



HD2328.0 TWO INPUTS THERMOCOUPLE THERMOMETER

HD2328.0 with **two inputs** is a portable instrument with a large LCD display. It measures temperature by means of immersion, penetration, contact or air probes. Its sensor can be a K, J, T or E thermocouple type.

Functions Max, Min and Avg calculate maximum, minimum and average values. Further functions are: REL relative measure, HOLD, automatic excludable switching-off system and the A-B difference of the two input channels.

The instrument has IP67 protection degree.

TECHNICAL SPECIFICATIONS OF THE INSTRUMENT

Instrument

Dimensions (Length x Width x Height)	140x88x38mm
Weight	160g (complete with batteries)
Materials	ABS
Display	2x4½ digits plus symbols Visible area: 52x42mm

Operating conditions

Operating temperature	-5 ... 50°C
Storage temperature	-25 ... 65°C
Working relative humidity	0 ... 90% RH, no condensation
Protection degree	IP67

Power supply

Batteries	3 Batteries 1.5V type AA
Autonomy	200 hours with 1800mAh alkaline batteries
Current consumption with instrument off	< 20µA

Unit of measurement

°C - °F

Connections

Probes input	2 per 2-pole female polarized standard miniature connector
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Temperature measure of the instrument

TC measuring range: K	-200...+1370°C
TC measuring range: J	-100...+750°C
TC measuring range: T	-200...+400°C
TC measuring range: E	-200...+750°C

Resolution

0.1°C

Instrument accuracy

Thermocouple K	±0.1°C up to 600°C ±0.2°C over 600°C
Thermocouple J	±0.1°C up to 400°C ±0.2°C over 400°C
Thermocouple T	±0.1°C
Thermocouple E	±0.1°C up to 300°C ±0.2°C over 300°C

Accuracy is referred to the instrument only; error due to the thermocouple or to the cold junction reference sensor is not included.

Temperature drift @20°C

0.02%/°C

Drift after 1 year

0.1°C/year

Thermocouple probes accuracy:

Tolerance of a type of thermocouple corresponds to the maximum acceptable shift from the e.m.f. of any thermocouple of that type, with reference junction at 0°C. The tolerance is expressed in degrees Celsius, preceded by the sign. The percentage tolerance is given by the ratio between the tolerance expressed in degrees Celsius and the measurement junction temperature, multiplied by one hundred.

The tolerances refer to the operating temperature expected for the thermocouple, in agreement with the thermo-elements' diameter.

Those thermocouples that comply with the limits for temperatures over 0°C, do not necessarily comply with the limits for ranges below 0°C.

Tolerance classes for thermocouples (reference junction at 0°C)

Type of thermocouple	Tolerance Class 1	Tolerance Class 2	Tolerance Class 3 ⁽¹⁾
Type T			
Temperature interval	from -40 to +125°C	from -40 to +133°C	from -67 to +40°C
Tolerance	± 0.5°C	± 1°C	± 1°C
Temperature interval	from 125 to 350°C	from 133 to 350°C	from -200 to -67°C
Tolerance	± 0.004 · t	± 0.0075 · t	± 0.015 · t
Type E			
Temperature interval	from -40 to +375°C	from -40 to +333°C	from -167 to +40°C
Tolerance	± 1.5°C	± 2.5°C	± 2.5°C
Temperature interval	from 375 to 800°C	from 333 to 900°C	from -200 to -167°C
Tolerance	± 0.004 · t	± 0.0075 · t	± 0.015 · t
Type J			
Temperature interval	from -40 to +375°C	from -40 to +333°C	-
Tolerance	± 1.5°C	± 2.5°C	-
Temperature interval	from 375 to 750°C	from 333 to 750°C	-
Tolerance	± 0.004 · t	± 0.0075 · t	-
Type K			
Temperature interval	from -40 to +375°C	from 40 to +333°C	from -167 to +40°C
Tolerance	± 1.5°C	± 2.5°C	± 2.5°C
Temperature interval	from 375 to 1000°C	from 333 to 1200°C	from -200 to -167°C
Tolerance	± 0.004 · t	± 0.0075 · t	± 0.015 · t

⁽¹⁾ Materials for thermocouples are generally supplied so to comply with the factory tolerances specified in the table for temperatures over -40°C. However these materials can sometimes not comply with the factory tolerances for the low temperatures reported under Class 3, for thermocouples of T, E, K and N type, when thermocouples have to comply at the same time the limits of Class 3 and Class 1 and/or Class 2.

ORDERING CODES

HD2328.0: The kit consists of **two inputs** instrument HD2328.0, 3 per 1.5V alkaline batteries, instruction manual, case. **Probes have to be ordered separately.**

Thermocouple probes

Any thermocouple probe with standard miniature connector available on the price list can be connected to these instruments.



THERMOCOUPLE PROBES FOR PORTABLE INSTRUMENTS

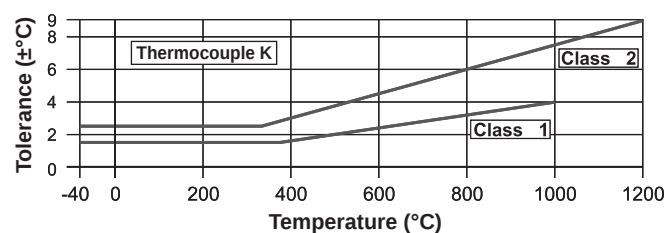
TOLERANCE CLASSES OF THERMOCOUPLES

Tolerances according to IEC 60584-2 standard. The values refer to thermocouples with reference junction at 0 °C.

Type of thermocouple	Tolerance class 1		Tolerance class 2		Tolerance class 3	
	Temperature range (°C)	Tolerance (°C)	Temperature range (°C)	Tolerance (°C)	Temperature range (°C)	Tolerance (°C)
B	---	---	+600...+1700	$\pm 0,0025 \cdot t$	+600...+800	± 4
	---	---	---	---	+800...+1700	$\pm 0,005 \cdot t$
E	-40...+375	$\pm 1,5$	-40...+333	$\pm 2,5$	-167...+40	$\pm 2,5$
	+375...+800	$\pm 0,004 \cdot t$	+333...+900	$\pm 0,0075 \cdot t$	-200...-167	$\pm 0,015 \cdot t$
J	-40...+375	$\pm 1,5$	-40...+333	$\pm 2,5$	---	---
	+375...+750	$\pm 0,004 \cdot t$	+333...+750	$\pm 0,0075 \cdot t$	---	---
K, N	-40...+375	$\pm 1,5$	-40...+333	$\pm 2,5$	-167...+40	$\pm 2,5$
	+375...+1000	$\pm 0,004 \cdot t$	+333...+1200	$\pm 0,0075 \cdot t$	-200...-167	$\pm 0,015 \cdot t$
R, S	0...+1100	± 1	0...+600	$\pm 1,5$	---	---
	+1100...+1600	$\pm [1+0,003 \cdot (t-1100)]$	+600...+1600	$\pm 0,0025 \cdot t$	---	---
T	-40...+125	$\pm 0,5$	-40...+133	± 1	-67...+40	± 1
	+125...+350	$\pm 0,004 \cdot t$	+133...+350	$\pm 0,0075 \cdot t$	-200...-67	$\pm 0,015 \cdot t$

Note: t = temperature of measurement junction in °C.

The K type thermocouple probes supplied by Delta OHM have tolerance class 1 in the operating temperature range, that depends on the thermoelements diameter.



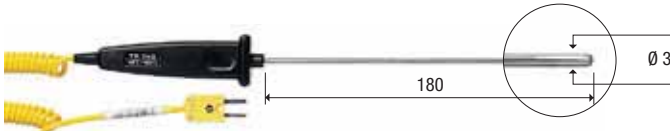
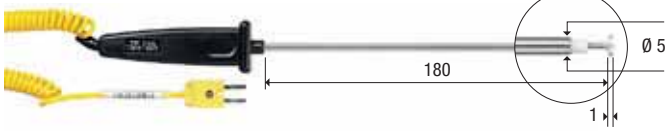
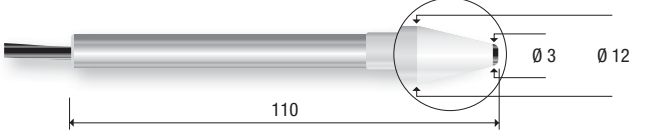
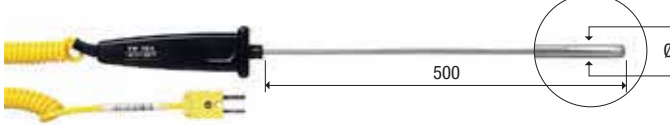
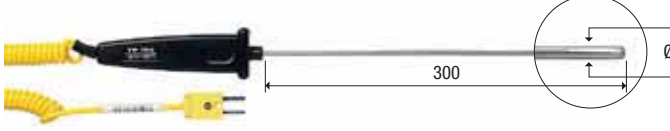
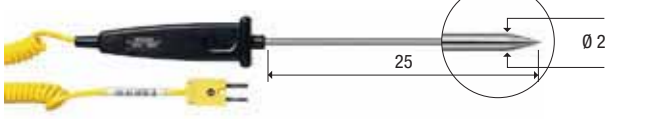
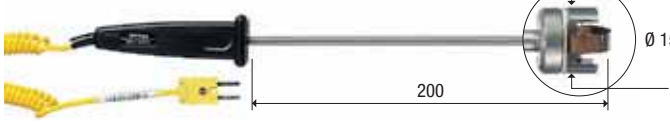
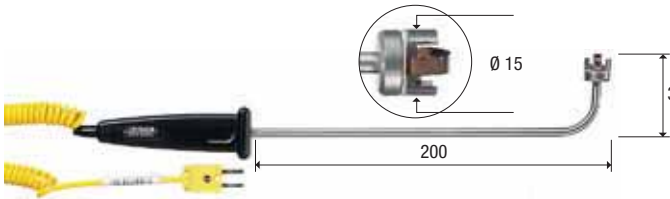
THERMOCOUPLE PROBES FOR PORTABLE INSTRUMENTS

TYPE "K" (CHROMEL - ALUMEL) THERMOCOUPLE PROBES

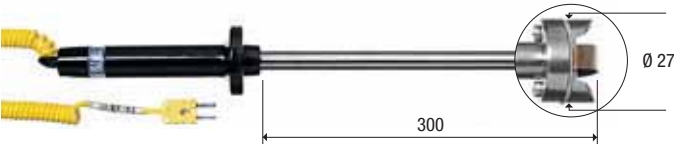
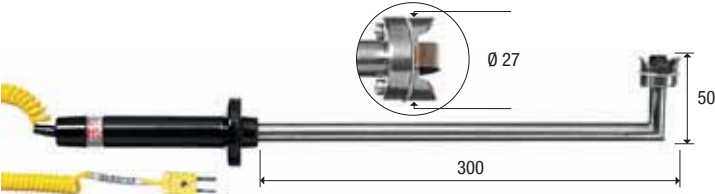
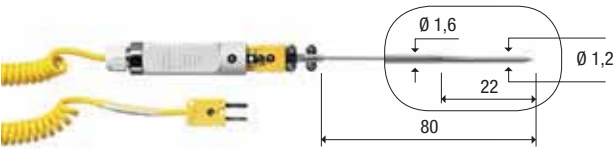
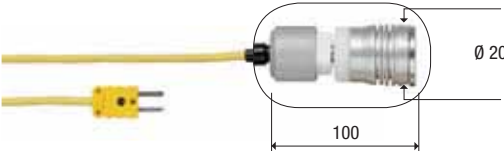
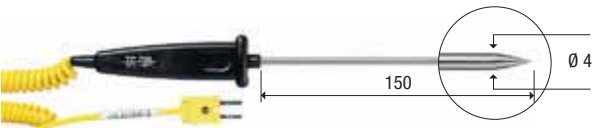
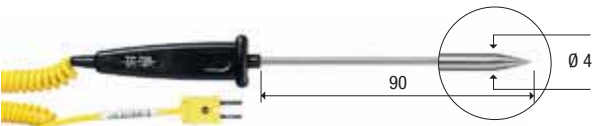
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TP 741	800	2s		
TP 741/1	400	2s		
TP 741/2	800	2s		
TP 742	400	2s		
TP 742/1	400	2s		

Temperature

TYPE "K" (CHROMEL - ALUMEL) THERMOCOUPLE PROBES

CODE	°C max	τ s	DIMENSIONS	USE
TP 742/2	800	2s		
TP 743	800	3s		
TP 744	400	4s		
TP 745	500	5s		
TP 746	250	2s		
TP 750	1000	3s		
TP 750.0	800	3s		
TP 751	200	2s		
TP 754	500	2s		
TP 754/9	500	2s		

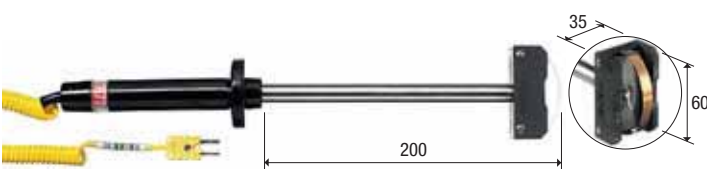
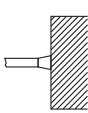
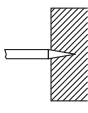
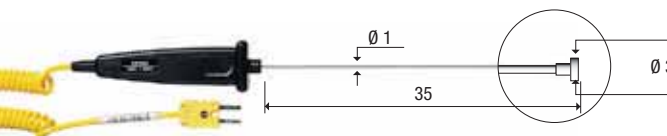
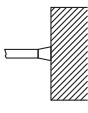
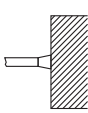
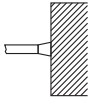
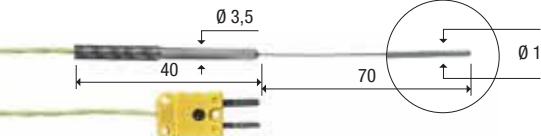
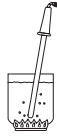
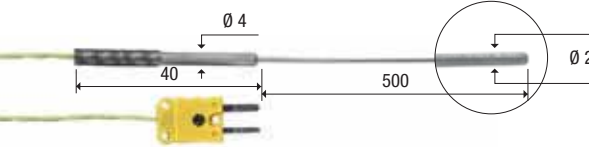
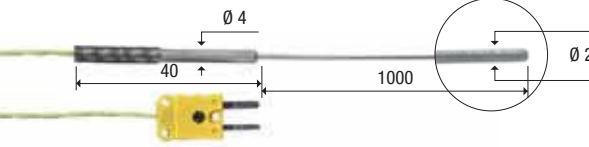
TYPE "K" (CHROMEL - ALUMEL) THERMOCOUPLE PROBES

CODE	°C max	τ s	DIMENSIONS	USE
TP 755	800	2s		
TP 755/9	800	2s		
TP 756	200	2s		
TP 757	180	30s	MAGNETIC PROBE FOR CONTACT MEASURE ON MAGNETIC METALLIC SURFACES 	
TP 758	400	4s		
TP 758.1	400	4s		
TP 772	400	3s		

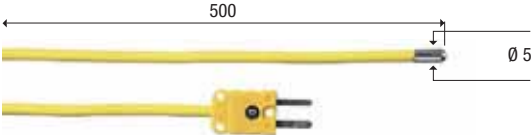
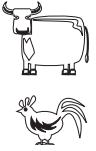
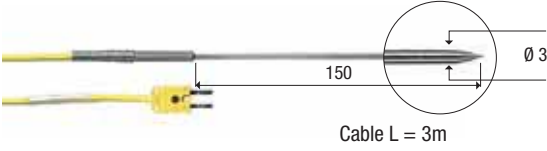
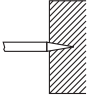
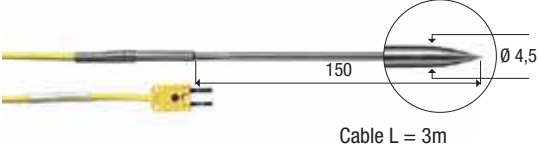
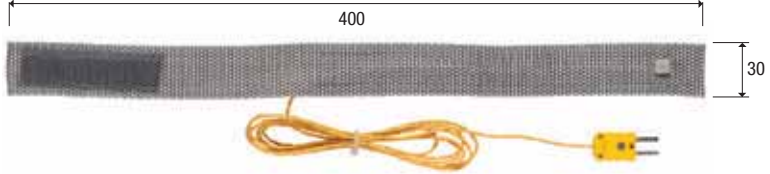
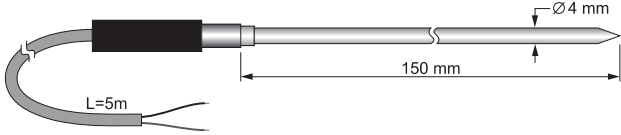
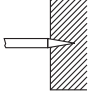
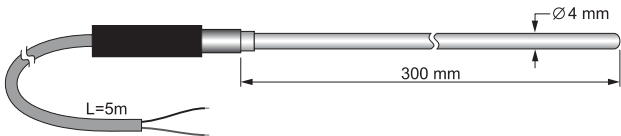
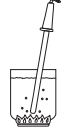
Temperature



TYPE "K" (CHROMEL - ALUMEL) THERMOCOUPLE PROBES

CODE	°C max	τ s	DIMENSIONS	USE
TP 774	250	2s		
TP 776	200	2s		
TP 777	200	3s		
TP 647 TP 647/2 TP 647/3 TP 647/5	300 300 300 300	2s 2s 2s 2s	For ACCREDIA calibration up to 300°C. 	
TP 651	1200	6s		
TP 652	1200	6s		
TP 655	180	2s		
TP 656	200	1s		
TP 656/1	1000	1s		
TP 656/2	1000	1s		

TYPE "K" (CHROMEL - ALUMEL) THERMOCOUPLE PROBES

CODE	°C max	τ s	DIMENSIONS	USE
TP 657/1	100	5s		
TP 659	400	3s		
TP 660	400	4s		
TP 661	-60 +50	30s		
TP 662	110	120s	PROBE WITH VELCRO TAPE FOR MEASURES ON PIPES MAX 110 DIAM. 	
TP 32MT.11P	-40 +100	4s		
TP 32MT.12	-40 +100	4s		
CM CS	"K"			
PW	"K"		 Cable length = 2m, 5m, 10m, 15m, 20m	

Response time for a 63% variation ($\tau_{0.63}$)

Response time τ s is the reaction time of the sensor to a temperature variation, with a variation of the measured signal to a given percentage (63%) of the variation.

Response times are referred to:

Immersion probes when into water at 100°C.

Contact probes when in contact with a metallic surface at 200°C.

Air probes at air temperature of 100°C.

At temperature above 400°C avoid violent impact or thermal shocks. The probe can be irreparably damaged.