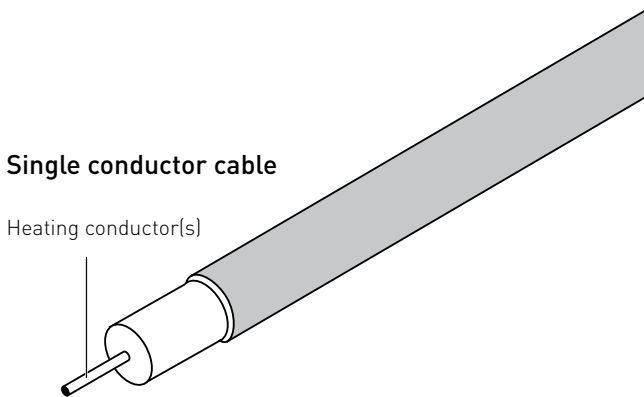
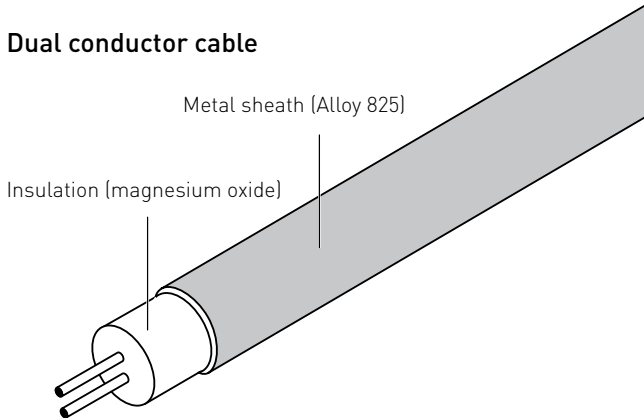


# MINERAL INSULATED (MI) ALLOY 825 HEATING CABLE

## TYPICAL CABLE CONSTRUCTIONS



SANTO HAx mineral insulated (MI) Alloy 825 series heating cables are suitable for use in hazardous areas. They have been designed for use in freeze protection and temperature maintenance applications of pipes, tanks and other equipment.



MI heating cables of the HAx-series offer an ideal combination of ruggedness, high temperature withstand capability and corrosion resistance and can therefore be used for a wide variety of heat-tracing applications, in particular for applications with high power requirements and for temperatures exceeding the capabilities of polymer insulated (PI) series heating cables.

The heating cables can be used for exposure temperatures of up to 700°C and a typical power output of up to 270 W/m. Higher temperatures and power outputs can be achieved, contact Santo for assistance.


HAx mineral insulated (MI) heating cables are available as single and dual conductor construction and in a very wide range of resistances. The use of dual conductor heating cables can significantly reduce total installed cost and simplifies installation, in particular for small pipes and instrument tubing.

The heating cables are offered as bulk cable as well as factory terminated heating units employing brazing and laser welding technology. The offering is completed with a full range of components for installation, connection and splicing of the heating cables.

## APPLICATION

Area classification	Hazardous area, Zone 1 or Zone 2 (Gas) or Zone 21 or zone 22 (Dust) Ordinary
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## APPROVALS

System (heating units)	 (Russia, Kazakhstan, Belarus) For other countries contact your local Santo representative.
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**TECHNICAL DATA**

Cable sheath material	Alloy 825		
Conductor material	Various alloys and copper		
Max. exposure temperature	700°C* (heating cable),		
	550°C (brazed heating units)		
	700°C* (laser welded heating units)		
Min. installation temperature	-60°C		
Min. bending radius	6 x OD (cable diameter) at -60°C		
Max. supply voltage and power	Voltage (U <sub>0</sub> /U)	Max. power output*	Heating cable type
	600/600 Vac	210 W/m	HAX1N Single conductor cable, 600 V
	300/300 Vac	200 W/m	HAX2M Dual conductor cable, 300 V
	600/600 Vac	270 W/m	HAX2N Dual conductor cable, 600 V
	*typical value, depending on application		
Earth leakage	3 mA /100 m (nominal at 20°C, 230 Vac, 50 - 60 Hz)		
Min. cable spacing	25 mm for hazardous areas		

**TABLE 1 MI SERIES HEATING CABLES HAX2M (Dual conductor cable, 300 V)**

Order Reference	Nominal resistance (Ω/km @ 20°C)	Outer diameter (mm)	Temp. coefficient (x 10 <sup>-3</sup> /K)	Max. coil length [m]	Nom. weight (kg/km)	Part Number PN
HAF2M36K	36000	3.2	0.09	628	45.1	32SF1110
HAF2M29.5K	29500	3.6	0.09	542	52.2	32SF2900
HAF2M24.5K	24500	3.9	0.09	431	65.8	32SF2750
HAA2M19.7K	19700	3.4	0.09	632	49.3	32SA2600
HAA2M13.2K	13200	3.7	0.09	500	57.0	32SA2400
HAA2M9000	9000	3.7	0.09	501	57.9	32SA2275
HAA2M6600	6600	4.6	0.09	329	88.2	32SA2200
HAA2M5600	5600	4.5	0.09	384	75.9	32SA2170
HAB2M3750	3750	4.7	0.04	315	87.8	32SB2114
HAB2M2300	2300	4.1	0.04	419	71.4	32SB3700
HAQ2M1560	1560	4.7	0.5	317	85.6	32SQ3472
HAQ2M1240	1240	4.7	0.5	317	85.9	32SQ3374
HAQ2M965	965	4.7	0.5	314	87.4	32SQ3293
HAQ2M660	660	3.7	0.5	503	58.6	32SQ3200
HAQ2M495	495	4.1	0.5	419	71.3	32SQ3150
HAQ2M330	330	4.6	0.5	332	91.7	32SQ3100
HAP2M240	240	4.6	1.3	316	89.9	32SP4734
HAP2M190	190	4.7	1.3	317	91.2	32SP4583
HAP2M150	150	4.7	1.3	315	94.1	32SP4458
HAC2M105	105	4.6	3.9	315	87.5	32SC4324

Resistance tolerance: ±10%

**TABLE 2 MI SERIES HEATING CABLES HAX2N** (Dual conductor cable, 600 V)

Order Reference	Nominal resistance (Ω/km @ 20°C)	Outer diameter (mm)	Temp. coefficient (x 10 <sup>-3</sup> /K)	Max. coil length [m]	Nom. weight (kg/km)	Part Number PN
HAF2N36K	36000	5.2	0.09	229	119.1	2000-170
HAF2N29.5K	29500	5.5	0.09	229	119.4	2000-171
HAF2N19.7K	19700	5.5	0.09	230	119.9	2000-172
HAA2N13.6K	13600	5.8	0.09	186	132.3	2000-173
HAF2N6600	6600	6.3	0.09	177	158.8	2000-174
HAT2N3750	3750	5.7	0.18	186	132.2	2000-175
HAB2N2300	2300	6.8	0.04	151	186.9	2000-176
HAQ2N1670	1670	5.7	0.5	194	127.2	2000-177
HAQ2N940	940	6.0	0.5	176	141.5	2000-178
HAQ2N660	660	6.3	0.5	177	157.7	2000-179
HAQ2N495	495	6.3	0.5	177	159.2	2000-180
HAQ2N330	330	6.7	0.5	152	189.4	2000-181
HAP2N255	255	6.4	1.3	151	166.1	2000-182
HAP2N185	185	6.7	1.3	138	183.8	2000-183
HAP2N130	130	7.1	1.3	124	206.4	2000-184
HAP2N92	92	7.5	1.3	110	236.2	2000-185
HAC2N66	66	7.5	3.9	131	217.4	2000-186
HAC2N43	43	7.9	3.9	115	252.1	2000-187
HAC2N27	27	8.7	3.9	98	297.2	2000-188
HAC2N17	17	9.2	3.9	81	267.3	2000-189
HAC2N10.5	10.5	10.2	3.9	67	468.0	2000-190
HAC2N6.6	6.6	12.6	3.9	46	706.6	2000-191
HAC2N4.3	4.3	13.8	3.9	143	837.1	2000-192

Resistance tolerance: ±10%

**TABLE 3 MI SERIES HEATING CABLES HAX1N** (Single conductor cable, 600 V)

Order Reference	Nominal resistance (Ω/km @ 20°C)	Outer diameter (mm)	Temp. coefficient (x 10 <sup>-3</sup> /K)	Max. coil length [m]	Nom. weight (kg/km)	Part Number PN
HAA1N6565	6565	3.7	0.085	519	52.8	2000-193
HAA1N5250	5250	4.1	0.085	436	67.3	2000-194
HAA1N4300	4300	4.1	0.085	415	67.6	2000-195
HAA1N3300	3300	4.0	0.085	416	68.0	2000-196
HAA1N2800	2800	4.3	0.085	368	77.1	2000-197
HAA1N2300	2300	4.1	0.085	417	69.1	2000-198
HAA1N1640	1640	4.5	0.085	329	88.1	2000-199
HAT1N920	920	4.6	0.18	317	87.1	2000-200
HAB1N660	660	4.6	0.04	330	88.7	2000-201
HAB1N500	500	4.6	0.04	331	90.6	2000-202
HAQ1N390	390	4.7	0.5	317	86.5	2000-203
HAQ1N240	240	4.7	0.5	314	88.4	2000-204
HAQ1N190	190	4.6	0.5	315	89.1	2000-205
HAP1N155	155	4.7	1.3	317	87.1	2000-206
HAP1N120	120	4.7	1.3	314	88.4	2000-207
HAP1N95	95	4.7	1.3	315	89.1	2000-208
HAP1N76	76	4.6	1.3	342	89.9	2000-209
HAP1N60	60	4.7	1.3	316	91.1	2000-211
HAP1N48	48	4.7	1.3	317	92.1	2000-212
HAP1N37	37	4.7	1.3	335	96.0	2000-213
HAC1N21.3	21.3	4.9	3.9	305	102.2	2000-214
HAC1N13.5	13.5	5.1	3.9	294	107.3	2000-215
HAC1N8.5	8.5	5.6	3.9	233	133.8	2000-216
HAC1N5.3	5.3	6.9	3.9	158	214.6	2000-217
HAC1N3.3	3.3	6.4	3.9	171	197.6	2000-218
HAC1N2	2.0	8.1	3.9	115	311.0	2000-219

Resistance tolerance: ±10%

**TABLE 4 RECOMMENDED COLD LEAD CABLES FOR HAX MI SERIES HEATING CABLES**

Nom. cross section [mm <sup>2</sup> ]	Reference Single Conductor Cable	Reference Dual Conductor Cable	Max. Current Design B* (single cond.)	Max. Current Design D. E* (dual cond.)	Nominal Diameter Single cond. (mm)	Diameter Dual cond. (mm)
1.0	–	AC2H1.0	–	18	–	7.3
2.5	AC1H2.5	AC2H2.5	34	28	5.3	8.7
6.0	AC1H6	AC2H6	57	46	6.4	14.0
16	AC1H16	AC2H16	102	98	9.0	14.7
25	AC1H25	AC2H25	133	128	10	17.1

All cold lead cables can be used for up to 600 Vac and use copper conductors with a temperature coefficient of  $3.9 \times 10^{-3} 1/K$ .

Delivery length of bulk cable on coil depends on type of resistance and is limited by max. coil length as indicated in the table on top. Factory terminated elements are limited by a max. weight of 50kg, however to ensure practical and safe on-site handling, it is strongly recommended to limit element lengths to 25 - 30kg. Not all resistances are standard items and as such may not be in stock. Contact SANTO to confirm lead time. SANTO requires the use of a 30 mA residual current device to provide maximum safety and protection from fire.

Where design results in higher leakage current, the preferred trip level for adjustable devices is 30 mA above any inherent capacitive leakage characteristic of the heater as specified by the trace heater supplier or alternatively, the next common available trip level for non adjustable devices, with a maximum of 300 mA. All safety aspects need to be proven.

**TABLE 5 CHEMICAL RESISTANCE**

Alloy	Maximum Cable Sheath Temp (°C)	Description	Nominal chemical composition, % (major elements)				High temperature resistance (+540°C)		Corrosion resistance										
			Nickel (+Cobalt)	Iron	Chromium	Other	Oxidation	Carburization	Sulfuric acid	Hydrochloric acid	Hydrofluoric acid	Phosphoric acid	Nitric acid	Organic acid	Alkalis	Salts	Seawater	Chloride cracking	
INCOLOY Alloy 825 nickel-iron-chromium	550°C*	Excellent resistance to a wide variety of corrosives. Resists pitting and intergranular type corrosion, reducing acids and oxidizing chemicals	42.0	30.0	21.5	Mo 3.0 Cu 2.2	G-E	G-E	G-E	G-E	G-E	G-E	G-E	G-E	G-E	G-E	G-E	G-E	G-E

From Huntington Alloys Publication 78-348-2

Note: NR Not recommended, A acceptable, GE Good to excellent, X Check for specific data

\* Temperature limitation based on construction of heating element.

Corrosion resistance data is dependent on temperature and concentration.