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# Mineral-Insulated Thermocouples According to DIN 43710 and DIN EN 60584

- For temperatures between -200 to +1200 °C
- Flexible sheath cable with vibration-resistant measuring insert
- Protection tube diameter as of 0.5 mm
- Quick response time
- Application-specific insertion length

Due to their specific features, mineral-insulated thermocouples are used in chemical plants, power plants, pipelines, engine building, and test rigs. Inside the flexible and thin-walled sheathed cable, the thermowires are embedded in compressed and fire-resistant magnesium oxide.

The good thermal transfer between the sheath and the thermocouple enables short response times ( $t_{0,5}$  as of 0.15 s) and excellent measuring accuracy. The vibration-resistant construction guarantees a long operating life. The smallest bending radius is 5 times the outer diameter. With a diameter of 0.5 to 2.0 mm, the minimum insertion length (EL) is  $\geq 50$  mm; with a diameter of 3.0 to 6.0 mm the EL is  $\geq 100$  mm.

The thermocouples are designed to be insulated from the sheath as standard. The measuring insert is equipped with thermocouples (elements) according to DIN EN 60584 and/or DIN 43710. Versions with two thermocouples are also possible.

**Test pressure:** check for leaks at the measuring point at 40 bar (helium).

**Leakage resistance:** thermocouple against sheath at room temperature and lengths < 1 m 200 M $\Omega$ , with lengths  $\geq 1$  m 200 M $\Omega$   $\times$  m.



## Technical data

<b>Terminal head</b>	Form B, diecast aluminum, M20 $\times$ 1.5; IP65, ambient temperature -40 to +100 °C Form BUZ, diecast aluminum, M20 $\times$ 1.5; IP65, ambient temperature -40 to +100 °C Form J, diecast aluminum, M16 $\times$ 1.5; IP65, ambient temperature -40 to +100 °C Caution: reduced ambient temperature when using transmitters
<b>Connection</b>	Cable ends stripped bare; alternatively available with ferrules, plug-in sleeves, or multi-pole electrical connectors (e.g. thermal-voltage-free connector)
<b>Compensating cable</b>	Silicone, ambient temperature -50 to +180 °C PTFE, ambient temperature 190 to +260 °C Metal braiding, ambient temperature -20 to +350 °C
<b>Process connection</b>	Thread, stainless steel 1.4571
<b>Protection tube</b>	Stainless steel 1.4541, thermocouple type "L" and "J" Inconel 2.4816 (Inconel 600), thermocouple type "K" and "N"
<b>Adapter sleeve (end closure)</b>	As standard, the adapter sleeve (end closure) is designed up to 120 °C; it is available up to 300 °C upon request.
<b>Measuring insert</b>	Insulated construction: 1 $\times$ Fe-CuNi "J", DIN EN 60584, class 2, operating temperature -200 to +800 °C 1 $\times$ Fe-CuNi "L", DIN 43710, class 2, operating temperature -200 to +800 °C 1 $\times$ NiCr-Ni "K", DIN EN 60584, class 2, operating temperature -200 to +1200 °C 1 $\times$ NiCrSi-NiSi "N", DIN EN 60584, class 2, operating temperature -200 to +1200 °C 2 $\times$ Fe-CuNi "L", DIN 43710, class 2, operating temperature -200 to +800 °C 2 $\times$ NiCr-Ni "K", DIN EN 60584, class 2, operating temperature -200 to +1200 °C 2 $\times$ NiCrSi-NiSi "N", DIN EN 60584, class 2, operating temperature -200 to +1200 °C
<b>Response times</b>	In water with 0.4 m/s / in air with 2 m/s $\varnothing$ 0.5 mm: water $t_{0,5} = 0.15$ s, $t_{0,9} = 0.30$ s/air $t_{0,5} = 3.5$ s, $t_{0,9} = 8.0$ s $\varnothing$ 1.0 mm: water $t_{0,5} = 0.20$ s, $t_{0,9} = 0.60$ s/air $t_{0,5} = 7.5$ s, $t_{0,9} = 17.0$ s $\varnothing$ 1.5 mm: water $t_{0,5} = 0.40$ s, $t_{0,9} = 0.90$ s/air $t_{0,5} = 10.0$ s, $t_{0,9} = 25.0$ s $\varnothing$ 2.0 mm: water $t_{0,5} = 0.80$ s, $t_{0,9} = 2.60$ s/air $t_{0,5} = 13.0$ s, $t_{0,9} = 34.0$ s $\varnothing$ 3.0 mm: water $t_{0,5} = 1.00$ s, $t_{0,9} = 2.80$ s/air $t_{0,5} = 22.0$ s, $t_{0,9} = 64.0$ s $\varnothing$ 4.5 mm: water $t_{0,5} = 2.50$ s, $t_{0,9} = 6.50$ s/air $t_{0,5} = 34.0$ s, $t_{0,9} = 113.0$ s $\varnothing$ 6.0 mm: water $t_{0,5} = 3.00$ s, $t_{0,9} = 9.00$ s/air $t_{0,5} = 55.0$ s, $t_{0,9} = 170.0$ s
<b>Transmitter</b>	Programmable transmitter, 4 to 20 mA / 20 to 4 mA output, data sheet 707010 programmable transmitter, 4 to 20 mA / 20 to 4 mA and HART® interface output, data sheet 707010

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**Lead wire resistance in  $\Omega/m$  at 20 °C for mineral-insulated thermocouples**

<b>Diameter D in mm</b>	<b>1 element resistance in <math>\Omega/m</math></b>	<b>2 elements resistance in <math>\Omega/m</math></b>
<b>Thermocouple Fe-CuNi "L"</b>		
6.0	0.66	0.85
4.5	1.40	1.80
3.0	2.70	3.50
2.0	5.00	-
1.5	12.00	-
1.0	21.50	-
<b>Thermocouple Fe-CuNi "J"</b>		
6.0	0.54	-
3.0	2.10	-
2.0	8.60	-
1.5	15.00	-
1.0	34.00	-
<b>Thermocouple NiCr-Ni "K"</b>		
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	-
<b>Thermocouple NiCrSi-NiSi "N"</b>		
6.0	1.81	1.68
3.0	5.98	7.00

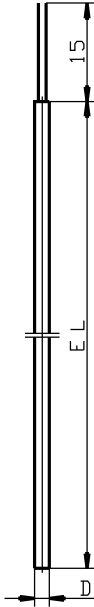
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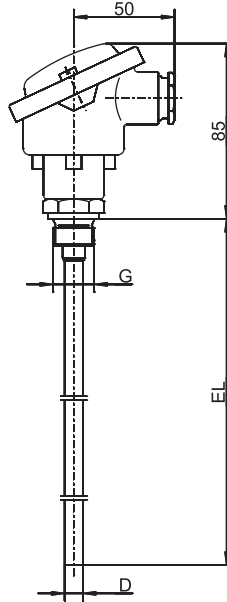
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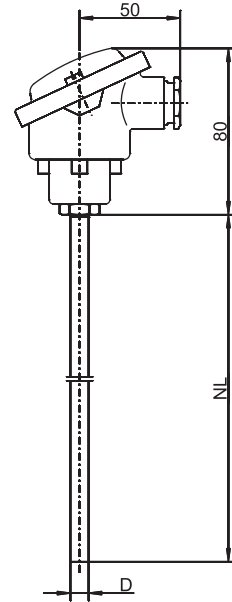
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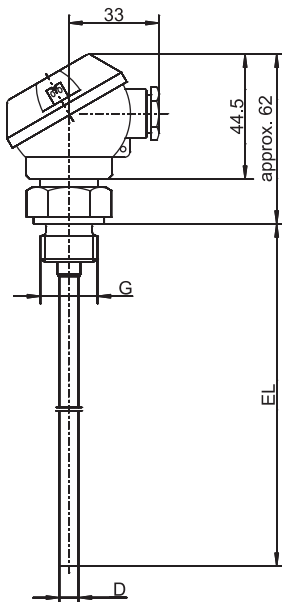
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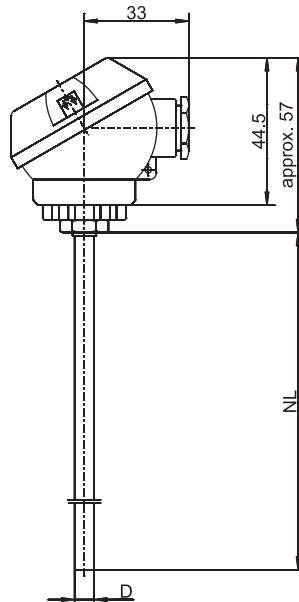
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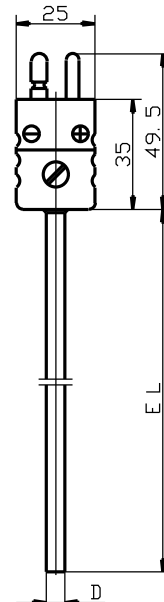
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**Basic type 901230/40**



**Basic type 901230/41**

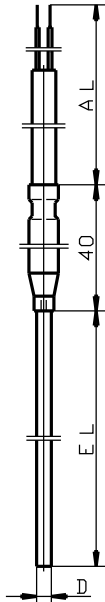


**Basic type 901240/20**

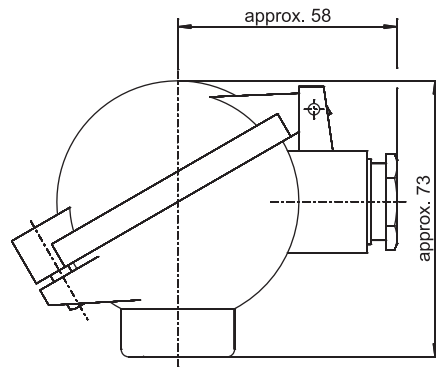
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Basic type 901250/3x



Terminal head form BUZ  
extra code 320

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**Order details: Mineral-insulated thermocouples according to DIN 43710 and DIN EN 60584**

**(1) Basic type**

901210/10 Mineral-insulated thermocouples with bare connection wires



901240/20 Mineral-insulated thermocouple with thermal-voltage-free standard tab-connector



**(2) Measuring insert / operating temperature in °C**

x	x	1040	1× Fe-CuNi "J", operating temperature -200 to +800 °C, sheath material no. 1.4541
x	x	1042	1× Fe-CuNi "L", operating temperature -200 to +800 °C, sheath material no. 1.4541
x	x	1043	1× NiCr-Ni "K", operating temperature -200 to +1200 °C, sheath material no. 2.4816
x		1048	1× NiCrSi-NiSi "N", operating temperature -200 to +1200 °C, sheath material no. 2.4816, D = 3 and 6 mm
x		2042	2× Fe-CuNi "L", operating temperature -200 to +800 °C, sheath material no. 1.4541
x		2043	2× NiCr-Ni "K", operating temperature -200 to +1200 °C, sheath material no. 2.4816
x		2048	2× NiCrSi-NiSi "N", operating temperature -200 to +1200 °C, sheath material 2.4816, D = 3 and 6 mm

**(3) Protection tube diameter D in mm**

x		0.5	Ø 0.5 mm, only in connection with measuring insert 1× NiCr-Ni "K"
x	x	1	Ø 1 mm
x	x	1.5	Ø 1.5 mm
x	x	2	Ø 2 mm
x	x	3	Ø 3 mm
x	x	4.5	Ø 4.5 mm
x	x	6	Ø 6 mm

**(4) Insertion length EL in mm (50 to 50000 mm)**

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

**(5) Extra codes**

x	x	000	Without
x	x	309	Uninsulated construction (element welded to the base)

**Order code**             (1) -  (2) -  (3) -  (4) /  (5)  
**Order example**    901210/10 - 1042 - 3 - 200 / 000

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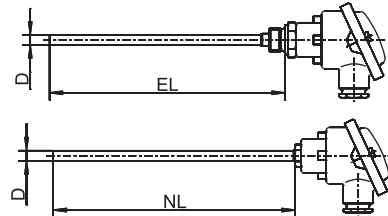


**Order details: Mineral-insulated thermocouples according to DIN 43710 and DIN EN 60584**

**(1) Basic type**

901220/40 Screw-in mineral-insulated thermocouple with terminal head, form B

901220/41 Push-in mineral-insulated thermocouple with terminal head, form B



**(2) Measuring insert / operating temperature in °C**

x	x	1040	1× Fe-CuNi "J", operating temperature -200 to +800 °C, sheath material no. 1.4541
x	x	1042	1× Fe-CuNi "L", operating temperature -200 to +800 °C, sheath material no. 1.4541
x	x	1043	1× NiCr-Ni "K", operating temperature -200 to +1200 °C, sheath material no. 2.4816
x	x	1048	1× NiCrSi-NiSi "N", operating temperature -200 to +1200 °C, sheath material no. 2.4816
x	x	2042	2× Fe-CuNi "L", operating temperature -200 to +800 °C, sheath material no. 1.4541
x	x	2043	2× NiCr-Ni "K", operating temperature -200 to +1200 °C, sheath material no. 2.4816
x	x	2048	2× NiCrSi-NiSi "N", operating temperature -200 to +1200 °C, sheath material no. 2.4816

**(3) Protection tube diameter D in mm**

x	x	3	Ø 3 mm
x	x	4.5	Ø 4.5 mm (not for measuring insert type "N")
x	x	6	Ø 6 mm

**(4) Insertion length EL/NL in mm (50 to 50000 mm)**

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

**(5) Process connection**

x		000	Without
x		103	Screw connection G 3/8
x		104	Screw connection G 1/2

**(6) Extra codes**

x	x	000	Without
x	x	309	Uninsulated construction (element welded to the base)
x	x	320	Terminal head form BUZ
x	x	331	1× programmable transmitter, 4 to 20 mA / 20 to 4 mA output, data sheet 707010
x	x	336	1× programmable transmitter, 4 to 20 mA / 20 to 4 mA and HART® interface output, data sheet 707010

**Order code**      (1)      (2)      (3)      (4)      (5)      (6)  
 Order example      901220/40 - 1040 - 3 - 100 - 104 / 000 , ...<sup>a</sup>

<sup>a</sup> List extra codes in sequence, separated by commas.

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**Accessories**

Article	Part no.
Pipe screw connection M8 × 1 stainless steel, clamping ring stainless steel for protection tube diameter D = 3 mm	00080810
Pipe screw connection M8 × 1 stainless steel, clamping ring PTFE for protection tube diameter D = 3 mm	00049709
Pipe screw connection M8 × 1 steel, clamping ring PTFE for protection tube diameter D = 4.5 mm	00049704
Pipe screw connection M8 × 1 stainless steel, clamping ring PTFE for protection tube diameter D = 4.5 mm	00049710
Pipe screw connection M10 × 1 stainless steel, clamping ring stainless steel for protection tube diameter D = 6 mm	00065416
Pipe screw connection G 1/4 stainless steel, clamping ring stainless steel for protection tube diameter D = 6 mm	00080811
Pipe screw connection G 3/8 steel, clamping ring steel for protection tube diameter D = 6 mm	00057945
Pipe screw connection G 3/8 stainless steel, clamping ring stainless steel for protection tube diameter D = 6 mm	00317966
Pipe screw connection G 1/2 stainless steel, clamping ring stainless steel for protection tube diameter D = 6 mm	00305445
Pipe screw connection 1/2-14NPT stainless steel, clamping ring stainless steel for protection tube diameter D = 6 mm	00444210
Sheet steel flange for protection tube diameter D = 6 mm	00065042

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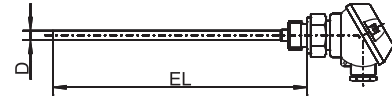
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**Order details: Mineral-insulated thermocouples according to DIN 43710 and DIN EN 60584**

**(1) Basic type**

901230/40 Screw-in mineral-insulated thermocouple with terminal head, form J



901230/41 Push-in mineral-insulated thermocouple with terminal head, form J



**(2) Measuring insert / operating temperature in °C**

x	x	1040	1× Fe-CuNi "J", operating temperature -200 to +800 °C, sheath material no. 1.4541
x	x	1042	1× Fe-CuNi "L", operating temperature -200 to +800 °C, sheath material no. 1.4541
x	x	1043	1× NiCr-Ni "K", operating temperature -200 to +1200 °C, sheath material no. 2.4816
x	x	1048	1× NiCrSi-NiSi "N", operating temperature -200 to +1200 °C, sheath material no. 2.4816
x	x	2042	2× Fe-CuNi "L", operating temperature -200 to +800 °C, sheath material no. 1.4541
x	x	2043	2× NiCr-Ni "K", operating temperature -200 to +1200 °C, sheath material no. 2.4816
x	x	2048	2× NiCrSi-NiSi "N", operating temperature -200 to +1200 °C, sheath material no. 2.4816

**(3) Protection tube diameter D in mm**

x	x	3	Ø 3 mm
x	x	4.5	Ø 4.5 mm (not for measuring insert type "N")
x	x	6	Ø 6 mm

**(4) Insertion length EL/NL in mm (50 to 50000 mm)**

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

**(5) Process connection**

	x	000	Without
x		103	Screw connection G 3/8
x		104	Screw connection G 1/2

**(6) Extra codes**

x	x	000	Without
x	x	309	Uninsulated construction (element welded to the base)

<b>Order code</b>	(1)	(2)	(3)	(4)	(5)	(6)
<b>Order example</b>	901230/40	- 1040	- 3	- 100	- 104	/ 000



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Pipe screw connection M8 × 1 stainless steel, clamping ring PTFE for protection tube diameter D = 3 mm	00049709
Pipe screw connection M8 × 1 steel, clamping ring PTFE for protection tube diameter D = 4.5 mm	00049704
Pipe screw connection M8 × 1 stainless steel, clamping ring PTFE for protection tube diameter D = 4.5 mm	00049710
Pipe screw connection M10 × 1 stainless steel, clamping ring stainless steel for protection tube diameter D = 6 mm	00065416
Pipe screw connection G 1/4 stainless steel, clamping ring stainless steel for protection tube diameter D = 6 mm	00080811
Pipe screw connection G 3/8 steel, clamping ring steel for protection tube diameter D = 6 mm	00057945
Pipe screw connection G 3/8 stainless steel, clamping ring stainless steel for protection tube diameter D = 6 mm	00317966
Pipe screw connection G 1/2 stainless steel, clamping ring stainless steel for protection tube diameter D = 6 mm	00305445
Pipe screw connection 1/2-14NPT stainless steel, clamping ring stainless steel for protection tube diameter D = 6 mm	00444210
Sheet steel flange for protection tube diameter D = 6 mm	00065042

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**JUMO Instrument Co. Ltd.**  
 JUMO House  
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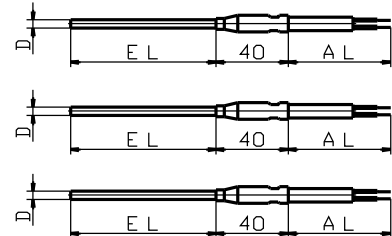
**JUMO Process Control, Inc.**  
 6733 Myers Road  
 East Syracuse, NY 13057, USA  
 Phone: 315-437-5866  
 1-800-554-5866  
 Fax: 315-437-5860  
 E-mail: info.us@jumo.net  
 Internet: www.jumousa.com



**Order details: Mineral-insulated thermocouples according to DIN 43710 and DIN EN 60584**

**(1) Basic type**

901250/32	Mineral-insulated thermocouple with silicone-insulated compensating cable
901250/33	Mineral-insulated thermocouple with PTFE-insulated compensating cable
901250/34	Mineral-insulated thermocouple with compensation cable that is metal-braided and insulated with glass-fiber



**(2) Measuring insert / operating temperature in °C**

x	x	x	1040	1× Fe-CuNi "J", operating temperature -200 to +800 °C, sheath material no. 1.4541
x	x	x	1042	1× Fe-CuNi "L", operating temperature -200 to +800 °C, sheath material no. 1.4541
x	x	x	1043	1× NiCr-Ni "K", operating temperature -200 to +1200 °C, sheath material no. 2.4816
x	x	x	2042	2× Fe-CuNi "L", operating temperature -200 to +800 °C, sheath material no. 1.4541
x	x	x	2043	2× NiCr-Ni "K", operating temperature -200 to +1200 °C, sheath material no. 2.4816

**(3) Protection tube diameter D in mm**

x	x	x	0.5	Ø 0.5 mm
x	x	x	1	Ø 1 mm
x	x	x	1.5	Ø 1.5 mm
x	x	x	2	Ø 2 mm
x	x	x	3	Ø 3 mm
x	x	x	4.5	Ø 4.5 mm
x	x	x	6	Ø 6 mm

**(4) Insertion length EL in mm (50 to 50000 mm)**

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

**(5) Compensating cable end**

x	x	x	11	Ferrules according to DIN 46228 part 4 (standard)
x	x	x	80	Multi-pole electrical connector (specify type in plain text)

**(6) Compensating cable length AL in mm (500 to 500000 mm)**

x	x	x	2500	2500 mm (standard)
x	x	x	...	Please specify in plain text (500 mm steps)

**(7) Extra codes**

x	x	000	Without
x	x	309	Uninsulated construction (element welded to the base)
x	x	317	Compensating cable shielded
x	x	855	Adapter sleeve (end closure) 300 °C

**Order code**            (1)        (2)        (3)        (4)        (5)        (6)        (7)  
 Order example      901250/32 - 1042 - 3 - 200 - 11 - 2500 / 000 , ...<sup>a</sup>

<sup>a</sup> List extra codes in sequence, separated by commas.

**JUMO GmbH & Co. KG**

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**Stock versions**

(1)	(2)	(3)	(4)	(5)	(6)	(7)	Part no.
901250/32	- 1042	- 3	- 100	- 11	- 2500	/ 000	00056809
901250/32	- 1042	- 3	- 200	- 11	- 2500	/ 000	00068433
901250/32	- 1042	- 1.5	- 100	- 11	- 2500	/ 000	00056811
901250/32	- 1042	- 1.5	- 200	- 11	- 2500	/ 000	00068438
901250/32	- 1043	- 6	- 100	- 11	- 2500	/ 000	00056812
901250/32	- 1043	- 6	- 200	- 11	- 2500	/ 000	00068427
901250/32	- 1043	- 3	- 100	- 11	- 2500	/ 000	00056813
901250/32	- 1043	- 3	- 200	- 11	- 2500	/ 000	00068441
901250/32	- 1043	- 3	- 300	- 11	- 2500	/ 000	00068442
901250/32	- 1043	- 3	- 500	- 11	- 2500	/ 000	00068443
901250/32	- 1043	- 1.5	- 100	- 11	- 2500	/ 000	00049205
901250/32	- 1043	- 1.5	- 200	- 11	- 2500	/ 000	00068436
901250/32	- 1043	- 1.5	- 500	- 11	- 2500	/ 000	00068437
901250/32	- 1043	- 0.5	- 100	- 11	- 2500	/ 000	00066345

**Stock versions**

(1)	(2)	(3)	(4)	(5)	(6)	Part no.
901230/40	- 1043	- 6	- 200	- 104	/ 000	00068430
901230/40	- 1043	- 6	- 300	- 104	/ 000	00068431