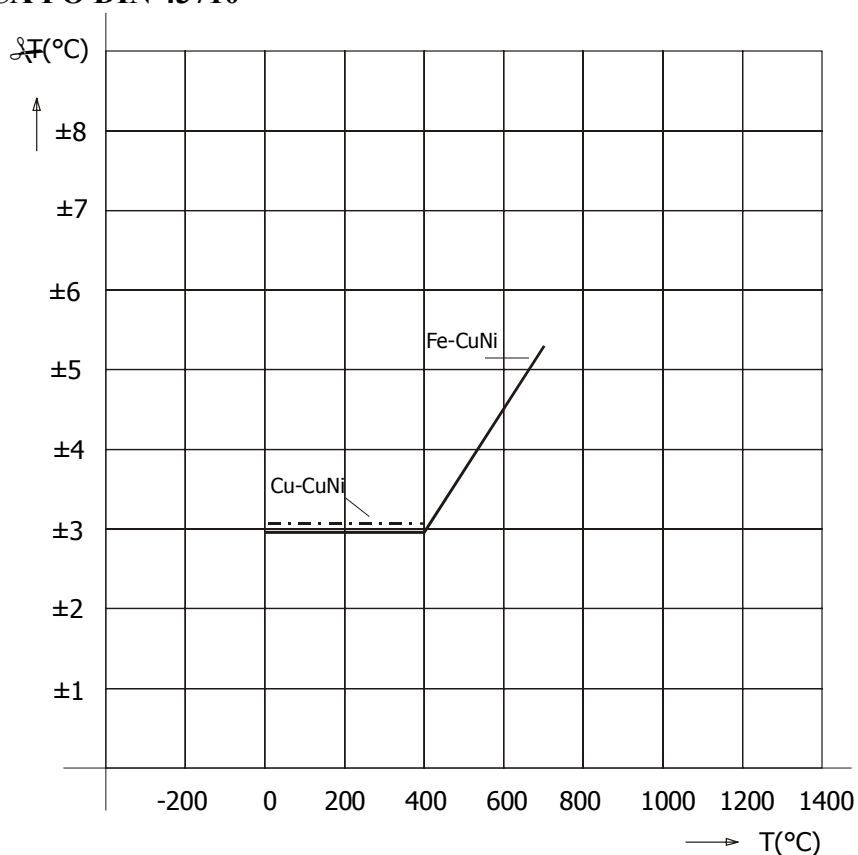


VII.II. ZA TERMOELEMENTE

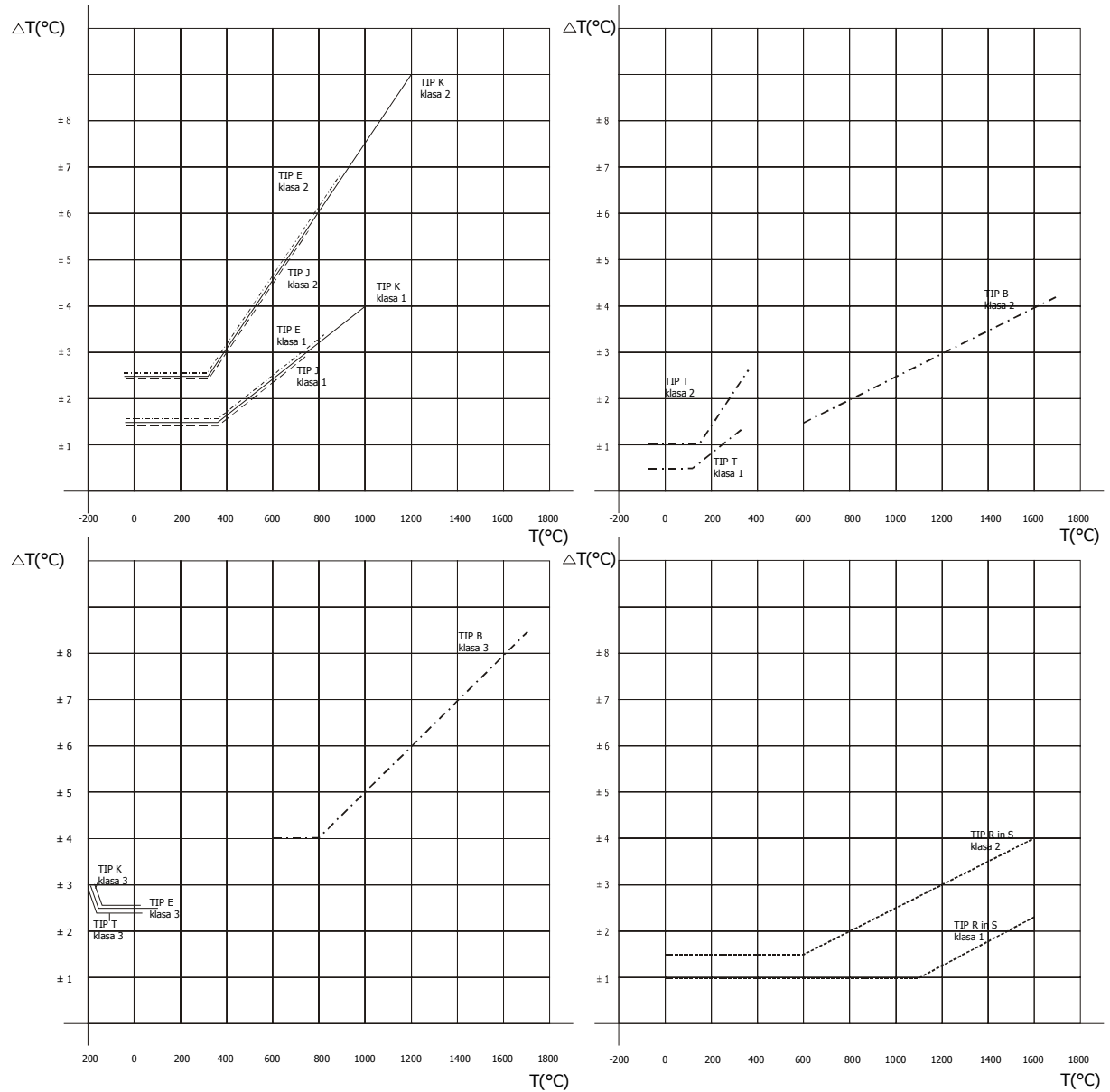
Osnovne vrednosti termonapetosti v mV po IEC 584 in DIN 43710

°C	IEC 584 - 1							DIN 43710	
	Cu-CuNi (tip T) (IPTS 68)	NiCr-CuNi (tip E)	Fe-CuNi (tip J)	NiCr-Ni (tip K)	Pt10Rh-Pt (tip T)	Pt13Rh-Pt (tip R)	Pt30Rh-Pt6Rh (tip B)	Cu-CuNi (tip U)	Fe-CuNi (tip L)
-200	-5,603	-8,824	-7,890	-5,891	-	-	-	-5,7	-8,15
-100	-3,378	-5,237	-4,632	-3,553	-	-	-	-3,4	-4,75
+100	4,277	6,317	5,268	4,095	0,645	0,647	0,033	4,25	5,37
200	9,286	13,419	10,777	8,137	1,440	1,468	0,178	9,20	10,95
300	14,860	21,033	16,325	12,207	2,323	2,400	0,431	14,9	16,56
400	20,869	28,943	21,846	16,395	3,260	3,407	0,786	21,0	22,16
500		36,999	27,388	20,640	4,234	4,471	1,241	27,41	27,85
600		45,085	33,096	24,902	5,237	5,582	1,791	34,31	33,67
700		53,110	39,130	29,128	6,274	6,741	2,430		39,72
800		61,022	45,498	33,277	7,345	7,949	3,154		46,22
900		68,783	51,875	37,325	8,448	9,203	3,957		53,14
1000		76,358	57,942	41,269	9,585	10,503	4,833		
1100			63,777	45,108	10,754	11,846	5,777		
1200			69,536	48,828	11,947	13,224	6,783		
1300				52,398	13,155	14,624	7,845		
1400					14,368	16,035	8,952		
1500					15,576	17,445	10,094		
1600					16,771	18,842	11,257		
1700					17,942	20,215	12,426		
1800							13,585		

TOLERANCA PO DIN 43710



TOLERANCE PO IEC 584-2



KLASE ZA TERMOPARE PO IEC 584, del 1 (primerjalno mesto 0°C)

TERMOPAR	MERILNO OBMOČJE	ODSTOPANJE±
Klasa 1		
Cu-CuNi (T)	- 40 ... + 350°C	0,5°C ali 0,004• t
Fe-CuNi (J)	- 40 ... + 750°C	1,5°C ali 0,004• t
NiCr-CuNi (E)	- 40 ... + 800°C	0,5°C ali 0,004• t
NiCr-Ni (K)	- 40 ... + 1000°C	1,5°C ali 0,004• t
Pt13Rh-Pt (R)	0 ... 1600°C	1 °C ali
Pt10Rh-Pt (S)	0 ... 1600°C	1 °C ali
Pt30Rh-Pt6Rh (B)	-	-
Klasa 2		
Cu-CuNi (T)	- 40 ... + 350°C	1 °C ali 0,0075• t
Fe-CuNi (J)	- 40 ... + 750°C	2,5°C ali 0,0075• t
NiCr-CuNi (E)	- 40 ... + 900°C	1 °C ali 0,0075• t
NiCr-Ni (K)	- 40 ... + 1200°C	2,5°C ali 0,0075• t
Pt13Rh-Pt (R)	0 ... 1600°C	1,5°C ali 0,0025 • t
Pt10Rh-Pt (S)	0 ... 1600°C	1,5°C ali 0,0025 • t
Pt30Rh-Pt6Rh (B)	600 ... 1700°C	1,5°C ali 0,0025 • t
Klasa 3		
Cu-CuNi (T)	- 200 ... + 40°C	1 °C ali 0,015• t
Fe-CuNi (J)	- 200 ... + 40°C	2,5°C ali 0,015• t
NiCr-CuNi (E)	- 200 ... + 40°C	1 °C ali 0,015• t
NiCr-Ni (K)	- 200 ... + 40°C	2,5°C ali 0,015• t
Pt13Rh-Pt (R)	-	-
Pt10Rh-Pt (S)	-	-
Pt30Rh-Pt6Rh (B)	600 ... 1700°C	4 °C ali 0,005 • t

Termonapetosti po IEC 584, del 1 v mV

Cu-CuNi (TIP T)

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90	-100
-100	-3,378	-3,656	-3,923	-4,177	-4,419	-4,648	-4,865	-5,069	-5,261	-5,439	-5,603
0	0	-0,383	-0,757	-1,121	-1,475	-1,819	-2,152	-2,475	-2,788	-3,089	-3,378
°C	0	10	20	30	40	50	60	70	80	90	100
0	0	0,391	0,789	1,196	1,611	2,035	2,467	2,908	3,357	3,813	4,277
100	4,277	4,749	5,227	5,712	6,204	6,702	7,207	7,718	8,235	8,757	9,286
200	9,286	9,820	10,360	10,905	11,456	12,011	12,572	13,137	13,707	14,281	14,860
300	14,860	15,443	16,030	16,621	17,217	17,816	18,420	19,027	19,638	20,252	20,869
400	20,869										

Fe-CuNi (TIP J)

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90	-100
-100	-4,632	-5,036	-5,426	-5,801	-6,159	-6,499	-6,821	-7,122	-7,402	-7,659	-7,890
0	0	-0,501	-0,995	-1,481	-1,960	-2,431	-2,892	-3,344	-3,785	-4,215	-4,632
°C	0	10	20	30	40	50	60	70	80	90	100
0	0	0,507	1,019	1,536	2,058	2,585	3,115	3,649	4,186	4,725	5,268
100	5,268	5,812	6,359	6,907	7,457	8,008	8,560	9,113	9,667	10,222	10,777
200	10,777	11,332	11,887	12,442	12,998	13,553	14,108	14,663	15,217	15,771	16,325
300	16,325	16,879	17,432	17,984	18,537	19,089	19,640	20,192	20,743	21,295	21,846
400	21,846	22,397	22,949	23,501	24,054	24,607	25,161	25,716	26,272	26,829	27,388
500	27,388	27,949	28,511	29,075	29,642	30,210	30,782	31,356	31,933	32,513	33,096
600	33,096	33,683	34,273	34,867	35,464	36,066	36,671	37,280	37,893	38,510	39,130
700	39,130	39,754	40,382	41,013	41,647	42,283	42,922	43,563	44,207	44,852	45,498
800	45,498	46,144	46,790	47,434	48,076	48,716	49,354	49,989	50,621	51,249	51,875
900	51,875	52,496	53,115	53,729	54,341	54,948	55,553	56,155	56,753	57,349	57,942
1000	57,942	58,533	59,121	59,708	60,293	60,876	61,459	62,039	62,619	63,199	63,777
1100	63,777	64,355	64,933	65,510	66,087	66,664	67,240	67,815	68,390	68,964	69,536

NiCr-Ni (TIP K)

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90	-100
-100	-3,553	-3,852	-4,138	-4,410	-4,669	-4,912	-5,141	-5,354	-5,550	-5,730	-5,891
0	0	-0,392	-0,777	-1,156	-1,527	-1,889	-2,243	-2,586	-2,920	-3,242	-3,553
°C	0	10	20	30	40	50	60	70	80	90	100
0	0	0,397	0,798	1,023	1,611	2,022	2,436	2,850	3,266	3,681	4,095
100	4,095	4,508	4,919	5,327	5,733	6,137	6,539	6,939	7,338	7,737	8,137
200	8,137	8,537	8,938	9,341	9,745	10,151	10,560	10,969	11,381	11,793	12,207
300	12,207	12,623	13,039	13,456	13,874	14,292	14,712	15,132	15,552	15,974	16,395
400	16,395	16,818	17,241	17,664	18,088	18,513	18,938	19,363	19,788	20,214	20,640
500	20,640	21,066	21,493	21,919	22,346	22,772	23,198	23,624	24,050	24,476	24,902
600	24,902	25,327	25,751	26,176	26,599	27,022	27,445	27,867	28,288	28,709	29,128
700	29,128	29,547	29,965	30,383	30,799	31,214	31,629	32,042	32,455	32,866	33,277
800	33,277	33,686	34,095	34,502	34,909	35,314	35,718	36,121	36,524	36,925	37,325
900	37,325	37,724	38,122	38,519	38,915	39,310	39,703	40,096	40,488	40,879	41,269
1000	41,269	41,657	42,045	42,432	42,817	43,202	43,585	43,968	44,349	44,729	45,108
1100	45,108	45,486	45,863	46,238	46,612	46,985	47,356	47,726	48,095	48,462	48,828
1200	48,828	49,192	49,555	49,916	50,276	50,633	50,990	51,344	51,697	52,049	52,398
1300	52,398	52,747	53,093	53,439	53,782	54,125	54,466	54,807			

Termonapetosti po IEC 584, del 1 v mV

Cu-CuNi (TIP T)

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90	-100
-100	-3,378	-3,656	-3,923	-4,177	-4,419	-4,648	-4,865	-5,069	-5,261	-5,439	-5,603
0	0	-0,383	-0,757	-1,121	-1,475	-1,819	-2,152	-2,475	-2,788	-3,089	-3,378
°C	0	10	20	30	40	50	60	70	80	90	100
0	0	0,391	0,789	1,196	1,611	2,035	2,467	2,908	3,357	3,813	4,277
100	4,277	4,749	5,227	5,712	6,204	6,702	7,207	7,718	8,235	8,757	9,286
200	9,286	9,820	10,360	10,905	11,456	12,011	12,572	13,137	13,707	14,281	14,860
300	14,860	15,443	16,030	16,621	17,217	17,816	18,420	19,027	19,638	20,252	20,869
400	20,869										

Fe-CuNi (TIP J)

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90	-100
-100	-4,632	-5,036	-5,426	-5,801	-6,159	-6,499	-6,821	-7,122	-7,402	-7,659	-7,890
0	0	-0,501	-0,995	-1,481	-1,960	-2,431	-2,892	-3,344	-3,785	-4,215	-4,632
°C	0	10	20	30	40	50	60	70	80	90	100
0	0	0,507	1,019	1,536	2,058	2,585	3,115	3,649	4,186	4,725	5,268
100	5,268	5,812	6,359	6,907	7,457	8,008	8,560	9,113	9,667	10,222	10,777
200	10,777	11,332	11,887	12,442	12,998	13,553	14,108	14,663	15,217	15,771	16,325
300	16,325	16,879	17,432	17,984	18,537	19,089	19,640	20,192	20,743	21,295	21,846
400	21,846	22,397	22,949	23,501	24,054	24,607	25,161	25,716	26,272	26,829	27,388
500	27,388	27,949	28,511	29,075	29,642	30,210	30,782	31,356	31,933	32,513	33,096
600	33,096	33,683	34,273	34,867	35,464	36,066	36,671	37,280	37,893	38,510	39,130
700	39,130	39,754	40,382	41,013	41,647	42,283	42,922	43,563	44,207	44,852	45,498
800	45,498	46,144	46,790	47,434	48,076	48,716	49,354	49,989	50,621	51,249	51,875
900	51,875	52,496	53,115	53,729	54,341	54,948	55,553	56,155	56,753	57,349	57,942
1000	57,942	58,533	59,121	59,708	60,293	60,876	61,459	62,039	62,619	63,199	63,777
1100	63,777	64,355	64,933	65,510	66,087	66,664	67,240	67,815	68,390	68,964	69,536

NiCr-Ni (TIP K)

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90	-100
-100	-3,553	-3,852	-4,138	-4,410	-4,669	-4,912	-5,141	-5,354	-5,550	-5,730	-5,891
0	0	-0,392	-0,777	-1,156	-1,527	-1,889	-2,243	-2,586	-2,920	-3,242	-3,553
°C	0	10	20	30	40	50	60	70	80	90	100
0	0	0,397	0,798	1,023	1,611	2,022	2,436	2,850	3,266	3,681	4,095
100	4,095	4,508	4,919	5,327	5,733	6,137	6,539	6,939	7,338	7,737	8,137
200	8,137	8,537	8,938	9,341	9,745	10,151	10,560	10,969	11,381	11,793	12,207
300	12,207	12,623	13,039	13,456	13,874	14,292	14,712	15,132	15,552	15,974	16,395
400	16,395	16,818	17,241	17,664	18,088	18,513	18,938	19,363	19,788	20,214	20,640
500	20,640	21,066	21,493	21,919	22,346	22,772	23,198	23,624	24,050	24,476	24,902
600	24,902	25,327	25,751	26,176	26,599	27,022	27,445	27,867	28,288	28,709	29,128
700	29,128	29,547	29,965	30,383	30,799	31,214	31,629	32,042	32,455	32,866	33,277
800	33,277	33,686	34,095	34,502	34,909	35,314	35,718	36,121	36,524	36,925	37,325
900	37,325	37,724	38,122	38,519	38,915	39,310	39,703	40,096	40,488	40,879	41,269
1000	41,269	41,657	42,045	42,432	42,817	43,202	43,585	43,968	44,349	44,729	45,108
1100	45,108	45,486	45,863	46,238	46,612	46,985	47,356	47,726	48,095	48,462	48,828
1200	48,828	49,192	49,555	49,916	50,276	50,633	50,990	51,344	51,697	52,049	52,398
1300	52,398	52,747	53,093	53,439	53,782	54,125	54,466	54,807			

Termonapetosti po IEC 584, del 1 v mV

Pt13Rh-Pt (TIP R)

°C	0	10	20	30	40	50	60	70	80	90	100
0	0	0,054	0,111	0,171	0,232	0,296	0,363	0,431	0,501	0,573	0,647
100	0,647	0,723	0,800	0,879	0,959	1,041	1,124	1,208	1,294	1,380	1,468
200	1,468	1,557	1,647	1,738	1,830	1,923	2,017	2,111	2,207	2,303	2,400
300	2,400	2,498	2,596	2,695	2,795	2,896	2,997	3,099	3,201	3,304	3,407
400	3,407	3,511	3,616	3,721	3,826	3,933	4,039	4,146	4,254	4,362	4,471
500	4,471	4,580	4,689	4,799	4,910	5,021	5,132	5,244	5,356	5,469	5,582
600	5,582	5,696	5,810	5,925	6,040	6,155	6,272	6,388	6,505	6,623	6,741
700	6,741	6,860	6,979	7,098	7,218	7,339	7,460	7,582	7,703	7,826	7,949
800	7,949	8,072	8,196	8,320	8,445	8,570	8,696	8,822	8,949	9,076	9,203
900	9,203	9,331	9,460	9,589	9,718	9,848	9,978	10,109	10,240	10,371	10,503
1000	10,503	10,636	10,768	10,902	11,035	11,170	11,304	11,439	11,574	11,710	11,846
1100	11,846	11,983	12,119	12,257	12,394	12,532	12,669	12,808	12,956	13,085	13,224
1200	13,224	13,363	13,502	13,642	13,782	13,922	14,062	14,202	14,343	14,483	14,624
1300	14,624	14,765	14,906	15,047	15,188	15,329	15,470	15,611	15,752	15,893	16,035
1400	16,035	16,176	16,317	16,458	16,599	16,741	16,882	17,022	17,163	17,304	17,445
1500	17,445	17,585	17,726	17,866	18,006	18,146	18,286	18,425	18,564	18,703	18,842
1600	18,842	18,981	19,119	19,257	19,395	19,533	19,670	19,807	19,944	20,080	20,215
1700	20,350	20,483	20,616	20,748	20,878	21,006					

Pt10Rh-Pt (TIP S)

°C	0	10	20	30	40	50	60	70	80	90	100
0	0	0,055	0,113	0,173	0,235	0,299	0,365	0,432	0,502	0,573	0,645
100	0,645	0,719	0,795	0,872	0,950	1,029	1,109	1,190	1,273	1,356	1,440
200	1,440	1,525	1,611	1,698	1,785	1,873	1,962	2,051	2,141	2,232	2,323
300	2,323	2,414	2,506	2,599	2,692	2,786	2,880	2,974	3,069	3,164	3,260
400	3,260	3,356	3,452	3,549	3,645	3,743	3,840	3,938	4,036	4,135	4,234
500	4,234	4,333	4,432	4,532	4,632	4,732	4,832	4,933	5,034	5,136	5,237
600	5,237	5,339	5,442	5,544	5,648	5,751	5,855	5,960	6,064	6,169	6,274
700	6,274	6,380	6,486	6,592	6,699	6,805	6,913	7,020	7,128	7,236	7,345
800	7,345	7,454	7,563	7,672	7,782	7,892	8,003	8,114	8,225	8,336	8,448
900	8,448	8,560	8,673	8,786	8,899	9,012	9,126	9,240	9,355	9,470	9,585
1000	9,585	9,700	9,816	9,932	10,048	10,165	10,282	10,400	10,517	10,635	10,754
1100	10,754	10,872	10,991	11,110	11,229	11,348	11,467	11,587	11,707	11,827	11,947
1200	11,947	12,067	12,188	12,308	12,429	12,550	12,671	12,792	12,913	13,034	13,155
1300	13,155	13,276	13,397	13,519	13,640	13,761	13,883	14,004	14,125	14,247	14,368
1400	14,368	14,489	14,610	14,731	14,852	14,973	15,094	15,215	15,336	15,456	15,576
1500	15,576	15,697	15,817	15,937	16,057	16,176	16,296	16,415	16,534	16,653	16,771
1600	16,771	16,890	17,008	17,125	17,243	17,360	17,477	17,594	17,711	17,826	17,942
1700	17,942	18,056	18,170	18,282	18,394	18,504	18,612				

Pt30Rh-Pt6Rh (TIP B)

°C	0	10	20	30	40	50	60	70	80	90	100
0	0	-0,002	-0,003	-0,002	0	0,002	0,006	0,011	0,017	0,025	0,033
100	0,033	0,043	0,053	0,065	0,078	0,092	0,107	0,123	0,140	0,159	0,178
200	0,178	0,199	0,220	0,243	0,266	0,291	0,317	0,344	0,372	0,401	0,431
300	0,431	0,462	0,494	0,527	0,561	0,596	0,632	0,669	0,707	0,746	0,786
400	0,786	0,827	0,870	0,913	0,957	1,002	1,048	1,095	1,143	1,192	1,241
500	1,241	1,292	1,344	1,397	1,450	1,505	1,560	1,617	1,674	1,732	1,791
600	1,791	1,851	1,912	1,974	2,036	2,100	2,164	2,230	2,296	2,363	2,430
700	2,430	2,499	2,569	2,639	2,710	2,782	2,855	2,928	3,003	3,078	3,154
800	3,154	3,231	3,308	3,387	3,466	3,546	3,626	3,708	3,790	3,873	3,957
900	3,957	4,041	4,126	4,212	4,298	4,386	4,474	4,562	4,652	4,742	4,833
1000	4,833	4,924	5,016	5,109	5,202	5,297	5,391	5,487	5,583	5,680	5,777
1100	5,777	5,875	5,973	6,073	6,172	6,273	6,374	6,475	6,577	6,680	6,783
1200	6,783	6,887	6,991	7,096	7,202	7,308	7,414	7,521	7,628	7,736	7,845
1300	7,845	7,953	8,063	8,172	8,283	8,393	8,504	8,616	8,727	8,839	8,952
1400	8,952	9,065	9,178	9,291	9,405	9,519	9,634	9,748	9,863	9,979	10,094

1500	10,094	10,210	10,325	10,441	10,558	10,674	10,790	10,907	11,024	11,141	11,257
1600	11,257	11,374	11,491	11,608	11,725	11,842	11,959	12,076	12,193	12,310	12,426
1700	12,426	12,543	12,659	12,776	12,892	13,008	13,124	13,239	13,354	13,470	13,585
1800	13,585	13,699	13,814								

Termonapetosti po DIN 43710 v mV

Cu-CuNi (TIP U)

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90	-100
-100	-3,40	-3,68	-3,95	-4,21	-4,46	-4,69	-4,91	-5,12	-5,32	-5,51	-5,70
0	0	-0,39	-0,77	-1,14	-1,50	-1,85	-2,18	-2,50	-2,81	-3,11	-3,40
°C	0	10	20	30	40	50	60	70	80	90	100
0	0	0,40	0,80	1,21	1,63	2,05	2,48	2,91	3,35	3,80	4,25
100	4,25	4,71	5,18	5,65	6,13	6,62	7,12	7,63	8,15	8,67	9,20
200	9,20	9,74	10,29	10,85	11,41	11,98	12,55	13,13	13,71	14,30	14,90
300	14,90	15,50	16,10	16,70	17,31	17,92	18,53	19,14	19,76	20,38	21,00
400	21,00	21,62	22,25	22,88	23,51	24,15	24,79	25,44	26,09	26,75	27,41
500	27,41	28,08	28,75	29,43	30,11	30,80	31,49	32,19	32,89	33,60	34,31

Fe-CuNi (TIP L)

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90	-100
-100	-4,75	-5,15	-5,53	-5,90	-6,26	-6,60	-6,93	-7,25	-7,56	-7,86	-8,15
0	0	-0,51	-1,02	-1,53	-2,03	-2,51	-2,98	-3,44	-3,89	-4,33	-4,75
°C	0	10	20	30	40	50	60	70	80	90	100
0	0	0,52	1,05	1,58	2,11	2,65	3,19	3,73	4,27	4,82	5,37
100	5,37	5,92	6,47	7,03	7,59	8,15	8,71	9,27	9,83	10,39	10,95
200	10,95	11,51	12,07	12,63	13,19	13,75	14,31	14,88	15,44	16,00	16,56
300	16,56	17,12	17,68	18,24	18,80	19,36	19,92	20,48	21,04	21,60	22,16
400	22,16	22,72	23,29	23,86	24,43	25,00	25,57	26,14	26,71	27,28	27,85
500	27,85	28,43	29,01	29,59	30,17	30,75	31,33	31,91	32,49	33,08	33,67
600	33,67	34,26	34,85	35,44	36,04	36,64	37,25	37,85	38,47	39,09	39,72
700	39,72	40,35	40,98	41,62	42,27	42,92	43,57	44,23	44,89	45,55	46,22
800	46,22	46,89	47,57	48,25	48,94	49,63	50,32	51,02	51,72	52,43	53,14

Barvne oznake za termopare

Termopar + -	Oznaka	MEDNARODNO IEC 584		DIN 433713/43714	
		Barva plašča	Barva kabla	Barva plašča	Barva kabla
Cu - CuNi	T	rjava	+ rjava - bela	-	-
Cu - CuNi	U	-	-	rjava	+ rdeča - rjava
Fe - CuNi	J	črna	+ črna - bela	-	-
Fe - CuNi	L	-	-	plava	+ rdeča - plava
NiCR - CuNi	E	vijolična	+ vijolična - bela	-	-
NiCr - Ni	K	zelena	+ zelena - bela	zelena	+ rdeča - zelena
NiCrSi - NiSi	N	roza	+ roza - bela	-	-
Pt13Rh - Pt	R	oranžna	+ oranžna - bela	bela	+ rdeča - bela
Pt10Rh - Pt	S	oranžna	+ oranžna - bela	bela	+ rdeča - bela
Pt30Rh - Pt	B	siva	+ siva - bela	modra	+ siva - bela