

Winterization Kit Heating Blankets

**155 mm x 45 Cal. EU Gun System
'Dhanush'**

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Winterization Kit Heating Blankets

SPECIFICATIONS FOR HEATING BLANKETS for 155 mm X 45 Cal. Gun System 'Dhanush'

OBJECTIVE

Heating Blankets are provided as an aid to the 'Dhanush' Gun system for ensuring proper functioning of the Gun System in extreme cold weather conditions, i.e., sub-zero temperatures where it is critical to maintain suitable temperature/ flow-state of various elements for proper functioning, viz. the temperature of hydraulic oil, recoil fluid, fuel in the engine along with its moving parts, and certain critical electrical sub-assemblies. Its main objective is to keep such critical elements warm enough to remain in working condition and hence not get frozen at sub-zero temperatures, thereby facilitating and ensuring ease of operation under critical cold weather conditions.

SCOPE

The kit shall comprise of the following 3 multi-layered heating blankets (to be mounted at 3 places on 'Dhanush' Gun system) along with all tools and accessories such as temperature controller, sensors, wires & cables, mounting accessories, transport cases, etc., *separately required* for operation of all these 3 heating blankets for easy and smooth functioning of the same –

1. Heating Blanket for Power Plant
2. Heating Blanket for Cradle Complete
3. Heating Blanket for C-18 Connection Box

SHAPE & SIZE

All 3 heating blankets are required to be flexible and shall be fabricated in a manner so as to facilitate ease of handling and mounting, and shall be made as follows –

- a. Heating Blanket for Power Plant (Engine Housing) to Drg. No. **AW2-23-2-825-0001**
- b. Heating Blanket for Cradle Complete to Drg. No. **AW2-23-2-825-0002**
- c. Heating Blanket for C-18 Connection Box to Drg. No. **AW2-23-2-825-0003**

Above drawings give the outer envelope of the structure on which these three blankets will be fitted. The shape and size of the blankets will be according to these drawings. The vendor, if required, can visit GCF to understand the requirement before participating in Tender.

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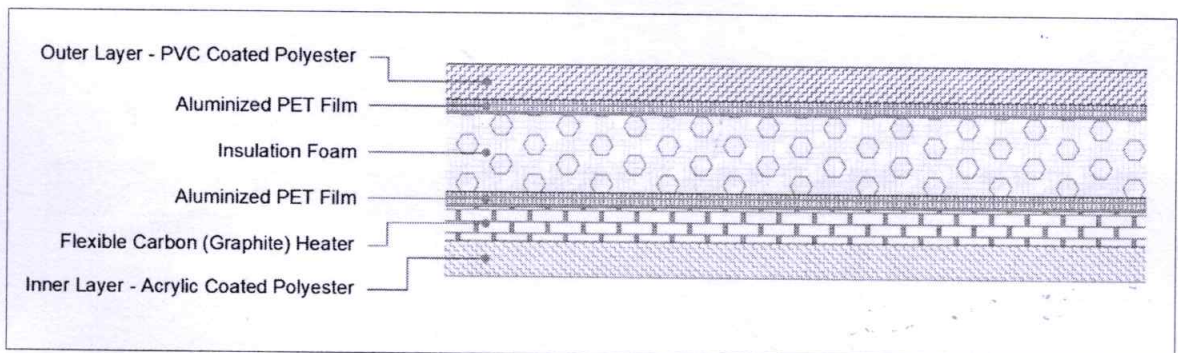
BASIC CHARACTERISTICS

Operating Conditions -

- Operating Temperature - -60 °C to +60 °C
- Heating Capacity - 50 °C above ambient conditions
- Heating rate - from -50 °C to 0 °C in less than 30 minutes
- in all weather conditions, *including High Altitude Area*
- Weight - < 1400 gsm

CONSTRUCTION

Multi-layered Blankets, i.e., Flexible heater with multiple layers of insulation and fabric sheet may be constructed as follows -



Schematic diagram of multi-layered blanket

A. HEATING PAD

Flexible Heater

It is made up of Carbon (Graphite) heaters with polyimide as the base fabric laminated suitably on top and shall possess characteristics as follows -

Typical Properties	Typical Values	Test Method
Haze	< 2%	ASTM D1003
Yellowness Index	< 2	ASTM E313
Tensile strength at break	>160 N/m ²	ASTM D882
Breakdown Voltage	>16 kV	ASTM D149

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B. INSULATION PAD

The blankets are required to be properly insulated for preventing any heat loss from the heater and also preventing damage/ injury to the system/ personnel. Insulating layer mainly consists of Insulation foam with add-on aluminized PET films on either side of the foam making it a three-layered insulation pad. The properties as required for Insulation foam and aluminized films are tabulated as under -

Foam -

Insulation foam should bear following set of properties -

Technical Properties	Specified Values	Test Standard
Material	Fire retardant Polyethylene	Test certificate by OEM/NABL accredited lab
Thickness, mm	6 - 8	
Flame Resistance		
Horizontal Burning Rate, mm/minute	< 90	IS : 15061

Aluminized PET Film -

These films should bear following set of properties -

Technical Properties	Specified Values	Test Standard
Base Fabric	Polyester	Test certificate by OEM/NABL accredited lab
Coating	Aluminized Polyurethane	
Weight, gsm	45 ± 5	IS : 7016, Pt. 1 - 1982
Bursting Strength, kgf/cm ²	> 4	IS : 7016, Pt. 2 - 1981
Flex cracking, number of cycles	> 1,00,000	IS : 7016, Pt. 4 - 1973

C. COVERING LAYERS

Flexible heater along with insulation pad is to be encased with two different layers on either side with following properties.

Inner Layer -

It is the innermost layer/ surface of the blanket to be in direct contact with the elements to be heated or kept warm. Since, this layer would be in direct contact with the surface of the Gun system at different places, it should be made from a fabric having higher tearing strength so as to prevent it from any unwanted injury/ damage from sharp edges. Also it is required to be fire retardant.

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The required characteristics of the layer are tabulated as under –

Technical Properties	Specified Values	Test Standard
Base Fabric	Polyester	Test certificate by OEM/NABL accredited lab
Coating	Acrylic	
Weight, gsm	< 300	IS : 7016, Pt. 1 - 1982
Breaking Strength		
Warp, kgf/ 5 cm	> 35	IS : 7016, Pt. 2 - 1981
Weft, kgf/ 5 cm	> 30	IS : 7016, Pt. 2 - 1981
Tear Strength		
Warp, N	> 50	IS : 7016, Pt. 3 - 1981
Weft, N	> 50	IS : 7016, Pt. 3 - 1981
Flame Resistance		
Horizontal Burning Rate, mm/minute	< 90	IS : 15061
Flex cracking, number of cycles	> 5,00,000	IS : 7016, Pt. 4 – 1973
Cold Crack in °C	< -40	IS : 7016, Pt. 10 - 1981
Heat ageing, mass loss of coating, percent	< 5	IS : 7016, Pt. 8 - 1975

Outer Layer -

Since, it is the outermost layer/ surface of the blanket facing ambient conditions, it is required to more rugged with higher breaking strength should be water-proof. Also it is required to be fire retardant.

The required characteristics of the layer are tabulated as under –

Technical Properties	Specified Values	Test Standard
Base Fabric	Polyester	Test certificate by OEM/NABL accredited lab
Coating	PVC	
Weight, gsm	< 320	IS : 7016, Pt. 1 - 1982
Breaking Strength		
Warp, kgf/ 5 cm	> 50	IS : 7016, Pt. 2 - 1981
Weft, kgf/ 5 cm	> 40	IS : 7016, Pt. 2 - 1981
Tear Strength		
Warp, N	> 15	IS : 7016, Pt. 3 - 1981
Weft, N	> 15	IS : 7016, Pt. 3 - 1981
Water Proofness	No leakage	IS : 7016, Pt. 7 – 1986 (low pressure) 50 cm for 30 min.
Flame Resistance		
Horizontal Burning Rate, mm/minute	< 90	IS : 15061
Cold Crack in °C	< -40	IS : 7016, Pt. 10 - 1981

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FABRICATION

Eyelets with metal rings (8-10 mm) along with Velcro-based mounting mechanism should be provided for fitment of pads.

Ease of installation and retrieval of the heating pad for repair/ maintenance purpose should be ensured, meaning 'Heating Pad' should be slid able in the pad housing.

ACCESSORIES

Apart from heating blankets various other elements are required for proper functioning of the blankets. Following such elements is to be included in the scope of supply –

1. Temperature Controller –

It is required for temperature control of all heater elements of thermal add-on pads. Temperature control of all individual thermal add-ons should be through embedded controller. Depending upon the background temperature, the temperature controller should be able to raise the temperatures of pads using resistive heaters embedded inside the thermal add-ons.

2. Power Supply –

Output Specifications	
Output Voltage	24V - 28V
Output current	80A
Float Current	0 - 6A
Boost Current	6 - 30A
Cooling	Forced Air
Efficiency	Greater than 85%
Load Regulation	Better than 1%
Dimensions	350*200*150mm (max)
Input Specifications	
Input Voltage	170V - 270V AC
Input Cable and Plug	5 mtr Copper cable suited to 20 A current with 15/20 A Single Phase domestic Plug Socket
Input Voltage Frequency	40Hz to 65Hz
Input Current	5-12 Amp Typical at 230V AC
Input Inrush Current	Limited by NTC Thermistor to 35A
Leakage current	<2 mA at 230V AC
Protection	
Input under voltage	Cut-off level 140V AC; Turn on voltage 160V AC
Input over voltage	320V AC units shut off if voltage goes above this value and automatic restart when input is less than 275V AC
Output over voltage (Battery charger included)	30V DC
Output short circuit and overload	Continuously Protected
Battery reverse polarity	Protected
Current drawn by charger from the battery	Draws zero current from the battery under any circumstances

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Externally Induced Over voltage	Protected against output over-voltage caused by parallel connection of alternator, etc.
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3. Sensors –

Temperature Sensor : Surface patch temperature sensor PT100 or equivalent on pad (one on each heater channel)

4. Wires & Cables –

External wire for interfacing thermal pad (for heater and sensor connections) should be of proper current rating and noise free. Teflon coated multi strand copper wires, suitably equipped with mil grade connector mechanism. Wiring should be concealed and properly harnessed.

All the cable for communication between sub-systems and power cable should be terminated with mil grade circular connector.

Minimum 10m length of wire from power supply to thermal add-on pads is required.

5. Proper arrangement to be given so that the blankets can be tightly knotted on the Gun structure.

TOOLS, SPARES & REPAIR KIT

As required to be included in scope of supply.

PACKING

Separate transport cases for all three blankets along with its accessories to be provided.

STORAGE CONDITIONS

The details regarding any specific storage conditions are to be provided.

SAFETY STANDARDS

All heating blankets should comply with all essential and relevant safety/ environmental standards, and should be RoHS and WEEE compliant.

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WARRANTY

Service life of 2 years for complete kit/ individual components.

AFTER SALES SERVICE

Through-out Service life of the equipment.

LITERATURE

Following is required -

- a. User manual
- b. Troubleshooting Guide

TRAINING

Adequate training for handling/ operating the equipment to be provided by the firm at GCF premises.

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ACCEPTABILITY CRITERIA

The successful vendor should be able to provide the following certificates from OEM/
NABL accredited or Govt. approved labs -

1. Certificates for all properties tested in accordance as stated in the document.
2. Certificate of Safety/ RoHS/ WEEE compliance.
3. Warranty Certificate.
4. Firm to submit one sample for practical trial on the Gun. This will be tested in High Altitude area (HAA) before giving Bulk production clearance. The conduction of practical trial is the responsibility of GCF. Vendor may be asked to present in HAA location during trials.