QAA-085-A

Operating Manual for Heat Tracing System

ELSR-HA and ELSR-NA

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Heat Tracing System ELSR-HA and -NA

Application
The Heat Tracing System ELSR-… is suitable for industrial use on piping, vessels, instrumentation and related equipment in non-classified (ordinary) areas, in outdoor exposed areas, in wet areas and in areas where combustible gasses, dust or fibres may be present.

Due to the self-regulating behaviour of the system, ELSR-… can be operated within the associated T-Class without additional temperature limitation. All electrical connections must be made to a suitable junction box approved for use in the above listed areas. The use of applicable eltherm power connection and termination kits is required.

System Components
The Heat Tracing System ELSR-… comprises the following components:

- Heating cable ELSR-HA-… or -NA...
- End Termination Kit EL-ECH-Ex
- End Termination Kit EL-ECN-Ex
- Power Termination Kit Ex ELVB-SREx-20 BR HT
- Power Termination Kit Ex ELVB-SREx-¾ BR HT
- Power Termination Kit ELVB-SRAH-¾ ST
- Power Termination Kit ELVB-SRAN-¾ ST

Rating of Trace Heater ELSR
ELSR-NA-…: -WS
ELSR-HA-…: -WS

Possible combinations

Accessories	ELSR-HA (wet; outdoor exposed)	ELSR-NA (wet; outdoor exposed)	ELSR-HA Ex Zone 1 Div 2	ELSR-NA Ex Zone 1 Div 2	ELSR-HA Ex Class I, II, III Div 2	ELSR-NA Ex Class I, II, III Div 2
End Termination Kit EL-ECH-Ex	+	-	+	-	+	-
End Termination Kit EL-ECN-Ex	-	+	-	+	-	+
Power Termination Kit Ex ELVB-SREx-20 BR HT	+	+	+	+	+	+
Power Termination Kit Ex ELVB-SREx-¾ BR HT	+	+	+	+	+	+
Power Termination Kit ELVB-SRAH-¾ ST	+	-	-	-	-	-
Power Termination Kit ELVB-SRAN-¾ ST	-	+	-	-	-	-

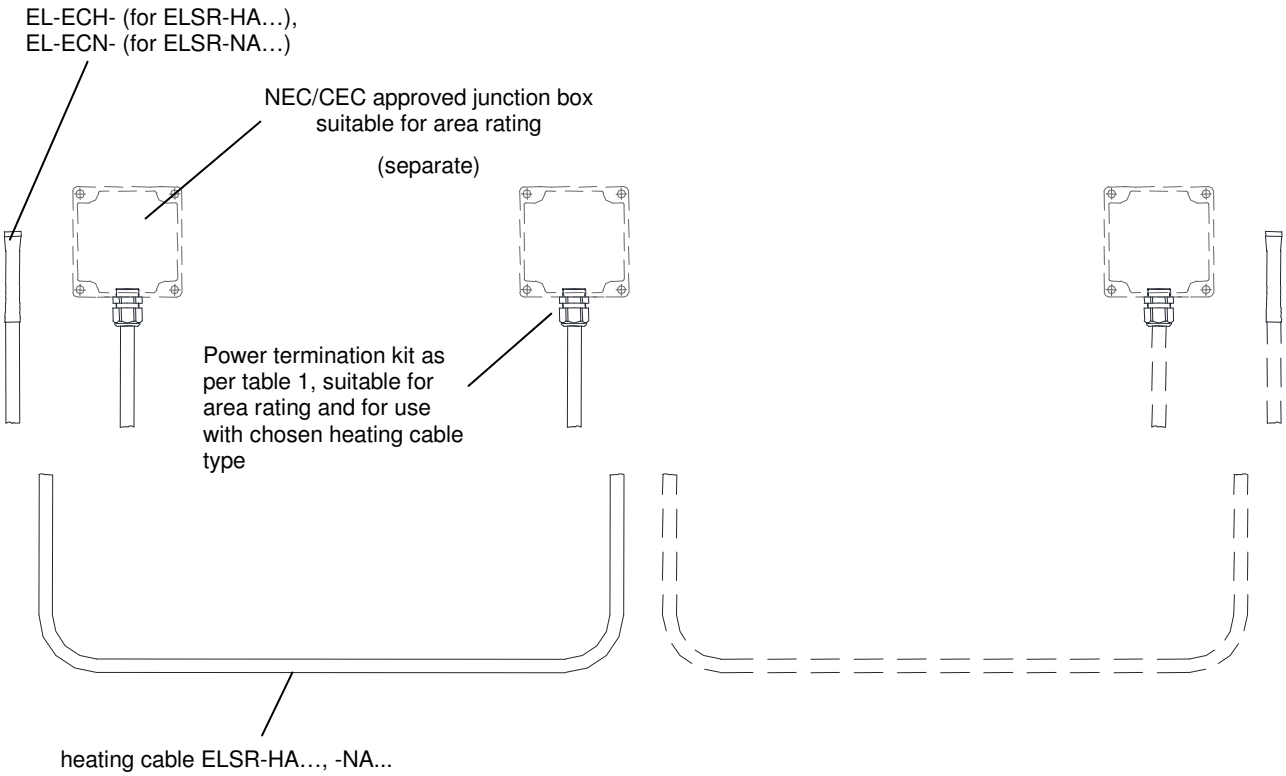
Table 1: Possible combinations of Heating Cable and Kit

Marking of Heat Tracing System ELSR-…
Heating Cables ELSR-… are marked as follows:

eltherm GmbH <*type*> <*power*> W/ft @ <temperature> Parallel-WS Trace Heater 40 A <*voltage*> VAC
<*min. installation temp*> <= Ta <= <*max. exposure temp.*> <*lot-No.*>
<*hazardous area marking*><*continuous length marking*>

Example ELSR-NA-8-2-BO:
eltherm GmbH ELSR-NA-8-2-BO 8 W/ft @ 5°C (41°F) Parallel-WS Trace Heater 40A
240VAC -45°C (-49°F) <= Ta <= 80°C (176°F) HAZ LOC Class I Div 2 Grp A,B,C,D
Class II Div 2 Grp E,F,G Class III T6 Class I Zone 1 AEx / Ex e II T6
Ex II 2G Ex e IIC Gb T6 Ex II 2D Ex tb IIIC Db T80°C B1346 0158m

Possible Cable Sets



Applicable temperature range
The minimum start up temperature for Heating Cable ELSR-NA… and -HA… is -30°C (-22°F);

The minimum installation temperature is

product	°C	°F
ELSR-NA-…AO	-45	-49
ELSR-NA-…BO	-45	-49
ELSR-NA-…BOT	-25	-13
ELSR-HA-…BOT	-45	-49
EL-ECN / -ECH	-45	-49
ELVB-SRA…	-45	-49
ELVB-SREx… HT	-60	-76

Table 2: minimum installation temperatures

The maximum operating temperature for heating cable ELSR-NA and integral components (termination kit EL-ECN) is 60°C / 140°F (energized) and 80°C / 176°F (de-energized).

The maximum operating temperature for heating cable ELSR-HA and integral components (termination kit EL-ECH) is 120°C / 248°F (energized) and 200°C / 392°F (de-energized, for 1000h cumulative).

Restrictions on permissible thickness and material of thermal insulation
Flexible (soft) materials: no restrictions
Rigid materials: groove to be provided to accommodate heating cable

Maximum length of heating circuit

Circuit length ELSR-NA-...-2 under consideration of 240V voltage, MCB type QO (100% utilisation), voltage drop max. 10%, single cable fed from 1 end

Start up temp. (°C)	CB capa-city (A)	Circuit length (ft) for			
		ELSR-NA-4-2	ELSR-NA-6-2	ELSR-NA-8-2	ELSR-NA-10-2
10	10	273	170	127	66
	15	410	255	191	99
	20	547	340	255	132
	25	683	425	318	165
	30	820	510	382	198
	35	957	595	446	231
	40	1087	857	509	264
0	10	245	154	117	61
	15	367	231	175	91
	20	489	308	233	121
	25	612	385	292	152
	30	734	462	350	182
	35	856	539	408	212
	40	979	616	467	243
-10	10	222	141	108	57
	15	333	211	162	85
	20	444	281	216	113
	25	555	352	270	142
	30	666	422	324	170
	35	777	492	378	198
	40	888	563	432	227
-30	10	187	120	3	50
	15	280	180	140	75
	20	373	240	187	100
	25	467	300	233	125
	30	560	360	280	150
	35	653	420	327	175
	40	747	480	373	200

Circuit length ELSR-NA-...-1 under consideration of 120V voltage, MCB type QO (100% utilisation), voltage drop max. 10%, single cable fed from 1 end

Start up temp. (°C)	CB capa-city (A)	Circuit length (ft) for			
		ELSR-NA-3-1	ELSR-NA-5-1	ELSR-NA-7-1	
10	10	159	125	82	
	15	238	187	123	
	20	317	249	164	
	25	397	312	205	
	30	476	374	246	
	35	555	436	287	
	40	612	499	328	
0	10	143	112	75	
	15	215	168	113	
	20	287	224	151	
	25	358	280	188	
	30	430	336	226	
	35	502	392	264	
	40	573	448	301	
-10	10	130	102	69	
	15	195	153	104	
	20	260	204	139	
	25	325	255	173	
	30	390	306	208	
	35	455	357	243	
	40	520	408	277	
-30	10	110	87	60	
	15	165	130	90	
	20	220	173	120	
	25	275	217	150	
	30	330	260	180	
	35	385	303	210	
	40	440	347	240	

Circuit length ELSR-HA-...-2 under consideration of 240V voltage, MCB type QO (100% utilisation), voltage drop max. 10%, single cable fed from 1 end

Start up temp. (°C)	CB capa-city (A)	Circuit length (ft) for				
		ELSR-HA-3-2	ELSR-HA-7-2	ELSR-HA-10-2	ELSR-HA-15-2	ELSR-HA-20-2
10	10	649	304	181	115	97
	15	973	456	271	173	146
	20	1267	608	361	231	194
	25	1267	759	452	288	243
	30	1267	864	542	346	291
	35	1267	864	632	404	340
	40	1267	864	716	461	389
0	10	610	286	171	110	92
	15	915	429	256	165	138
	20	1220	571	341	220	184
	25	1267	714	427	275	230
	30	1267	857	512	330	276
	35	1267	864	597	385	322
	40	1267	864	683	440	368
-10	10	576	270	162	105	87
	15	864	404	243	158	131
	20	1152	539	324	211	175
	25	1267	674	405	263	219
	30	1267	809	486	316	262
	35	1267	864	567	369	306
	40	1267	864	648	421	350
-30	10	518	242	147	97	80
	15	777	364	220	145	119
	20	1036	485	293	193	159
	25	1267	606	367	242	199
	30	1267	727	440	290	239
	35	1267	848	513	338	278
	40	1267	864	587	387	318

Circuit length ELSR-HA-...-1 under consideration of 120V voltage, MCB type QO (100% utilisation), voltage drop max. 10%, single cable fed from 1 end

Start up temp. (°C)	CB capa-city (A)	Circuit length (ft) for				
		ELSR-HA-3-1	ELSR-HA-7-1	ELSR-HA-10-1	ELSR-HA-15-1	ELSR-HA-20-1
10	10	261	137	113	72	53
	15	391	205	169	108	79
	20	521	273	225	145	105
	25	559	342	282	181	132
	30	559	411	338	217	158
	35	559	411	374	253	184
	40	559	411	374	289	211
0	10	249	132	108	70	50
	15	374	198	162	104	75
	20	499	264	216	139	100
	25	559	330	270	174	125
	30	559	396	324	209	150
	35	559	411	374	244	175
	40	559	411	374	279	200
-10	10	239	128	104	67	48
	15	358	192	156	101	72
	20	477	256	208	134	95
	25	559	320	260	168	119
	30	559	384	312	201	143
	35	559	411	364	235	167
	40	559	411	374	269	191
-30	10	220	120	97	63	43
	15	330	180	145	94	65
	20	440	240	193	125	87
	25	550	300	242	157	109
	30	559	360	290	188	130
	35	559	411	338	220	152
	40	559	411	374	251	174

Location of temperature sensors

1. Temperature controllers
Temperature sensors may be used either as ambient sensing devices or attached directly to the equipment/device that is to be heated.

In case of ambient sensing, place the sensor in the coldest expected spot of the area where the heated equipment is located. This is typically a shaded place (e.g. on the northern side of buildings) on low ground. However, ambient sensing is recommended only for frost protection applications and when the permissible temperature band of the equipment to be heated and its contents is considerably wide (approx. 50K / 122°F). Please consult the eltherm project department if further assistance is required.

In cases where sensors are directly attached to the heated equipment/device, two different applications need to be considered:

a) heated pipes
Place the sensor on the anticipated coldest section of the pipe. Avoid direct contact between sensor and heating cable. Branched piping systems may require more than one heating circuit (with a sensor each) or implementation of the “dead leg” technique depending on the flow pattern of the piping system. If help is required, please consult the eltherm project department for further assistance.

b) heated vessels
Place the heating on surfaces that always have contact to the contents of the vessel (typically the bottom of the vessel and/or lower section). Then place the temperature sensor in the heated area. Avoid direct contact between sensor and heating cable. Large vessels may require more than one heating circuit, especially when they need to be heated up to various levels. If help is required, please consult the eltherm project department for further assistance.

Be aware of the fact that temperature sensors mounted on the surface of the heated equipment never provide readings of the exact temperatures of the medium inside the device that is being heated. Therefore, temperature settings may need to be determined in an empirical way when exact temperatures are crucial for the process.

2. Temperature limiters
Due to the self limiting behaviour of ELSR-… heating cable, temperature limiters are not required for most applications. However, when temperature limiters are used, the associated sensors are to be installed in the anticipated hottest areas of the equipment that is to be heated. Avoid direct contact between sensor and heating cable. A temperature offset between the equipment and heating cable sheath needs to be considered for the temperature settings. Please consult the eltherm project department if further assistance is required.

Further documents
In addition to this manual, the following documents apply:
- Data sheet heating cable ELSR-HA, –NA
- Documents provided with the kits listed under “System Components”

Installation of the Ex Heat Tracing System ELSR-…

1. Receipt of Goods

After receipt of goods, check the heating cable and all supplied accessories and compare with the data on the delivery note to ensure that the correct material was supplied.

Verify the integrity of the electrical insulation as described under “5. Test and Commissioning”. If the heating cable is to be stored for installation at a later date, it is recommended that the exposed wires and braid are trimmed and that the end is sealed against possible ingress of water.

2. Storage

The goods have to be stored in a dry environment at an ambient temperature of –20 … +60°C (-4°F…+140°F). If a dry storage is impossible, the heating cable must be closed with an end termination set. This is also necessary if a heating circuit cannot be finished at the end of a shift.

3. Protective Measures

- the use of a ground fault protection device (30mA, or 30mA above the inherent fault current level of the installation) for each heating circuit is mandatory.
- the metallic braid or screen of the heating cable has to be connected to the potential earth (ground).
- de-energize all circuits prior to installation or maintenance of heating components
- all work has to be carried out in compliance with all effective codes and regulations

4. Installation Instructions

- remove any sharp objects on the surface to be heated
- clean and degrease the surface
- the installation of a heating circuit has to be carried out using original eltherm accessories according to eltherm installation instructions. Maintain minimum bend radius of 25mm with all cables.
- to fasten the heating cable to a pipe, self adhesive glass tape or pre-punched (stainless) steel fastening strips are recommended. In case of ELSR-NA…, plastic cable ties may also be used

  Attention: Do not use adhesive tape with emollients (i.e. PVC)!

  Overlapping or contacting of the heating cable during installation is acceptable, due to the self-regulating characteristics of the product.

- the heating cable should be fully covered (the entire length) with aluminum foil in order to prevent insulation material from slipping between the cable and surface to be heated. If the insulation is covered with metal cladding, an insulation entry kit has to be used to avoid mechanical damage of the heating cable.

- the connection and end termination of a heating circuit has to be carried out using eltherm Ex power and end termination kits. Required air gaps and creeping distances need to be observed (see eltherm termination instructions).

  Attention: To avoid short circuit, do not connect the two bus wires of the heating cable to each other. Under all circumstances observe the termination and maintenance instructions for the connection and termination of the heating cables.

- make sure to attach the heating cable – especially the area adjacent to the power connection and / or to the cable entry of the junction box - properly and avoid pulling stress and tension of the electrical connections.

- make sure that heating cable type ELSR-HA-… is kept at a minimum distance of 1’ (approx. 300 mm) from combustible material

- upon completion of the installation, the heating circuit needs to be marked by fitting an appropriate label to the associated junction box or to the heating cable close to the junction box. The label shall be weatherproof and bear relevant information of all used components

- identification: electrically heated parts have to be identified in reasonable distances with warning labels “Electrical Heating” on the thermal insulation (approx. 5 m / 15ft distance between each label on pipelines or at least 1 warning label per pipe-branch respectively).

5. Test and Commissioning

After completion of a heating circuit and prior to the installation of the thermal insulation, the following steps shall be taken:

- perform visual inspection of the heating cable for possible mechanical damage or improper installation.
- perform insulation resistance test
- measure the insulation resistance of each heating circuit between each single bus wire and the metal braid or screen. To do this, expose braid and bus wires as shown in the termination instructions of the power termination kits, then connect both bus wires to the same pole of the tester and the braid to the other pole.
- test voltage: min 500 VDC, preferably 2500 VDC; duration 1 min
- regardless of heating circuit length, the insulation resistance must not be lower than 20 MOhm (the measured values are to be noted and recorded). In case of a lower insulation resistance, the source of defect has to be determined and eliminated.
- check the operation of the heating circuit (only in connection with the required temperature controller and/or limiter)
- in case of damage, replace or repair heating cable immediately. With short heating circuits, the heating cable may be replaced completely. With longer heating circuits, the defective portion may be removed by cutting out the damaged part and replacing it with a new piece of heating cable according to the termination instructions.
- repeat the tests after the thermal insulation has been applied.

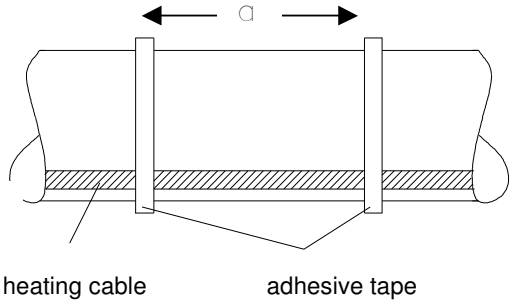
6. Operation and Maintenance:

- follow local codes and regulations for the use of electrical heating cables
- the permissible operating specifications stated in the data sheets (i.e. voltage, amperage, exposure temp., operating temp., IP rating) are to be followed accordingly
- the permissible temperatures provided in section “Applicable temperature range” must not be exceeded
- the use of temperature controllers may be desired (e.g. to conserve energy) or required (e.g. to maintain accurate temperature control). Contact eltherm project engineering department for assistance.
- if heating cable ELSR-H is used in temperature class T4, T5 or T6, its surface temperature needs to be limited by controlled or stabilized design in compliance with applicable standards
- self regulating heating cables are generally maintenance free. However, it is recommended that the heating cables be checked by qualified personnel in regular intervals for damage and insulation resistance.
- disconnect any power supply to the heating system prior to opening of any controllers, junction boxes and terminations. Access is only permitted when heating system is de-energized.
- protect installed heating cable against damage which may occur during repair work on heated components
- after completion of the repair, test heating circuit.
- do NOT operate damaged heating circuits.
- check temperature control units and control devices annually by trained workers or authorized personnel.

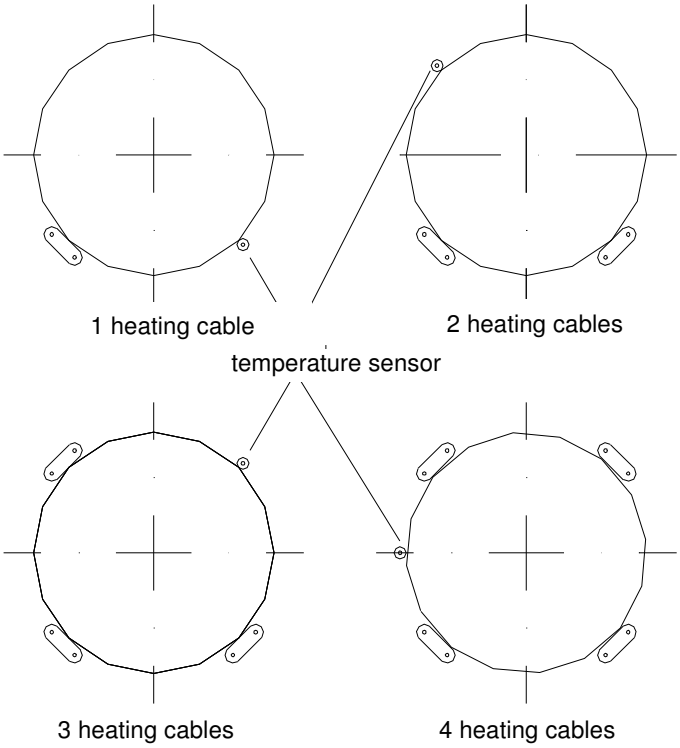
Installation of heating cables on pipes

The heating cable is traced and fixed parallel to the pipe axis.

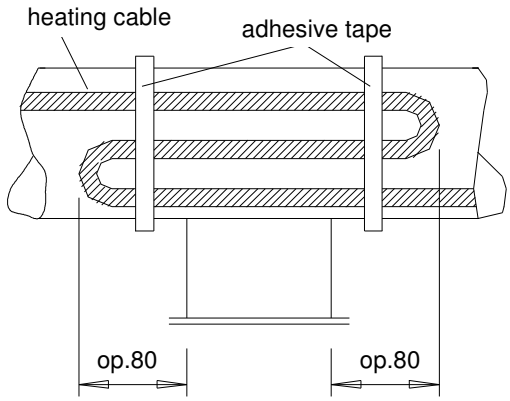
Hazardous area: a max. 300 mm



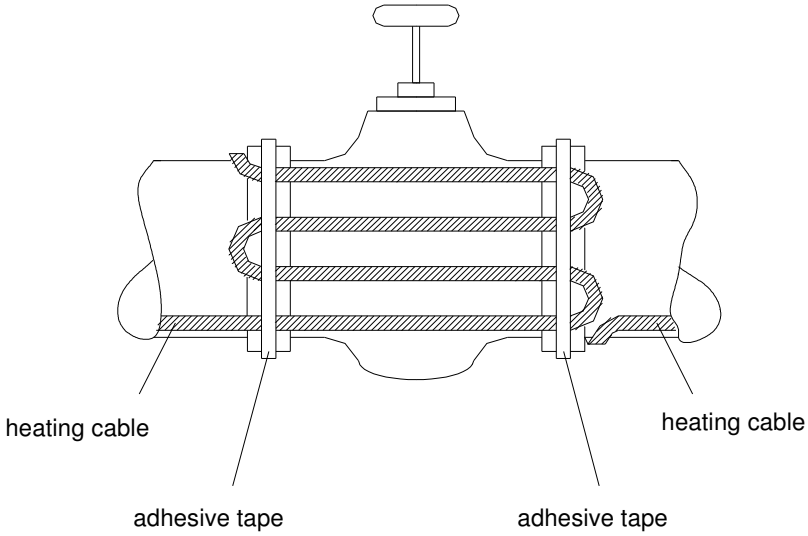
For multiple tracing please follow the drawing



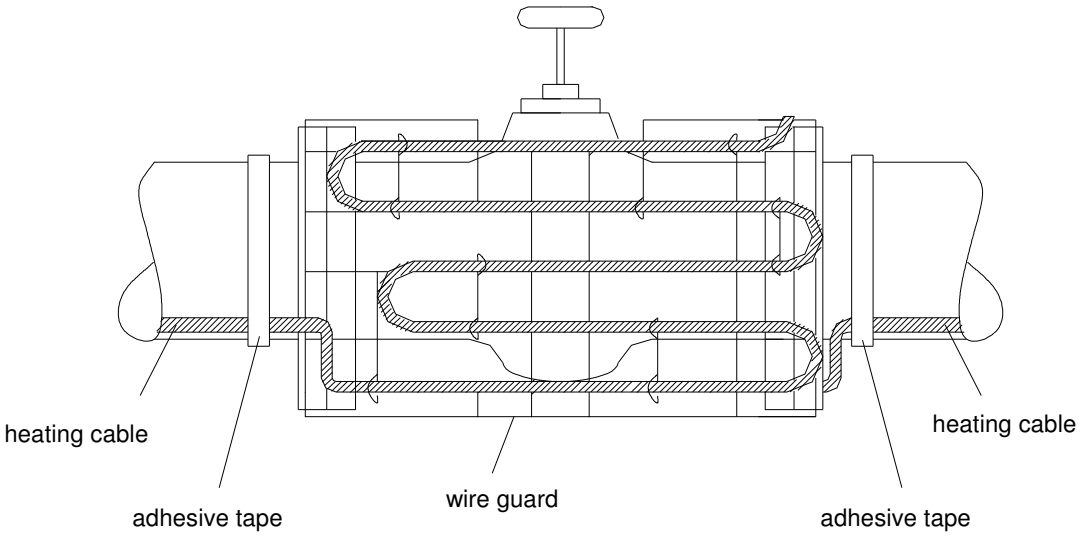
Installation of heating cable on pipe supports



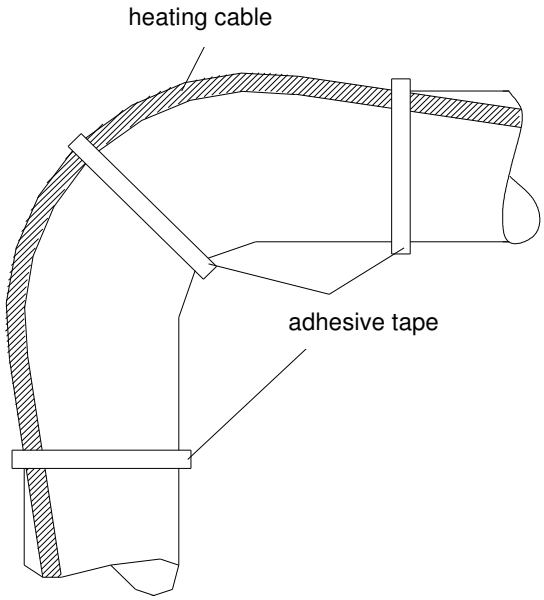
Installation of heating cables on valves



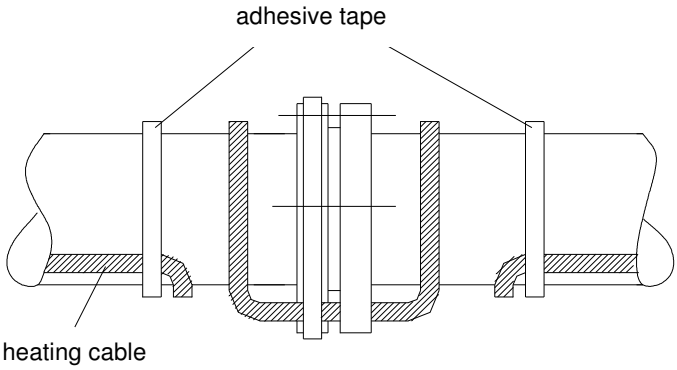
Installation of heating cables on valves by means of a wire guard for a quick disassembly and re-assembly of the heating during maintenance work at the valve.

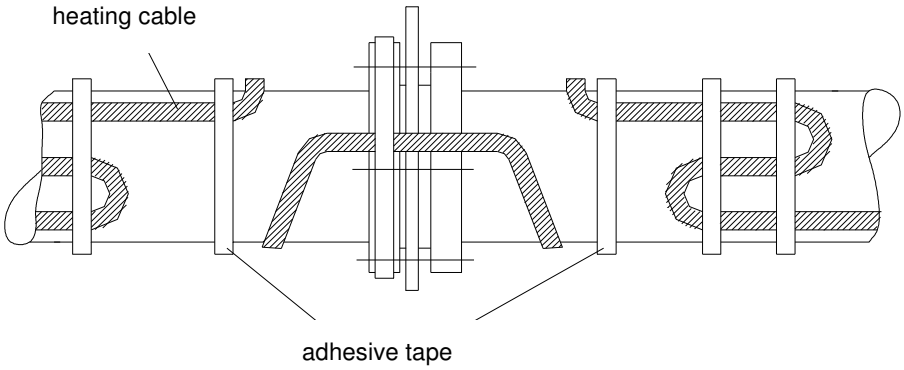


Installation on elbows

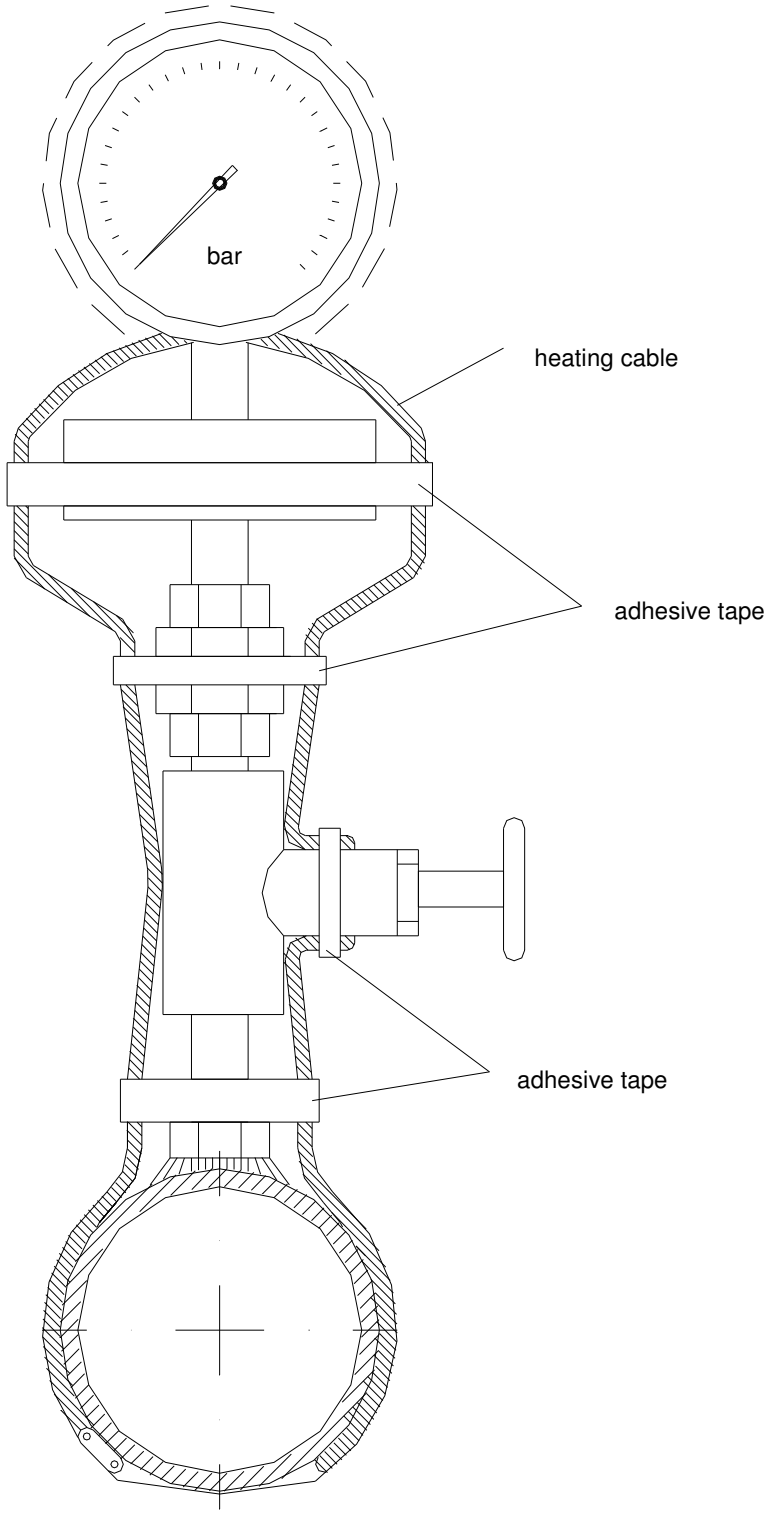


Installation on flanges

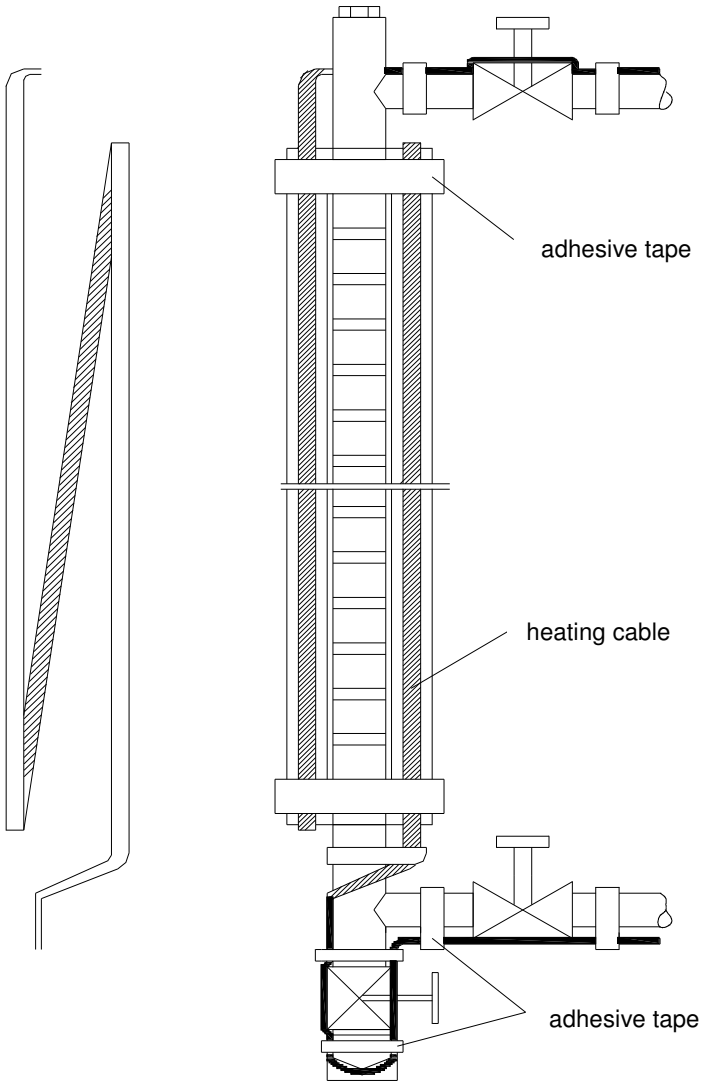




Installation of heating cable on fittings & valves



Installation of heating cables on level indicators



<u>Remark:</u> Attach heating cable with self-adhesive aluminum tape.