumentazione General Electric modello TransPort® PT900 Portable Ultrasonic Flow Meter.

Si riporta il grafico relativo all'andamento della portata in esame e la tabella con i relativi valori registrati nello strumento utilizzato per la verifica.

21_06_2021



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Date	Time	Velocity	Volumetric
2021/06/21		m/s	m ³ /h
N°.			
1	10:15:00	0,3506	90,1423
2	10:16:00	0,350211667	86,569975
3	10:17:00	0,348623333	86,09208
4	10:18:00	0,353418333	87,277132
5	10:19:00	0,3678	90,828048
6	10:20:00	0,35284	87,132682
7	10:21:00	0,361213333	89,202858
8	10:22:00	0,36397	89,882555
9	10:23:00	0,370781667	91,563828
10	10:24:00	0,356096667	87,937398
11	10:25:00	0,363603333	89,790318
12	10:26:00	0,354636667	87,577618
13	10:27:00	0,354945	87,654762
14	10:28:00	0,36192	89,375915
15	10:29:00	0,365118333	90,166873
16	10:30:00	0,381576667	94,230012
17	10:31:00	0,362955	89,632798
18	10:32:00	0,363313333	89,721187
19	10:33:00	0,35032	86,510942
20	10:34:00	0,356231667	87,971253
21	10:35:00	0,372818333	92,067727
22	10:36:00	0,363071667	89,661382
23	10:37:00	0,3602	88,953875
24	10:38:00	0,358248333	88,470408
25	10:39:00	0,379091667	93,616353
26	10:40:00	0,356853333	88,125158
27	10:41:00	0,374158333	92,401053
28	10:42:00	0,372603333	92,0141
29	10:43:00	0,363231667	89,699985
30	10:44:00	0,361113333	89,175633
31	10:45:00	0,380781667	94,033923
32	10:46:00	0,371236667	91,675725
33	10:47:00	0,357203333	88,211617
34	10:48:00	0,348348333	86,02561

Date	Time	Velocity	Volumetric
2021/06/21		m/s	m ³ /h
N°.			
35	10:49:00	0,363453333	89,754348
36	10:50:00	0,372346667	91,950228
37	10:51:00	0,361295	89,222062
38	10:52:00	0,362191667	89,44381
39	10:53:00	0,365876667	90,352983
40	10:54:00	0,362608333	89,544875
41	10:55:00	0,365628333	90,291752
42	10:56:00	0,36576	90,326057
43	10:57:00	0,350263333	86,498215
44	10:58:00	0,360516667	89,029773
45	10:59:00	0,35408	87,440508
46	11:00:00	0,35656	88,053365
47	11:01:00	0,353278333	87,243753
48	11:02:00	0,364563333	90,028952
49	11:03:00	0,359335	88,737133
50	11:04:00	0,342681667	84,6241
51	11:05:00	0,350701667	86,605507
52	11:06:00	0,347546667	85,827462
53	11:07:00	0,36412	89,919717
54	11:08:00	0,365265	90,201412
55	11:09:00	0,362968333	89,635297
56	11:10:00	0,361146667	89,18561
57	11:11:00	0,352178333	86,9704
58	11:12:00	0,357008333	88,163537
59	11:13:00	0,359795	88,848772
60	11:14:00	0,365136667	90,17091
61	11:15:00	0,396	97,8011

Città Giardino, 28 Giugno 2021

DiPietroGroup S.r.l.
Luca Provenza