

SUPERSEDES INVENTORY NO.	<h3 style="margin: 0;"><u>TURBINE OIL COOLER (Plate Type Heat Exchanger)</u></h3>	
<p>1.0 Objective: This standard is prepared to purchase turbine oil cooler (Plate Type Heat exchanger)</p> <p>The nozzle location of same fluid shall be parallel i.e. the inlet and outlet of turbine oil shall be on the same vertical line. (refer sketch 01 & 02).</p>		

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स्वत्वधिकार एवं गोपनीय इस दस्तावेज में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स लिमिटेड की सम्पत्ति है इसका प्रयोग एवं आशयता रूप में किसी भी तरह, प्रकार, अर्थ कि सारणी के बिना में अधिकारक हो न सिका जाय।		
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दिनांक एवं हस्ताक्षर SIGN & DATE	Sandeep 31/12/2024	
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	नाम NAME	दिनांक एवं हस्ताक्षर SIGNATURE & DATE			
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REV. NO. 00					20-12-21
Dt. 20-12-21			निर्माण PREPARED: HXE	ज़ारी ISSUED: TSX	दिनांक DATE: 20-12-21

दिनांक एवं हस्ताक्षर
SIGN & DATE



PRODUCT STANDARD HEAT EXCHANGER ENGINEERING

HE 57075

पृष्ठ 13 का 2
Page 2 of 13

सुपरसेडस
INVENTORY NO.

नामकी सूची संख्या में
अवधि का क्रमांक

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स्वत्वाधिकार एवं गोपनीयता
 इस दस्तावेज में दी गई जानकारी भारत भारती लिमिटेड का संपत्ति है। इसका प्रयोग
 एवं प्रकाशन बिना भारत भारती लिमिटेड की अनुमति के किये जाने से निमित्त कंपनी के हितों में हानि हो सकती है।

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नामकी सूची संख्या
INVENTORY NO.

3.0 Designation

3.1 The Turbine oil cooler shall be designated as below

3.1.1 ON DRAWINGS AND INDENTS

Material specification column: HE 57075
Description column : Turbine Oil Cooler (PHE)

3.1.2 ON ENQUIRIES AND PURCHASE ORDER

In addition to incorporating the above detail a copy of this product standard shall be enclosed along with enquiry.

4.0 Codes and Standards:

This standard is not based on any standard. Details have been taken from supplier's approved design.

5.0 Technical Requirements

5.1 The construction shall be as per figure (sketch 1 & 2).

5.2 Construction of heat exchanger

Heat transfer plates shall be packed in a frame consisting of fixed frame plate and movable pressure plate and aligned at top and bottom of carrying bars. Design shall be such that cleaning is possible without dismantling the piping. Heat transfer plates shall be sealed at their outer edges and around the ports and gaskets in order to prevent leakage and inter-mixing of fluids.

Double sealing arrangement shall be provided at outer edge and around ports. The inter space between the seals shall be vented to atmosphere in order to avoid inter-mixing of liquids in case of gasket failure.

REV. NO: .00

निर्माणकर्ता
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JHAMENDER
KUMAR

Jhamender 20.12.21

जांचकर्ता
CHECKED BY

D KYADAV

Dm 20.12.21

P-6514

SUPERSEDES INVENTORY NO.	सामग्री सूची संख्या को अधिकारित करना है	<p>The gasket arrangement shall be such that it receives continuous support to ensure a long gasket life. The gasket should be able to retain its properties and shape over a life period of 10 years.</p> <p>Heat transfer plates shall be provided with sufficient thickness in order to impart sufficient rigidity to the plates particularly from handling considerations. Plates shall have contact points in order to provide inter plates support. The recesses on the plates are suitably strengthened by a reinforcement plate.</p> <p>Plate thickness shall be adequate to withstand all operating conditions as specified in data sheet furnished after placement of order enquiry. Thickness of pressure and frame plates shall be as per ASME Sect VIII div.1. Extra capacity of 30% over and above required margin for additional plates shall be provided in frame.</p> <p>Each plate shall be numbered in sequence. The number shall be marked by indelible ink on the plate to permit easy reassembly.</p> <p>The plates shall be pressed from one piece. They shall be pressed in single/ progressive manner.</p> <p>The corrugation shall be smooth, uniform, and identical for every plate. The PHE bottom frame plate and support should have fixing jigs and cleats to keep provision for enabling to fit through with outlet nozzle fitted underneath to collect and drain water in the event of leakages.</p>	COPYRIGHT AND CONFIDENTIAL <small>The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company.</small>
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भारत एवं भारत SIGN & DATE <i>Sander</i>	स्वत्वाधिकार एवं गोपनीय <small>यस प्रयोग में की गई सूचना भारत इलेक्ट्रिकल्स लिमिटेड की सम्पत्ति है। इसका प्रयोग इस अर्थव्यवस्था रूप में किसी भी तरह प्रयोग को कि सम्पत्ति के हित में हानिकारक हो न किताव सता।</small>	सामग्री सूची संख्या INVENTORY NO. P-6514	REV. NO.: 00	निर्माणकर्ता WORKED BY JHAMENDER KUMAR <i>Jhamender</i>	जांचकर्ता CHECKED BY D K YADAV <i>Doom</i>	20.12.21	20.12.21
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दिनांक एवं प्रस्ताव SIGN & DATE	सामग्री सूची संख्या INVENTORY NO	<p>Frame for each of heat exchanger shall have extra capacity to accommodate the additional plates.</p> <p>The upper carrying bar and lower guide bar shall be rigid in construction without any risk of sagging or buckling and shall facilitate easy guiding of the plates.</p>
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दिनांक एवं प्रस्ताव SIGN & DATE	सामग्री सूची संख्या INVENTORY NO	<p>The nozzle sizes of primary/secondary streams of PHE's shall be of adequate size within acceptable range of velocity. The size selection shall be subject to approval in the event of order</p> <p>If necessary, relief valves shall be provided on both the streams.</p>
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दिनांक एवं प्रस्ताव SIGN & DATE	सामग्री सूची संख्या INVENTORY NO	<p>5.3 Technical Data</p> <p>Material plates and connection : ASTM A240TYPE as per enquiry Material gasket : Neoprene, Non-glued Data Sheet : <i>AS PER PROJECT SPECIFIC DESIGN INPUT</i></p>
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दिनांक एवं प्रस्ताव SIGN & DATE	सामग्री सूची संख्या INVENTORY NO	<p style="font-size: small;">स्वत्वधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी एलिक्ट्रिकल्स लिमिटेड की सम्पत्ति है, इसका प्रस्ताव एवं अप्रस्ताव रूप में किसी भी तरह प्रयोग जो कि, कम्पनी के हित में हानिकारक हो, न किया जाए।</p> <p style="font-size: small;">COPYRIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company</p>
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PRODUCT STANDARD HEAT EXCHANGER ENGINEERING

HE 57075

पृष्ठ 13 का 5
Page 5 of 13



हस्ताक्षर एवं तिथि
SIGN & DATE

SUPERSEDES
INVENTORY NO.

संशोधन नं. संशोधन की
अवधि/दिनांक दर्शाता है

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स्वतंत्रताधिकार एवं गोपनीय

किसी व्यक्ति को इस दस्तावेज़ की प्रतिलिपि देना या इस दस्तावेज़ की प्रतिलिपि को किसी अन्य व्यक्ति को देना या इस दस्तावेज़ की प्रतिलिपि को किसी अन्य व्यक्ति को देना, बिना BHEL की लिखित अनुमति के, गैर कानूनी है।

हस्ताक्षर एवं तिथि
SIGN & DATE

Sandeep

6.0 Quality Assurance, Inspection and Testing

6.1 The Manufacturer shall conduct all tests required to ensure that all the major component of the cooler offered confirm to the requirements of the specification and is in compliance with requirements of applicable codes and standards.

6.2 The bidder shall submit quality plan along with his offer.

6.3 The particular of proposed shop tests and procedures for the test shall be Submitted to BHEL/owner for approval along with quality plan.

6.4 The minimum tests /checks to be carried out on the cooler as envisaged by BHEL are given below. This is however not intended to form a comprehensive testing program, as it is supplier responsibility to prepare the detailed quality plan, which also include tests/checks carried out by supplier as a part of his normal practice. This quality plan is subject to the approval of BHEL /owner and BHEL/owner reserve to right to ask for any more checks at the time of quality plan finalization.

6.4.1 Testing of material: The material of major component shall be tested as per relevant specification for its chemical composition and mechanical properties viz. Y.S, UTS, Impact, % age elongation. Suitable NDT to ensure freedom from surface and subsurface defect shall be carried out.

Plate material used for pressing shall be furnished with mill test report showing chemical and physical properties and heat treatment records.

The following tests shall be carried out during various stages of manufacturing at Manufacturer's works.

6.4.1.1 All the component parts of the cooler including assembly shall be subjected to dimensional and visual inspection. After pressing visual and dimensional checks on the plates shall be made in the presence of BHEL's inspector, on sampling basis.

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INVENTORY NO.

P-6514

REV. NO: .00

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PRODUCT STANDARD HEAT EXCHANGER ENGINEERING

HE 57075

पृष्ठ 13 का 6
Page 6 of 13



6.4.1.2 Heat transfer plates shall be subjected to light box test/ vacuum test as per agreed procedure.

6.4.1.3 Fillet welds shall be subjected to 100% DPT as per ASME Section VIII. Butt welds if any shall be subjected to 10% RT as per ASME Section VIII.

6.4.1.4 Hydraulic test for PHE's shall be performed at 1.5 times the design pressure with 30 minutes holding time for each side. No leak is permitted.

The pressing of HT plates shall be carried out in one operation.

100% PMI inspection for material grade of PHE heat transfer plates from BHEL nominated third party and certificate shall be submitted for review of BHEL.

BHEL reserves the right to conduct random and independent PMI inspection on PHE'S heat transfer plates to ascertain the plate material.

6.5 Bidder shall furnish the procedure for white light scanning method during detailed engineering viz. after award of contract which shall be subjected to BHEL/ customer approval.

Inspection of plate area measurement for one heat transfer plate per PHE by white light scanning shall be from BHEL nominated third party, same shall also be witnessed by BHEL. No type test certificates are acceptable to BHEL for same.

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INVENTORY NO.

सामग्री सूची संख्या को
अधिकारित करना है

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सामग्री सूची संख्या
INVENTORY NO.

P-6514

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20.12.27

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CHECKED BY

D K YADAV

Dk

20.12.21

Bidder to note that heat transfer area measured by white light scanning during contract stage should not have negative tolerance more than 3% w.r.t to the heat transfer area indicated by bidder against the offered mode of PHE. However, in the case of negative tolerance (limited to maximum 3%). Bidder has to provide additional plates proportionately, as free issue assembled into all the applicable PHE'S before the final inspection and as built certificate shall be issued by the bidder accordingly. Bidder to note that negative tolerance beyond three percent shall not be accepted.

6.6 The heat transfer plates from each lot of the plates shall be tested by liquid/dye penetrant test in order to check for cracks and other surface defects in presence BHEL/BHEL nominated third party If any defect is detected in any of these plates, the whole lot shall be tested and plates without defects only shall be accepted. Plate cleaning agent, liquid penetrant and developer shall not contain any halogen.

6.7 The heat transfer plates shall be tested by light box in order to check for cracks and other surface defects in presence of BHEL/BHEL nominated Third party. The plates without defects only shall be accepted.

Gaskets:

Certificate on chemical composition of the gasket material shall be furnished to prove the quality sample testing in presence of BHEL's inspector, if desired. Shore hardness test shall be conducted on the gasket and certificate shall be furnished.

Visual and dimensional check on a sampling basis shall be done. Plates and gaskets assembled together will be inspected for proper assembly.

Frame assembly:

All materials for various components of frame assembly viz. frame plate, pressure plate, carrying bar, guide bar, tightening/clamping bolts and nuts etc. shall be tested quality and test certificates for chemical composition and physical properties shall be furnished

दिनांक एवं हेतु SIGN & DATE <i>Sander</i>	सापेक्षी सूची संख्या INVENTORY NO. P-6514	REV. NO: .00		निर्माणकर्ता WORKED BY JHAMENDER KUMAR	<i>Jhamender</i> 20.12.21
				जांचकर्ता CHECKED BY D K YADAV	<i>Dson</i> 20.12.21

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PRODUCT STANDARD HEAT EXCHANGER ENGINEERING

HE 57075

पृष्ठ 13 का 8
Page 8 of 13

SUPERSEDES
INVENTORY NO

सामग्री सूची संख्या को
अधिकारित करना है

If the thickness of the plates used for frame and pressure plates is 40mm or more the same shall be checked ultrasonically to demonstrate the absence of lamination and lack of fusion etc.

All weld joints used for fabrication of heat exchangers shall be subjected to suitable nondestructive examination. This shall include 100% magnetic particle examination or other suitable NDT of all welds.

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7.0 INSPECTION

The cooler shall be inspected by BHEL/CUSTOMER representative at the supplier works and stamped with BHEL/CUSTOMER QC seal.

8.0 TESTS AND GUARANTEE CERTIFICATES

Five copies of the following certificates shall be furnished for each cooler along with the supply.

- a) Hydro test certificates including hydraulic test result as per clause 6.0 above.
- b) Material test certificates of body sealing, pipe and all other major component. This shall include chemical composition, mechanical properties etc.
- c) Dimensional report and NDT reports.
- d) The supplier shall guarantee the satisfactory operation of the cooler for a period of 18 month of operation after commissioning or 36 month of date of supply whichever is later.

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एक अथवा अधिक अन्य से किसी भी तरह प्रयोग को कि संपत्ति के हित में अधिकारकर्ता को न किया
जाए।

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Sander

सामग्री सूची संख्या
INVENTORY NO.

P-6514

REV. NO: .00

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जांचकर्ता CHECKED BY	D K YADAV	<i>DKY</i>	20.12.21

दिनांक एवं प्रमाण SIGN & DATE	SUPERSEDES INVENTORY NO.	<h3 style="margin:0;">9.0 <u>SUPPLY OF TECHNICAL DOCUMENTATION</u></h3> <p style="margin:0;">9.1 The following documents shall be submitted along with quotation for technical scrutiny in 2 copies each</p> <ol style="list-style-type: none"> a) Catalogue and detailed literature including cross-sectional and assembly drawing of the cooler stating all necessary dimensions, design and test Pressure details, material details of all component parts etc. b) Calculation for cooler sizing. Technical data like element capacity, total number of plates, heat exchanger area, cooling water flow rate, cooling water pressure drop, cooling water outlet temperature, oil pressure drop etc shall be furnished. c) O & M manual of the cooler giving complete description installation, operation, maintenance feature including trouble shooting. d) List of recommended spares along with item wise price. 	
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The tenderer shall submit during contract stage a curve showing expected Turbine Oil (primary side) temperature at heat exchanger outlet for each one-degree centigrade variation in DM water (secondary stage) temperature, all other parameters remaining unchanged.

Similar curve for expected Oil temperature outlet temperature for variation of DM water flow rate with DM water inlet temperature remaining unaltered shall also be furnished. The bidder shall also furnish various curves to enable apply corrections during site PG testing in the event of any data variation from the stipulated design parameters

Bidder shall also furnish thermal design calculations at contract stage to justify the no. of plates offered.

दिनांक एवं प्रमाण SIGN & DATE <i>Sandeep</i>					
नामावली क्र. संख्या INVENTORY NO. <i>P-6514</i>	REV. NO: .00		निर्माणकर्ता WORKED BY JHAMENDER KUMAR <i>Jhamender</i>	जांचकर्ता CHECKED BY D K YADAV <i>Dk</i>	<i>20.12.21</i> <i>20.12.21</i>

सामग्री सूची संख्या INVENTORY NO.	सामग्री सूची संख्या की संशोधित संख्या है	<p>9.2 10 copies of Operation & Maintenance Manual of the Cooler giving complete description, installation operation and maintenance features including trouble shooting, conservation list of spares etc. and assembly drawing of the cooler. This shall be in bound form and shall be supplied with in four weeks' after placement of order.</p>
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10.0 PAINTING

Unless otherwise specified the cooler shall be painted as per supplier's standard. Total paint thickness shall be between 120-150 micron.

11.0 MARKING

11.1 BODY MARKING

The following markings shall be integral with the body.

- a) Manufacturer's name or trade mark.
- b) Design heat load
- c) Design pressure (NP)
- d) Nominal flow
- e) Inlet/ outlet marking for primary & secondary flows.
- f) Body material designation.

11.2 MARKING ON THE NAME PLATE

A nameplate giving the following detail shall be suitably fixed to the cooler.

- a) Manufacturer's name or trade mark
- b) Sl. No. of cooler
- c) Year of manufacture
- d) Material specification of body
- e) Nominal flow
- f) Nominal pressure
- g) No. of element
- h) B.H.E.L material code no.

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SIGN & DATE
Sandhu

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P-6514			जांचकर्ता CHECKED BY	D K YADAV	<i>DKY</i> 20-12-21

PRODUCT STANDARD HEAT EXCHANGER ENGINEERING

HE 57075

पृष्ठ 13 का 11
Page 11 of 13



दिनांक एवं हस्ताक्षर
SIGN & DATE

सुपरसेडस
INVENTORY NO.

सामग्री सूची संख्या को
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दिनांक एवं हस्ताक्षर
SIGN & DATE
Sandhu

सामग्री सूची संख्या
INVENTORY NO.
P-6514

11.3 A tag bearing the material code of BHEL shall be attached to each cooler.

11.4 Marking of the packing case

- a) Manufacturer's name or trade mark
- b) B.H.E.L order No.
- c) BHEL product standard No.

12.0 PACKING

Each cooler shall be drained, cleaned and packed in such a way as to avoid the possibility of damage to inside and outside parts during storage and transit. Opening should be covered to exclude dirt and other foreign material. Threaded and mechanical surfaces shall be well covered with an approved rust preventive material

13.0 REFERRED STANDARDS:

ASME SECT VIII DIV. 1

ASTM A240 TYPE

REV. NO: .00

निर्माणकर्ता WORKED BY	JHAMENDER KUMAR	<i>Jhamender</i>	20.12.21
जांचकर्ता CHECKED BY	D K YADAV	<i>Dk</i>	20.12.21

दिनांक एवं तारीख
SIGN & DATE



PRODUCT STANDARD HEAT EXCHANGER ENGINEERING

HE 57075

पृष्ठ 13 का 12
Page 12 of 13

सुपरसेड्स नंबर
SUPERSEDES
INVENTORY NO.

सामग्री सूची संख्या को
अतिरिक्तित संख्या है

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दिनांक एवं तारीख
SIGN & DATE

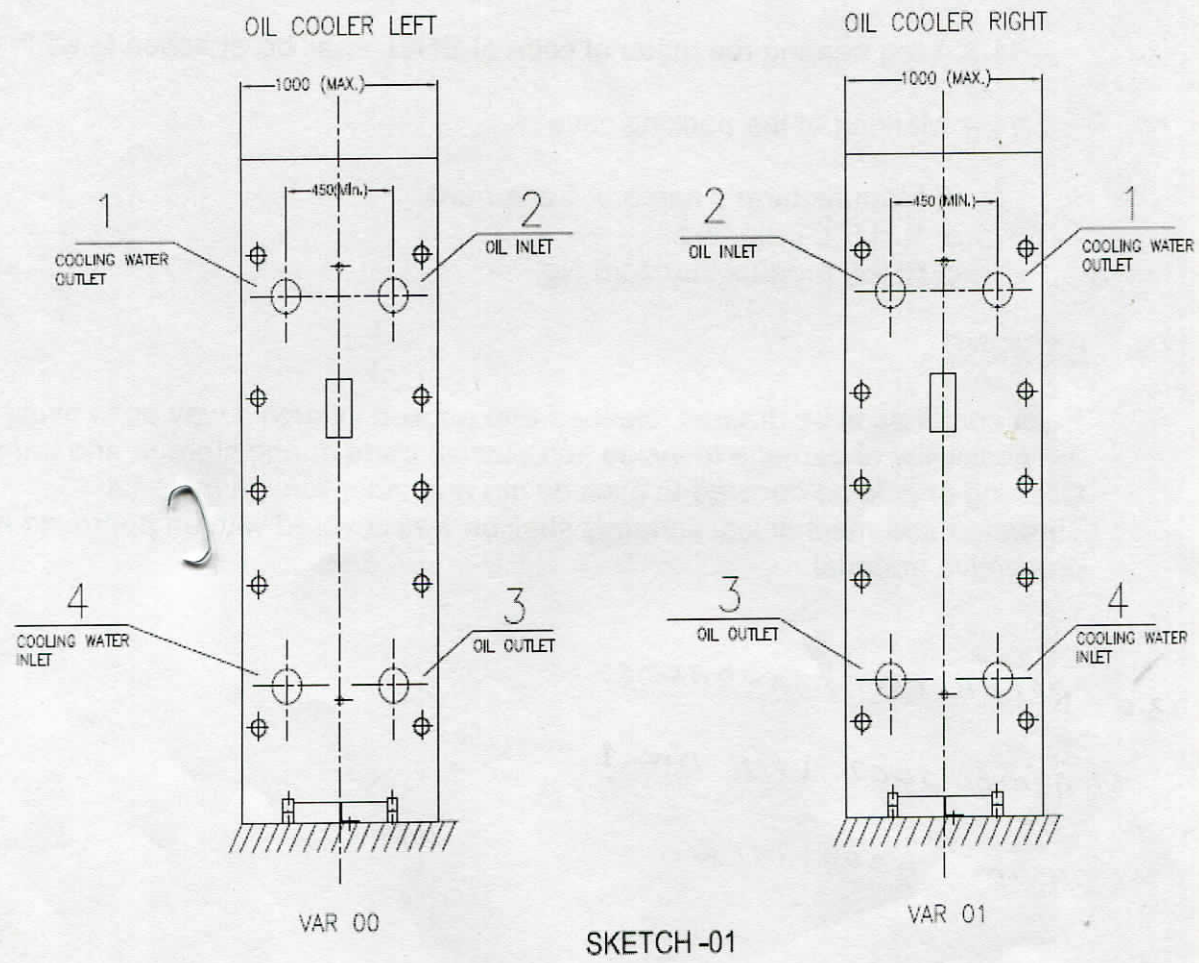
Sanjeev

सामग्री सूची संख्या
INVENTORY NO.

P-6514

REV. NO: .00

view-A



SKETCH-01

Dimensions shown in sketch 1 are of Indicative nature only

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जांचकर्ता CHECKED BY	D K YADAV	<i>Dk</i>	20.12.21

नाम एवं दिनांक:
SIGN & DATE



PRODUCT STANDARD HEAT EXCHANGER ENGINEERING

HE 57075

पृष्ठ 13 का 13
Page 13 of 13

SUPERSEDES
INVENTORY

सामग्री सूची संख्या को
अधिकारिता करना है

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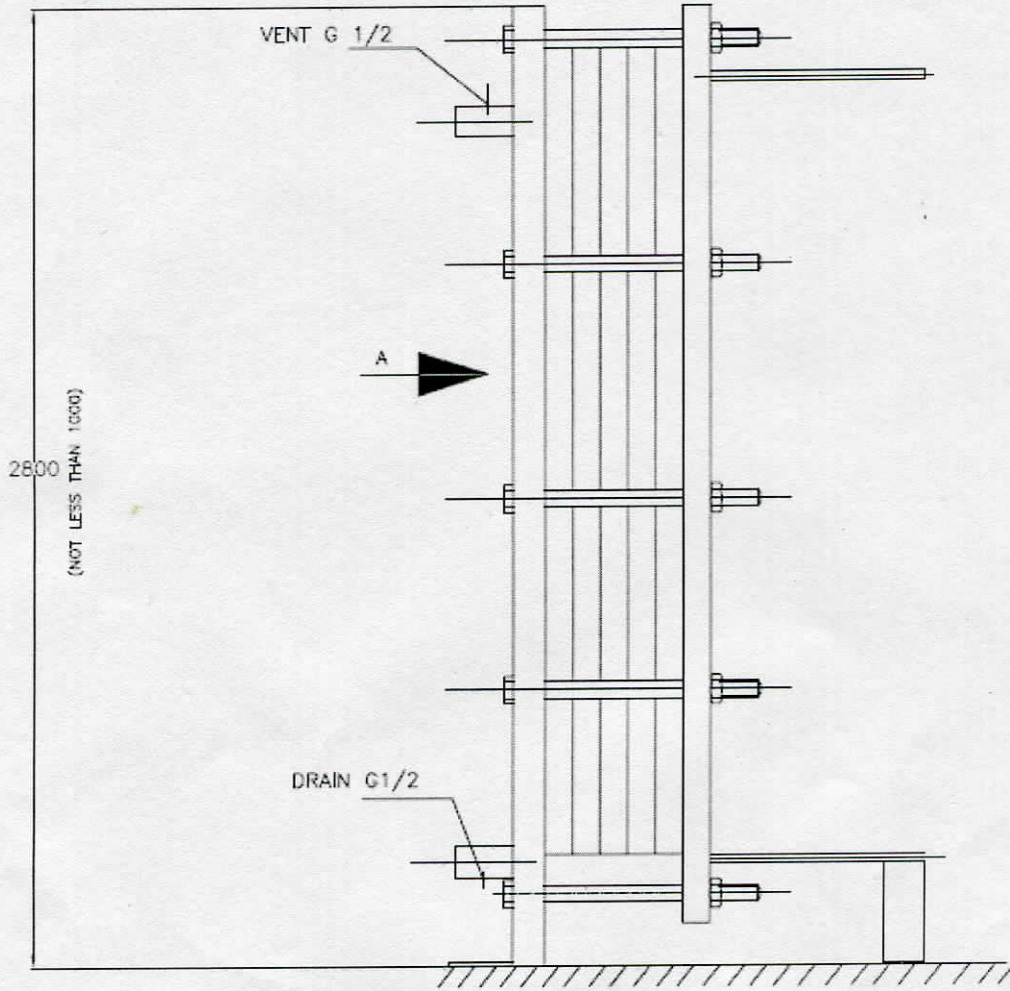
दिनांक एवं दिनांक:
SIGN & DATE

Sandeep

सामग्री सूची संख्या
INVENTORY NO.

P-6514

REV. NO.: .00



SKETCH - 02

Dimensions shown are of indicative nature only

निर्माणकर्ता WORKED BY	JHAMENDER KUMAR	<i>Jhamender</i>	20-12-21
जांचकर्ता CHECKED BY	D K YADAV	<i>DK</i>	20-12-21



उत्पाद मानक

HE57018

पृष्ठ 5 का 1

PRODUCT STANDARD

Page 1 of 5

INERT GAS ACTUATED DIAL THERMOMETER

1.0 SCOPE :

1.1 This standard specifies the requirements of inert gas actuated dial thermometer for power plant application.

1.2 This standard shall be supplemented by AA0851410, technical delivery conditions for temperature measuring instruments, dial type.

2.0 COMPLIANCE WITH STANDARDS :

The thermometer shall generally comply with BS: 5235 (Dial type expansion thermometer).

3.0 TYPE OF THERMOMETER :

3.1 This standard covers three types of thermometers.

TYPE A : Direct mounting, vertical having bottom entry stem.

TYPE B : Direct mounting, co-axial having back entry stem.

TYPE C : Capillary type, surface mounting with bottom entry.

4.0 DESCRIPTION :

A direct mounting inert gas actuated co-axial dial thermometer, to this standard, of range 0 to 80° C, dial size 150 mm and threading connection size M20x1.5 shall be designated on the indents as follows :

- (A) Material specification column : HE57018
- (B) Description column : THERMOMETER INERT GAS ACTUATED, M20X1.5 TYPE -B
- (C) Size column : RANGE 0 TO 80° C.

दिनांक एवं हस्ताक्षर
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SUPERSEDES
INVENTORY

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दिनांक एवं हस्ताक्षर
SIGN & DATE

संश्लेषण नं.
INVENTORY NO.

28/11/06

P-6021

				नाम NAME	दिनांक एवं हस्ताक्षर SIGNATURE & DATE
			अनुवादक TRANSLATED BY		
QAX	S.K. CHAUHAN	<i>S.K. Chauhan</i>	निर्माणकर्ता WORKED BY	M.K. LAHOTI	<i>M.K. Lahoti</i>
TSX	D.L. OBEROI	<i>D.L. Oberoi</i>	संश्लेषणकर्ता CHECKED BY	M.K. LAHOTI	<i>M.K. Lahoti</i>
सहमत विभाग AGREED DEPTT	नाम NAME	दिनांक एवं हस्ताक्षर DATE & SIGNATURE	पर्यवेक्षणकर्ता SUPERVISED BY	L. KISHORE	<i>L. Kishore</i>
WORKED BY	GULSHAN	<i>Gulshan 21/10/21</i>	स्वीकृति APPROVED :	V.K.SAXENA, AGM (HXE)	26.4.06
CHECKED BY	DEEPAK KR.	<i>Deepak Kr. 21/10/21</i>	निर्माण PREPARED :	HXE	ISSUED : TSX
REV.NO. 02	REAFFIRMED	Year 2021	दिनांक DATE :	08.04.06	
D/19.04.15	CA No. HXF-21-03				GRiNo 3.50



उत्पाद मानक

HE57018

पृष्ठ 5 का 2

Page 2 Of 5

PRODUCT STANDARD

4.1 On enquiries and purchase orders :

In addition to incorporating the above details, a copy of this standard and TDC Standard no. AA0851410 shall be enclosed.

5.0 TECHNICAL REQUIREMENT :

5.1 Dial size : 150 mm.

5.2 Range and connection size : As specified in purchase order.

5.3 Capillary (Refer thermometer type-C): Shall be stainless steel armored capillary tubing. Length of capillary 5 meters.

6.0 INSPECTION :

6.1 Inspection and testing shall be done as per CL. 5.0 of AA0851410.

6.2 Test certificates shall be supplied as per CL. 6.0 of AA0851410.

7.0 GENERAL REQUIREMENT :

Constructional features, guarantee, document, packing, marking etc. shall be as given in standard AA0851410.

8.0 REFERRED STANDARDS :

- (i) BS : 5235
- (ii) AA0851410

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दिनांक एवं हस्ताक्षर
SIGN & DATE
28/11/06

सामग्री सूची संख्या
INVENTORY NO.
P-6021

REV.NO.
02

निर्माणकर्ता WORKED BY	M.K.LAHOTI	
जांचकर्ता CHECKED BY	L.KISHORE	

10/11/06



उत्पाद मानक

HE57018

पृष्ठ 5 का 3

PRODUCT STANDARD

Page 3 Of 5

SUPERSEDES INVENTORY

सामग्री सूची संख्या को

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SIGN & DATE

28/4/06

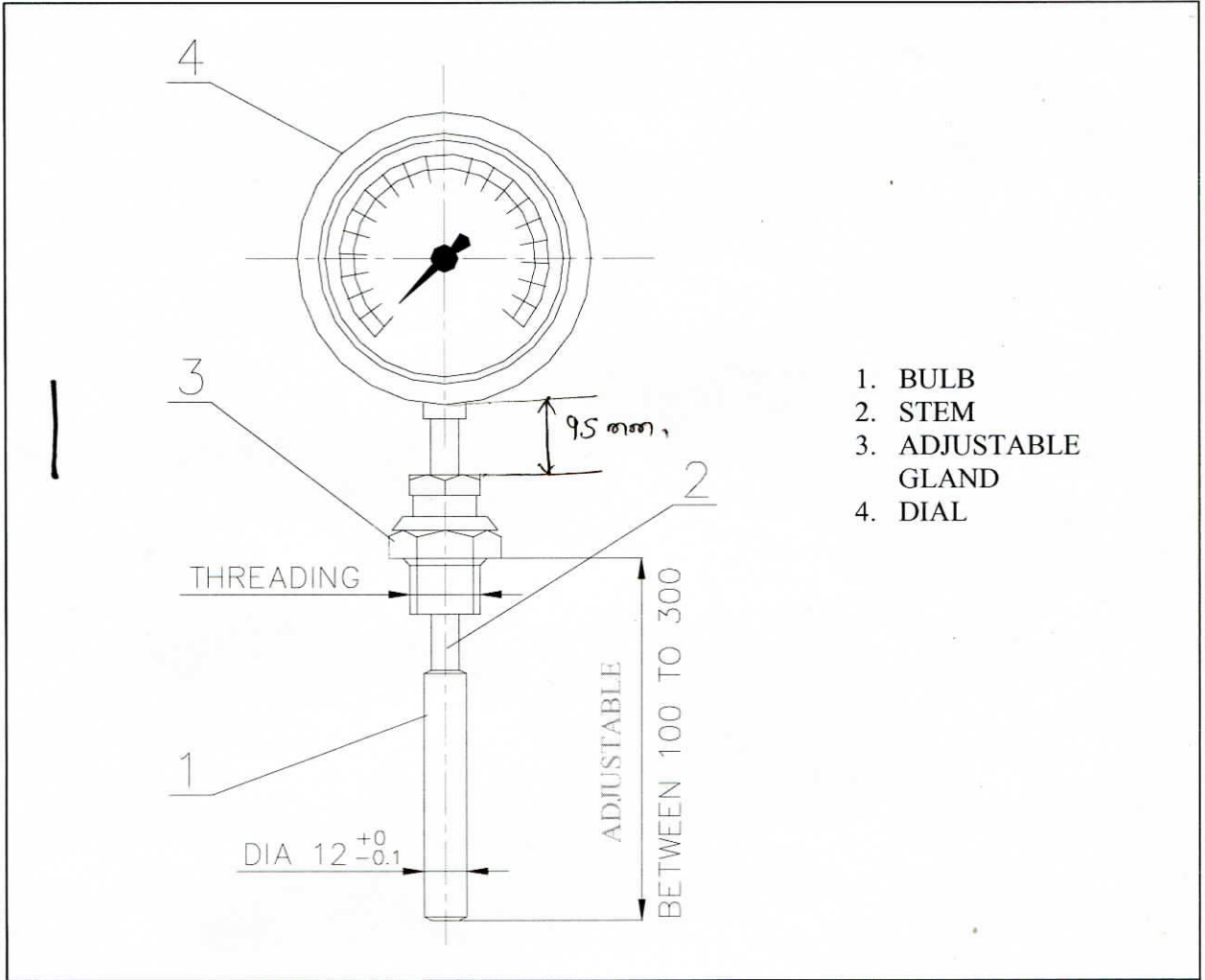
INVENTORY NO. P-6021

REV.NO. 02

WORKED BY M.K.LAHOTI

CHECKED BY L.KISHORE

Handwritten signatures and date 10/4/06



- 1. BULB
- 2. STEM
- 3. ADJUSTABLE GLAND
- 4. DIAL

TYPE -A

PRODUCT STANDARD



संकेत एवं दिनांक
SIGN & DATE

SUPERSEDES
INVENTORY

सामग्री सूची
संख्या को

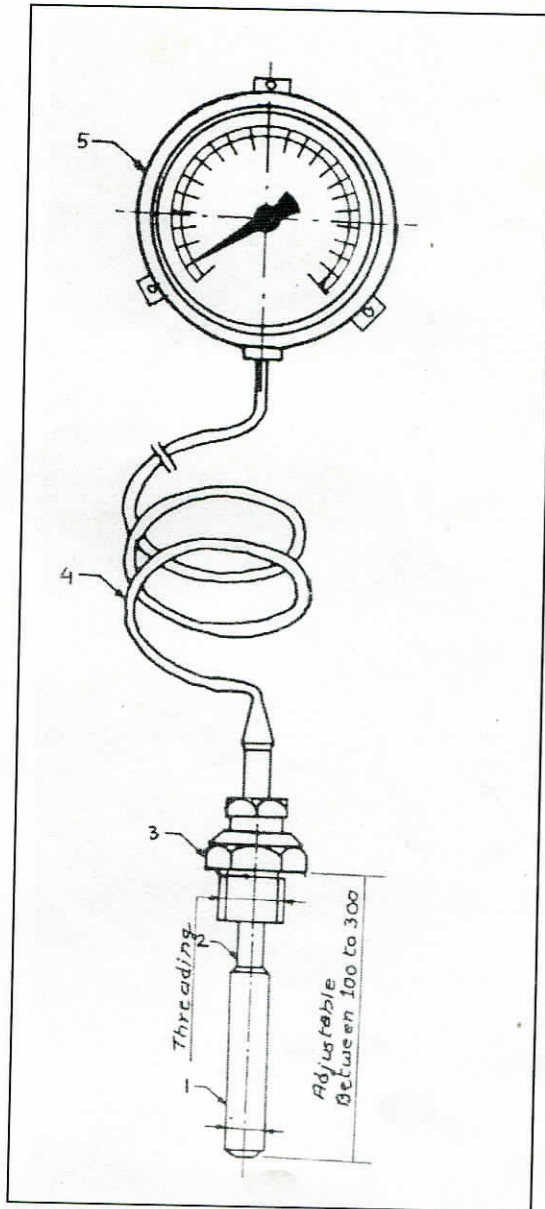
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- 1- BULB
- 2- STEM
- 3- ADJUSTABLE GLAND
- 4- CAPILLARY
- 5- DIAL



TYPE - C

REV.NO.

02

सामग्री सूची संख्या
INVENTORY NO.

P-6021

निर्माणकर्ता
WORKED BY

M.K.LAHOTI

जांचकर्ता
CHECKED BY

L.KISHORE

(Handwritten signatures and initials)

