Mineral-insulated thermocouples to DIN 43 710 and EN 60 584

- **for temperatures from -200 to +1150°C**
- **flexible sheath with shock-proof measuring insert**
- **protection tube diameter from 0.5mm**
- **fast response**
- **fitting length to suit application**

Thanks to their special properties, mineral-insulated thermocouples are used in chemical plant, power stations, pipelines, in engine construction and on test beds. The thermocouple wires are embedded in compressed fire-resistant magnesium oxide inside the flexible thin-walled sheath.

The excellent heat transfer between the sheath and the thermocouple enables short response times ($t_{0.5}$ from 0.15sec) and high measurement accuracy. The shock-proof construction ensures a long life. The minimum bending radius is 5 x the external diameter. The minimum fitting length EL is 50mm for 0.5mm to 2.0mm dia., and 100mm for 3.0 to 6.0mm dia.

The thermocouples are normally insulated from the sheath. The measuring insert is fitted with thermocouples to EN 60 584 or DIN 43 710. Versions with two thermocouples are also available.

Test pressure: 40 bar (helium) leakage test at the measurement point.

Insulation resistance: thermocouple against sheath at room temperature for lengths < 1m 200MΩ, for lengths ≥ 1m 200MΩ x m.

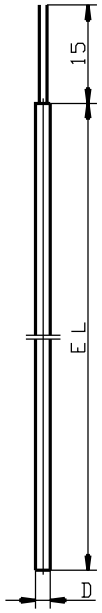
Technical data

Connection	available with cable ends as: bare wires, with ferrules, receptacles or multipole connector
Connecting cable	silicone, ambient temperature -50 to +180°C Teflon, ambient temperature -190 to +260°C metal braiding, ambient temperature -20 to +350°C
Protection tube	stainless steel 1.4541, thermocouple Type L and Type J Inconel 2.4816, thermocouple Type K
Measuring insert	insulated assembly: 1 x Fe-Con J, EN 60 584, Cl. 2, operating temperature -200 to +800°C 1 x Fe-Con L, DIN 43 710, Cl. 2, operating temperature -200 to +800°C 1 x NiCr-Ni K, EN 60 584, Cl. 2, operating temperature -200 to +1150°C 2 x Fe-Con L, DIN 43 710, Cl. 2, operating temperature -200 to +800°C 2 x NiCr-Ni K, EN 60 584, Cl. 2, operating temperature -200 to +1150°C
Response times	in water with 0.4m/sec / in air with 2m/sec 0.5mm dia: water $t_{0.5}$ = 0.15sec, $t_{0.9}$ = 0.30sec / air $t_{0.5}$ = 3.5sec, $t_{0.9}$ = 8.0sec 1.0mm dia: water $t_{0.5}$ = 0.20sec, $t_{0.9}$ = 0.60sec / air $t_{0.5}$ = 7.5sec, $t_{0.9}$ = 17.0sec 1.5mm dia: water $t_{0.5}$ = 0.40sec, $t_{0.9}$ = 0.90sec / air $t_{0.5}$ = 10.0sec, $t_{0.9}$ = 25.0sec 2.0mm dia: water $t_{0.5}$ = 0.80sec, $t_{0.9}$ = 2.60sec / air $t_{0.5}$ = 13.0sec, $t_{0.9}$ = 34.0sec 3.0mm dia: water $t_{0.5}$ = 1.00sec, $t_{0.9}$ = 2.80sec / air $t_{0.5}$ = 22.0sec, $t_{0.9}$ = 64.0sec 4.5mm dia: water $t_{0.5}$ = 2.50sec, $t_{0.9}$ = 6.50sec / air $t_{0.5}$ = 34.0sec, $t_{0.9}$ = 113.0sec 6.0mm dia: water $t_{0.5}$ = 3.00sec, $t_{0.9}$ = 9.00sec / air $t_{0.5}$ = 55.0sec, $t_{0.9}$ = 170.0sec

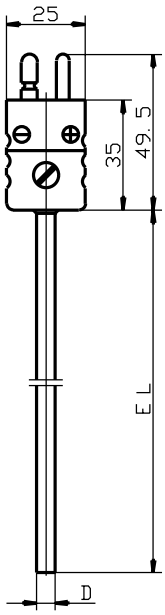
Lead resistances in Ω/m at 20°C for mineral-insulated thermocouples

Diameter D in mm	1thermocouple resistance in Ω/m	2 thermocouples resistance in Ω/m
Thermocouple Fe-Con L		
6.0	0.66	0.85
4.5	1.40	1.80
3.0	2.70	3.50
2.0	5.00	7.70
1.5	12.00	-
1.0	21.50	-
Thermocouple Fe-Con J		
6.0	0.54	-
3.0	2.10	-
1.5	8.60	-
Thermocouple NiCr-Ni K		
6.0	0.88	2.70
4.5	1.56	4.80
3.0	3.50	11.00
2.0	7.90	25.00
1.5	14.00	-
1.0	32.00	-
0.5	126.00	-

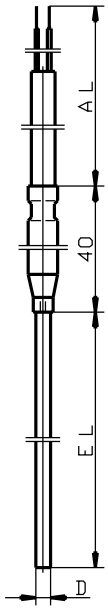
Dimensions



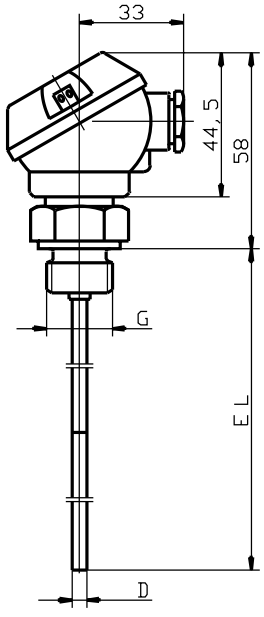
Type 901221/10



Type 901221/20



Type 901221/3x

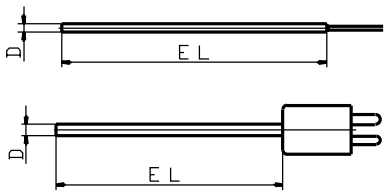


Type 901221/40

Order details: Mineral-insulated thermocouples to DIN 43 710 and EN 60 584

(1) Basic version

		901221/10	Mineral-insulated thermocouple with bare connecting wires
		901221/20	Mineral-insulated thermocouple with standard flat emf-free connector



			(2) Measuring insert / operating temperature in °C
x	x	1040	1 x Fe-Con J, operating temperature -200 to +800°C, sheath, Mat. Ref. 1.4541
x	x	1042	1 x Fe-Con L, operating temperature -200 to +800°C, sheath, Mat. Ref. 1.4541
x	x	1043	1 x NiCr-Ni K, operating temperature -200 to +1200°C, sheath, Mat. Ref. 2.4816
x		2042	2 x Fe-Con L, operating temperature -200 to +800°C, sheath, Mat. Ref. 1.4541
x		2043	2 x NiCr-Ni K, operating temperature -200 to +1200°C, sheath, Mat. Ref. 2.4816
			(3) Protection tube diameter D in mm
	x	0.5	0.5mm, only with Type 1 x NiCr-Ni K
x	x	1	1mm
x	x	1.5	1.5mm
x	x	2	2mm
x	x	3	3mm
x	x	4.5	4.5mm
x	x	6	6mm
			(4) Fitting length EL in mm (50≤ EL ≤50000)
x	x	100	100mm
x	x	200	200mm
x	x	300	300mm
x	x	400	400mm
x	x	500	500mm
x	x	...	please specify in plain text (50mm steps)
			(5) Extra codes
x	x	000	no extra code
x	x	309	uninsulated assembly (thermocouple welded to tip)

	(1)		(2)		(3)		(4)		(5)	
Order code		-		-		-		/		,...
Order example	901221/10	-	1042	-	3	-	200	/	000	

1. List extra codes in sequence, separated by commas.

Order details: Mineral-insulated thermocouples to DIN 43 710 and EN 60 584

				(1) Basic version
			901221/32	Mineral-insulated thermocouple with siliconized compensating cable
			901221/33	Mineral-insulated thermocouple with teflonized compensating cable
			901221/34	Mineral-insulated thermocouple and compensating cable with metal-braiding and glass silk insulation
				(2) Measuring insert / operating temperature in °C
x	x	x	1040	1 x Fe-Con J, operating temperature -200 to +800°C, sheath, Mat. Ref. 1.4541
x	x	x	1042	1 x Fe-Con L, operating temperature -200 to +800°C, sheath, Mat. Ref. 1.4541
x	x	x	1043	1 x NiCr-Ni K, operating temperature -200 to +1200°C, sheath, Mat. Ref. 2.4816
x		x	2042	2 x Fe-Con L, operating temperature -200 to +800°C, sheath, Mat. Ref. 1.4541
x		x	2043	2 x NiCr-Ni K, operating temperature -200 to +1200°C, sheath, Mat. Ref. 2.4816
				(3) Protection tube diameter D in mm
x	x	x	0.5	0.5mm, only with Type 1 x NiCr-Ni K
x	x	x	1	1mm
x	x	x	1.5	1.5mm
x	x	x	2	2mm
x	x	x	3	3mm
x	x	x	4.5	4.5mm
x	x	x	6	6mm
				(4) Fitting length EL in mm (50≤ EL ≤50000)
x	x	x	100	100mm
x	x	x	200	200mm
x	x	x	300	300mm
x	x	x	400	400mm
x	x	x	500	500mm
x	x	x	...	please specify in plain text (50mm steps)
				(5) Compensating cable end
x	x	x	03	bare cable ends
x	x	x	11	ferrules to DIN 46 228 Part 4 (standard)
x	x	x	13	receptacle 6.3 to DIN 46 247
x	x	x	80	multipole connector (please specify type in plain text)
				(6) Compensating cable length AL in mm (500≤ AL ≤500000)
x	x	x	2500	2500mm (standard)
x	x	x	...	please specify in plain text (500mm steps)
				(7) Extra codes
x	x	x	000	no extra code
x	x	x	309	uninsulated assembly (thermocouple welded to tip)
x	x	x	317	shielded compensating cable

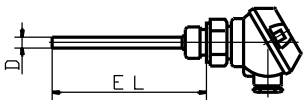
	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
Order code		-		-		-		-		-		/		,...
Order example	901221/32	-	1042	-	3	-	200	-	11	-	2500	/	000	

1. List extra codes in sequence, separated by commas.

Order details: Mineral-insulated thermocouples to DIN 43 710 and EN 60 584

(1) Basic version

	901221/40	Mineral-insulated thermocouple with terminal head Form J



(2) Measuring insert / operating temperature in °C

x	1040	1 x Fe-Con J, operating temperature -200 to +800°C, sheath, Mat. Ref. 1.4541
x	1042	1 x Fe-Con L, operating temperature -200 to +800°C, sheath, Mat. Ref. 1.4541
x	1043	1 x NiCr-Ni K, operating temperature -200 to +1200°C, sheath, Mat. Ref. 2.4816
x	2042	2 x Fe-Con L, operating temperature -200 to +800°C, sheath, Mat. Ref. 1.4541
x	2043	2 x NiCr-Ni K, operating temperature -200 to +1200°C, sheath, Mat. Ref. 2.4816

(3) Protection tube diameter D in mm

x	3	3mm
x	4.5	4.5mm
x	6	6mm

(4) Fitting length EL in mm (50≤ EL ≤50000)

x	100	100mm
x	200	200mm
x	300	300mm
x	400	400mm
x	500	500mm
x	...	please specify in plain text (50mm steps)

(5) Process connection

x	103	thread 3/8" pipe
x	104	thread 1/2" pipe

(6) Extra codes

x	000	no extra code
x	309	uninsulated assembly (thermocouple welded to tip)

	(1)		(2)		(3)		(4)		(5)	/	(6)	
Order code		-		-		-		-		/		,...
Order example	901221/40	-	1042	-	6	-	200	-	104	/	000	

1. List extra codes in sequence, separated by commas.

Stock versions:

(1)		(2)		(3)		(4)		(5)	Sales No.
901221/20	-	1043	-	3	-	100	/	000	90/00056899
901221/20	-	1043	-	3	-	250	/	000	90/00068440
901221/20	-	1043	-	1.5	-	100	/	000	90/00049208
901221/20	-	1043	-	1.5	-	250	/	000	90/00311228

Stock versions:

(1)		(2)		(3)		(4)		(5)		(6)		(7)	Sales No.
901221/32	-	1042	-	6	-	100	-	11	-	2500	/	000	90/00049206
901221/32	-	1042	-	6	-	200	-	11	-	2500	/	000	90/00068450
901221/32	-	1042	-	6	-	300	-	11	-	2500	/	000	90/00068451
901221/32	-	1042	-	6	-	500	-	11	-	2500	/	000	90/00068452
901221/32	-	1042	-	3	-	100	-	11	-	2500	/	000	90/00056809
901221/32	-	1042	-	3	-	200	-	11	-	2500	/	000	90/00068433
901221/32	-	1042	-	3	-	300	-	11	-	2500	/	000	90/00068434
901221/32	-	1042	-	3	-	500	-	11	-	2500	/	000	90/00068435
901221/32	-	1042	-	1.5	-	100	-	11	-	2500	/	000	90/00056811
901221/32	-	1042	-	1.5	-	200	-	11	-	2500	/	000	90/00068438
901221/32	-	1042	-	1.5	-	500	-	11	-	2500	/	000	90/00068439
901221/32	-	1043	-	6	-	100	-	11	-	2500	/	000	90/00056812
901221/32	-	1043	-	6	-	200	-	11	-	2500	/	000	90/00068427
901221/32	-	1043	-	6	-	300	-	11	-	2500	/	000	90/00068428
901221/32	-	1043	-	6	-	500	-	11	-	2500	/	000	90/00068429
901221/32	-	1043	-	3	-	100	-	11	-	2500	/	000	90/00056813
901221/32	-	1043	-	3	-	200	-	11	-	2500	/	000	90/00068441
901221/32	-	1043	-	3	-	300	-	11	-	2500	/	000	90/00068442
901221/32	-	1043	-	3	-	500	-	11	-	2500	/	000	90/00068443
901221/32	-	1043	-	1.5	-	100	-	11	-	2500	/	000	90/00049205
901221/32	-	1043	-	1.5	-	200	-	11	-	2500	/	000	90/00068436
901221/32	-	1043	-	1.5	-	500	-	11	-	2500	/	000	90/00068437
901221/32	-	1043	-	0.5	-	50	-	11	-	2500	/	000	90/00069614
901221/32	-	1043	-	0.5	-	100	-	11	-	2500	/	000	90/00066345
901221/32	-	1043	-	0.5	-	150	-	11	-	2500	/	000	90/00069615
901221/32	-	1043	-	0.5	-	200	-	11	-	2500	/	000	90/00069616

Stock versions:

(1)		(2)		(3)		(4)		(5)		(6)	Sales No.
901221/40	-	1042	-	6	-	100	-	104	/	000	90/00087482
901221/40	-	1042	-	6	-	200	-	104	/	000	90/00068453
901221/40	-	1042	-	6	-	300	-	104	/	000	90/00068454
901221/40	-	1042	-	6	-	500	-	104	/	000	90/00068455
901221/40	-	1043	-	6	-	100	-	104	/	000	90/00087483
901221/40	-	1043	-	6	-	200	-	104	/	000	90/00068430
901221/40	-	1043	-	6	-	300	-	104	/	000	90/00068431
901221/40	-	1043	-	6	-	500	-	104	/	000	90/00068432