

"CFOR" HIGH HEATING DENSITY ELECTRIC HEATING CARTRIDGES, MODELS IN mm.

General characteristics

- Stainless steel tube AISI 321 ground and calibrated, welded bottom, sealed to a pressure of 60 Kg/cm²
- Resistance of 80-20 Nickel-Chrome wire, melting point 1400 °C
- Highly compacted electromelted magnesium oxide.
- Braided nickel cables, covered with siliconized fiber glass flexible from inside, 250 mm long except thermocouple cables which measure 1000 mm.
- Cold zones: According to diameter, 6 to 12 mm on the connection side, and 4 to 8 mm on the welded bottom side.
- Standard voltage ~230 V.



- If you require, we can supply heating cartridges according to your specifications:
 - Diameters
 - Lengths
 - Connections: On the basis of nickel wires leading from the cartridge, other executions may be provided, such as fixed connection strips, special cables, connection elbows, flexible metal tube, sealed connections, etc.
 - All cartridges may be supplied with built-in Fe-Co thermocouple.

Diameter in mm	Length in mm	Watts					With built-in Fe-Co thermocouple
6,5	30					160-200-300	
	40		100	125	165	200	200
	50		100-125-150	160	200	250	200
	60		125-170-180	200	250	315	
	80	125-170	200-250	280-300-315	350		
	100	100-160-200	220-250-315	350-400			350
	130	220	300-350-400				
	160	250-350	400				
	180	250-350	400				
	200	350-400	500				
8	250	250-350-400	500				
	40		100-140	160	200	250	
	50		125-160	200	250	315	315
	60	100-125-140	160-200-220	250-280	315-350		350
	80	160-180-200	250-280-315	350-400			315
	100	180-200-250	280-315-400				
	130	250-315	400				
	160	200-315	400				
	180	250-300-400	500				
	200	300-400-500					
10	250	300-400-500					
	40	100	125-160-165	200	250	315-400	
	50	100-125	165-200	250	315	400-500	250
	60	125-170	200-250	315-350	400-450	500	
	80	100-150-160-200	220-250-300-315	400-500	630		400
	100	125-150-220-250	315-350-400	500-560	630-700	850	560
	130	250-315-350	400-500-630	750-800	1000		500-1000
	160	160-315-400-500	600-630-750-800				630
	180	300-500	600-800				
	200	250-300-400-500	600-630-1000				
12,5	250	200-400-630	800-1000	1600			
	40	100	160-200	250	315	400	
	50	100-150-160	200-250	315	400	500	
	60	125-160-200	250-315	400	500		315
	80	150-200-250	315-400	500-630	800		
	100	250-315-400	500-630	800	1000		800
	130	350-400	500-630-800	1000	1250		
	160	400-500	630-800-1000	1250			
	180	500-670	800-1000	1250			670
	200	500-630-800	900-1000	1500			
16	250	630-800-900	1000-1250-1500				
	300	600-1000	1250-1500	2000			
	40	100-160	200-250	315	400	500	
	50	160-200	250-315	400	500	630	
	60	160-200-250	315-400	500	630		
	80	250-280-315	400-500-630	800-850	1000		
	100	350-400-500	630-800	1000	1250		
	130	400-500-630	700-800	1000	1400	1800	
	160	500-630-800	900-1000-1250	1600-1800			
	180	600-850	1000-1250	1500-1800			
20	200	500-800-1000	1250	2000			2000
	250	800-1000-1250	1600-2000				
	300	1000-1250-1500	1800-2000				
	50	200-250	315-400				
	60	200	315-400-500	630	800		
	80	315-350-400	500	800	1000-1250		
	100	400-450-500	630-800	1000-1250	1400-1600	1800	
	130	500-630	900-1000-1250	1400	1800	2200	
	160	800-1000	1250	1800	2200		
	180	1000	1250-1600	1800			
200	800-1000-1250	1600-2000	2500				
250	1000-1250-1600	2000-2500				2000	
300	1000-1250-1600	2000-2500					
Heating density		6 to 11 W/cm ²	12 to 19 W/cm ²	20 to 24 W/cm ²	25 to 29 W/cm ²	>30 W/cm ²	

Tolerances

- Diameter: -0,02 mm
-0,08 mm
- Length: Up to 130 mm → ± 2 mm
From 160 mm → ± 1,5% of the total length



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General characteristics

- Stainless steel tube AISI 321 rectified and calibrated, welded bottom, sealed to a pressure of 60 Kg/cm²
- Resistance of 80-20 Nickel-Chrome wire, melting point 1400 °C
- Highly compacted electromelted magnesium oxide.
- Braided nickel cables, covered with siliconized fiber glass, clamped with stainless tubular terminal on pure nickel wires that lead from the cartridge, 250 mm long, except thermocouple cables which measure 1000 mm.
- Cold zones: According to diameter, 6 to 12 mm on the connection side, and 4 to 8 mm on the welded bottom side.
- Standard voltage ~230 V.
- If you require, we can supply heating cartridges according to your specifications:
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 - Lengths
 - Connections: On the basis of nickel wires leading from the cartridge, other executions may be provided, such as fixed connection strips, special cables, connection elbows, flexible metal tube, sealed connections, etc.
 - All cartridges may be supplied with built-in Fe-Co thermocouple.



Diameter in mm	Length in mm	Watts					With built-in Fe-Co thermocouple
6,5	40		100	125	160-175	200	100
	50		100	160	200	250	200
	60		125	200	250	315	
	80	125	180	280	350		
	100	160	220	350			350
8	40		100	160	200	250	
	50		125	200	250	315	
	60	100	140	220	280	350	
	80	160	200	315	400		
	100	180	280	400			
10	130	250	400				
	40	100	125	200	250	315	200
	50	100	160	250	315	400	250
	60	125	180	315	400	500	400
	80	160	250	400	500	630	400
	100	220	350	560	700	850	250
12,5	130	315	500	800			
	160	400	630				400
	200	630	900				
	40	100	160	250	315	400	
	50	100	200	315	400	500	
	60	125	200	315	400	500	
	80	200	315	500	630	800	
16	100	250	400	630	800	1000	
	130	400	630	1.000	1250		
	160	500	800	1.250			
	200	630	900				
	40		100	250	315	400	
	50	160	250	400	500	630	
	60	160	250	400	500	630	
	80	280	400	630	800	1000	
	100	350	500	800	1000	1250	
20	130	500	700	1.100	1400	1800	
	160	630	900	1.600	1800		
	200	800	1250	2.000			
	250	1000	1600				
	300	1250	1800				
	60	200	315	500	630	800	
	80	350	500	800	1000	1250	
	100	450	630	1.000	1400	1600	
	130	630	900	1.400	1800	2200	
	160	800	1100	1.800	2200		
Heating density		8 to 11 W/cm ²	12 to 19 W/cm ²	20 to 24 W/cm ²	25 to 29 W/cm ²	30 to 35 W/cm ²	

Tolerances

- **Diameter:** -0,02 mm
-0,08 mm
- **Length:** Up to 130 mm → ± 2 mm
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- Braided nickel cables, covered with siliconized fiber glass, clamped with stainless tubular terminal on pure nickel wires that lead from the cartridge, 250 mm long, except thermocouple cables which measure 1000 mm.
- Cold zones: According to diameter, 6 to 12 mm on the connection side, and 4 to 8 mm on the welded bottom side.
- Standard voltage ~230 V.
- If you require, we can supply heating cartridges according to your specifications:
 - Diameters
 - Lengths
 - Connections: On the basis of nickel wires leading from the cartridge, other executions may be provided, such as fixed connection strips, special cables, connection elbows, flexible metal tube, sealed connections, etc.
 - All cartridges may be supplied with built-in Fe-Co thermocouple.



Diameter in inches		Length In inches	Watts					With built-in Fe-Co thermocouple	
Tolerance over real diameter: +0,05mm -0 mm	1/4 " Nominal diameter: 6,35 mm Real diameter: 6,22 mm	1 1/2" (38,1)*		100	125	160-175	200	100	
		2" (50,8)		100	160	200	250	200	
		2 1/2" (63,5)		125	200	250	315		
		3 1/4" (82,55)	125	180	280	350			
		4" (101,6)	160	220	350			350	
	5/16 " Nominal diameter: 7,93 mm Real diameter: 7,87 mm	1 1/2" (38,1)*		100	160	200	250		
		2" (50,8)		125	200	250	315		
		2 1/2" (63,5)	100	140	220	280	350		
		3 1/4" (82,55)	160	200	315	400			
		4" (101,6)	180	280	400				
	3/8 " Nominal diameter: 9,52 mm Real diameter: 9,4 mm	5 1/4" (133,35)	250	400					
		1 1/2" (38,1)*	100	125	200	250	315	200	
		2" (50,8)	100	160	250	315	400	250	
		2 1/2" (63,5)	125	180	315	400	500	315	
		3 1/4" (82,55)	160	250	400	500	630	400	
		4" (101,6)	220	350	560	700	850	350	
		5 1/4" (133,35)	315	500	800				
	1/2 " Nominal diameter: 12,7 mm Real diameter: 12,57 mm	6 1/2" (165,1)	400	630					
		1 1/2" (38,1)*	100	160	250	315	400		
		2" (50,8)	100	200	315	400	500		
		2 1/2" (63,5)	125	200	315	400	500		
		3 1/4" (82,55)	200	315	500	630	800		
		4" (101,6)	250	400	630	800	1000		
		5 1/4" (133,35)	400	630	1.000	1250			
		6 1/2" (165,1)	500	800	1.250				
	5/8 " Nominal diameter: 15,87 mm Real diameter: 15,75 mm	8" (203,2)	630	900					
		1 1/2" (38,1)*		100	250	315	400		
		2" (50,8)	160	250	400	500	630		
		2 1/2" (63,5)	160	250	400	500	630		
		3 1/4" (82,55)	280	400	630	800	1000		
		4" (101,6)	350	500	800	1000	1250		
		5 1/4" (133,35)	500	700	1.100	1400	1800		
		6 1/2" (165,1)	630	900	1.600	1800			
		8" (203,2)	800	1250	2.000				
		10" (254)	1000	1600					
	12" (304,8)	1250	1800						
	Heating density			8 to 11 W/cm ²	12 to 19 W/cm ²	20 to 24 W/cm ²	25 to 29 W/cm ²	30 to 35 W/cm ²	

Tolerances

- **Diameter:** -0,02 mm
-0,08 mm
- **Length:** Up to 130 mm → ± 2 mm
From 160 mm → ± 1,5% of the total length



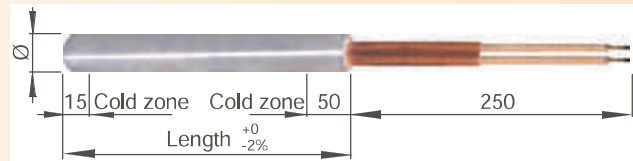
EXTRA-LONG MONOTUBE HEATING ELEMENTS, MODELS CM

General characteristics

The extra-long monotube heating elements support a surface temperature of up to 600 °C maximum. The maximum working temperature is directly related to the heating density (in this case up to 12'2 W/cm²) and the maximum ease of fit of the hole where it is lodged in the heating element. Thus, we can say that the greater the working temperature, the better the fit should be. In the case of the monotube heating elements, for a working temperature in the mould of 400 °C it will be necessary to make a hole with minimum tolerance H11 (+0 +0'09 mm). For more information consult our catalogue n° 841, Graph 1.

General characteristics

- Stainless Steel tube with TIG welding.
- Tube laminated and calibrated WITHOUT shaving.
- Tolerance in tube Ø10 -0,02 -0,09 mm.
- Braided nickel cables, covered with siliconized fiber glass, clamped with stainless steel tubular terminal on pure nickel wires that lead from the cartridge, 250 mm long.
- Insulated with electromelted and lamination-compressed magnesium oxide.
- Ni-Cr 80/20 Resistance coil.
- Standard voltage ~230 V.
- If you require, we can supply monotube heating elements of Ø10 mm up to 1300 mm length. Also to order on other voltages..



Tolerances

- Diameter: -0,02 mm -0,09 mm
- Length: +0 % -2%

Code	Dimensions in mm		Watts	W/cm ²	Electricfor's constructive thermic class	Weight in Kg
	Diameter	Length				
CM10x250-800	10	250	800	12	T-600-T	0,08
CM10x300-1000	10	300	1000	12	T-600-T	0,11
CM10x350-1200	10	350	1200	12	T-600-T	0,15
CM10x400-1400	10	400	1400	12	T-600-T	0,13
CM10x500-1750	10	500	1750	12	T-600-T	0,17
CM10x600-2100	10	600	2100	12	T-600-T	0,20
CM10x750-2750	10	750	2750	12	T-600-T	0,25
CM10x1000-3500	10	1000	3500	12	T-600-T	0,33



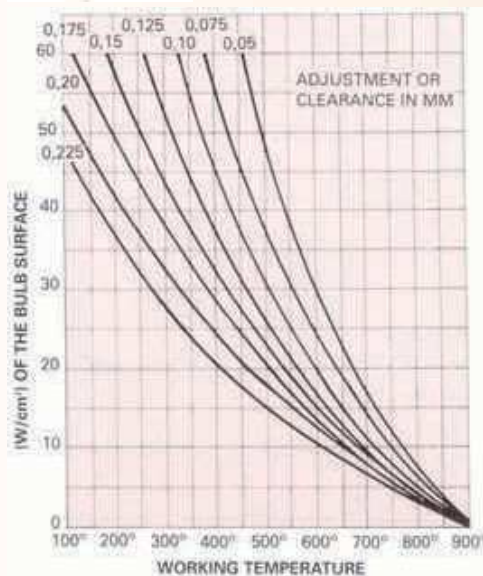
NEVER-SEEZ® LUBRICANT

General characteristics

120 gr. tins of NEVER-SEEZ lubricant, which simplifies the installation and removal of the cartridges while enhancing thermal conductivity. NEVER-SEEZ® lubricant prevents formation of oxide and galvanic rust, seizures and corosions in tools and metal parts. Applied to the metal parts, it prevents imperfections and dead periods due to repairs

VERY IMPORTANT: Do not use on cartridges with unwelded cap or when the cartridges are to be installed with the connections facing down. Do not moisten within 10 mm of the connections as this could contaminate the whole insulation.

Code: 580000000



GUIDELINES FOR OBTAINING OPTIMUM PERFORMANCE IN HIGH HEATING DENSITY ELECTRIC HEATING CARTRIDGES

- Strategically select the location and number of cartridges to be installed with a view to obtaining a good distribution of heating. Take these three factors into consideration:
 1. Heat rises
 2. At equal distances, heat concentrates in the center because there is no lateral dissipation.
 3. For the same reason, the outer edges of the periphery are heated less, above all if the block to be heated is not insulated from the outside.
- Try to choose cartridges of 8 to 11 W/cm² range or, at most, of the 12 to 19 W/cm² range, and install them in scratch-free boreholes with a tolerance of H7.
- Consider using cartridges of Ø3/8" or Ø10 mm, they provide the highest performance at the lowest price.
- In event it is necessary to use cartridges of over 20 W/cm², carefully follow (applying safety margins, if possible) the assembly instructions
- To simplify the insertion-adjustment and withdrawal of the cartridge, the borehole should have an outlet. The lubricating compound NEVER-SEEZ®, which withstands a temperature of up to 1100 °C, also simplifies installation and removal in addition to improving thermal conductivity.
- Do not leave the cables inside the housing or leave the heating zone outside of the housing since the connections of the element could burn out.
- Protect the unwelded end and the connections against liquids, moisture, metallic particles, plastics, etc, which could produce leakage currents. Likewise, protect the cables against vibrations and mechanical friction.
- The temperature detection probe should be set at a maximum distance of 10 mm from the cartridge. It is recommended to use P.I.D. control temperature. Consult our catalogue pages n° 98, 99 and 100
- The minimum distance between the cartridges is equivalent to two diameters.

Example

An aluminium block should be heated to 250 °C. The required heating is of 500 W; for measurement reasons, only two cartridges of 250 W, Ø10 x 80 mm may be installed. These cartridges are within the range of 12 to 19 W/cm², so applying a density of 20 W/cm² in Graph 1 and a safety temperature of 400 °C for the part to be heated, we find that the tolerance or adjustment could be 0,25. However, the borehole is made with a precision as per ISA H7, so the adjustment calculation is as follows:

- Hole diameter: $10^{+0}_{-0,018}$, so the maximum diameter may be Ø10,018 mm.

- Cartridge diameter: $10^{-0,02}_{-0,08}$, so the minimum diameter may be Ø9,92 mm.

- Maximum adjustment or clearance: $10,018 - 9,92 = 0,098$ mm. We round off to 0,10 mm

According to Graph 1, between 0,25 and 0,10 there is a safety margin of 300 °C. The maximum load of W/cm² at 400 °C with an adjustment of 0,10 mm would be 45 W/cm², and since we have chosen from 12 to 19 W/cm², we are covered by over 25 W/cm².

