TECHNICAL SPECIFICATION FOR OIL PUMP WITH MOTOR FOR TRANSFORMER FOR 3-PHASE ELECTRIC LOCOMOTIVES SPECIFICATION NO.:- CLW/ES/3/0106 ALT. G

Enclosure :

a) **Drawing No:**
- (i) CLW/ES/3/SK-1/0106/G
- (ii) CLW/ES/3/SK-2/0106/G
- (iii) CLW/ES/3/SK-3/0106/G
- (iv) CLW/ES/3/SK-4/0106/G
- (v) CLW/ES/3/SK-5/0106/G
- (vi) CLW/ES/3/SK-6/0106/G
- (vii) CLW/ES/3/SK-7/0106/G
- (viii) CLW/ES/3/SK-8/0106/G

b) Specification Nos: RDSO Specification No.: E-10/3/09 (Motor) with Amendment No-1 to 6 (For Motor)

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ISSUE DATE: 20.07.2001

ISSUED BY:

DY. CHIEF ELECTRICAL ENGINEER/D-III
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ALTERATIONS RECORD SHEET

Amend No.	Date of amendment	Page No.	Alteration	Reason	Authority
1	14/8/99		A	Colour, weight and throat dia of Equipment indicated in drg. Sheet No. 17	
2	20/7/2001		B	i) Old specification has been revised and more details are added with same specification No. CLW/ES/3/0106. ii) For motor testing details, this specification has been linked with motor specn. No.CLW/ES/3/0454. iii) Nominal pressure value changed 1.83 bar instead of 1.7 bar vide PLUMETTAZ, SA's document on Sheet No.8.	
3	13/12/2002		C	Pump and motor body should be Die-casted.	
4	31/12/2002		D	(i) Position of Rotation Indicator has been shifted and provided in line with Terminal Box in Drg. No. CLW/ES/3/SK-4/0106 on Sheet No.17. (ii) Drain Plug has been deleted from Drg No. CLW/ES/3/SK-4/0/0106 on Sheet No.17.	
5	11/03/2005		E	i) Clause No. 4.11- 2.7 at Page No.6 & 7 details of bearing changed as per Specn. off Blower Moor Sheet no.21 Specn. No.CLW/ES/3/0454. ii) Schematic Position, ABB Identification Number, Oil Pump type Number has been changed as per OEM Documents.	
6	04/05/2019		F	Nomenclature changed from Oil Pump Transformer to Oil Pump with Motor for Transformer	
7		14	G	Warranty Clause added.	

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NOTE: "Specifications have been digitized and all alterations have been incorporated"

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SPECIFICATION FOR OIL PUMP WITH MOTOR FOR TRANSFORMER FOR 3-PHASE ELECTRIC LOCOMOTIVE

1. SCOPE

The Oil Pump Transformers are used which is powered by 3-phase asynchronous motor supplied by a static converter at the Indian Railways, 3-phase Electric Locomotives.

2. CLIMATE AND ENVIRONMENT CONDITIONS:-

- Maximum atmospheric temperatures : 70°C (Under Sun)
  : 50°C (In shade)
- Humidity : 100% saturation during rainy season.
- Reference Site condition:
  (i) Ambient Temp. : Max.65°C and min. -10°C
  (ii) The contactor will indicate the expected temperature rise in the machine room under reference site condition.
  (iii) Humidity : 60%.
  (iv) Altitude : 160 meters above mean sea level.
- Rainfall : Very heavy in certain areas. The locomotive will be designed to permit it's running at 10 km per hour in flood water level of 102 millimeter above rail level.
- Atmosphere during hot weather : Extremely dusty and desert terrain in certain areas.
- Coastal areas : Locomotive and equipment will be designed to work in coastal areas in humid and salt laden atmosphere.
- Vibration. : The equipment , subsystem and their mounting arrangement will be designed to withstand vibrations and shocks encountered in service as specified in corresponding IEC publications unless otherwise prescribed.

3. STANDARDS

Short – circuit current	Standard publication : IEC 34-1 § 23
Over speed test	Standard publication : IEC 34-1 § 21

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Coolant - tightness test	Standard publication : DIN 42579 § 6.2
Motor insulation test	Standard publication : IEC 1133 § 5.6
Temperature test	Standard publication : IEC 34-1 § 15
Dielectric test	Standard publication : IEC 34-1 § 17
Checking of operating specification	Standard publication : ISO 9905 § 6.3
Checking of operating specification	Standard publication : ISO 3555
Starting torque and starting current	Standard publication : IEC 34-1 § 20
Cold start test	Standard publication : IEC 34 § 16
Technical specification for Centrifugals	Standard publication : ISO 9905
Centrifugal, mixed flow and axial pumps	Standard publication : ISO 3555
Glandless centrifugal pump for transformer	Standard publication : DIN 42579
IEC Standards voltage	: IEC38
Rules for Electric Traction equipment	: IEC77 / 1968
Rules for Testing of Electric rolling	: IEC 77 / 1968
Stock in completion of construction	: IEC 165 / 1973
and before entry into service	: IEC 165 / 1973

4. DESCRIPTION:

4.1 Transformer oil pump unit covered by this specification shall be circulating the hot transformer oil and work as a part of transformer cooling system.

4.2 The pump motor units shall be manufactured generally in accordance with the drawing attached to this specification which is the purpose of guidance and to indicate the overall limits of dimensions to which the equipment is to be built. The tenderer shall however submit along with the quotation a detailed drawing indicating clearly the full constructional details of the equipment offered. The tenderer shall also bring out clearly in a write up all salient features of the equipment offered.

4.3 The motor pump unit shall be of single stage, mixed flow centrifugal type of vertical/horizontal mounting and of integral construction with its driving motor. The motor pump unit shall be capable of the requirement as in given technical data.

4.4 Nominal rated voltage and frequency is 415 V ± 10%, 50 Hz.

4.5 **Normal duty –** Oil pump motor shall be rated for continuous operation at rated output over the full range of supply voltage variation without exceeding the limits of temperature rise subsequently.

4.6 The maximum stating current shall not exceed 7.0 times the normal full load current.

4.7 The slip at rated voltage shall be 2.75%. Permissible value of slip at lowest voltage shall be 5 to 8%.

4.8 **Speed torque characteristics –** The motor characteristics shall be carefully matched with the driven unit to obtained normal duty and starting performance.

4.9 The magnetic design of motor shall be such that the motors do not exhibit saturation behavior up to 457 V. The no load current verses voltage curve for the motors shall have linear characteristic up to 457 V. i.e.. with abrupt slope changes in the no load characteristics. In general the motors shall be designed from magnetic consideration for the highest voltage and from copper consideration for the lowest voltage.

4.10 **Mounting –** The type of mounting shall be adopted as horizontal and foot mounted.

4.11 **Constructional feature:** – The constructional feature of the motor shall be such that there will be space between the stator core of the motor and shell of the pump, through with oil from the transformer will be circulated when the pump sets are in working condition.

4.11-1. **Rotor: -** Dynamically balanced pressure die cast aluminium alloy rotor shall be used for the pump motor.

4.11-2. **Certain design & constructional aspects:-**

4.11-2.1 **Pump Impeller:** The impeller shall be made of Tin – Bronze to IS-306 or equivalent to material used by M/s Plumett and subjected to sand blasting and cleaning by dipping them in kerosene oil. This shall be further cleaned with file and emery paper and rinsed thoroughly with warm transformer oil.

4.11-2.2 The criterion for selection of bearing along with tear life calculation shall be furnished by tenderer. Only angular contact bearing of SKF make shall be used for the pump end bearing.

4.11-2.3 **'O' Seal:-** The 'O' seal shall be manufactured from synthetic rubber compound confirming to specification ASTM-D 735-6177 grade No. 5B.715. The size of the 'O' Seal and their housing shall be according with BS.1806: 1962 (or latest).

4.11-2.4 **Locking of Impeller: -** Locking of the pump impeller on to shaft shall be effective and shall give trouble free performance in service. This point shall specially be indicated in detailed drawings which shall be submitted along with the tender quotation.

4.11-2.5 **Casting of Motor / Pump Body:-** The pump and motor body shall be of aluminium casting. The casting shall be non-porous and it shall hydraulically tested separately

at a pressure of 4.5 bar. No signs of sweating on the motor / pump body shall be noticed. The completely assembled pump motor unit shall like wise be tested before painting. To prevent loose scales and sand particles of the castings for the oil pump set, the interior of the motor frame, the valute chamber of the pump casing and the end shield shall be thoroughly subjected to shot blasting with the help of shot blasting hand gun. This casting shall then be thoroughly cleaned by immersing in kerosene oil bath and ensure interiors of the casing are free from loose scales.

4.11-2.6 **Terminal Box: -** The inside of the terminal box carrier shall be lined with a non-hygroscopic varnished insulating paper to prevent inadvertent contact with terminal screws while fitting. The terminal box on the motor body shall be fitted with leak proof gaskets which shall withstand a temperature of 100°C. The gasket shall have the same composition and properties as the 'O' seal referred. Epoxy moulded glass reinforced terminal block confirming to BS: 3815 shall be provided.

4.11-2.7 **Bearing:** Bearing 6306 of SKF make will be preferred. Bearing shall be properly insulated to prevent earth fault. Firm may use sealed bearing, however firm needs to get their drawing approved from RDSO/CLW/BLW, vendors may also suggest any change in BOM to get better quality.
DE – 4306A open type (SKF / FAG make imported)
NDF – 6306 open type (SKF / FAG make imported)

4.12.1 **Marking of direction of rotation: -** The direction of rotation shall be clearly marked by an embossed arrow on the motor end shield and the pump body.

4.12.2 All bolt fixing holes both in the assembly of the pump and motor as well as in the suction and delivery connections shall be Jig drilled to ensure complete interchangeability.

4.12.3 **Rust Proofing: -** All hardware items employed in the construction of the pump set shall be cadmium plated to classification Cd 8 confirming to IS: 1572.

4.12.4 **Cooling: -** The oil coming from transformer also passes through the space between yoke and core of the stator winding of the motor so that winding may be cooled.

5. TECHNICAL DATA

5.1 NOMINAL DATA FOR OIL PUMP

Oil flow	:	1000 L/Min.
Nominal pressure	:	1.83 bar
Maximum oil inlet temperature.	:	85°C

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Type of oil	:	Shell Diala D (for guidance)
Round per min.	:	2920 r.p.m.
Power mechanical	:	4.7 kW
Efficiency	:	48%
Class of protection	:	IP 65
Sound level (max.)	:	65 dBA

MOTOR

Power consumption	:	5.7 kW
Nominal voltage	:	415 V + 10%
Nominal current*	:	9A
Starting current*	:	64A
Nominal frequency	:	50 Hz
Cos Φ	:	> 0.89
Efficiency	:	> 0.82
Phase	:	3
Form of construction	:	IM
Class of winding insulation	:	H insulation with VPI
*Oil temperature	:	80°C
Class of protection	:	IP65
Noise level at 7.5m	:	Less than 60 dB (A)
Rating	:	Continuous (S1)
Insulation class	:	Mica Insulation/H
Cooling	:	Running in oil
Is/In	:	711%
Nominal torque Tn	:	15.7 Nm.

5.2 COOLANT

Type of coolant	:	Mineral
Designation	:	Shell Diala DX/Equivalent
Kinematic viscosity*	:	19 cSt (mm^2/s)
Density (15°C)	:	0.872 g / cm^3
Specific heat*	:	1.87 kJ/kgK
Thermal Conductivity	:	0.1325 W/mK
Nominal temperature	:	60°C
Maximum temperature	:	85°C

5.3 POWER SUPPLY

Principle of auxiliary converter has been shown at sketch no. CLW/ES/3/SK-2/0106.

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Sketch 2 shows the principle of auxiliary machine, controlled by a static converter.

Line voltage nominal Un : 1000V
Un, max. : 1200V
Line frequency f : 50 Hz±3%
Max. intermediate circuit voltage Uic, Max : 580 V ± 5%

5.4 SUPPLY VOLTAGE

The asynchronous motor will be supplied with the output of an inverter having a pulse width modulated output voltage with following datas: -

Voltage nominal U_V, eff, nom : 415 ± 10% (fundamental wave)
Frequency nominal f_{nom} : 50 Hz (fundamental wave)
Switching frequency (Hz) : 50 (short time max. 300)
Slope du/dt v/µs : < 500
Voltage spikes (VAC) : < 1000 (peak value)
Type of power circuit : Two level

5.5 Voltage stress between motor terminal and earth.

5.5.1 Continuous Operating

Middle point earthing of transformer winding with resistors, current relays for earth fault detection.

$U_{S,}$ max = U_{ic}, max / 2 + U_n, max / √2 = 1153 V (Peak value)

5.5.2 Earth fault stress (stress about 1 day within 10 years)

$U_{S,}$ max = U_{ic}, max / 2 + U_n, max * √2 = 2002 V (Peak value)

6. TEST PROGRAMME :-

6.1 TYPE TEST:

The following are the type tests that should be carried out for complete oil pump of transformer.

- The test temperature corresponds to the oil temperature, which is 60°C.
- Tests are carried out respectively at the nominal voltage as well as at tolerance maximum and minimum voltages, that are 373, 415, 457 V.

6.1.1 Test on Pump with the motor :

Type test	Routine test
(a) Preliminary checking	

(i) Checking of assembly position of drain plug, terminal box and of the rotation indicator are in accordance with the customer requirement (a-b-c positions) and checking of rotary field. (ii) Direction of rotation – Looking at the pump entry side, the impeller must turn counter clock wise. Checking with the rotation indicator device and direction of red arrow according to drawing. (iii) Measurement of vibration.	(a) Preliminary checking same as type test.
(b) (i) **Hydraulic test** The test is carried out on a fully assembled pump. The pump must be tight to an air pressure equal to 4.5 bar during 3 hours. A pressure drop of 2% i.e. 0.1 bar is permitted at the end of the test. A visual control at the air leak is carried out by means of immersion of the oil pump into a water tank. (ii) **Oil Leakage Test**. The test is carried out with hot oil upto 85°C during 3 hours.	(b) Hydraulic test and oil leakage test same as type test.
(c) Characteristics curves The oil being cold record and plot as a function of the oil flow, pressure current, power input, efficiency, speed and power factor at 373 V, 415 V and 457 V.	(c) Characteristics curves. Same as type test but only at 415 V Omitting efficiency.
(d) **Temperature Rise Test** This test **comprise** of measurement and calculation of the temperature rise characteristic between motor winding and coolant temp. This test is carried out at the working pressure and at the working flow rate. The test shall be carried out at 373 V, 415 V and 457 V	(d) **Temperature Rise Test** (One hour test) Same as type test at 373 Voltage for one hour.
(e) **Characteristics Test on pump set.** After the continuous rating temperature is obtained, test will be made at 415 V to measure following characteristics of the motor with the load being varied in steps of 25% from	(e) Characteristics Test on pump set. Same as type test.

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no load to 1.25% times full load. Measure input power, frequency, speed input power factor, output power, on load input current. Perform the test at 373 V and 457 V also at full load. Calculate and record slip and efficiency.	
(f) **Cold Start Test** The test is to be conducted at testing temperature of -15°C as recommended by the standard or at a temperature agreed by the customer. If manufacturer do not have thermic chamber facility, they may do the test with oil having high kinematic viscosity, e.g. Shell DIALA DX Oil have Viscosity 9.2 mm^2/s at 40°C. It can be replaced by VITREA 460 oil having viscosity of 460 mm^2/s at 40°C. The starting resistance obtained at a temperature of 60°C is almost equivalent to the one obtained with the DIALA DX Oil at -15°C. The following measurement are to be taken after 0-2 Seconds, 10 Seconds, 30 Seconds, 1 Min.-2, 3, 4, 5, 6, 7, 8, 9 & 10 min., 12, 14, 16, 18---------56, 58 & 60 min. a. Time b. Oil temperature c. Current d. Pressure e. Input KW f. Delivery l/min. The hot resistance of winding shall be measured after 10 Sec., 10 min., 20 min., 30 min., 40 min., 50 min. and 60 min. Temp. rise of the winding shall be calculated and recorded.	(f) ----------
(g) **Checking of dimension and assembly** Checking of general dimensions of the pump accordance to enclosed drawing No. CLW/ES/3/SK-3/0107.	(g) Checking of dimension and assembly. Same as type test.
(h) **Weighment test** (i) Pump set weight (ii) Impeller weight (iii) Shaft with Rotor and Bearings weight	(h) Weighment test Same as type test.

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6.1.2 Test on Motor (For details refer RDSO Specification no: E-10/3/09 (Motor) with amendment no-1 to 6.)

Type Test	Routine Test
(a) Resistance Measurement	(a) Resistance Measurement
(b) Direction of rotation & terminal marking	(b) Direction of rotation & terminal marking
(c) No load test (100, 200, 300, 374, 415 & 457 volts)	(c) No load test (100, 200, 300, 374, 415 & 457 volts)
(d) Locked Rotor Test. (Short circuit test)	(d) Locked Rotor Test. (Short circuit test)
(e) Pull up and pull out torque test	(e) ----------
(f) Load test	(f) ----------
(g) Temperature Rise test	(g) Temperature Rise test
(h) Over speed test	(h) ----------
(i) High voltage test	(i) High voltage test
(j) Dielectric test – The test is carried out at an over voltage of 3.4 KV during 1 min. at 50 Hz. The test shall be started at a voltage not more than half of the full test voltage being then increased progressively of 5% of full value, minimum every 10 sec. up to the full test voltage. The full voltage test shall not be repeated, however on the request of the purchaser a second test at 80% of the voltage may carried out.	(j) Dielectric test – The test is carried out at an over voltage of 3.4 KV during 1 min. at 50 Hz. The test shall be started at a voltage not more than half of the full test voltage being then increased progressively of 5% of full value, minimum every 10 sec. up to the full test voltage. The full voltage test shall not be repeated, however on the request of the purchaser a second test at 80% of the voltage may carried out.
(k) Vibration test	(k) Vibration test
(l) Starting test	(l) ----------
(m) Surge test	(m) Surge test
(n) Measurement of NOISE level	(n) ----------
(o) Motor insulation test, (test voltage 500V. D.C., I.R must be more than 5 M Ohm for circuits having a rated voltage equal to or more than 300V D.C.).	(o) Motor insulation test, (test voltage 500V. D.C., I.R must be more than 5 M Ohm for circuits having a rated voltage equal to or more than 300V D.C.).

7. Operating condition: -

7.1 **<u>Operational time</u>**

Daily approx. : 16 hours (aprox. 330 days per year)
Yearly approx. : 5,280 hours
Within 30 years approx. : 1, 58, 400 Hours
Life time under correct maintenance : 30 years

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7.2 **Reliability**

According to chapter "Environmental condition" the MTBF of 1 motor shall be at least 40,000 hours. The lifetime of bearings shall be at least 20,000 hours.

8. Name Plate

Firm should emboss following data in their product.

i. Manufacturer's name, type and Sl. No.
ii. Power consumption in KV
iii. Rated speed
iv. Weight
v. Nominal voltage
vi. Nominal current
vii. Insulation class
viii. Inspection
ix. Manufacturing date and year
x. Oil temperature
xi. Direction of rotation by arrow mark (in red)
xii. Direction of oil flow by arrow mark (in red)

9. Drawings:

i. Dimensional drawing of motor CLW/ES/3/SK-1/0106/G
ii. Torque speed characteristic curve CLW/ES/3/SK-2/0106/G
iii. Aux. Machine controlled by a static converter CLW/ES/3/SK-3/0106/G
iv. Dimensional drawing of Pump CLW/ES/3/SK-4/0106/G
v. Sectional Diagram of pump CLW/ES/3/SK-5/0106/G
vi. Sectional Diagram of pump CLW/ES/3/SK-6/0106/G
vii. Assly. Wheel checking CLW/ES/3/SK-7/0106/G
viii Assly. Plate of Terminal CLW/ES/3/SK-8/0106/G

10. Reference

Schematic position on lieu of apparatus 62 ABB identification No. HBTB585513R2761
Motor type - 112M – 2B, Make Landert Motoren.
Oil Pump type : PLU-TA-08 2174/15, 11 KW, Make – Plumettnz SA.
Required quantity is 2 Nos. per loco
` Supplier's Address:-

Plumett SA
Zone Industrielle
CH – 1880
Bex
Switzerland
Ph. No.004125630606

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11. WARRANTY :- The supplier must give a clear warranty for a period of 42 month from the date of Supply or 36 Month from the date of commissioning in locomotives whichever is earlier.

NOTE

1. The Tenderer may offer body of pump made of cast iron as an alternative with only slight variation in the weight of the pump.
2. All hardware and fasteners are to be used from UVAM Approved/Developmental source only.

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Annexure – I

SECTION VIEW OF OIL PUMP

SEQ.	DESCRIPTION
0	DRAWING : CIRCULATOR TA GLF OIL PUMP
0	1ST START-UP CIRCULATING PUMP
1	TIGHT WASH 8, 7/13 X 1
2	SCREW, VENTILATION
3	JOINT
4	BALL BEARING 30 / 72 X 30, 2 ANGULAR
5	RECTIFIER A
6	CIRCLIPS I 72 X 2, 5 J
8	SCREW M8X10, SLOT
9	SOCK SCREW , M 8X12 HD CAP
10	ROTOR, 94 X 117/335
11	LINING, STATOR
12	STATOR 4, 713 X 415 D 50 GLF
13	FRAME A
14	THERMOPLASTIC SHEET
18	HEX. SCREW MI 10X45 /26
19	SPRING WASH 10 / 18, 1X1, 8
20	BALL BEARING 30 / 72 X 19
21	FLANGE, OUT LET, ND80, NP 6
25	ASSY, WHEEL, CHECKING
34	COMPRESSION –SPRING
35	O-RING 18, 72X2, 62
36	LEANING, SPRING
37	RING, CHECKING
38	SCREW M 3X5, SOCK SET +CUP
39	PLUG
40	CHAN NAIL 2 X 4
41	LABEL - PLATE
42	ASSY. PLATE TERMINALS
43	HEX. SCREW M6 X 20
49	WASHER 6, 4 /12, 5X1,6
50	SPRING – WASH 6/11, 8X1, 3
51	HEX. NUT M 6
53	ROUND TERMINAL 1, 5 – 5, 3
57	WASHER 5, 3/10 X 1
59	CONNCTION SCHEME, THREE-PHASE
60	SPRING – WASH 5/9, 2X1
61	HEX. NUT M 5

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Annexure –II

SECTION VIEW OF OIL PUMP

SEQ.	DESCRIPTION
62	HEX. SCREW M6X20
63	COVER
64	JOINT
65	BOX, TERMINALS
75	26X8 JOINT CABLE GLAND
76	WASHER 21 / 26 X 1
77	CABLE GLAND PG 21 HEAD
78	SOCK SCREW, M 8 X 50/28 HD CAP
79	SPRING – WASH 8/12, 8X2
82	JOINT
83	SCREW M 8X25, SOCK SET + H-DOG
84	WASHER 30, 1 / 36 X 0, 1
85	WASHER 30, 1 / 36 X 0, 2
86	WASHER 30, 1 / 36 X 0, 2
88	SLOT NUT M 30 X 1 , 5 GT
89	FLAT KEY 8 / 7 X 25 A
90	IN COVER 72 / 37, 2 X 2, 5 GT
91	FLANGE, INLET, BND, NP 6
92	CENTRIFUGAL WHEEL
910	LOCTITE 638 GREEN RETAINER
922	GLUE, 2- COM ARALDIT 144 - 2
932	RIBBON 12, 7 TEFLON GOLDEAD
934	PERMATEX NO.31 GASKET

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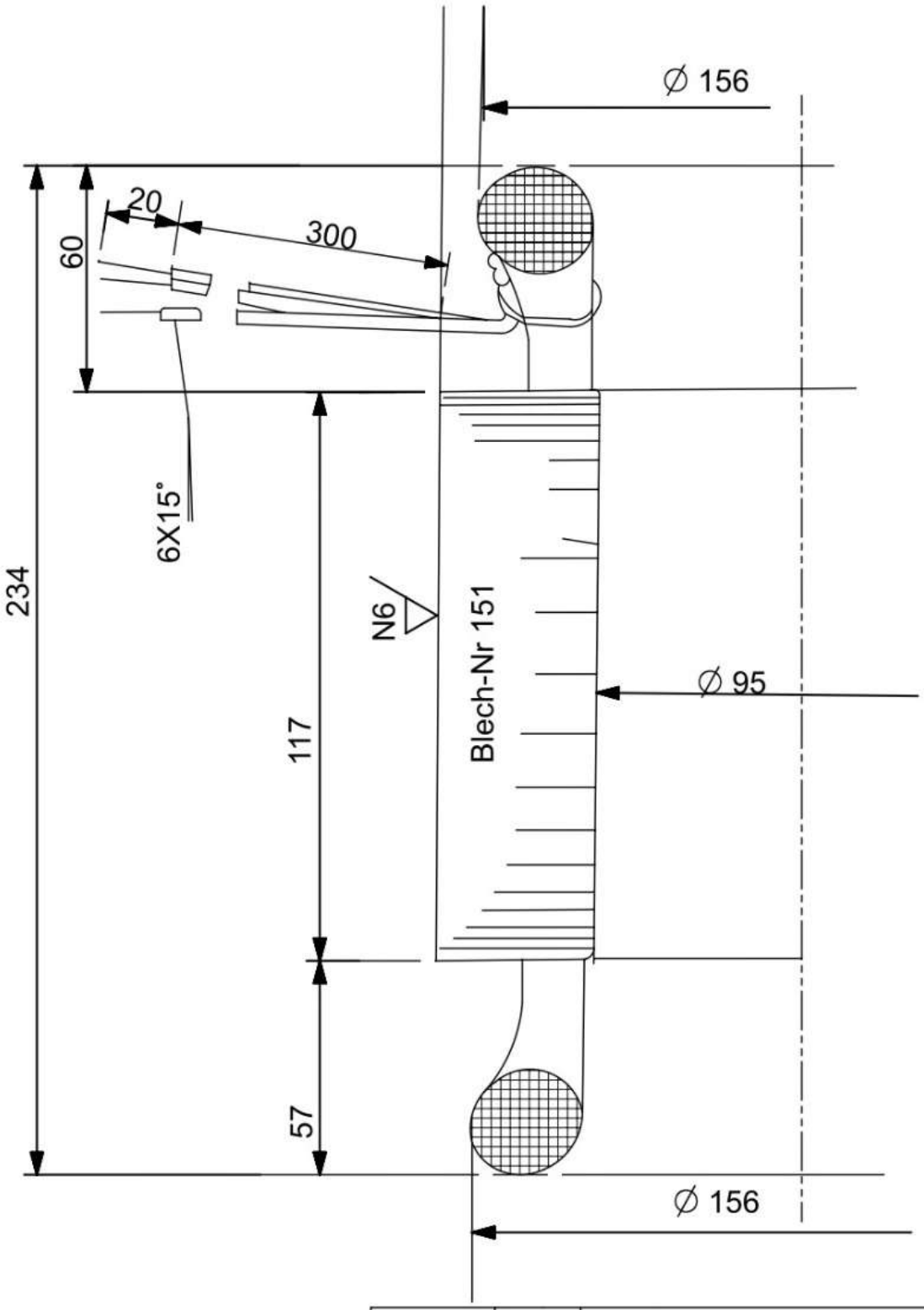
Annexure –III

SEQ.	DESCRIPTION
1	SPINDLE
2	SOCKET, GUIDE
3	O – RING 2.9 X 1.78
5	BALL BEARING 5 / 16 X 5
10	SOCKET, TIGHTNESS
11	SPACING BUSH
12	WHEEL, CHECKING

Annexure –IV

SEQ.	DESCRIPTION
0	ASSY. PLATE, TERMINALS
1	TERMINAL CONNECTION
2	WASHER 5 / 12 X 1
4	WASHER 5, 3/10 X 1
6	HEX NUT, M 5
10	PLATE, TERMINALS
5	SPRING WASH 5/8, 7 X 1.2

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All dimensions are in mm.

परिवर्तन संख्या ALT.NO.	प्राधिकार AUTHY	वर्णन DESCRIPTION	दिनांकित बाद्वार DATED INITIAL

सतह – रुक्षता का मान भा. मा. 3073 / अ. मा. सं. 1302 SURFACE ROUGHNESS VALUE TO IS:3073 / ISO:1302	अनिर्दिष्ट सह्य – सीमा भा. मा. : 2102 / अ. मा. सं. : 2768 UNSPECIFIED TOLEARANCE TO IS : 2102 / ISO : 2768	TOL. CLS.
	धातु–वेल्डन चिन्ह भा. मा. : 813 / अ. मा. सं. :2553 WELDING SYMBOLS TO IS:813 / ISO:2553	

पदांक GRADE NO.	सं1 N1	सं2 N2	सं3 N3	सं4 N4	सं5 N5	सं6 N6	सं7 N7	सं8 N8	सं9 N9	सं10 N10	सं11 N11	सं12 N12
Rz	0.16-0.3	0.5-0.7	0.9-1.1	1.5-2.0	2.5-3.8	5.0-6.3	9.0-12	16-25	30-40	50-63	75-100	160-250
Ra μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50
चिन्ह SYMBOL												

अभिकल्पित DGN	
जाँचा व.अ.अ. CHD SSE	
समीक्षित स.वि.अ. / व.वि.अ. REVIEWED AEE / SEE	
अनुमोदित उ.मु.वि.अ. APPROVED DYCEE	
दिनांक DATE	
रैखिक अनुपात SCALE	NTS
संदर्भ / REF. ALT.-	

चित्तरंजन रेलइंजन कारखाना
CHITTARANJAN LOCOMOTIVE WORKS, INDIA

पदार्थ MATL	प्रति भार कि. ग्रा. WT. EACH IN KG
विशिष्टि SPECN	

वर्णन DESCRIPTION: **OIL PUMP WITH MOTOR FOR TRANSFORMER**

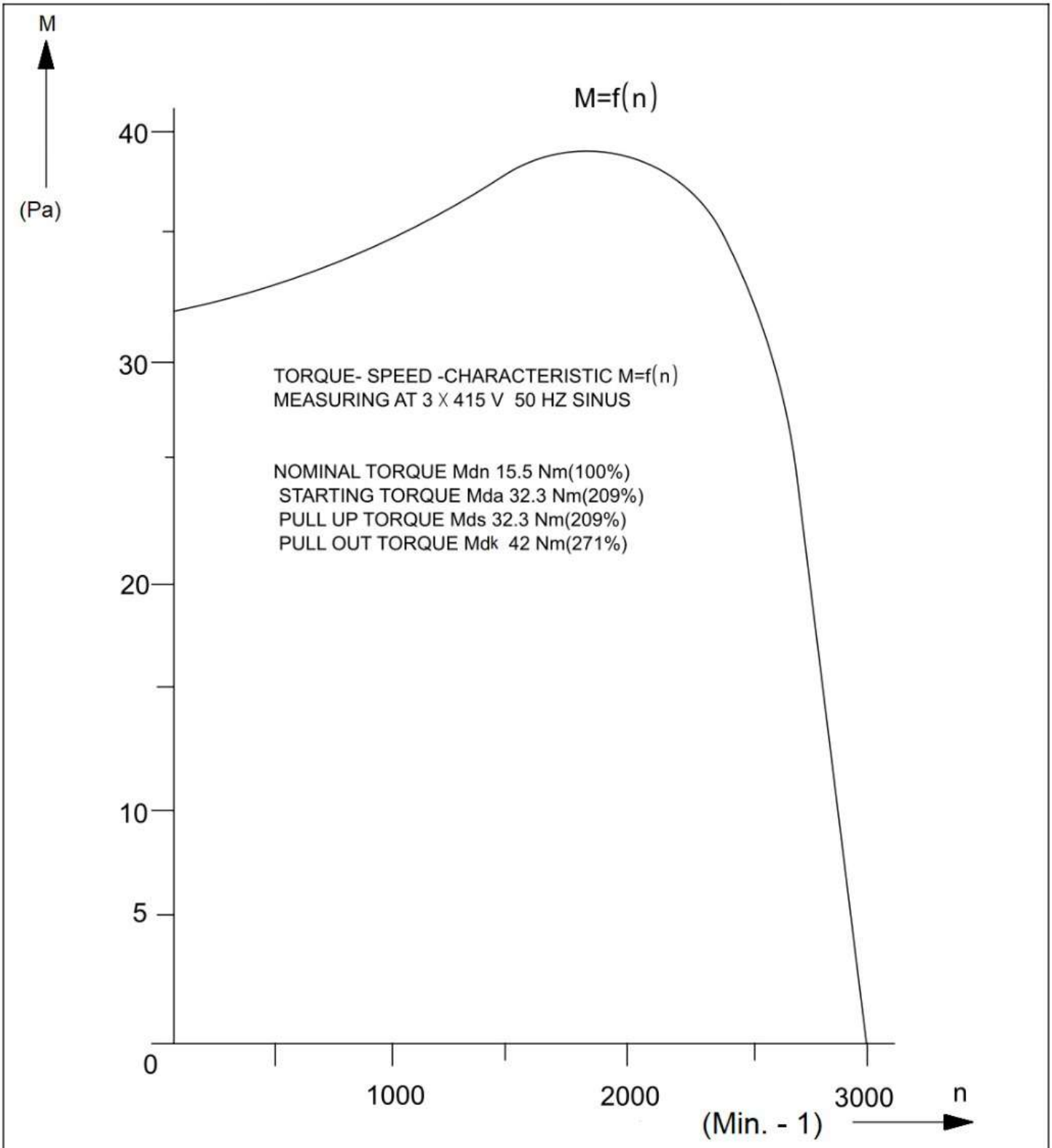
आरेखण संख्या DRAWING NO.: CLW/ES/3/SK-1/0106/G

परिवर्तन संख्या ALTERATION. NO. | पर्ण SHEET 1 OF 1 | A4

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REDRAWN BY COE

Test12347



परिवर्तन संख्या ALT.NO.	प्राधिकार AUTHY	वर्णन DESCRIPTION	दिनांकित हस्ताक्षर DATED INITIAL

सतह – रुक्षता का मान भा. मा. 3073 / अ. मा. सं. 1302 SURFACE ROUGHNESS VALUE TO IS:3073 / ISO:1302	अनिर्दिष्ट सह्य – सीमा भा. मा. : 2102 / अ. मा. सं. : 2768 UNSPECIFIED TOLEARANCE TO IS : 2102 / ISO : 2768	TOL. CLS.
	धातु–वेल्डन चिन्ह भा. मा. : 813 / अ. मा. सं. :2553 WELDING SYMBOLS TO IS:813 / ISO:2553	

पदांक GRADE NO.	सं1 N1	सं2 N2	सं3 N3	सं4 N4	सं5 N5	सं6 N6	सं7 N7	सं8 N8	सं9 N9	सं10 N10	सं11 N11	सं12 N12
Rz	0.16-0.3	0.5-0.7	0.9-1.1	1.5-2.0	2.5-3.8	5.0-6.3	9.0-12	16-25	30-40	50-63	75-100	160-250
Ra μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50
चिन्ह SYMBOL												

अभिकल्पित DGN	
जाँचा व.अ.अ. CHD SSE	
समीक्षित स.वि.अ. / व.वि.अ. REVIEWED AEE / SEE	
अनुमोदित उ.मु.वि.अ. APPROVED DYCEE	
दिनांक DATE	
रैखिक अनुपात SCALE	N.T.S
संदर्भ / REF. ALT.-	

चित्तरंजन रेलइंजन कारखाना
CHITTARANJAN LOCOMOTIVE WORKS, INDIA

पदार्थ MATL	प्रति भार कि. ग्रा. WT. EACH IN KG
विशिष्टि SPECN	

वर्णन DESCRIPTION: OIL PUMP WITH MOTOR FOR TRANSFORMER

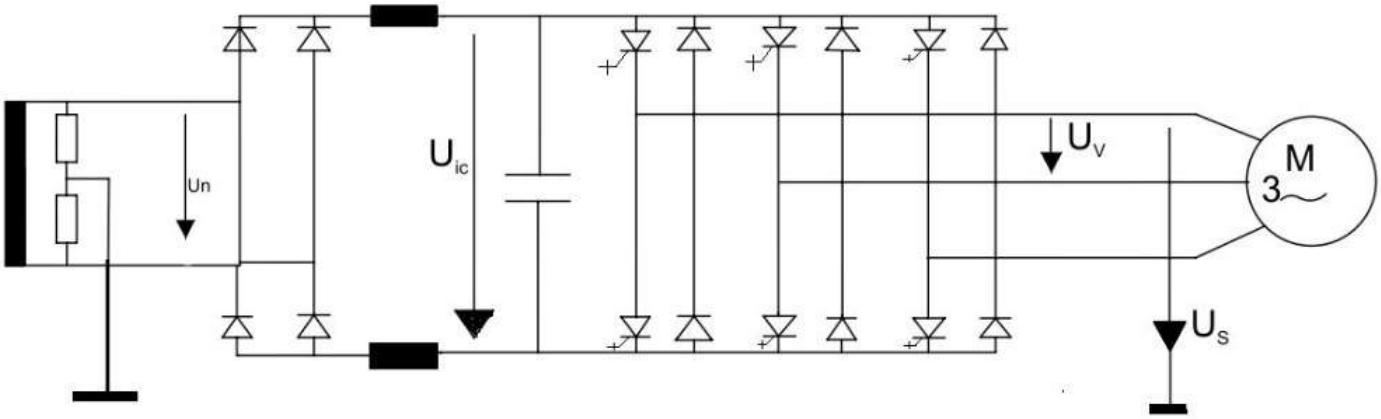
आरेखण संख्या DRAWING NO.: CLW/ES/3/SK-2/0106/G

परिवर्तन संख्या ALTERATION. NO. | पर्ण SHEET 1 OF 1 | A4

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REDRAWN BY COE

Test12347



परिवर्तन संख्या ALT.NO.	प्राधिकार AUTHY	वर्णन DESCRIPTION	दिनांकित हस्ताक्षर DATED INITIAL

सतह – रूक्षता का मान भा. मा. 3073 / अ. मा. सं. 1302 SURFACE ROUGHNESS VALUE TO IS:3073 / ISO:1302	अनिर्दिष्ट सह्य – सीमा भा. मा. : 2102 / अ. मा. सं. : 2768 UNSPECIFIED TOLEARANCE TO IS : 2102 / ISO : 2768	TOL. CLS.
	धातु–वेल्डन चिन्ह भा. मा. : 813 / अ. मा. सं. :2553 WELDING SYMBOLS TO IS:813 / ISO:2553	

पदांक GRADE NO.	सं1 N1	सं2 N2	सं3 N3	सं4 N4	सं5 N5	सं6 N6	सं7 N7	सं8 N8	सं9 N9	सं10 N10	सं11 N11	सं12 N12
Rz	0.16-0.3	0.5-0.7	0.9-1.1	1.5-2.0	2.5-3.8	5.0-6.3	9.0-12	16-25	30-40	50-63	75-100	160-250
Ra μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50
चिन्ह SYMBOL												

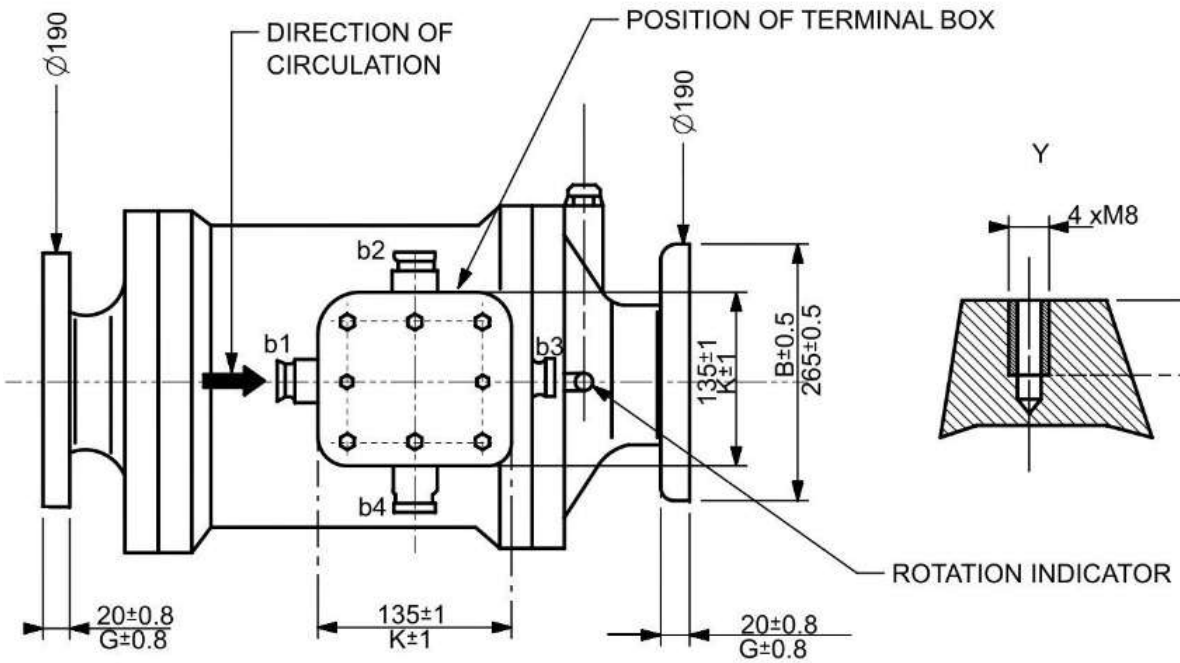
अभिकल्पित DGN	
जाँचा व.अ.अ. CHD SSE	
समीक्षित स.वि.अ. / व.वि.अ. REVIEWED AEE / SEE	
अनुमोदित उ.मु.वि.अ. APPROVED DYCEE	
दिनांक DATE	
रैखिक अनुपात SCALE	N.T.S
संदर्भ / REF. ALT.-	

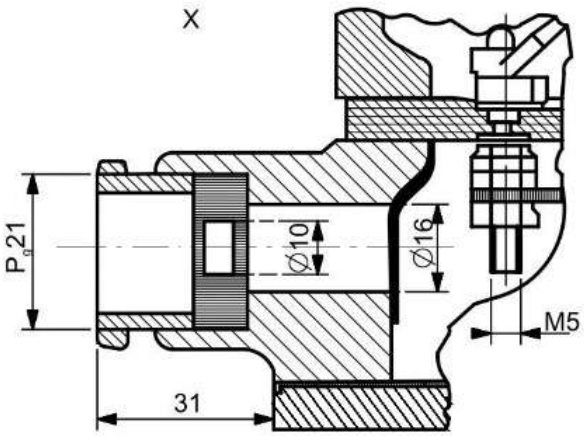
चित्तरंजन रेलइंजन कारखाना
CHITTARANJAN LOCOMOTIVE WORKS, INDIA

पदार्थ MATL	प्रति भार कि. ग्रा. WT. EACH IN KG
विशिष्टि SPECN	
वर्णन DESCRIPTION	OIL PUMP WITH MOTOR FOR TRANSFORMER
आरेखण संख्या DRAWING NO.	CLW/ES/3/SK-3/0106/G
परिवर्तन संख्या ALTERATION. NO.	पर्ण SHEET 1 OF 1 — A4

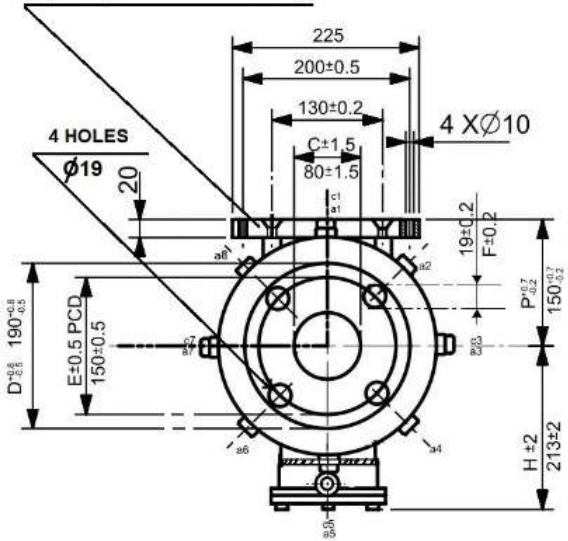
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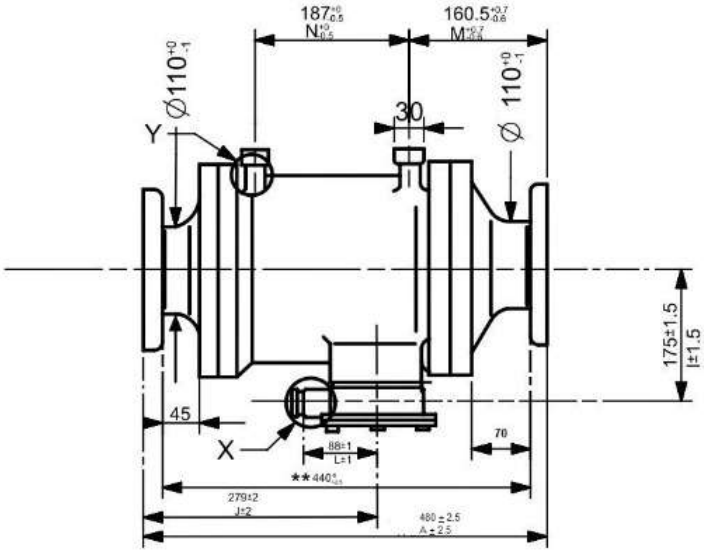
REDRAWN BY COE





* See note 6
(Option) : With 1 or 2 Fixing Feet





NOTE:
1) SURFACE PROTECTION : EPOXY RESIN
2) PAINTING : RAL 7009 FINISH SILKY
3) GROSS WEIGHT : 56KG. APPROX
4) C&D NO. : - T017/004
5) QTY./LOCO : -02 NOS.
* 6 FIXING FEET IS NOT REQUIRED FOR OIL - PUMP TRANSFORMER FOR WAG-9 LOCO
7) ** ⟶ DIMENSIONS TO BE MAINTAINED

All Dimensions are in mm.

धातु–वेल्डन चिन्ह भा. मा. : 813 / अ. मा. सं. :2553 WELDING SYMBOLS TO IS:813 / ISO:2553	अनिर्दिष्ट सद्य – सीमा भा. मा. : 2102 / अ. मा. सं. : 2768 UNSPECIFIED TOLERANCE TO IS : 2102 / ISO : 2768											TOL. CLS.
	ग्रेडांक GRADE NO.	सं1 N1	सं2 N2	सं3 N3	सं4 N4	सं5 N5	सं6 N6	सं7 N7	सं8 N8	सं9 N9	सं10 N10	सं11 N11	सं12 N12
सतह – रुक्षता का मान भा. मा. 3073 / अ. मा. सं. 1302 SURFACE ROUGHNESS VALUE TO IS:3073 / ISO:1302	Rz	0.16-0.3	0.5-0.7	0.9-1.1	1.5-2.0	2.5-3.8	5.0-6.3	9.0-12	16-25	30-40	50-63	75-100	100-250
	Ra μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50
	चिन्ह SYMBOL												

परिवर्तन संख्या ALT. NO.	प्राधिकार AUTHY	वर्णन DESCRIPTION	दिनांकित आद्याक्षर DATED INITIAL

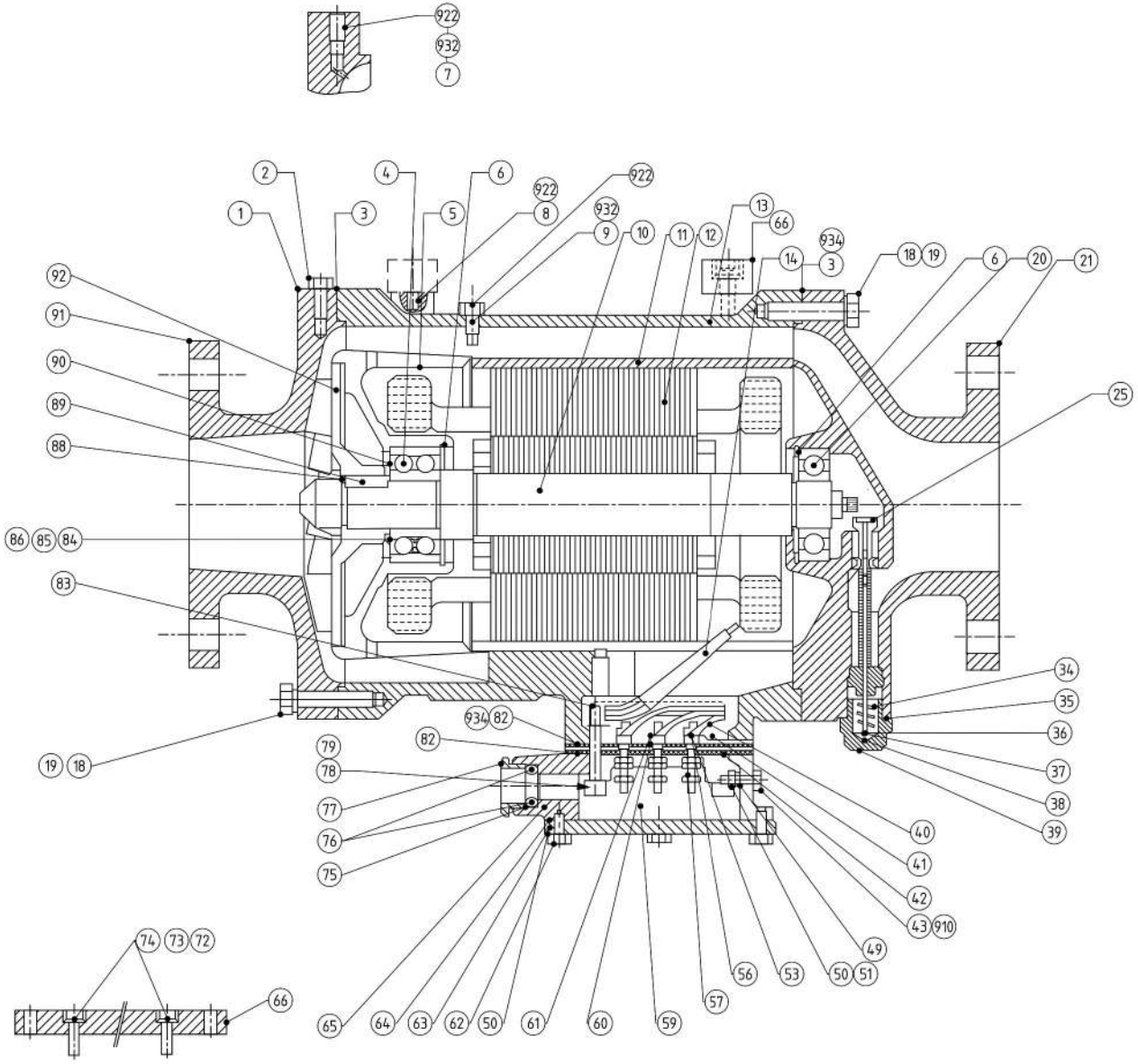
अभिकल्पित DSN	
जाँचा व.अ.अ. CHD SSE	
समीक्षित च.वि.अ. / च.वि.अ. REVIEWED AEE / SEE	
अनुमोदित च.मु.वि.अ. APPROVED DYCEE	
दिनांक DATE	
रैखिक अनुपात SCALE	N.T.S
संदर्भ / REF.	ALT:-

चित्तरंजन रेलइंजन कारखाना
CHITTARANJAN LOCOMOTIVE WORKS, INDIA

पदार्थ MATL	प्रति भार कि. ग्रा. WT. EACH IN KG
विशिष्टि SPECN	
वर्णन DESCRIPTION	OIL PUMP WITH MOTOR FOR TRANSFORMER
आरेखण संख्या DRAWING NO.	CLW/ES/3/SK-4/0106/G
परिवर्तन संख्या ALTERATION NO.	पृष्ठ SHEET 1 OF 1 — A3

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REDRAWN BY TCS



Details in Annexure I & II

धातु-वेल्डन चिन्ह भा. मा. : 813 / अ. मा. सं. :2553 WELDING SYMBOLS TO IS:813 / ISO:2553	अनिर्दिष्ट सत्रह – सीमा भा. मा. : 2102 / अ. मा. सं. : 2768 UNSPECIFIED TOLERANCE TO IS : 2102 / ISO : 2768										TOL. CLS.	
सतह – खराश का मान भा. मा. 3073 / अ. मा. सं. 1302 SURFACE ROUGHNESS VALUE TO IS:3073 / ISO:1302	ग्रेडांक GRADE NO.	घटा N1	घटा N2	घटा N3	घटा N4	घटा N5	घटा N6	घटा N7	घटा N8	घटा N9	घटा N10	घटा N11	घटा N12
	Ra	0.8-4.3	8.5-17	18-11	15-50	25-100	50-200	100-400	200-800	400-1600	800-3200	1600-6300	3200-12500
	Ra µm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50
	चिन्ह SYMBOL												

परिवर्तन संख्या ALT. NO.	प्राधिकार AUTHY	वर्णन DESCRIPTION	दिनांकित आरेखण DATED INITIAL

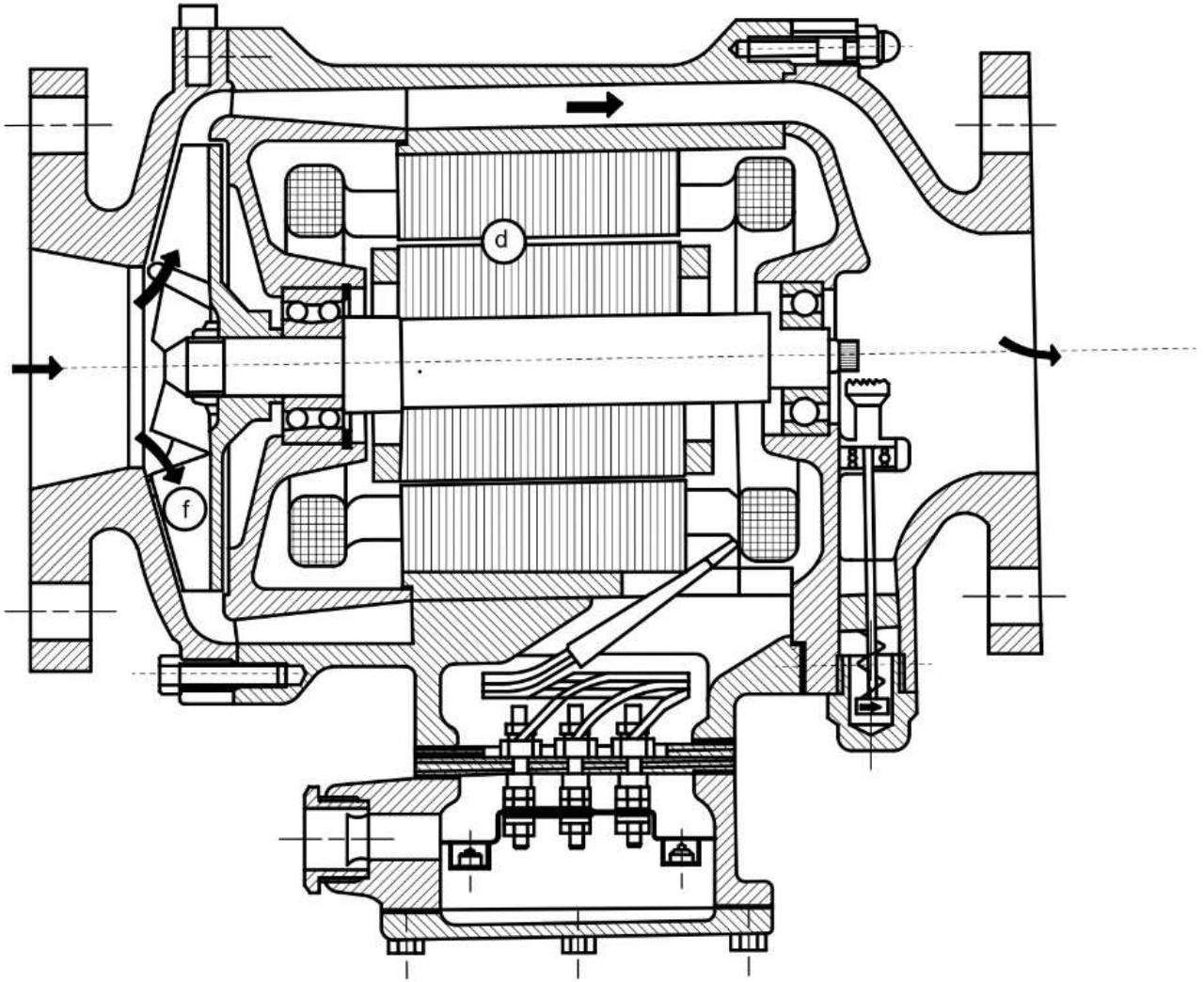
अभिकल्पित DSN	
जीका स.अ.अ. CHD SSE	
समीक्षित स.डि.अ. / स.डि.अ. REVIEWED AEE / SEE	
अनुमोदित उ.अ.डि.अ. APPROVED DYCEE	
दिनांक DATE	
रेखिक अनुपात SCALE	N.T.S
संदर्भ / REF.	ALT.-

चित्तरंजन रेलइंजन कारखाना
CHITTARANJAN LOCOMOTIVE WORKS, INDIA

पदार्थ MATL	प्रति भाग कि. ग्रा. WT. EACH IN KG
विशिष्टि SPECN	
वर्णन DESCRIPTION	OIL PUMP WITH MOTOR FOR TRANSFORMER
आरेखण संख्या DRAWING NO.	CLW/ES/3/SK-5/0106/ G
परिवर्तन संख्या ALTERATION NO.	पृष्ठ SHEET OF
	A2

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REDRAWN BY CDE



धातु–वेल्डन चिन्ह भा. मा. : 813 / अ. मा. सं. :2553 WELDING SYMBOLS TO IS:813 / ISO:2553	अनिर्दिष्ट सह्य – सीमा भा. मा. : 2102 / अ. मा. सं. : 2768 UNSPECIFIED TOLEARANCE TO IS : 2102 / ISO : 2768											TOL. CLS.	
	ग्रेडांक GRADE NO.	सं1 N1	सं2 N2	सं3 N3	सं4 N4	सं5 N5	सं6 N6	सं7 N7	सं8 N8	सं9 N9	सं10 N10	सं11 N11	सं12 N12
सतह – रुक्षता का मान भा. मा. 3073 / अ. मा. सं. 1302 SURFACE ROUGHNESS VALUE TO IS:3073 / ISO:1302	Rz	0.16-0.3	0.5-0.7	0.9-1.1	1.5-2.0	2.5-3.8	5.0-6.3	9.0-12	16-25	30-50	50-63	75-100	100-250
	Ra μm	0.075	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50
	चिन्ह SYMBOL												

परिवर्तन संख्या ALT. NO.	प्राधिकार AUTHY	वर्णन DESCRIPTION	दिनांकित आधार DATED INITIAL

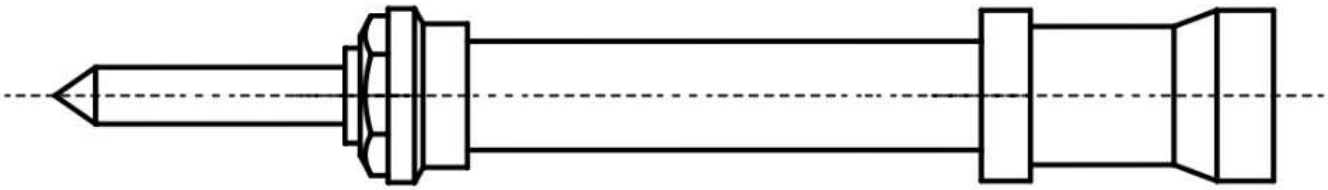
अभिकल्पित DSN	
जाँचा व.अ.अ. CHD SSE	
समीक्षित च.वि.अ. / च.वि.अ. REVIEWED AEE / SEE	
अनुमोदित च.मु.वि.अ. APPROVED DYCEE	
दिनांक DATE	
रैखिक अनुपात SCALE	NTS
संदर्भ / REF.	ALT:-

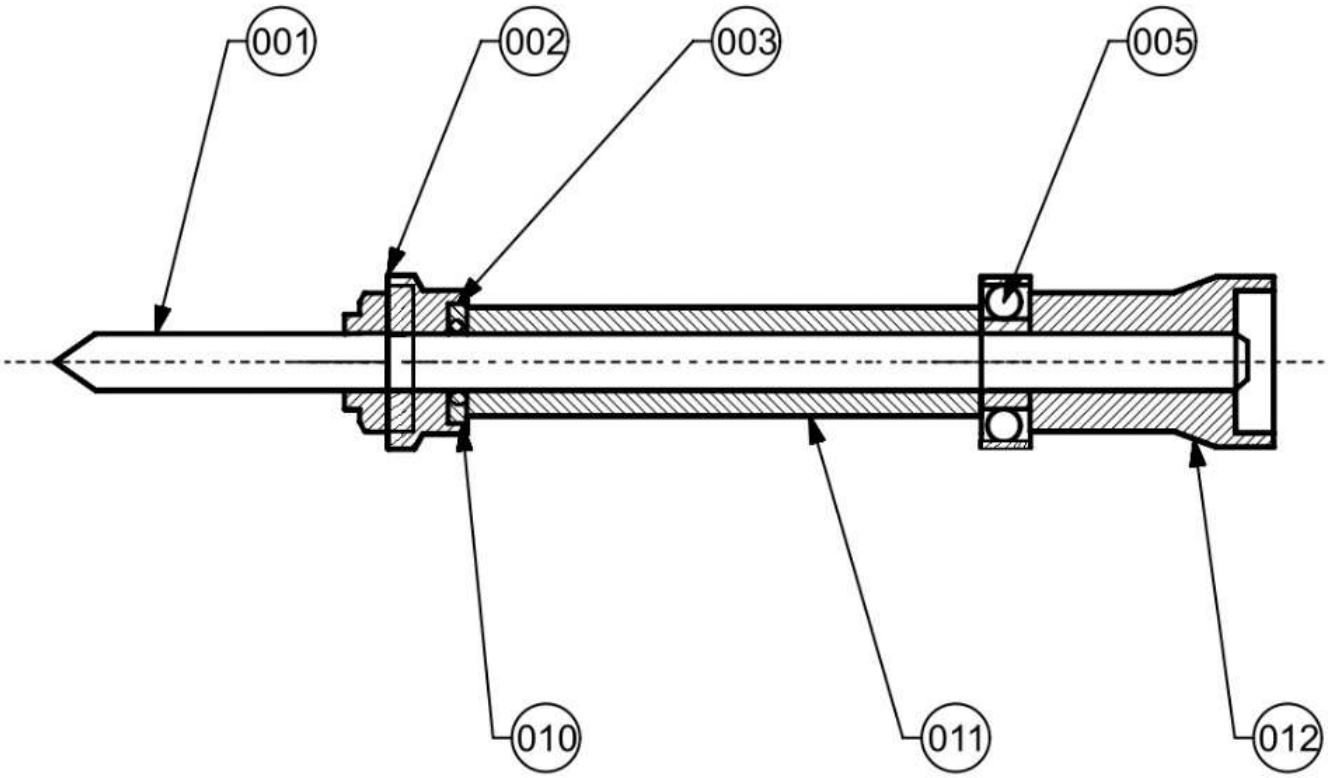
चित्तरंजन रेलइंजन कारखाना
CHITTARANJAN LOCOMOTIVE WORKS, INDIA

पदार्थ MATL	प्रति भार कि. ग्रा. WT. EACH IN KG
विशिष्टि SPECN	
वर्णन DESCRIPTION	OIL PUMP WITH MOTOR FOR TRANSFORMER
आरेखण संख्या DRAWING NO.	CLW/ES/3/SK-6/0106/ G
परिवर्तन संख्या ALTERATION NO.	पृष्ठ SHEET 1 OF 1
	A3

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REDRAWN BY COE





Detailss in Annexure III

परिवर्तन संख्या ALT.NO.	प्राधिकार AUTHY	वर्णन DESCRIPTION	दिनांकित बाबत DATED INITIAL

सतह – रूक्षता का मान भा. मा. 3073 / अ. मा. सं. 1302 SURFACE ROUGHNESS VALUE TO IS:3073 / ISO:1302	अनिर्दिष्ट सह्य – सीमा भा. मा. : 2102 / अ. मा. सं. : 2768 UNSPECIFIED TOLEARANCE TO IS : 2102 / ISO : 2768	TOL. CLS.
	धातु–वेल्डन चिन्ह भा. मा. : 813 / अ. मा. सं. :2553 WELDING SYMBOLS TO IS:813 / ISO:2553	

पदांक GRADE NO.	सं1 N1	सं2 N2	सं3 N3	सं4 N4	सं5 N5	सं6 N6	सं7 N7	सं8 N8	सं9 N9	सं10 N10	सं11 N11	सं12 N12
Rz	0.16-0.3	0.5-0.7	0.9-1.1	1.5-2.0	2.5-3.8	5.0-6.3	9.0-12	16-25	30-40	50-63	75-100	160-250
Ra μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50
चिन्ह SYMBOL												

अभिकल्पित DGN	
जाँचा व.अ.अ. CHD SSE	
समीक्षित स.वि.अ. / व.वि.अ. REVIEWED AEE / SEE	
अनुमोदित उ.मु.वि.अ. APPROVED DYCEE	
दिनांक DATE	
रैखिक अनुपात SCALE	N.T.S
संदर्भ / REF.	ALT.-

चित्तरंजन रेलइंजन कारखाना
CHITTARANJAN LOCOMOTIVE WORKS, INDIA

पदार्थ MATL	प्रति भार कि. ग्रा. WT. EACH IN KG
विशिष्टि SPECN	

वर्णन DESCRIPTION: **OIL PUMP WITH MOTOR FOR TRANSFORMER**

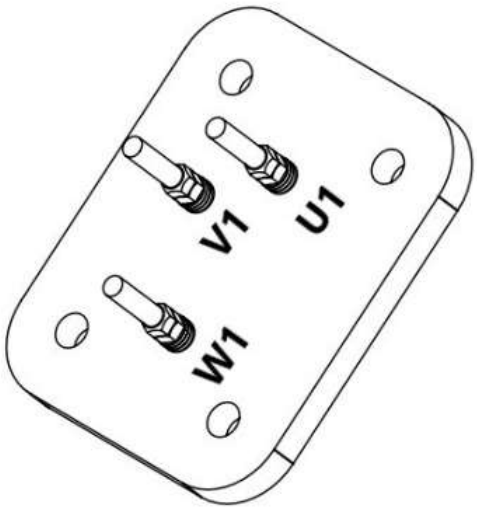
आरेखण संख्या DRAWING NO.: CLW/ES/3/SK-7/0106/G

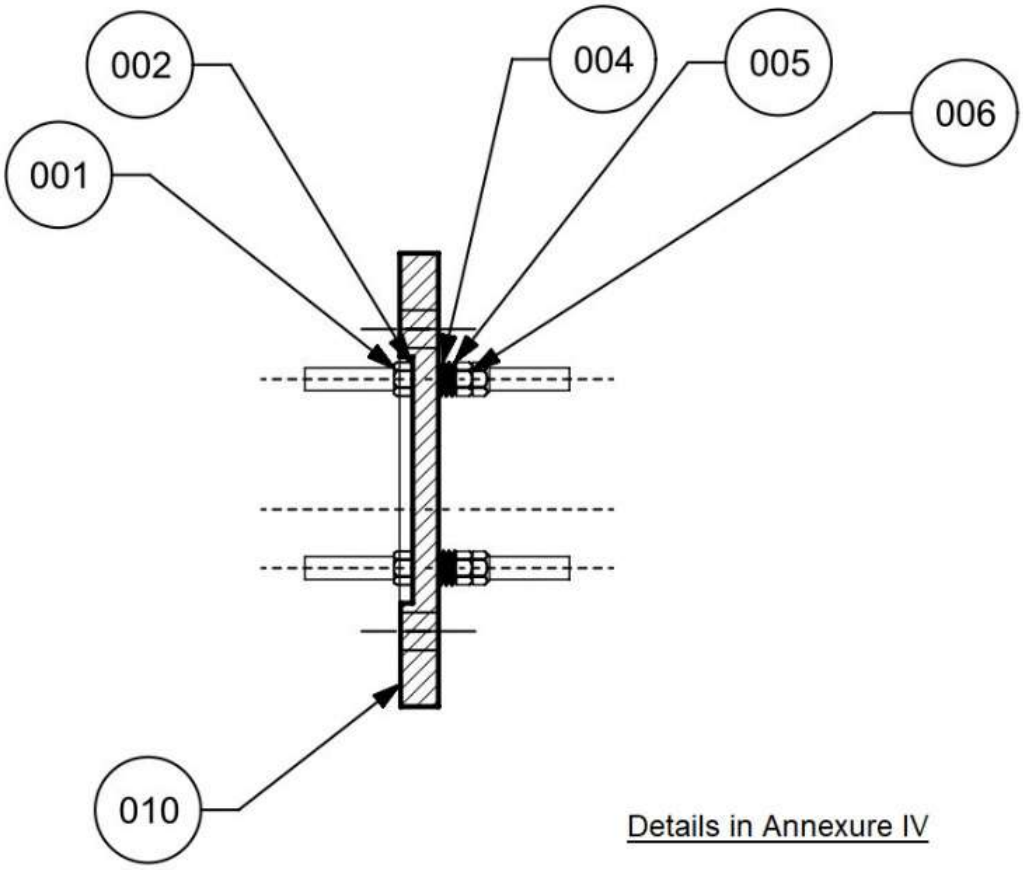
परिवर्तन संख्या ALTERATION. NO. | पर्ण SHEET 1 OF 1 | A4

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REDRAWN BY COE

Test12347





Details in Annexure IV

परिवर्तन संख्या ALT.NO.	प्राधिकार AUTHY	वर्णन DESCRIPTION	दिनांकित बाबत DATED INITIAL

सतह – रुक्षता का मान भा. मा. 3073 / अ. मा. सं. 1302 SURFACE ROUGHNESS VALUE TO IS:3073 / ISO:1302	अनिर्दिष्ट सह्य – सीमा भा. मा. : 2102 / अ. मा. सं. : 2768 UNSPECIFIED TOLEARANCE TO IS : 2102 / ISO : 2768	TOL. CLS.
	धातु–वेल्डन चिन्ह भा. मा. : 813 / अ. मा. सं. :2553 WELDING SYMBOLS TO IS:813 / ISO:2553	

पदांक GRADE NO.	सं1 N1	सं2 N2	सं3 N3	सं4 N4	सं5 N5	सं6 N6	सं7 N7	सं8 N8	सं9 N9	सं10 N10	सं11 N11	सं12 N12
Rz	0.16-0.3	0.5-0.7	0.9-1.1	1.5-2.0	2.5-3.8	5.0-6.3	9.0-12	16-25	30-40	50-63	75-100	160-250
Ra μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50
चिन्ह SYMBOL												

अभिकल्पित DGN	
जाँचा व.अ.अ. CHD SSE	
समीक्षित स.वि.अ. / व.वि.अ. REVIEWED AEE / SEE	
अनुमोदित उ.मु.वि.अ. APPROVED DYCEE	
दिनांक DATE	
रैखिक अनुपात SCALE	N.T.S
संदर्भ / REF.	
ALT.-	

चित्तरंजन रेलइंजन कारखाना
CHITTARANJAN LOCOMOTIVE WORKS, INDIA

पदार्थ MATL	प्रति भार कि. ग्रा. WT. EACH IN KG
विशिष्टि SPECN	

वर्णन DESCRIPTION: **OIL PUMP WITH MOTOR FOR TRANSFORMER**

आरेखण संख्या DRAWING NO.: CLW/ES/3/SK-8/0106/G

परिवर्तन संख्या ALTERATION. NO. | पर्ण SHEET 1 OF 1 | A4

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