			class 1		class 2		class 3	
type	standard	material	temperature-range	(2) limit deviation	temperature-range	(2) limit deviation	temperature-range	(2) limit deviation
T	DIN EN 60584	Cu-CuNi	-40 … + 350°C	0,5 °C or 0,40%	-40 … +350 °C	1,0 °C or 0,75 %	-200 … + 40 °C	1,0 °C or 1,5 %
(1)U	DIN 43710	Cu-CuNi	-	-	0 …+600 °C	± 3 °C / ± 0,75 %	-	-
J	DIN EN 60584	Fe-CuNi	-40 … + 750°C	1,5 °C or 0,40%	-40 …+750 °C	2,5 °C or 0,75 %	-	-
(1)L	DIN 43710	Fe-CuNi	-	-	0 …+900 °C	± 3 °C / ± 0,75 %	-	-
K	DIN EN 60584	NiCr-Ni	-40 … +1000°C	1,5 °C or 0,40%	-40 …+1200 °C	2,5 °C or 0,75 %	-200 … + 40 °C	2,5 °C or 1,5 %
E	DIN EN 60584	NiCr-CuNi	-40 … + 800°C	1,5 °C or 0,40%	-40 …+900 °C	2,5 °C or 0,75 %	-200 … + 40 °C	2,5 °C or 1,5 %
N	DIN EN 60584	NiCrSi-NiSi	-40 … +1000°C	1,5 °C or 0,40%	-40 …+1200 °C	2,5 °C or 0,75 %	-200 … + 40 °C	2,5 °C or 1,5 %
S	DIN EN 60584	PtRh 10-Pt	0 … +1600°C	1,0 °C or (3)	0 …+1600 °C	1,5 °C or 0,25 %	-	-
R	DIN EN 60584	PtRh13-Pt	0 … +1600°C	1,0 °C or (3)	0 …+1600 °C	1,5 °C or 0,25 %	-	-
B	DIN EN 60584	PtRh30-PtRh6	-	-	+600 …+1700 °C	1,5 °C or 0,50 %	+600 … +1700 °C	4,0 °C or 1,0 %

Classes 1, 2, and 3 are valid for thermocouples.

(1) Since April 1994 the standard DIN 43710 is no longer valid.

(2) For the limit deviation, the higher value is valid.

(3) 1°C or [1 + (t - 1100) x 0,003] °C

CHARACTERISTICS OF THERMOCOUPLES

characteristics / thermocouples	general	composition	temperature range	suitable application	unsuitable application
Typ E	base metal thermocouple NiCr - CuNi (nickel-chrome/ copper-nickel) single wires made of non precious metals	**EP-leg:** 89-90% nickel, 9-9,5% chrome, 0,5% silicium and iron balance: C, Mn, Nb, Co **EN-leg:** 55% copper, 45% nickel approx. 0,1%, cobalt, iron and manganese	-200°C/+700°C	▶ in pure, oxidizing (air) or neutral atmosphere (inert gases) ▶ high resistance against corrosion ▶ small thermal conductivity	▶ not sulphuric, reducing or alternately oxidizing and reducing atmosphere ▶ do not apply in vacuum for a long time
Typ J	base metal thermocouple Fe - CuNi (iron/copper-nickel) single wires made of non precious metals	**JP-leg:** 99,5 % iron, approx. 0,25 % manganese, approx. 0,12 % copper, balance: other impurities **JN-leg:** 55% copper, 45% nickel approx. 0,1%, cobalt, iron and manganese	-180°C/+700°C	▶ from 0-760°C in vacuum, oxidizing (air), reducing or inert atmosphere (inert gases)	▶ temperatures below 0°C ▶ sulphurous atmosphere above +500°C ▶ above 760°C only with bigger wire diameters
Typ K	base thermocouple NiCr - NiAl (nickel-chrome/ nickel-aluminium) single wires made of non precious metals	**KP-leg:** 89-90% nickel, 9-9,5% chrome, 0,5 % silicium and iron balance: C, Mn, Nb, Co **KN-leg:** 95-96% nickel, 1-1,5% silicium, 1-2,3 % aluminium, 1-3,2% manganese, 0,5% cobalt, balance: Fe, Cu, Pb	-270°C/+1372°C	▶ from 250°C-1260°C in pure, oxidizing (air) and neutral atmosphere (inert gases) ▶ for higher temperatures bigger wire diameters are recommended	▶ between 250°C up to 600°C not suitable for exact measurements with quick temperature changes ▶ not appropriate for a longer time with high temperatures in vacuum ▶ do not apply with high temperatures in sulphurous, reducing or alternately oxidizing and reducing atmoshere without protection ▶ do not use in atmosphere favourizing "green mould"
Typ L	base thermocouple Fe - CuNi (iron/copper-nickel) single wires made of non precious metals	**LP-leg:** 99,5 % iron, approx. 0,25 % manganese, approx. 0,12 % copper, ballance: other impurities **LN-leg:** 55% copper, 45% nickel, approx. 0,1% cobalt, iron and manganese	0°C/+900°C	▶ from 0°C-760°C in vacuum, oxidizing (air), reducing or inert atmosphere (inert gases) ▶ above 500°C bigger wire diameters are recommended	▶ temperatures below 0°C ▶ sulphurous atmosphere above +500°C ▶ above 760°C only with bigger wire diameters
Typ N	base thermocouple NiCrSi - NiSi (nickel-chrome-silicium/nickel-silicium-magnesium) single wires made of non precious metals	**NP-leg:** 84% nickel, 14-14,4 % chrome, 1,3-1,6% silicium, ballance (not more than 0,1%): Mn, Fe, C, Co **NN-leg:** 95 % nickel, 4,2-4,6 % silicium, 0,5-1,5 % magnesium, ballance: Fe, Co, Mn, C, (altogether 0,1-0,3%)	-270°C/+1300°C	▶ from 300°C-1260°C in pure, oxidizing (air) and neutral atmosphere (inert gases)	▶ do not use with high temperatures in sulphurous, reducing or alternately oxidizing and reducing atmosphere without protection ▶ do not use with high temperatures in vacuum ▶ do not use in atmosphere faviourizing "green mould" ▶ reducing atmosphere
Typ R	base thermocouple Pt13%Rh - Pt (platinum 13% rhodium/ platinum) single wires made of platinum and platinum - rhodium alloy	**RP-leg:** platinum with 99,99% purity with a rhodium alloy (purity 99,98%) 13±0,05 % rhodium portion **RN-leg:** platinum with 99,99% purity	-50°C/+1768,1°C (melting point) recommended: up to +1300°C	▶ pure, oxidizing atmosphere (air), non aggresive (inert-) gases and short-term in vacuum ▶ above +1200°C type B more appropriate	▶ reducing atmosphere ▶ metal gases (for example plomb or zinc) ▶ agressive vapours containing arsenic, phosphor or sulphur ▶ do never use metal protecting tubes with higher temperatures ▶ sensitive against impurities of impure metals
Typ S	base thermocouple Pt10%Rh - Pt (platinum 10%Rhodium/ platinum). single wires made of platinum and platinum - rhodium alloy	**SP-leg:** platinum with 99,99% purity with a rhodium alloy (purity 99,98%) 10±0,05 % rhodium portion **SN-leg:** platinum with 99,99% purity	-50°C/+1768,1°C (melting point) recommended: up to +1300°C	▶ pure, oxidizing atmospheres (air), non agressive (inert-) gases and short-term in vacuum ▶ above +1200°C type B more appropriate	▶ reducing atmosphere ▶ metal gases (for example plomb or zinc) ▶ agressive vapours containing arsenic, phosphor or sulphur ▶ do never use metal protecting tubes with higher temperatures ▶ sensitive against impurities of impure metals
Typ B	base thermocouple (Pt30%Rh - Pt6%Rh platinum - 0% rhodium/ platinum-6% rhodium) single wires made of platinum and platinum - rhodium alloy	**BP-leg:** platinum with 99,99% purity with a rhodium alloy (purity 99,98%) 29,60±0,2 % rhodium portion **BN-leg:** platinum with 99,99% purity with a rhodium alloy (purity 99,98%) 6,12±0,02 % rhodium portion	max. +1820°C (melting point) ordinary up to +1700°C	▶ pure, oxidizing atmosphers ▶ neutral atmospheres ▶ vacuum	▶ reducing atmosphere or such with agressive vapours or impurities which react with metals of the platinum group, if it isn´t protected with a non metal protecting tube
Typ T	base thermocouple Cu - CuNi (copper/copper-nickel) single wires made of non precious metals	**TP-leg:** 99,95% copper, 0,02-0,07% oxygen 0,01% impurities **TN-leg:** 55% copper, 45% nickel approx. 0,1% cobalt, iron and manganese	-270°C/+400°C	▶ from -200°C-370°C in vacuum, oxidizing (air), reducing or inert atmosphere (inert gases) ▶ with higher temperatures bigger wire diameters are recommended	▶ above +370°C not appropriate in a hydrogen atmosphere ▶ not appropriate in radioactive environment
Typ U	base thermocouple Cu - CuNi (copper/copper-nickel) single wires made of non precious metals	**UP-leg:** 99,95% copper, 0,02-0,07% oxygen 0,01% impurities **UN-leg:** 55% copper, 45% nickel approx. 0,1% cobalt, iron and manganese	0°C/+600°C (+400°C)	▶ from -200°C-370°C in vacuum, oxidizing (air), reducing or inert atmosphere (inert gases) ▶ with higher temperatures bigger wire diameters are recommended	▶ above +370°C not appropriate in a hydrogen atmosphere ▶ not appropriate in radioactive environment

Abbreviations: C= carbon, Mn= manganese, Nb=niobium, Co=cobalt, Fe= iron, Pb=plomb, Cu=copper