

Certificato di Taratura Certificate of Calibration

Data di emissione

Date of issue

Cliente

Customer

Destinatario

Receiver

Si riferisce a:

Referring to:

- oggetto
item
TERMOCOPPIA - Termocoppia tipo S
THERMOCOUPLE - Thermocouple type S
- costruttore
manufacturer
- modello
model
- matricola
serial number
- data di ricevimento
date of receipt of item
- data delle misure
date of measurements
- registro di laboratorio
laboratory reference

Il presente certificato di taratura è emesso in base all'accreditamento n. 00171 Calibration che attesta le capacità di misura e di taratura, le competenze metrologiche del Centro e la riferibilità delle tarature eseguite ai campioni nazionali e internazionali delle unità di misura del Sistema Internazionale delle Unità (SI) in conformità ai requisiti della norma UNI CEI EN ISO/IEC 17025. L'accreditamento è rilasciato in accordo ai decreti attuativi della legge n. 273/1991 che ha istituito il Sistema Nazionale di Taratura (SNT).

This certificate of calibration is issued in compliance with the accreditation n. 00171 Calibration attesting the calibration and measurement capability, the metrological competence of the Centre and the traceability of calibration results to the national and international standards of the International System of Units (SI) in compliance with requirements of ISO/IEC 17025. The accreditation is granted according to decrees connected with Italian law No. 273/1991 which has established the National Calibration System.

I risultati di misura riportati nel presente Certificato sono stati ottenuti applicando le procedure di taratura citate alla pagina seguente, dove sono specificati anche i campioni o gli strumenti che garantiscono la catena di riferibilità del Centro e i rispettivi certificati di taratura in corso di validità. Essi si riferiscono esclusivamente all'oggetto in taratura e sono validi nel momento e nelle condizioni di taratura, salvo diversamente specificato.

The measurement results reported in this Certificate were obtained following the calibration procedures given in the following page, where the reference standards or instruments are indicated which guarantee the traceability chain of the laboratory, and the related calibration certificates in the course of validity are indicated as well. They relate only to the calibrated item and they are valid for the time and conditions of calibration, unless otherwise specified.

Le incertezze di misura dichiarate in questo documento sono state determinate conformemente alla Guida ISO/IEC 98 e al documento EA-4/02. Solitamente sono espresse come incertezza estesa ottenuta moltiplicando l'incertezza tipo per il fattore di copertura k corrispondente ad un livello di fiducia di circa il 95 %. Normalmente tale fattore k vale 2.

The measurement uncertainties stated in this document have been determined according to the ISO/IEC Guide 98 and to EA-4/02. Usually, they have been estimated as expanded uncertainty obtained multiplying the standard uncertainty by the coverage factor k corresponding to a confidence level of about 95 %. Normally, this factor k is 2.

per la Direzione tecnica
(on behalf of the Approving Officer)

Mauro Berton

CERTIFICATO DI TARATURA LAT 124 Certificato di Taratura
Certificate of Calibration

I risultati di misura riportati nel presente Certificato sono stati ottenuti applicando le procedure N.
The measurement results reported in this Certificate were obtained following procedures No.

DHLT-E-04 Rev.8

La catena di riferibilità ha inizio dai campioni di riferimento N. 0697504, 9755, 1744
Traceability is through reference standards No.

muniti di certificati validi di taratura rispettivamente N. LAT 046 372483, INRiM 22-0827-01, INRiM 22-0885-01
validated by certificates of calibration No.

CONDIZIONI AMBIENTALI DI TARATURA - ENVIRONMENTAL CONDITIONS :

Temperatura - Temperature : (23 ± 2) °C
Umidità relativa - Relative Humidity : (50 ± 20) %R.H.

INCERTEZZE - UNCERTAINTIES :

Le migliori incertezze estese di taratura accreditate, espresse al livello di fiducia del 95 %, sono:
The best measurement capability, expressed at a confidence level of about 95 %, is:

0.5 °C	per i punti compresi nell'intervallo - at calibration points in the range	-50 °C / 50 °C
0.3 °C	per i punti compresi nell'intervallo - at calibration points in the range	50 °C / 250 °C
0.4 °C	per i punti compresi nell'intervallo - at calibration points in the range	250 °C / 540 °C
1.2 °C	per i punti compresi nell'intervallo - at calibration points in the range	540 °C / 250 °C

LA TARATURA VIENE ESEGUITA SECONDO IL SEGUENTE PROCEDIMENTO:

THE CALIBRATION HAS BEEN CARRIED OUT ACCORDING TO THE FOLLOWING PROCEDURES:

- da 250 °C a 540 °C in bagno termostatico a sali fusi per confronto con termometro campione a resistenza di platino;
immersione dei termoelementi: 300 mm
*a) from 250 °C to 540 °C in molten salts bath by comparison with standard platinum resistance thermometer;
immersion depth: 300 mm*
- da 540 °C a 1064 °C in forno ad aria trizona con blocco equalizzatore per confronto con termocoppia di riferimento, tipo S;
immersione dei termoelementi: 400 mm
*b) from 540 °C to 1064 °C in vertical air furnace, with metal equalizing block, by comparison with reference type S thermocouple;
immersion depth: 400 mm*

CERTIFICATO DI TARATURA LAT 124 Certificato di Taratura
Certificate of Calibration

RISULTATI DELLA TARATURA - CALIBRATION RESULTS

- Strumento
Instrument
- Costruttore
Manufacturer
- Modello
Model
- Matricola
Serial number

Punto Point N°	Riferimento Reference t_{ref} /°C	Lettura Reading $f.e.m._{read}$ /mV	Riferimento ¹ Reference ¹ $f.e.m._{ref}$ /mV	Errore Error $f.e.m._{read} - f.e.m._{ref}$ /mV $t_{read} - t_{ref}$ /°C		Incertezza ² Uncertainty ² U /°C
1	500.14	4.236	4.235	0.002	0.16	0.40
2	599.30	5.221	5.232	-0.011	-1.04	1.21
3	700.00	6.260	6.275	-0.015	-1.46	1.21
4	799.96	7.325	7.345	-0.020	-1.83	1.21
5	899.76	8.422	8.447	-0.025	-2.23	1.22
6	999.77	9.556	9.584	-0.029	-2.49	1.22
7	1060.10	10.256	10.286	-0.030	-2.60	1.22

Il separatore decimale usato in questo documento è il punto.

¹ f.e.m. di riferimento secondo la Norma IEC 60584.

¹ Reference emf according to the Standard IEC 60584.

² Le incertezze U dichiarate in questo documento sono espresse come due volte lo scarto tipo (corrispondente, nel caso di distribuzione normale, a un livello di fiducia di circa 95 %, $k = 2$). Esse includono il contributo della ripetibilità delle letture e alla disomogeneità dello strumento in taratura.

² The measurement uncertainties have been estimated as extended uncertainty obtained multiplying the standard uncertainty by the coverage factor $k = 2$ corresponding to a confidence level of about 95 %. Repeatability and inhomogeneity of the wires are included in the uncertainties.

Nota: I risultati valgono per lo strumento nello stato in cui è pervenuto al laboratorio e riconsegnato al committente.

The calibration results are referred to the instrument so as received at our laboratory and delivered to the customer.

Il Responsabile del Laboratorio
Head of the Laboratory
Mauro Berton

CERTIFICATO DI TARATURA LAT 124 Certificato di Taratura
Certificate of Calibration

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Instrument 0
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Tabulazione $E / \text{mV} = f(t / ^\circ\text{C})$ - Table $E / \text{mV} = f(t / ^\circ\text{C})$

Nella seguente tabella sono indicati, in relazione al campo di temperatura, i coefficienti dei polinomi lineari che esprimono la relazione $E = f(t)$ riportata nella tabulazione.
In the following table the linear polynomial coefficients which express the relation $E = f(t)$ are listed.

Essi sono stati ricavati combinando i coefficienti di riferimento, previsti nella Norma CEI EN 60584-1 con quelli della curva del secondo ordine ottenuta interpolando con il metodo dei minimi quadrati i valori delle differenze ($E_{\text{sperimentale}} - E_{\text{riferimento}}$) in funzione della temperatura.
They have been calculated by combining the reference coefficients of CEI EN 60854-1 Standard with the second order polynomial curve, obtained by the interpolation of the values of the differences according to the temperature ($E_{\text{experimental}} - E_{\text{reference}}$), by using the least square method.

Intervallo di temperatura / °C Temperature range / °C	Grado del polinomio Polynomial degree	Coefficienti Coefficients	Grado del termine Degree of the term
da 500.14 °C	8	6.172 440 608 7 E+1	t^1
a 1060.10 °C		5.247 542 575 3 E+0	t^2
		1.265 858 731 3 E-2	t^3
		-2.324 779 686 9 E-5	t^4
		3.220 288 230 4 E-8	t^5
		-3.314 651 963 9 E-11	t^6
		2.557 442 517 9 E-14	t^7
		-1.250 688 713 9 E-17	t^8
		2.714 431 761 5 E-21	

L'incertezza (due volte lo scarto quadratico medio) relativa al
procedimento di interpolazione è contenuta entro: 0.31 °C
Expanded uncertainty of the least square fitting is:

Il Responsabile del Laboratorio
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CERTIFICATO DI TARATURA LAT 124 Certificato di Taratura
Certificate of Calibration

t /°C	E /mV	dE/dt / mV/°C	t /°C	E /mV	dE/dt / mV/°C
500	4.2335	0.00981	550	4.7280	0.00997
501	4.2433	0.00982	551	4.7380	0.00997
502	4.2531	0.00982	552	4.7480	0.00998
503	4.2630	0.00982	553	4.7580	0.00998
504	4.2728	0.00982	554	4.7679	0.00998
505	4.2826	0.00983	555	4.7779	0.00999
506	4.2924	0.00983	556	4.7879	0.00999
507	4.3023	0.00983	557	4.7979	0.00999
508	4.3121	0.00984	558	4.8079	0.01000
509	4.3219	0.00984	559	4.8179	0.01000
510	4.3318	0.00984	560	4.8279	0.01000
511	4.3416	0.00985	561	4.8379	0.01001
512	4.3515	0.00985	562	4.8479	0.01001
513	4.3613	0.00985	563	4.8579	0.01001
514	4.3712	0.00986	564	4.8679	0.01002
515	4.3810	0.00986	565	4.8779	0.01002
516	4.3909	0.00986	566	4.8880	0.01002
517	4.4008	0.00987	567	4.8980	0.01003
518	4.4106	0.00987	568	4.9080	0.01003
519	4.4205	0.00987	569	4.9180	0.01003
520	4.4304	0.00988	570	4.9281	0.01004
521	4.4402	0.00988	571	4.9381	0.01004
522	4.4501	0.00988	572	4.9481	0.01004
523	4.4600	0.00989	573	4.9582	0.01004
524	4.4699	0.00989	574	4.9682	0.01005
525	4.4798	0.00989	575	4.9783	0.01005
526	4.4897	0.00990	576	4.9883	0.01005
527	4.4996	0.00990	577	4.9984	0.01006
528	4.5095	0.00990	578	5.0084	0.01006
529	4.5194	0.00990	579	5.0185	0.01006
530	4.5293	0.00991	580	5.0286	0.01007
531	4.5392	0.00991	581	5.0386	0.01007
532	4.5491	0.00991	582	5.0487	0.01007
533	4.5590	0.00992	583	5.0588	0.01008
534	4.5689	0.00992	584	5.0689	0.01008
535	4.5788	0.00992	585	5.0789	0.01008
536	4.5888	0.00993	586	5.0890	0.01009
537	4.5987	0.00993	587	5.0991	0.01009
538	4.6086	0.00993	588	5.1092	0.01009
539	4.6186	0.00994	589	5.1193	0.01010
540	4.6285	0.00994	590	5.1294	0.01010
541	4.6384	0.00994	591	5.1395	0.01010
542	4.6484	0.00995	592	5.1496	0.01011
543	4.6583	0.00995	593	5.1597	0.01011
544	4.6683	0.00995	594	5.1698	0.01011
545	4.6782	0.00996	595	5.1799	0.01012
546	4.6882	0.00996	596	5.1900	0.01012
547	4.6981	0.00996	597	5.2001	0.01012
548	4.7081	0.00997	598	5.2103	0.01012
549	4.7181	0.00997	599	5.2204	0.01013
550	4.7280	0.00997	600	5.2305	0.01013

CERTIFICATO DI TARATURA LAT 124 Certificato di Taratura
Certificate of Calibration

t /°C	E /mV	dE/dt / mV/°C	t /°C	E /mV	dE/dt / mV/°C
600	5.2305	0.01013	650	5.7411	0.01030
601	5.2406	0.01013	651	5.7514	0.01030
602	5.2508	0.01014	652	5.7617	0.01030
603	5.2609	0.01014	653	5.7720	0.01031
604	5.2711	0.01014	654	5.7823	0.01031
605	5.2812	0.01015	655	5.7926	0.01031
606	5.2914	0.01015	656	5.8029	0.01032
607	5.3015	0.01015	657	5.8132	0.01032
608	5.3117	0.01016	658	5.8235	0.01032
609	5.3218	0.01016	659	5.8339	0.01033
610	5.3320	0.01016	660	5.8442	0.01033
611	5.3421	0.01017	661	5.8545	0.01033
612	5.3523	0.01017	662	5.8648	0.01034
613	5.3625	0.01017	663	5.8752	0.01034
614	5.3727	0.01018	664	5.8855	0.01034
615	5.3828	0.01018	665	5.8959	0.01035
616	5.3930	0.01018	666	5.9062	0.01035
617	5.4032	0.01019	667	5.9166	0.01035
618	5.4134	0.01019	668	5.9269	0.01036
619	5.4236	0.01019	669	5.9373	0.01036
620	5.4338	0.01020	670	5.9476	0.01036
621	5.4440	0.01020	671	5.9580	0.01037
622	5.4542	0.01020	672	5.9684	0.01037
623	5.4644	0.01021	673	5.9787	0.01037
624	5.4746	0.01021	674	5.9891	0.01038
625	5.4848	0.01021	675	5.9995	0.01038
626	5.4950	0.01022	676	6.0099	0.01038
627	5.5052	0.01022	677	6.0202	0.01039
628	5.5154	0.01022	678	6.0306	0.01039
629	5.5256	0.01023	679	6.0410	0.01039
630	5.5359	0.01023	680	6.0514	0.01040
631	5.5461	0.01023	681	6.0618	0.01040
632	5.5563	0.01024	682	6.0722	0.01040
633	5.5666	0.01024	683	6.0826	0.01041
634	5.5768	0.01024	684	6.0930	0.01041
635	5.5871	0.01025	685	6.1034	0.01041
636	5.5973	0.01025	686	6.1138	0.01042
637	5.6075	0.01025	687	6.1243	0.01042
638	5.6178	0.01026	688	6.1347	0.01042
639	5.6281	0.01026	689	6.1451	0.01043
640	5.6383	0.01026	690	6.1555	0.01043
641	5.6486	0.01027	691	6.1660	0.01043
642	5.6588	0.01027	692	6.1764	0.01044
643	5.6691	0.01027	693	6.1868	0.01044
644	5.6794	0.01028	694	6.1973	0.01044
645	5.6897	0.01028	695	6.2077	0.01045
646	5.6999	0.01028	696	6.2182	0.01045
647	5.7102	0.01029	697	6.2286	0.01045
648	5.7205	0.01029	698	6.2391	0.01046
649	5.7308	0.01029	699	6.2495	0.01046
650	5.7411	0.01030	700	6.2600	0.01047

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CERTIFICATO DI TARATURA LAT 124 Certificato di Taratura
Certificate of Calibration

t /°C	E /mV	dE/dt / mV/°C	t /°C	E /mV	dE/dt / mV/°C
700	6.2600	0.01047	750	6.7875	0.01064
701	6.2705	0.01047	751	6.7982	0.01064
702	6.2809	0.01047	752	6.8088	0.01065
703	6.2914	0.01048	753	6.8195	0.01065
704	6.3019	0.01048	754	6.8301	0.01065
705	6.3123	0.01048	755	6.8408	0.01066
706	6.3228	0.01049	756	6.8514	0.01066
707	6.3333	0.01049	757	6.8621	0.01067
708	6.3438	0.01049	758	6.8727	0.01067
709	6.3543	0.01050	759	6.8834	0.01067
710	6.3648	0.01050	760	6.8941	0.01068
711	6.3753	0.01050	761	6.9048	0.01068
712	6.3858	0.01051	762	6.9154	0.01068
713	6.3963	0.01051	763	6.9261	0.01069
714	6.4068	0.01051	764	6.9368	0.01069
715	6.4173	0.01052	765	6.9475	0.01069
716	6.4278	0.01052	766	6.9582	0.01070
717	6.4384	0.01052	767	6.9689	0.01070
718	6.4489	0.01053	768	6.9796	0.01070
719	6.4594	0.01053	769	6.9903	0.01071
720	6.4699	0.01053	770	7.0010	0.01071
721	6.4805	0.01054	771	7.0117	0.01072
722	6.4910	0.01054	772	7.0224	0.01072
723	6.5016	0.01055	773	7.0332	0.01072
724	6.5121	0.01055	774	7.0439	0.01073
725	6.5227	0.01055	775	7.0546	0.01073
726	6.5332	0.01056	776	7.0653	0.01073
727	6.5438	0.01056	777	7.0761	0.01074
728	6.5543	0.01056	778	7.0868	0.01074
729	6.5649	0.01057	779	7.0975	0.01074
730	6.5755	0.01057	780	7.1083	0.01075
731	6.5860	0.01057	781	7.1190	0.01075
732	6.5966	0.01058	782	7.1298	0.01076
733	6.6072	0.01058	783	7.1405	0.01076
734	6.6178	0.01058	784	7.1513	0.01076
735	6.6283	0.01059	785	7.1621	0.01077
736	6.6389	0.01059	786	7.1728	0.01077
737	6.6495	0.01059	787	7.1836	0.01077
738	6.6601	0.01060	788	7.1944	0.01078
739	6.6707	0.01060	789	7.2052	0.01078
740	6.6813	0.01061	790	7.2159	0.01078
741	6.6919	0.01061	791	7.2267	0.01079
742	6.7025	0.01061	792	7.2375	0.01079
743	6.7131	0.01062	793	7.2483	0.01079
744	6.7238	0.01062	794	7.2591	0.01080
745	6.7344	0.01062	795	7.2699	0.01080
746	6.7450	0.01063	796	7.2807	0.01081
747	6.7556	0.01063	797	7.2915	0.01081
748	6.7663	0.01063	798	7.3023	0.01081
749	6.7769	0.01064	799	7.3131	0.01082
750	6.7875	0.01064	800	7.3239	0.01082

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CERTIFICATO DI TARATURA LAT 124 Certificato di Taratura
Certificate of Calibration

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800	7.3239	0.01082	850	7.8693	0.01100
801	7.3348	0.01082	851	7.8803	0.01100
802	7.3456	0.01083	852	7.8914	0.01101
803	7.3564	0.01083	853	7.9024	0.01101
804	7.3672	0.01083	854	7.9134	0.01101
805	7.3781	0.01084	855	7.9244	0.01102
806	7.3889	0.01084	856	7.9354	0.01102
807	7.3998	0.01085	857	7.9464	0.01103
808	7.4106	0.01085	858	7.9574	0.01103
809	7.4214	0.01085	859	7.9685	0.01103
810	7.4323	0.01086	860	7.9795	0.01104
811	7.4432	0.01086	861	7.9905	0.01104
812	7.4540	0.01086	862	8.0016	0.01104
813	7.4649	0.01087	863	8.0126	0.01105
814	7.4757	0.01087	864	8.0237	0.01105
815	7.4866	0.01087	865	8.0347	0.01105
816	7.4975	0.01088	866	8.0458	0.01106
817	7.5084	0.01088	867	8.0568	0.01106
818	7.5192	0.01088	868	8.0679	0.01106
819	7.5301	0.01089	869	8.0790	0.01107
820	7.5410	0.01089	870	8.0900	0.01107
821	7.5519	0.01090	871	8.1011	0.01108
822	7.5628	0.01090	872	8.1122	0.01108
823	7.5737	0.01090	873	8.1233	0.01108
824	7.5846	0.01091	874	8.1343	0.01109
825	7.5955	0.01091	875	8.1454	0.01109
826	7.6064	0.01091	876	8.1565	0.01109
827	7.6173	0.01092	877	8.1676	0.01110
828	7.6283	0.01092	878	8.1787	0.01110
829	7.6392	0.01092	879	8.1898	0.01110
830	7.6501	0.01093	880	8.2009	0.01111
831	7.6610	0.01093	881	8.2120	0.01111
832	7.6720	0.01094	882	8.2231	0.01111
833	7.6829	0.01094	883	8.2342	0.01112
834	7.6938	0.01094	884	8.2454	0.01112
835	7.7048	0.01095	885	8.2565	0.01112
836	7.7157	0.01095	886	8.2676	0.01113
837	7.7267	0.01095	887	8.2787	0.01113
838	7.7376	0.01096	888	8.2899	0.01114
839	7.7486	0.01096	889	8.3010	0.01114
840	7.7595	0.01096	890	8.3121	0.01114
841	7.7705	0.01097	891	8.3233	0.01115
842	7.7815	0.01097	892	8.3344	0.01115
843	7.7924	0.01097	893	8.3456	0.01115
844	7.8034	0.01098	894	8.3567	0.01116
845	7.8144	0.01098	895	8.3679	0.01116
846	7.8254	0.01099	896	8.3790	0.01116
847	7.8364	0.01099	897	8.3902	0.01117
848	7.8474	0.01099	898	8.4014	0.01117
849	7.8584	0.01100	899	8.4125	0.01117
850	7.8693	0.01100	900	8.4237	0.01118

Il Responsabile del Laboratorio
Head of the Laboratory
Mauro Berton

CERTIFICATO DI TARATURA LAT 124 Certificato di Taratura
Certificate of Calibration

t /°C	E /mV	dE/dt / mV/°C	t /°C	E /mV	dE/dt / mV/°C
900	8.4237	0.01118	950	8.9868	0.01135
901	8.4349	0.01118	951	8.9982	0.01135
902	8.4461	0.01118	952	9.0095	0.01136
903	8.4573	0.01119	953	9.0209	0.01136
904	8.4684	0.01119	954	9.0322	0.01136
905	8.4796	0.01119	955	9.0436	0.01137
906	8.4908	0.01120	956	9.0550	0.01137
907	8.5020	0.01120	957	9.0663	0.01137
908	8.5132	0.01121	958	9.0777	0.01138
909	8.5244	0.01121	959	9.0891	0.01138
910	8.5356	0.01121	960	9.1005	0.01138
911	8.5469	0.01122	961	9.1119	0.01139
912	8.5581	0.01122	962	9.1232	0.01139
913	8.5693	0.01122	963	9.1346	0.01139
914	8.5805	0.01123	964	9.1460	0.01140
915	8.5917	0.01123	965	9.1574	0.01140
916	8.6030	0.01123	966	9.1688	0.01140
917	8.6142	0.01124	967	9.1802	0.01141
918	8.6254	0.01124	968	9.1916	0.01141
919	8.6367	0.01124	969	9.2030	0.01141
920	8.6479	0.01125	970	9.2145	0.01142
921	8.6592	0.01125	971	9.2259	0.01142
922	8.6704	0.01125	972	9.2373	0.01142
923	8.6817	0.01126	973	9.2487	0.01143
924	8.6929	0.01126	974	9.2601	0.01143
925	8.7042	0.01126	975	9.2716	0.01143
926	8.7155	0.01127	976	9.2830	0.01144
927	8.7267	0.01127	977	9.2944	0.01144
928	8.7380	0.01127	978	9.3059	0.01144
929	8.7493	0.01128	979	9.3173	0.01145
930	8.7605	0.01128	980	9.3288	0.01145
931	8.7718	0.01128	981	9.3402	0.01145
932	8.7831	0.01129	982	9.3517	0.01146
933	8.7944	0.01129	983	9.3631	0.01146
934	8.8057	0.01130	984	9.3746	0.01146
935	8.8170	0.01130	985	9.3860	0.01147
936	8.8283	0.01130	986	9.3975	0.01147
937	8.8396	0.01131	987	9.4090	0.01147
938	8.8509	0.01131	988	9.4205	0.01148
939	8.8622	0.01131	989	9.4319	0.01148
940	8.8735	0.01132	990	9.4434	0.01148
941	8.8848	0.01132	991	9.4549	0.01149
942	8.8962	0.01132	992	9.4664	0.01149
943	8.9075	0.01133	993	9.4779	0.01149
944	8.9188	0.01133	994	9.4894	0.01150
945	8.9301	0.01133	995	9.5009	0.01150
946	8.9415	0.01134	996	9.5124	0.01150
947	8.9528	0.01134	997	9.5239	0.01151
948	8.9641	0.01134	998	9.5354	0.01151
949	8.9755	0.01135	999	9.5469	0.01151
950	8.9868	0.01135	1000	9.5584	0.01152

Il Responsabile del Laboratorio
Head of the Laboratory
Mauro Berton

CERTIFICATO DI TARATURA LAT 124 Certificato di Taratura
Certificate of Calibration

<i>t</i>	<i>E</i>	<i>dE/dt</i>	<i>t</i>	<i>E</i>	<i>dE/dt</i>
<i>t</i>	<i>E</i>	<i>dE/dt</i>	<i>t</i>	<i>E</i>	<i>dE/dt</i>
l°C	ImV	l mV/°C	l°C	ImV	l mV/°C
1000	9.5584	0.01152	1050	10.1382	0.01168
1001	9.5699	0.01152	1051	10.1499	0.01168
1002	9.5814	0.01152	1052	10.1616	0.01169
1003	9.5929	0.01153	1053	10.1733	0.01169
1004	9.6045	0.01153	1054	10.1849	0.01169
1005	9.6160	0.01153	1055	10.1966	0.01170
1006	9.6275	0.01154	1056	10.2083	0.01170
1007	9.6391	0.01154	1057	10.2200	0.01170
1008	9.6506	0.01154	1058	10.2317	0.01171
1009	9.6621	0.01155	1059	10.2434	0.01171
1010	9.6737	0.01155	1060	10.2552	0.01171
1011	9.6852	0.01155			
1012	9.6968	0.01156			
1013	9.7084	0.01156			
1014	9.7199	0.01156			
1015	9.7315	0.01156			
1016	9.7430	0.01157			
1017	9.7546	0.01157			
1018	9.7662	0.01157			
1019	9.7777	0.01158			
1020	9.7893	0.01158			
1021	9.8009	0.01158			
1022	9.8125	0.01159			
1023	9.8241	0.01159			
1024	9.8357	0.01159			
1025	9.8473	0.01160			
1026	9.8589	0.01160			
1027	9.8705	0.01160			
1028	9.8821	0.01161			
1029	9.8937	0.01161			
1030	9.9053	0.01161			
1031	9.9169	0.01162			
1032	9.9285	0.01162			
1033	9.9401	0.01162			
1034	9.9518	0.01163			
1035	9.9634	0.01163			
1036	9.9750	0.01163			
1037	9.9867	0.01164			
1038	9.9983	0.01164			
1039	10.0099	0.01164			
1040	10.0216	0.01165			
1041	10.0332	0.01165			
1042	10.0449	0.01165			
1043	10.0565	0.01166			
1044	10.0682	0.01166			
1045	10.0798	0.01166			
1046	10.0915	0.01167			
1047	10.1032	0.01167			
1048	10.1148	0.01167			
1049	10.1265	0.01168			
1050	10.1382	0.01168			

Il Responsabile del Laboratorio
Head of the Laboratory
Mauro Berton

Kalibrierschein / Calibration Certificate

gemäß DIN EN ISO/IEC 17025 / according to DIN EN ISO/IEC 17025

erstellt durch das Kalibrierlaboratorium

issued by the calibration laboratory



Deutsche
Akkreditierungsstelle
D-K-21043-01-00

Senseca Germany GmbH
Hans-Sachs-Straße 26
93128 Regensburg

Mitglied im Deutschen Kalibrierdienst
Member of the Deutschen Kalibrierdienst



Kalibrierzeichen
Calibration mark

77777
D-K- 21043-01-00
7777-77

Gegenstand
Object

**1 Thermoelementfühler, angeschlossen an
Temperaturanzeigergerät**

*1 Thermocouple-Probe, connected with temp.
measuring device*

Hersteller
Manufacturer

**Senseca Germany GmbH
Hans-Sachs-Straße 26
93128 Regensburg**

Typ
Type

GMH 3230 + GTF 300

Serien- oder Prüfmittel-Nr.
Serial number

Kunden- oder
Eigentümerdaten
Customer

Auftragsnummer
Order No.

Anzahl der Seiten des Kalibrierscheines
Number of pages of the certificate

4

Datum der Kalibrierung
Date of calibration

Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung des ausstellenden Kalibrierlaboratoriums. Kalibrierscheine sind bei Nennung des für die Freigabe Verantwortlichen in Klarschrift auch ohne Unterschrift gültig.

This calibration certificate may not be reproduced other than in full except with the permission of the issuing laboratory. Calibration certificates with the full name of the approval responsible person are valid without signature.

Datum der Ausstellung
Date of issue

Freigabe des Kalibrierscheins durch
Leiter des Kalibrierlaboratoriums
*Approval of the certificate of calibration by
Head of the calibration laboratory*

Bearbeiter
Person in charge

Alexandra König-Gerbersdorf

Kalibriergegenstand
Calibration item

1 Thermoelementfühler (Typ K, NiCr-Ni), Ø 1 mm, Länge 1 m, angeschlossen an
Temperaturanzeigergerät

1 Thermocouple-Probe (Type K, NiCr-Ni), Ø 1 mm, length 1 m, connected with
temp. measuring device

Typ <i>Type</i>	GMH 3230	GTF 300
Seriennummer <i>Serial number</i>	---	---
Messbereich <i>Measuring range</i>	-220 °C ... +1750 °C	-65 °C ... +250 °C
Genauigkeit <i>Accuracy</i>	±0,03 %v.MW. ±1 Digit ±0,05 %FS (T≥-60 °C)	±1,5 °C
Spezifikationen <i>Specifications</i>	Thermoelemente: J, K, N, S, T	Typ K, NiCr-Ni

Kalibrierverfahren
Calibration procedure

Die Kalibrierung erfolgt nach der Richtlinie des Deutschen Kalibrierdienstes (DKD-R 5-3:09/2018) für die Kalibrierung von technischen Thermoelementen nach der Vergleichsmethode.

Calibration was carried out to the Guidelines of Deutscher Kalibrierdienst / German Calibration Service (DKD-R 5-3:09/2018) for the calibration of technical thermocouples according to the comparison method.
Messbedingungen
Measurement conditions

Der Temperaturfühler des Kalibriergegenstands und das Referenzthermometer waren während der Kalibrierung direkt in Flüssigkeitsbad eingetaucht. Die Eintauchtiefe betrug 100 mm.

The temperature probe and the reference thermometer were immersed in a liquid bath during the calibration. The Immersion depth was 100 mm.
Umgebungsbedingungen
Environmental conditions
Temperatur
Temperature
(22 ± 2)°C

Ort der Kalibrierung
Place of calibration

Senseca Germany GmbH, Regenstau Kalibrierlabor

Senseca Germany GmbH, Regenstau calibration laboratory

Rückführbarkeit auf Normale
Traceability of Standards

Gerätebezeichnung <i>Device name</i>	Hersteller <i>Manufacturer</i>	Seriennummer <i>Serial number</i>	Messbereich <i>Measuring range</i>	Kalibrierzeichen <i>Calibration mark</i>
RT5-CH2: TTI 22 eXacal Pt100L	Isotech Klasmeier	381725 147-19-250	-189 ... +156°C	7604 D-K-15224-01-00 2025-11
RT1-CH2: MKT 50 GTF101/Pt100, 1/10DIN Kl. B	Anton Paar	82282158	-90 ... +50°C	4804 D-K-15219-01-00 2026-07

Messergebnisse Eingangswerte
Test Results - as found

Bezugswert <i>Reference value</i>	Anzeige <i>Indication</i>	Korrekturwerte <i>Correction values</i>	
°C	°C	OFFS	SCAL
---	----	off	off
---	---		
---	---		

Der Kalibriergegenstand wurde justiert.

The calibration item has been adjusted.

Korrekturwerte sind die Einstellungen im Prüfling während der Wertaufnahme.

Correction values are settings of the calibration item during the recording of the value.
Altes Kalibrierzeichen / ---
Previous calibration mark
Messergebnisse Ausgangswerte
Measuring Results - as-left

Anschluss / Connection / CH1					
Bezugswert <i>Reference value</i>	Anzeige <i>Indication</i>	Abweichung <i>Deviation</i>	Messunsicherheit <i>Measurement uncertainty</i>	Korrekturwerte <i>Correction values</i>	
°C	°C	°C	°C	OFFS	SCAL
-60,00	-59,8	0,2	0,61	off	1,013
0,00	0,0	0,0	0,20		
37,02	37,0	0,0	0,39		

Die in diesem Kalibrierschein angegebenen Ergebnisse beziehen sich nur auf den kalibrierten Gegenstand.

The results in this calibration certificate refer only to the calibrated object.

Messunsicherheit*Measurement uncertainty*

Angegeben ist die erweiterte Messunsicherheit, die sich aus der Standardmessunsicherheit durch Multiplikation mit dem Erweiterungsfaktor $k=2$ ergibt. Sie wurde gemäß EA-4/02 M:2022 ermittelt. Der Wert der Messgröße liegt mit einer Wahrscheinlichkeit von etwa 95% im zugeordneten Werteintervall.

The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k=2$. It was determined according to EA-4/02 M:2022. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

Bemerkungen*Remarks*

Meinungen und Interpretationen*Reporting opinions and interpretations*

Weitere Hinweise*Additional information*

Die DAKKS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine. Die weiteren Unterzeichner innerhalb und außerhalb Europas sind den Internetseiten von EA (www.european-accreditation.org) und ILAC (www.ilac.org) zu entnehmen.

The DAKKS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates. The other signatories in and outside Europe can be seen on the websites of EA (www.european-accreditation.org) and ILAC (www.ilac.org).

Im Zweifelsfall gilt der deutsche Originaltext.

In case of doubt only the German original text is valid and has to be used.

Ende des Kalibrierscheines.

End of calibration certificate.

Werkskalibrierschein

Proprietary Calibration Certificate (Calibration report)



77777
77-77

Kalibrierzeichen / Calibration Mark



Seite / Page / 1

Kalibriergegenstand / Calibration item

ECO 130
GTF 300

Seriennummer / Serial number

Hersteller / Manufacturer

Senseca Germany GmbH
Hans-Sachs-Straße 26
93128 Regenstein

Auftraggeber / Customer

Auftragsnummer / Order number

Datum der Kalibrierung / Date of calibration

Anzahl der Seiten / Number of pages

3

Dieser Werkskalibrierschein darf nur vollständig und unverändert weiterverbreitet werden.
Auszüge oder Änderungen bedürfen der Genehmigung des ausstellenden Kalibrierlaboratoriums.
Werkskalibrierscheine ohne Unterschrift haben keine Gültigkeit.

This calibration certificate may not be reproduced other than in full except with the permission of the issuing laboratory.
Calibration certificates without signature are not valid.

Dieser Werkskalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).

Am Kalibriergegenstand (KG) ist eine Klebmarke angebracht, die mit der Kalibriernummer dieses Werkskalibrierscheines sowie dem Kalibriermonat und Jahr versehen wurde.

Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

This calibration certificate documents the traceability to national standards, which realize the units of measurements according to the International Systems of units (SI). The calibration label fixed to the calibration item contains number, month and year of the calibration. The client is responsible for an appropriate calibration interval.

Datum
Date

Leiter des Kalibrierlabors
Head of calibration laboratory

Sachbearbeiter
Person responsible

Alexandra König-Gerbersdorf



77777

77-77

Kalibrierzeichen / Calibration Mark



Seite / Page / 2

Kalibriergegenstand / Calibration item / KG

Messgerät <i>Instrument</i>	Seriennummer <i>Serial number</i>
ECO 130 Thermoelement-Sekundenthermometer <i>Thermocouple Quick Response Thermometer</i>	---

Messfühler <i>Measuring probe</i>	Seriennummer <i>Serial number</i>	Messbereich Messfühler <i>Measuring range sensor</i>	Spezifikationen <i>Specifications</i>
GTF 300 Drahtfühler <i>Wire probe</i>	---	-65 ... 300°C	Typ K, Länge 1m, Ø ca. 1mm <i>Type K, Length 1m, Ø approx. 1mm</i>

Anzeige und Thermometer können nur in der angegebenen Kombination die Kalibrierergebnisse wiedergeben.
The calibration results can only be reproduced, in the specified combination of the indicator and thermometer.

Werksnormal / Reference standard / WN

Gerätebezeichnung <i>Device name</i>	Hersteller <i>Manufacturer</i>	Seriennummer <i>Serial number</i>	Messbereich <i>Measuring range</i>	Kalibrierzeichen <i>Calibration mark</i>

Die Rückführung auf nationale Normale ist somit gegeben.
Traceability to recognized national standards is given.

Kalibrierverfahren / Calibration methods

Vergleichsmessung des Kalibriergegenstandes mit dem Werksnormal in einem gerührten Wasser und Glykol-Wasser Flüssigkeitsbad für die Temperaturen von 0°C und 37°C.

Comparison of the calibration item with the reference standard in a well mixed liquid bath with water and glycol-water for the test temperatures 0°C and 37°C.

Eintauchtiefe / Immersion depth / 100mm

Die Kalibrierung erfolgte in Anlehnung an die Richtlinie des Deutschen Kalibrierdienstes (DKD-R 5-3:09/2018)

The calibration has been done according to the Guidelines of Deutscher Kalibrierdienst / German Calibration Service (DKD-R 5-3:09/2018)

Umgebungsbedingungen / Environmental conditions

Temperatur <i>Temperature</i>	Luftdruck <i>Atmospheric pressure</i>	Luftfeuchte <i>Air humidity</i>
22°C ± 2°C	981mbar ± 5mbar	43%RH ± 5%RH



77777

77-77

Kalibrierzeichen / Calibration Mark



Prüfergebnisse vor Justage / Results before adjustment

ECO 130 + GTF 300			
Werksnorm / WN Reference standard	Kalibriergegenstand / KG Calibration item	Korrekturwerte Correction values	
°C	°C	OFFS	SCAL
---	---	---	---
---	---	---	---

Der Kalibriergegenstand wurde nicht nachgestellt. The calibration item has not been adjusted.

Altes Kalibrierzeichen / Previous calibration mark / ---

Prüfergebnisse nach Justage / Results after adjustment

ECO 130 + GTF 300				
Werksnorm / WN Reference standard	Kalibriergegenstand / KG Calibration item		Mess- unsicherheit Uncertainty of measurement	Korrekturwerte Correction values
Temperatur Temperature	Anzeige Display	Abweichung Deviation		OFFS SCAL
°C	°C	°C	°C	0,0 0,00
0,02	-0,5	-0,5	0,20	
37,02	36,9	-0,1	0,20	

Angegeben ist die erweiterte Messunsicherheit, die sich aus der Standardmessunsicherheit durch Multiplikation mit dem Erweiterungsfaktor $k=2$ (Normalverteilung) ergibt. Sie wurde in Anlehnung an die Richtlinie EA-4/02 M:2022 ermittelt. Der Wert der Messgröße liegt mit einer Wahrscheinlichkeit von 95% im zugeordneten Werteintervall.
The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k=2$ (normal distribution). It has been determined in accordance with EA-4/02 M:2022. The value of the measurand lies within the assigned range of values with a probability of 95%.

(*): Traceability to recognized national standards by DKD calibrated instruments are accepted in the following countries:

Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.
Argentina, Australia, Brazil, Canada, Chile, People's Republic of China, Costa Rica, Cuba, Ecuador, Egypt, Guatemala, Hong Kong China, India, Indonesia, Israel, Japan, Kazakhstan, Republic of Korea, Malaysia, Mexico, New Zealand, Pakistan, Papua New Guinea, Philippines, Russian Federation, Singapore, South Africa, Sri Lanka, Chinese Taipei, Thailand, Tunisia, United Arab Emirates, United States of America, Uruguay and Vietnam.