1. Use for the Intended Purpose

The EMK heating circuit 27-3643-..../.... is considered to be operated in accordance with its intended purpose only if the following points are complied with:

- The heating cable must be suitable for heating liquid and gaseous media.
- The heating cable may be operated only when controlled.
- The heating cable may be operated only within the restricted operating temperature range
- Only authorised personnel may work on the heating cable.
- The heating cable may be operated only with the installed safety devices.
- The points in these Operating Instructions which relate to safety, handling and usage must be adhered to.
- The operating instructions from the owner/ managing operator must be adhered to.
- The statutory accident prevention regulations must be complied with.
- The points in these Operating Instructions which relate to safety, handling and usage must be adhered to.

The following are not in accordance with the intended purpose:

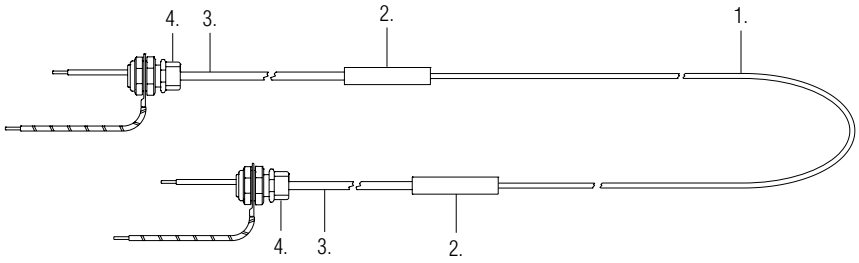
- The heating of explosive media or media which release explosive gases when heated
- Operation in hazardous areas
- Operation by non-authorised personnel
- Operation without observing the safety regulations
- Operation with deactivated, modified or defective safety devices

2. Product description

EMK Heating cable

1. Heating conductor
2. Magnesiumoxid MgO
3. Outer sheath

EMK Heating circuit



1 EMK heating conductor (heating conductor T)
2 Connection sleeve
3 Cold end (cold end T)
4 Gland

The heating cables with plastic insulation are distinguished by the fact that their specific heating output depends on the design parameters such as the length of installed cable and the supply voltage.

Heating cables in this series are mineral-insulated, waterproof, electric sheathed heating cables with a sheath material made of VA 1.4541 or 2.4816. They are used for heating up and maintaining a constant temperature in pipes, apparatus, containers and similar equipment. Heating cables in this series are delivered complete with cold leads and screw connections. The connections can be established with commercially available junction boxes.

The heating cable output reached and the attainable operating temperatures depend on the following operating conditions and can influence them:

- Heat conductivity of the material to be heated,
- Heat conductivity of the medium to be heated,
- Type and thickness of the insulation and its values.

EMK heating circuits 27-3643-..../.... are for setting up heating systems and heating equipment in the industrial area in accordance with the standards specified under “3. Marking and Safety Instructions”.

Heating cables in this series can be used for a regulated operating state up to 800 °C (07-3643-3.../....), 600 °C (07-3643-4.../....) or 1000 °C (07-3643-7.../....) at the heating conductor.

Chemical resistance:

The outer sheath made of VA 1.4541 or 2.4816 can be used in a lot of cases but only to a limited extent where chemical liquids and gases are involved. These conditions for utilisation must be checked by the owner/ managing operator before the heating cables are commissioned.

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3. Marking and Safety Instructions

Marking

Particularly important points in these instructions are marked with a symbol:

DANGER

DANGER draws attention to a danger which will lead to death or serious injury if not avoided.

WARNING

WARNING draws attention to a danger which can lead to a death or serious injury if it is not avoided.

CAUTION

CAUTION draws attention to a danger which can lead to an injury if it is not avoided.

NOTICE

ATTENTION draws attention to measures to prevent damage to property.

Note

Important instructions and Information on effective, economical and environmentally compatible handling.

Safety instructions

- Before commissioning, please check the marking on the heating cable to make sure that it is suitable for the intended application.
- When electric equipment is used, the applicable EC standards and directives, national rules and the respective safety regulations must be observed.
- The installation should be carried out by a qualified electrician who is appropriately trained in handling trace heating.
- All generally applicable statutory rules and other binding directives on workplace safety, accident prevention and environment protection must be complied with.
- An incorrect installation of the trace heating and adjoining system parts or damage to the heating cable can cause short-circuiting and the risk of fire during operation.

This product is intended for the electrical heating of industrial systems and devices. During all work relating to planning, creation, inspection, operation and servicing, the requirements:

- in these Operating Instructions,
- EN 60519-1 and EN 60519-2 “Safety in Electroheating Installations”,
- Part 1: General requirements (= IEC 519-1 = VDE 0721 Part 911),
- the applicable parts of VDE 0100

and other standards, regulations (e. g. the employers´ liability insurance association) and rules which apply to the respective utilisation must be observed.

The protective measures against electric shock must be implemented in accordance with VDE 0100 Part 410 and Part 540 (earthing/system earthing) and the details in the above standards.

4. Guidelines on handling heating cables

Note

4.1. Storage

- The EMK heating cables must be stored in protected, clean and dry areas.
- It must be ensured that the heating cables are protected from mechanical damage and environmental impacts.
- The storage temperature must be between -20 °C and +60 °C.

4.2. Handling

- The following points must be taken into account when unrolling:
  - avoid excessive pulling forces.
  - avoid bending and crushing the cables.
  - Do not tread on the cables or use them as loops for stepping on.
  - To prevent damage to the insulation, particular care must be taken with sharp corners and edges, such as for example on flanges or holding devices.
  - It is not permissible to drive over the cables with vehicles or auxiliary means of transport.
  - It is not permissible to have single-core heating cables cross over or be in contact with each other because this can cause the heating cable´s limit temperature or max. permissible operating temperature to be exceeded.
  - The minimum bending radius must be observed.

5. Mounting and Installation

Note

5.1. Installation instructions

- The surface of the pipe must be dry and clean.
- Check the intended operating voltage.
- The minimum installation temperature must be observed.
- The leads may not be painted over.
- The minimum bending radius must be observed.
- The minimum installation spacing must be observed.

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⚠ CAUTION

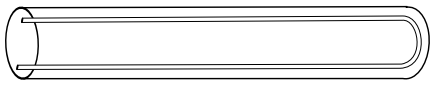
During the assembly of laser-welded heating circuits make sure that this does not cross or touch. You could overheat or cause fires.

5.2. Inspection before Mounting

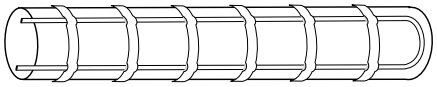
- Before starting to install the heating cable, measure the insulation resistance.
- On the basis of the resistance measurement, check if the supplied heating cable is suitable for the project planning.

5.3. Installing the Heating Cable

Depending on conditions, the heating cable can be placed longitudinally along the object to be heated or wound spirally around it. The heat will be conducted better if the heating cable is laid longitudinally along the pipe.



EMK heating cables must be attached with stainless steel band clamps or cable ties.

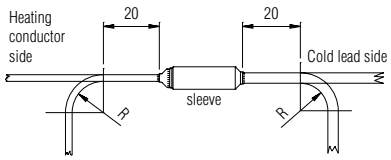


When installing, observe the minimum bending radii relative to the diameter of the heating cable.

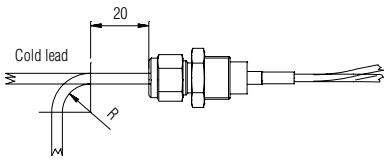
Type	Short name	Resistance [Ω/km]	Heating conductor diameter	Bending radius
27-3643-3…-010K	EMK VA 010K NiCr	10000	3.2 mm	16 mm
27-3643-3…-6300	EMK VA 6300 NiCr	6300	3.2 mm	16 mm
27-3643-3…-4000	EMK VA 4000 NiCr	4000	3.2 mm	16 mm
27-3643-3…-2500	EMK VA 2500 NiCr	2500	3.6 mm	18 mm
27-3643-3…-1600	EMK VA 1600 NiCr	1600	3.8 mm	20 mm
27-3643-3…-1000	EMK VA 1000 NiCr	1000	4.1 mm	21 mm
27-3643-3…-0630	EMK VA 630 NiCr	630	4.5 mm	23 mm
27-3643-3…-0400	EMK VA 400 NiCr	400	5.0 mm	25 mm
27-3643-3…-0250	EMK VA 250 NiCr	250	5.6 mm	28 mm
27-3643-3…-0160	EMK VA 160 NiCr	160	6.5 mm	33 mm
27-3643-4…-1600	EMK VA 1600 CuNi	1600	3.2 mm	16 mm
27-3643-4…-1000	EMK VA 1000 CuNi	1000	3.4 mm	17 mm
27-3643-4…-0630	EMK VA 630 CuNi	630	3.7 mm	18.5 mm
27-3643-4…-0400	EMK VA 400 CuNi	400	4.0 mm	20 mm
27-3643-4…-0250	EMK VA 250 CuNi	250	4.4 mm	22 mm
27-3643-4…-0160	EMK VA 160 CuNi	160	4.9 mm	24.5 mm
27-3643-1…-0063	EMK VA 63 Cu	63	3.2 mm	16 mm
27-3643-2…-0040	EMK VA 40 CuNi	40	4.0 mm	20 mm
27-3643-1…-0025	EMK VA 25 Cu	25	3.7 mm	18.5 mm
27-3643-1…-0017	EMK VA 17 Cu	17	4.6 mm	23 mm
27-3643-1…-0011	EMK VA 11 Cu	11	4.9 mm	24.5 mm

When bending between the heating conductor and PTC thermistor, a minimum spacing of 20 mm before the bending must be adhered to. Relative to the rated current, the PTC thermistors in the heating cables are produced with different cross-sections, whereby the following bending radii must be observed:

Bending radius of the sleeve



Bending radius of cold lead



Cross-section (mm^2)	**PTC thermistor diameter** (Ø)	**Bending radius** (mm)
2,5	4,9 mm	25
6,0	6,1 mm	31

When installing, make sure the surface contact is good and the heat transfer effective. Heat-conductive material can be used to bridge critical points (edges or corners).

Prior to putting on insulation, cover the heating cable with aluminium or VA-grade stainless steel foil. On the one hand, this improves the distribution of heat on the object and on the other hand it protects against the penetration of insulating material between the heating cable and the object to be heated. Insulating parts between the heating cable and the object lead to higher temperatures in this area and can destroy the heating cable. The user must check that the covering has been put on properly and correctly.

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Metallic components which come into contact with the heating cable must be incorporated in the protective measures for Protection Class I (protective earthing). More details are to be found in VDE 0100.

The cold leads are provided for permanent connection and are established by means of a screwed connection with flexible connection strands. During connections the requirements in the standards and regulations which are listed under "3. Marking and Safety Instructions" must be observed. The max. permissible temperature in the connecting area is 90 °C.

The heating cable may be operated only if it is controlled. It must be ensured by means of suitable temperature control units that the heating conductor temperature will not exceed the permissible operating temperature of 800 °C (07-3643-3.../....), 600 °C (07-3643-4.../....) or 1000 °C (07-3643-7.../....) at any point. The position of the temperature sensor is crucial.However, the specified level can be much lower if the heat transfer to the object that is being heated is poor.

The temperature regulation must be designed to rule out the possibility of the max. permissible temperature being exceeded either in the medium being heated or in the object. Risks arise whenever a fault occurs (e.g. a failure in temperature regulation). A safety device must be used to limit the temperature.

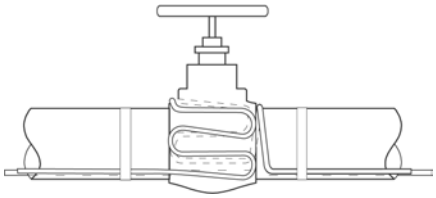
Constant regulation with thyristor power controller (phase angle control) with switching at phase zero crossing must be used for temperatures as of 500 °C.

5.4. Installation on Fittings, Flanges and Pumps

- Always install heating cables on fittings, valves etc. in a way that ensures that they can be easily accessed and replaced during maintenance and repair work and that heating circuits do not need to be cut up. This is best achieved by having a sufficiently large heating cable loop.
- The higher heat losses at fittings, valves etc. increase the length of heating cable that is required. This additional requirement can be found in the project planning specifications.
- The heating cables should be mounted so that they are in as close contact as possible with the surface that is to be heated. Where such contact is not possible, for example on valves, suitable heat conducting cladding made of temperature resistant metal foil or other heat conducting materials may be used.

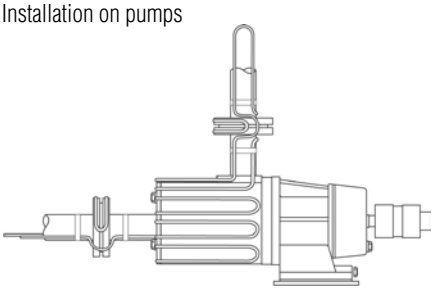
Typical types of installation can be seen in the following illustrations:

Installation on valves

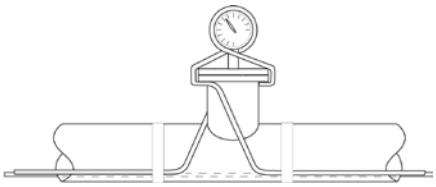


Installation on supports

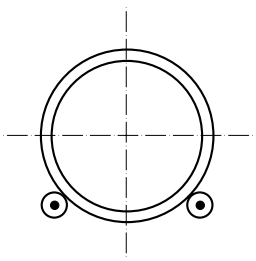
Installation on pumps



Installation on pressure gauges



5.5. Stretched Installation



When laying two heating cables, lay them in approximately the "half past four" and "half past seven" positions on the pipe.

When installing on horizontal pipes, do not install the heating cable at the lowest point.

5.6. Installation

CAUTION

Deactivate all electrical circuits prior to any installation or maintenance work. Switching off must involve disconnecting all outer conductors, i.e. including the neutral conductor, from the power supply. It is essential to heed the Ex protection type marking on the heating cable.

Note

- Conduct a visual inspection of the delivered goods. Make sure that the marking on the cables agree with the ordered goods. Make sure that the marking on the cables agree with the ordered goods.

  Before and during installation: keep the heating cable and cold lead ends and also the trace heating connection components dry. Cable ends that are not connected must be closed off in the field by using a suitable end termination.
- As a basic rule, the resistance heating cable must be attached to the workpiece to be heated with mechanical and temperature stability in order to ensure a reliable thermal coupling.
- Once the thermal insulation has been installed, the object provided with trace heating (work-piece, plant part) must be clearly marked as such by affixing warnings and markings at suitable points and/or at regular intervals along the heating circuit.
- For claims under guarantee the submission of a correctly and completely written acceptance test report is mandatory.

NOTICE

For warranty claims, the submission of a properly completed in full acceptance certificate is mandatory.

The standard acceptance report BARTEC's documentation to find "Assembly and operating systems install EKL/EMK" (www.bartec.de).

6. Electrical Protective Equipment

CAUTION

6.1. Overcurrent Protective Device

- *For overcurrent protection, please use only circuit-breakers which comply with the project planning and technical documents provided by BARTEC. Deviations from this may result in a faulty triggering of circuit-breakers and impair the efficiency of the overcurrent protection.*
- *If you intend to use forms of protection other than those specified in the project planning and technical documents from BARTEC, please consult the technical office at BARTEC.*

6.2. Residual-current circuit-breaker

- A residual-current circuit-breaker is needed for each circuit.

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7. Electrical Connection

⚠ CAUTION

- *Observe the nominal voltage in accordance with the marking on the heating cable.*
- *Operate the respective heating cables exclusively with the nominal voltage intended for them, which was specified in the heating circuit design.*
- *To connect the cold leads to external circuits, use cable entries, enclosures and connection parts that are suitable for the respective application and have been installed correctly.*

8. Inspection and Commissioning

⚠ CAUTION

After installing the trace heating and also after installing the thermal insulation, the following tests must be conducted and recorded in a test report. These test details must be submitted whenever a complaint is made.

8.1. Measurement of the Insulation Resistance

- After installing the trace heating and also after installing the thermal insulation, the following tests must be conducted and recorded in a test report. These test details must be submitted whenever a complaint is made.
- An insulation tester with a minimum test voltage of DC 500 V and a maximum test voltage of DC 2500 V is used.

  The insulation resistance for each circuit should be at least 20 MΩ (in conformance to EN 62395-1), irrespective of the length.
- Measuring:
  - The measurements are taken between the heating conductor and the protective braid.
  - Another measurement is taken between the protective braid and the earthed piping.

8.2. Inspection of the electric protective equipment

It is important to make sure that the requirements for protecting external circuits are fulfilled. See the chapter on “Electrical Protective Equipment” in these instructions.

8.3. Checking the Design Data

After switching on, it is important to check the design data which were specified when the trace heating system was designed, such as applied voltage, the levels of current that arise and the pipe temperature must be checked with the measures and devices appropriate for that purpose.

9. Operation, Maintenance, Servicing

The owner/managing operator of an electrical system must keep the operating equipment in an orderly condition, operate it in accordance with its intended purpose, monitor it and do the required maintenance and repairs. Each piece of electric equipment must be selected for its suitability for use in the respective area.

Before starting operation again, check conformance to the applicable laws and directives. The specified safety instructions must be observed before starting maintenance work and/or troubleshooting.

⚠ WARNING

During operation, the heating cable can reach temperatures which can cause burns on contact, which is why the heating cable must not be touched when it is switched on. Suitable measures must be taken to protect personnel.

9.1. Fault location

Special fault location procedures make it easier to detect faults under the thermal insulation in electric trace heating systems. The engineer planning the electric trace heating systems should be consulted about these. Faults are often caused by mechanical damage, corrosion, overheating or the penetration of moisture. The inspections required for commissioning should be repeated as a basis for fault location.

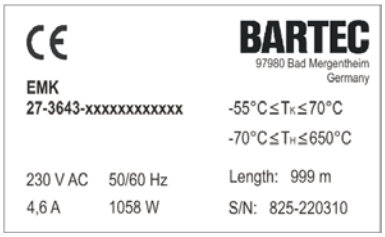
9.2. Repairs, Servicing

Maintenance and servicing are conducted in accordance with the standards and conditions specified in point “3. Marking and Safety Instructions” and, depending on the application, employers´ liability insurance associations’regulations and other conditions of relevance to the respective application situation. The correct functioning of the heating device and the control should be tested at least once a year.

10. Technical data

	VA/CuNi 44	VA/CuNi 44	VA/NiCr 8020	VA/NiCr 8020	VA/Cu	VA/Cu	VA/CuNi 5	VA/CuNi 5	Inconel 2.4816/ NiCr 8020	Inconel 2.4816/ NiCr 8020
Type	27-3643-42..	27-3643-45..	27-3643-32..	27-3643-35..	27-3643-12..	27-3643-15..	27-3643-22..	27-3643-25..	27-3643-72..	27-3643-75..
Rated voltage	500 V	750 V	500 V	750 V	500 V	750 V	500 V	750 V	500 V	750 V
Rated current Cross-section: 2.5 mm² to 30 A; cross-section: 6.0 mm² to 55 A										
Safety class	I	I	I	I	I	I	I	I	I	I
Protection class	IP 67	IP 67	IP 67	IP 67	IP 67	IP 67	IP 67	IP 67	IP 67	IP 67
Heating conductor temperature (T-heating conductor)	600 °C	600 °C	800 °C	800 °C	500 °C	500 °C	500 °C	500 °C	1000 °C	1000 °C
Min. operating heating temperature (T-heating conductor): -55 °C										
Operating temperature cold end (T-heating conductor): -55 °C to +90 °C										
Bending radius: See 5.3 “Installation of the heating tape”										

11. Identification plate



12. Service address

BARTEC GmbH
Max-Eyth-Straße 16
97980 Bad Mergentheim
Germany

Phone: +49 7931 597-0
Fax: +49 7931 597-119
info@bartec.de
www.bartec-group.com

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Declaration of EC-Conformity

Erklärung der Konformität
Declaration of Conformity
Attestation de conformité

No 21-3643-7C0001

BARTEC
BARTEC GmbH
Max-Eyth-Straße 16
97980 Bad Mergentheim
Germany

CE

Wir	We	Nous
BARTEC GmbH,		
erklären in alleiniger Verantwortung, dass das Produkt	declare under our sole responsibility that the product	attestons sous notre seule responsabilité que le produit
EMK Heizkreis	**EMK heating circuit**	**EMK circuit de chauffage**
Typ 27-3643-**/******		
auf das sich diese Erklärung bezieht den Anforderungen der folgenden **Richtlinien (RL)** entspricht	to which this declaration relates is in accordance with the provision of the following **directives (D)**	se référant à cette attestation correspond aux dispositions des **directives (D)** suivantes
Niederspannungs-Richtlinie 2006/95/EG	**Low Voltage-Directive 2006/95/EC**	**Directive Basse Tension 2006/95/CE**
und mit folgenden Normen oder normativen Dokumenten übereinstimmt	and is in conformity with the following standards or other normative documents	et est conforme aux normes ou documents normatifs ci-dessous
EN 60519-1:2011 **EN 60519-2:2006**		
Kennzeichnung **-/-**	**Marking**	**Marquage**
Verfahren der internen Fertigungskontrolle CE	**Procedure of internal control of Production**	**Procédure de contrôle interne de fabrication**

Bad Mergentheim, den 31.01.2013

ppa. Ewald Warmuth
Geschäftsleitung / General Manager

03-0383-0289

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