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Definitions/Abbreviations

COMPANY / OWNER

CONTRACTOR The entity which has been contracted to supply goods and/or services to the COMPANY.

SUPPLIER The party which manufactures or supplies equipment and/or services to perform the duties specified by COMPANY or CONTRACTOR.

SUB-SUPPLIER Any party which manufactures or supplies equipment and/or services to the SUPPLIER to perform the duties specified by COMPANY or CONTRACTOR

IEC International Electrotechnical Commission
IEEE Institute of Electrical and Electronic Engineers
IP Ingress Protection

LED Light Emitting Diode
MCB Miniature Circuit Breaker
MI Mineral Insulated
RCBO Residual Current Breaker with Over Current
RCD Residual Current Device
SDRS Supplier Documentation Requirement Schedule
TRCU Technical Regulation Customs Union

1 PURPOSE

The purpose is to set the standard for good design and engineering practice to be applied on facilities to achieve maximum technical and economic benefit from standardisation.

2 SCOPE

This specification covers the general requirements for the design, manufacture, testing of materials and installation for the complete electrical trace heating systems.

The SUPPLIER's Scope of supply, shall be as defined in Contract documents.

The COMPANY will supply appropriately rated feeds from distribution boards.

Thermal insulation will be supplied by others.

3 REFERENCES

-00-ENG-SPC-00026-E	Climatic, Environmental and Utility Data
-00-ENG-SPC-00033-E	Power and Control, Instrumentation and Telecommunication Cables
-AL-LGT-SPC-00001	Packing and Shipping Instructions
-AL-LGT-SPC-00002	Import Instructions
-00-ENG-SPC-00041	List of Applicable Specifications

4 ROLES AND RESPONSIBILITIES

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5 CODES AND STANDARDS

Electrical trace heating systems/materials shall be designed, manufactured, installed and tested in accordance with the latest applicable sections of international, federal, state or local codes, regulations, ordinances and rules of Kazakhstan as detailed in Appendix A.

The word 'should' shall be replaced by 'shall' wherever it appears in the reference standards.

Kazakhstan is a member country of the Eurasian Customs Union (EAC), equipment shall meet the requirements of the technical regulations of the Customs Union. Attention should be paid to:

- Electromagnetic compatibility
- Low voltage equipment
- Machinery
- Safety
- EAC marking

Where the data sheet indicates that the equipment is for use in a hazardous area, the equipment and all its associated parts shall comply with the requirements of Technical Regulation Customs Union (TR CU) 012/2011.

6 PRECEDENCE

The order of precedence shall be as follows (unless stated otherwise in the project documentation):

- 1) National and/or Local Regulations;
- 2) Purchase Requisition;
- 3) Data sheets and drawings;
- 4) Project specifications;
- 5) This specification
- 6) Industry codes and standards referenced.

CONTRACTOR is responsible for satisfying all technical and certification requirements for and on behalf of the COMPANY with the local Kazakh authorities.

Any apparent conflict between documents in the same level of the hierarchy shall be brought to the attention of the COMPANY for clarification. However, as a general rule, where such conflict exists, the most onerous requirement shall govern.

CONTRACTOR shall identify and detail any deviations and/or exclusions to the documents during the Tendering phase. Unless such deviations/exclusions are specifically identified, the CONTRACTOR shall be deemed to have confirmed full compliance with all the documents listed.

7 SERVICE AND ENVIRONMENTAL CONDITIONS

The site climatic conditions are stated in the Project Specification for Climatic, Environmental and Utility Data No -00-ENG-SPC-00026. Electrical equipment shall be designed generally for use in temperatures ranging minus 45 to plus 40 degrees Celsius.

The equipment and materials are to be suitable for installation in the prevailing atmospheric conditions at the location of the plant. Area classification will be in accordance with the documents attached to the material requisition.

The equipment shall have a design life of 20 years minimum.

Electrical equipment intended for outdoor installation shall have minimum protection IP 55 in accordance with IEC 60529.

8 POWER SUPPLY SYSTEM

400V, 50Hz, three phase, four wire, neutral solidly earthed system or 230V, 50Hz, single phase, two wire derived from the above.

Electrical Supply Tolerances
Steady state limits are:

- Voltage +6/-6%
- Frequency +/-5%

The two extremes of voltage and frequency variations are to be considered to coincide.

Circuits will be fed via MCBs with earth leakage protection.

The following phase colours shall be adopted, reference should be made to document - 00-ENG-SPC-00033-E Power and Control, Instrumentation and Telecommunication Cables.

3 Phase/neutral Systems:

Line 1:	Yellow
Line 2:	Green
Line 3:	Red

Neutral: Blue
Earth: Green/Yellow

Single Phase/neutral (2 wire) Systems:

Line: Red
Neutral: Blue
Earth: Green/Yellow

Single Phase/neutral (3 wire) Systems:

Line 1: Yellow
Line 2: Red
Neutral: Blue
Earth: Green/Yellow

Direct Current Systems:

Positive: Red
Negative: Black
Earth: Green/Yellow

9 GENERAL REQUIREMENTS

The SUPPLIER shall provide design work sheets to facilitate the installation of the trace heating system(s), including any instruments and impulse lines of the instruments, showing the following information:

- Line Number, Pipe Size, Pipe Material and Specification, Fluid in Pipe & Fluid Ignition Temperature, Pipe Length, Number of Valves, Number of Flanges.
- Type of Insulation Material, Thickness, Cladding, Heat Loss.
- Heater Reference and Type.
- Length of Heater per metre of Pipe, Valve and Pipe Support.
- Spiral Pitch where applicable.
- Length of Heater per Circuit.
- Temperatures.
- Mass Flow Rate.
- Distribution Board and Circuit Reference. *
- Circuit Inrush and Duration.
- RCD Rating, Type/Characteristic. *
- Power cable size and type including gland size.
- Drawing/Document References.
- Hazardous Area Classification.
- Detail Calculation Result from Vendor Trace Heating Software

This design data shall be prepared to parameters provided by the COMPANY which shall include the following:

- Pipe Material.
- Pipe Size.
- Pipe Route (Isometric / General Arrangement Drawing where available).
- Pipe Run Details (Product in Pipe, no. of Valves and Flanges etc.)
- Insulation Type and Thickness (and Cladding where applicable).
- Temperature to be achieved / maintained and Heating Range.
- Piping and Instrumentation Diagrams (P & ID's)
- Flow Rate
- Initial Temperature of Pipe Fluid.
- Minimum Ambient Temperature.
- Line List.

*Data provided by the SUPPLIER, as a total system design, will need to be reviewed and approved by the COMPANY.

For installations in Zone 1 and Zone 2 areas, the following types of protection shall be used:

Zone 1 Areas	Equipment complying with the Requirement for Zone 1 IIB T3.
Zone 2 Areas	Equipment complying with the Requirement for Zone 2 IIB T3
Unclassified Areas	Equipment complying with the requirements for Zone 2, IIB T3.

For heat tracing cable that could not meet T3 requirement due to high process temperature, it shall must be design by stabilise or temp limiting method to meet T3 according to IEEE515 or IEC60079-30-2. Detail Calculation from Vendor trace heating software shall be provide as part of the design package to proof suitability of the design.

Standard industrial equipment is not to be use without the approval of Authorised Electrical Engineer and Technical Safety Engineer.

Apart from compensation heating, there may be a need to heat-up (to liquefy) the content of a line within a certain duration. For this type of application additional heating capacity/control shall be given to the maximum heat density allowed under such conditions.

When the pipe material or content has low thermal conductivity, the heat density of the heating elements shall be such that the temperature limits for pipe or content are not exceeded.

The inclusion of spare capacity, i.e., design margin, shall be considered when for critical application the power output is not allowed to drop below the design values.

All electrical equipment subject to operating and maintenance activities shall be easily accessible and shall allow for safe and convenient performance of such activities.

Trace heating circuit load on start-up shall not be greater than 75% of the MCB rating at -20°C.

For winterisation requirements in detailed design refer to Winterisation Philosophy -00- ENG-PHL-00006.

10 HEAT TRACING CABLE

The following tracing cable types shall be used in sequence of preference:

- self-regulating heating cable
- constant wattage parallel heating cable
- mineral insulated heating cable (M.I. cable)

SUPPLIER shall offer heating cable type best suited for each application.

For piping and vessel which require steam cleaning, the following types of heating cables or equivalent is to be consider to prevent damage of trace heating cable:

- XTV
- KTV
- VPL
- FMP
- FHT

10.1 Self-Regulating Heating Cables

Self-regulating heat cable shall be utilised where possible within the restrictions of heat output and operating temperatures. They can be used for all winterising and the majority of compensation heating requirements. Heating tape shall consist of two parallel copper conductors, both being in contact with a self-regulating semi-conductive material. This basic element shall be insulated by one or more non-hygroscopic jackets, and shall be covered with a braided metal screen covering at least 70% of the surface and a polymer outer jacket. The braided metal screen shall have an electrical conductivity not less than the conductivity of one conductor.

The heating cable shall vary the power output in response to the sensed temperature at every point of the surface.

Self-regulating tape shall be capable of being overlapped on itself without causing hotspots.

10.2 Constant Wattage Parallel Heating Cable

Constant wattage parallel heating cable shall be utilised when the required heat output or the operating temperature is beyond the capabilities of self-regulating heating cable. A constant wattage parallel heating cable shall consist of two copper conductors separated by an insulating core.

Heating elements (wires or other type of elements) are connected to the two conductors at certain distances, forming heated zones. The maximum length between two elements (unheated zone) shall not be more than 0.5 metre.

The conductor and the heating elements shall be provided with one or more layers of insulating material. All insulating material shall be heat resistant and non-hygroscopic, and shall be covered with either a braided metal screen covering at least 70% of the surface together with a polymer outer jacket or stainless steel corrugated outer sheath.

The electrical conductivity of both the braided metal screen and the stainless steel corrugated outer sheath shall be not less than the conductivity of one conductor.

The heaters (both cables and pads) shall provide a constant power output regardless of the operating temperature.

Crossovers shall be eliminated from the design and installation to prevent hot spots.

10.3 Mineral Insulated Heating cable

Mineral insulated heating cable shall only be used when the required temperatures are beyond the capabilities of constant wattage parallel heaters. The necessity of utilising them shall be discussed with the SUPPLIER in an early stage and approved by COMPANY electrical authority.

Mineral insulated heating cable shall consist of a metal outer tube with a concentric heating conductor inside, insulated with compressed magnesia oxide powder. The cable shall have a constant power output per metre, which shall be determined by the specific conductor resistance, the total length of the cable and the applied voltage.

The cable shall be prefabricated in the required length and provided on both ends with proper seals, cold connection leads and metal cable glands.

Heating cable identification tags shall be of the thermo-fit marker system (heat shrink) type. Each identification tag to be coloured white, have space for 15 digits and be pre-assembled on a suitable carrier to facilitate installation. Tag marking to be in accordance with pipe line schedule.

All heating cable is to be supplied in continuous drum lengths as stated in the Material Requisition.

The SUPPLIER shall state in his quotation his standard and maximum drum lengths.

Drums are to be non-returnable and of rigid construction, with a metal reinforced centre and wood or metal flanges, suitable for shipping and transportation. Heating tape is to be weather protected over the exposed outer coils.

To facilitate ease of identification each drum is to be clearly labelled with the following:

- Cable Type and Voltage Grade.
- Cable Output (W / M).
- Length of cable on Drum.
- Purchase Order and Item Number.
- Drum No. as stated on the Purchase Order.

This identification is to be indelibly stencilled in dual language, English and Russian, on each outer flange of the drum.

SUPPLIER shall prepare drumming schedules to facilitate material control during installation.

11 HEAT TRACING DISTRIBUTION BOARDS

Trace Heating distribution boards designed and manufactured in accordance with project specification "Distribution Boards", Doc. No. -00-ELT-SPC-00019-ER shall be located in substations, PIBs, and at strategic locations.

Outdoor distribution boards shall be avoided as far as is practical in the plant areas. Where they are required they shall be equipped with thermostatically controlled space heaters, Ex e 2G IIB T3 rated with GRP enclosure, lift-up windows for outgoing circuits, completed with canopy, free standing frame. Where the incomer breaker of the distribution is not suitable for Ex e enclosure, it shall be housed in an Ex de enclosure. Vendor shall ensure there is sufficient height clearance (minimum bending radius of 15 times) for the large incoming cable and space for termination.

The distribution boards shall comprise MCB controlled outgoing final sub circuits with RCDs or Residual Current Breaker with Over Current (RCBO) for the protection of trace heating circuits and shall be suitable for indoor or outdoor use and the hazardous area in which they are to be situated. There shall be suitable co-ordination between the MCC feeder and the distribution board MCBs / RCBO. MCBs and RCBO for outgoing heat tracing circuit shall be of type C curve. Earth Leakage protection for heat tracing circuits shall be 30mA.

Trace Heating circuits shall be supplied at 230V, 50Hz, single phase but main distribution may be by a 4 wire 400/230V system where this is appropriate. All circuits feeding fittings in classified areas shall have both poles switched. Switch handles on distribution boards shall be padlockable in the 'off' position.

Trace Heating distribution boards shall be designed to include for 25% spare ways to account for future growth.

Each miniature circuit breaker, RCD and RCBO on the distribution board shall be provided with one (1) normally open tripped alarm auxiliary contact connected to form a Common Alarm, wired to terminals. The alarms shall be cabled to the DCS.

Distribution Board identified for Winterisation (Frost protection) shall be provided with ambient sensing thermostat and contactor to energise the winterisation circuits at 10°C.

12 CONTROL AND MONITORING

The selection of temperature control will be dependent on the following criteria:

- Winterisation
- Heat Conversion
- Temperature Limitation for Safety Reason

12.1 Thermostats

Thermostats for winterisation shall be of the ambient air sensing type utilising either an integral or external sensor.

Line Sensing Thermostat for heat conversion or safety cut out shall be of the bulb/capillary or electronic type. Thermostats shall be complete with an internal, accessible adjustment and rated as follows:

Local thermostats shall be of the capillary type. The maximum capillary length shall be not more than 5 metres. The contacts of thermostats used for direct switching shall have a minimum rated capacity of 25A, 230 V AC which may be obtained by an integrated local contactor. The temperature setting accuracy shall be at least 95% of the set value and the maximum difference shall not be more than 10°C, whatever is more stringent.

Local thermostats shall only be adjustable with the use of tools. Thermostats installed as temperature limiters for safety reasons shall be of the fail-safe type

12.2 Temperature Control for Winterization

Pipes which required 5 Deg C as indicated in P&ID does not require heating during warm season and activate during cold season to compensate for the heat losses. Heat tracing shall be design by stabilise method as in IEC 60079-30-2 or IEEE 515.

The circuit shall be centralise activated at the heat tracing distribution board as in Clause 11.

Proportional ambient sensing controller (PASC) should be adopted if it is considered advantageous.

12.3 . Temperature Control for Heat Conversion

Pipelines for heat conversion (pipes with 20 Deg C and above as in P&ID) shall be design by stabilise or temperature limiting method as in IEC 60079-30-2 or IEEE 515.

Proportional ambient sensing controller (PASC) should be adopted as part of a complex control system if it is considered advantageous.

The number and location of the thermostats shall be selected to ensure that the heating requirements of all piping and equipment involved will be maintained under all process conditions.

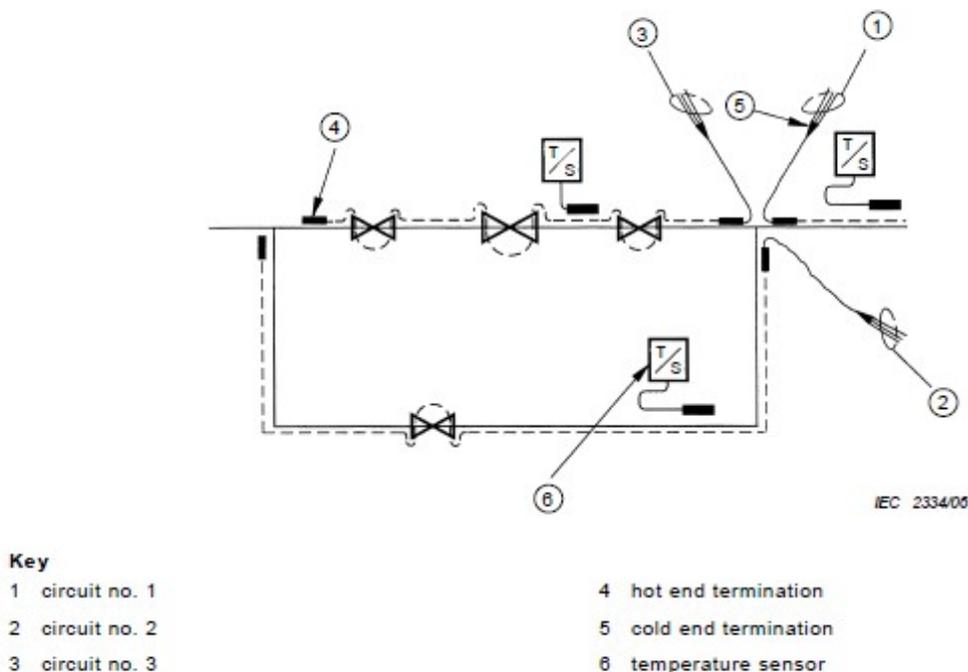


Figure 1 : Arrange of thermostat (Extract from IEC 60079-30-2) for bypass line

12.4 Temperature Limitations for Safety Reasons

When the calculated sheath temperature of cable based on stabilized design is higher than Temperature Rating T3 (200 Deg C), Thermostat / temperature device shall be installed to monitor the sheath temperature of the heating cable. When the maximum allowable temperature has been reached, the associated heating cable shall switched off automatically

according to IEEE 515 or IEC60079-30-2. For Zone 1 hazardous area, additional limiter shall be provided, upon activation it shall give an alarm signal to a manned control room and remain switched off until the temperature limiter has been reset manually. In the event of an error by, or damage to the sensor, the heat tracing system shall be de-energised before the defective equipment is replaced.

For winterisation circuit, set point for the temperature device shall be provided by the vendor to ensure that the coldest portion / dead leg of the pipe will not freeze due to the introduction of temperature device or limiter. Winterisation tracing with additional temperature device shall remain in winterisation circuit. This is to ensure that the circuit will remain switch off during warmer session.

Hazardous area protection shall be selected from the basis outlined in section 9.0.

Double insulation design according to IEEE515 or IEC60079-30-2 could also be consider to avoid the selection of heating tracing cable not comply with the Area Classification. Contractor is to ensure that the increase insulation thinkness will not cause any obstruction to site installation.

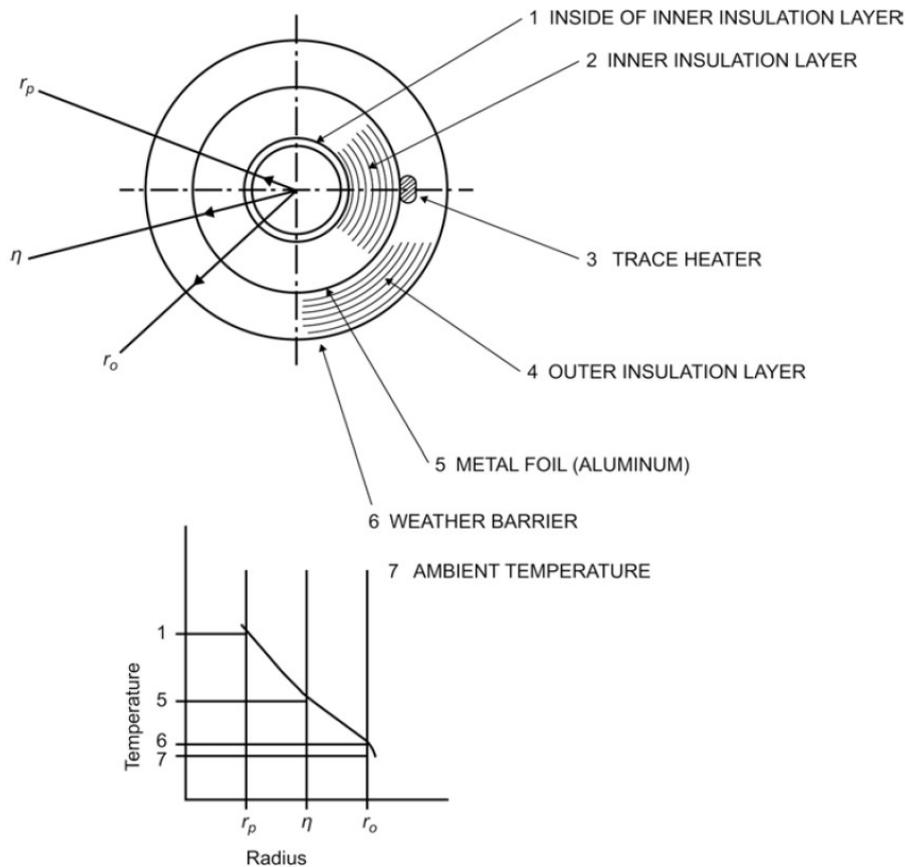


Figure 2 – Typical Double –Insulation (IEC 60079-30-2 / IEEE 515)

Temperature limitation equipment configured for Zone 1 or Zone 2 shall be subject to approval by COMPANY electrical authority.

13 SOPHISTICATED MONITORING SYSTEM

Pipelines carrying products which have narrow temperature range to maintain viscosity and prevent fluid or pipe degradation may require a more sophisticated control and monitoring

system than local thermostats. The COMPANY is to indicate the requirement of sophisticated monitoring system type in data sheet.

Temperature control for the compensation heating shall under these conditions be obtained from the process temperature measuring system. If such a system is not available, an independent control system with thermocouple devices or resistor element type devices (e.g. PT100 elements) shall be provided.

Line mounted PT-100 devices shall be wired back to the main controller via field mounted remote monitoring modules and RS-485 connection(s).

The sensors shall be of the sealed type and shall be hooked up to separate junction boxes. The wiring between a sensor and its associated connection box shall not be more than 5 m.

The control units shall be installed in the switch house and shall control the heater circuits via contactors incorporated in the heater supply. The control unit shall also provide high and low temperature signals to the control room.

Selected lines shall be energised according to this line-sensed temperature rather than via the main group control system.

The monitoring system shall also be capable to provide pre-ground fault alarm to the control room.

14 JUNCTION BOXES

Junction boxes shall as far as practical be located at close to grade or adjacent to platforms, stairs, or ladders to facilitate access for safe installation, inspection and maintenance.

Junction Boxes shall be suitable for the service conditions stated in section 7, with protection to IP55 (minimum). Enclosures shall be glass filled engineered polymer, supplied with internal and external earthing studs. Internal terminals shall be fixed within the terminal box. All cable entries shall have ISO metric threads and shall be plugged with removable threaded stopper plugs.

All junction boxes for hazardous area installation shall be glass filled engineered polymer.

Junction boxes shall be used for:

- The connections between supply cable and heater cable.
- The distribution of supply of one circuit of the distribution board to sub circuits. Only the supply of one circuit of the distribution board shall be allowed in a connection box.
- Splitting of a three-phase circuit into three single-phase circuits.
- Splicing of long runs of series heating cables for maintenance and instability purposes.

Junction boxes shall contain sufficient terminals for all the connections to be made. Individual terminals shall be provided for each conductor. The terminals shall be of non-loosening construction and of the wedge type, obviating the use of cable lugs and constructed in such a way that direct contact between screw and conductor is avoided.

Terminals shall be identified in accordance with the related diagram. In addition, sufficient earth terminals or an earth bar with sufficient earth connection points shall be provided to earth the metal screens of all cables and heaters.

All cables connected to the box shall enter the box through the bottom or the sides. No entrance from the top is allowed. Sufficient cable glands suitable sized for the associated cables shall be installed.

15 HEAT TRACING ACCESSORIES

15.1 Thermostat/Junction Box Mounting Brackets

Mounting Brackets, for securing thermostats / junction boxes to piping, shall be manufactured from stainless steel and shall be complete with all necessary accessories for securing thermostat / junction box to bracket. Stainless, adjustable straps for securing brackets to pipelines shall also be provided.

15.2 Adhesive Tape

Adhesive tape, for securing heating tape to pipe lines shall be glass cloth pressure sensitive with thermo-setting adhesive.

15.3 Caution Signs

All pipelines and equipment heated with electrical tracing shall be provided with suitable, durable weatherproof caution signs, visible from all sections of a traced system. Signs on traced pipe lines shall not be more than 5 metres apart and positioned on alternate sides of the cladding. Caution signs shall be yellow with black pictorial warning and lettering and shall be in dual language, English and Russian.

The elements of a circuit such as thermostats, junction boxes and heaters shall be provided with permanent labels which shall consistently indicate the number of the circuit to which the elements are connected and the circuit reference. The labels shall be fixed on a non-removable part and shall be in dual language, English and Russian. Labels for heaters shall be fixed on the sheathing of the associated pipe lines or equipment.

All signs and nameplates shall be securely attached with stainless steel screws.

15.4 Termination Kits

Heating elements shall be fitted with termination kit where they are connected to the power source. Termination kit cable glands shall be brass, weatherproof and fitted with special grommet to suit each size of heating tape as required. Each gland shall be supplied complete with lockout, IP washer and termination sleeving where necessary. Remote end sealing materials of cold applied or heat-shrinkable type shall also be provided.

15.5 Insulation Entry Kits

Insulation entry kit to provide weather proof entry into thermal insulation shall include cable gland with grommet to suit each size of heating tape as required. In addition, each kit to include tightening plate manufactured from stainless steel or plastic and locknut for cable gland.

15.6 Jointing/End Sealing Devices

Through jointing and remote end sealing devices shall be of the cold applied or heat-shrinkable type. End sealing devices shall have dimensions to permit installation within the insulation without any deformation.

16 FINISH

Equipment and material finish shall be in accordance with the Manufacturers standards for the service conditions specified.

SUPPLIER shall detail in his quotation finish offered.

17 SPARES AND SPECIAL TOOLS

The SUPPLIER shall include in his quotation any installation and commissioning spares, also, any special tools that are required to install and commission the heat tracing systems.

The SUPPLIER shall include a separate quotation for the supply of operating spares. These spares shall be fully detailed in the quotation.

18 INSPECTION AND TESTING

The SUPPLIER shall supply type test certificates of heaters quoted.

The SUPPLIER shall carry out tests at his works on each heater tape to show that the requirements of the specifications and purchase order are met. Tests shall be in accordance with the relevant IEC Standards, BS 6351 Electrical surface heating and IEEE Std 515 (IEEE Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Heat Tracing for Industrial Applications). The SUPPLIER shall provide details of the tests to be carried out during, and on completion of manufacture.

The SUPPLIER shall give two weeks notice of tests prior to commencement. The tests will be witnessed, at the COMPANY's discretion, by the COMPANY's representatives (electrical authority).

19 INSTALLATION AND COMMISSIONING

19.1 Heat Tracing Distribution

Heating cable will be distributed and grouped logically to minimise the number of circuits, thermostats and power cabling required. The SUPPLIER shall provide all relevant information to enable a logical and economical circuiting of the trace heating system, concern also being paid to need for safe access for subsequent inspection and maintenance. In installations where the process flow can follow different routes, each independent part of the system shall be controlled separately (supplied via separate MCBs). Where in a pipeline the same conditions apply, the heating cable shall be controlled from one point unless the applied heating cable are connected to different circuits.

The maximum length of a parallel heating tape shall be limited in accordance with the specification of the manufacturer.

No through connections or "tee offs" shall be made underneath the pipe insulation. Cold-lead connections shall be made in junction boxes. Sufficient heater capacity shall be installed to ensure that, towards the end of the tape, the output does not drop below the minimum design value owing to the voltage drop in the tape conductors.

19.2 Trace Heating Installation

Trace Heating shall be installed in accordance with the SUPPLIER instructions. All heating cable shall be fixed to ensure a good and permanent contact with the surface to be heated over the entire (hot) length.

Heating tapes shall normally run straight along the lower quadrant of the pipes. If spiralling of tapes is necessary, this shall be done in such a way to ensure that the tape can easily be removed. Overlapping or touching of constant wattage output heaters is not allowed. Where heaters run close together, special retaining fixings shall be used to prevent the heaters from touching. Overlapping of self-regulating heaters shall be avoided as much as possible.

Entry kits shall be used where heating tapes, cold leads or temperature leads enter the thermal insulation, to prevent damage and to ensure weatherproofing.

The entry kits may consist of special entry brackets, cable gland or conduit type entries. Cable glands or conduit type entries shall be fixed to the bottom part of the pipeline.

The design and the installation of the entry brackets shall be such that ingress of water is prevented. Heating cables and pads shall be protected from water absorption during transportation and installation.

Heating cable fixed to pumps, valves, flanges, etc. shall allow easy removal of the equipment without damaging the tape. To obtain good contact between heater and heated surface, additional metal tape or foil can be used. Additional fixing straps shall be provided on both sides of the fitting to avoid loosening of the heater from the associated pipes. Special measures shall be taken to prevent damage to the heaters from sharp edges or rough surfaces.

Fixing materials for heaters shall ensure good and permanent contact between heater and heated surface. They shall be of sufficient mechanical strength, noncorrosive, suitable for the relevant operating temperature, and shall not damage the heater mechanically or chemically.

In general, for heaters with a polymer outer jacket self-adhesive plastic or glass fibre tape shall be used. For heaters with a stainless steel outer sheath, stainless steel straps or bands shall be utilised.

During transportation from the Manufacturer/SUPPLIER to the site, the ends of the cables or the connection leads shall be suitably sealed by heat shrinkable adhesive end seals.

19.3 On Site Supervision

The SUPPLIER may be required on-site to supervise the installation and commissioning of the heat tracing systems and ensure that work is properly executed.

The SUPPLIER shall provide with his quotation rates for the on-site supervision of the erection and commissioning.

The SUPPLIER shall advise and prepare detailed procedures for the following:

- Construction and installation of critical pieces of equipment.
- Testing and checkout of installation during construction.
- Commissioning checkout of systems.

20 SHIPPING AND HANDLING

Preparation for shipment shall be as stated in Project Specifications -AL-LGT-SPC-00001 and -AL-LGT-SPC-00002. The SUPPLIER shall be solely responsible for the adequacy of the preparation for shipment provisions stated.

Preparation for shipment shall protect the component parts against corrosion, dampness, breakage or vibration injury during transportation or handling.

Each shipping container shall be clearly identified with the contents, purchase order number and item number.

Location of lifting points, the weight and the centre of gravity shall be clearly marked on all shipping containers.

Where items are required to be dismantled for shipping, instructions shall be provided for reassembly of sections in the field.

The SUPPLIER is required to provide COMPANY (electrical authority) with a Certificate of Compliance prior to shipping of equipment.

21 DRAWING AND DATA REQUIREMENTS

SUPPLIER shall provide the documentation detailed in the SUPPLIER Documentation Requirement Schedule (SDRS) and the "Supplier Documentation Descriptions" as listed in the Requisition.

Documentation shall include but not be limited to:

- Design Worksheets including heat balance calculations for Selection of Heat Tracing Cable Type, Rating etc. and as defined in section 9.0
- General arrangement, isometric and installation drawings showing the configuration of the heating system shall be submitted in the form of an Electrical Trace Heating Manual.
- Bill of material per pipeline and for the total installation.
- Technical data of heaters, electrical equipment and other materials used.
- Schematic and connection diagrams.
- Type approval certificates for all equipment to be installed in hazardous areas.
- Brochures covering main components of the heating system.
- Technical Operating and Maintenance Dossier.
- Certification and Manufacturing Data Dossier.

APPENDIX A – CODES AND STANDARDS

CODES AND STANDARDS OF THE REPUBLIC OF KAZAKHSTAN

Rules for the Arrangement of Electrical Installations RK

Explosive atmospheres - Part 0: Equipment - General requirements, (IDT)	ST RK IEC 60079-0-2010
Explosive atmospheres. Electrical resistance trace heating. Part 30-1. General and testing requirements	GOST IEC 60079-30-1-2011
Explosive atmospheres. Electrical resistance trace heating. Part 30-2. Application guide for design, installation and maintenance	GOST IEC 60079-30-2-2011
Degrees of protection provided by enclosures (IP code) (IDT)	ST RK IEC 60529-2012
Low-voltage electrical installations - Part 1: fundamental principles, assessment of general characteristics, definitions (IDT)	ST RK IEC 60364-1-2012

INTERNATIONAL CODES AND STANDARDS

AMERICAN STANDARDS

Recommended practice for electrical impedance, induction and skin effect heating of pipelines and vessels	IEEE 844
Testing, Design, Installation and Maintenance of Electrical Resistance Trace Heating for Industrial Applications	IEEE 515

EUROPEAN STANDARDS

Electrical Accessories - Circuit-breakers for overcurrent protection for household and similar installations - Part 1: Circuit-breakers for A.C. operation - Edition 1.2; Consolidated with Amendments 1: 2002 and 2 2003	IEC60898-1
Explosive atmospheres	IEC 60079
Explosive atmospheres – Part 30-1: Electrical resistance trace heating – General and testing requirements	IEC 60079-30-1
Explosive atmospheres – Part 30–2: Electrical resistance trace heating – Application guide for design, installation and maintenance	IEC 60079-30-2
Degrees of protection provided by enclosures (IP Code)	IEC 60529
Quality management systems – Requirements	ISO 9001
Low-voltage electrical installations – Part 1: Fundamental principles, assessment of general characteristics, definitions.	IEC 60364-1

TECHNICAL REGULATION CUSTOMS UNION STANDARDS

Safety of equipment for operation in explosive atmospheres	TR CU 012/2011
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