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भारत सरकार
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GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

अनुसंधान अभिकल्प एवं मानक संगठन
रेल मंत्रालय

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यूनिट 500 ऐम्पियर रेटिंग की विषयि

**SPECIFICATION FOR HIGH CAPACITY INTER VEHICULAR COUPLER
UNIT (500 AMPS. RATING) FOR EOG TYPE AC COACHES/POWER
CARS**

आर.डी.एस.ओ./पी.ई./एस पी ई सी/ए.सी./0177 (संशोधन)-2013

RDSO/PE/SPEC/AC/0177 (Rev.0)-2013

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ED/PS & EMU

Prepared by SSE/Elect	Checked by DSE(TL-AC System Design)
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Index

Clause No.	Description	Page No.
1.0	Scope	3
2.0	Governing Specifications	3
3.0	Basic General Requirements & Service Conditions	4
4.0	Design and Technical Requirements	5
5.0	Material of components	8
6.0	Marking	9
7.0	Tests	9
8.0	Technical Data	13
9.0	Manufacturer's responsibility	14
10.0	Warranty period and liability	14
11.0	Infringement of patent right	14
12.0	Schedule of Technical Requirement (STR)	15
13.0	Maintenance Manual	15
14.0	Enclosures	15
--	Annexure -A	16
--	Distribution List	17

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SPECIFICATION FOR HIGH CAPACITY INTER VEHICULAR (IV) COUPLER UNIT (500 AMPS. RATING) FOR EOG TYPE AC COACHES/POWER CARS

FOREWARD

At present Rajdhani/Shatabdi trains are working on End on Generation (EOG) system. Power generated in the power car at the ends of the rake is fed to each coach of the rake through inter vehicular coupler. The existing Inter Vehicular (IV) couplers used in LHB AC Coaches (Rajdhani/shatabdi trains) are rated for 400 Amps, which is suitable for 18-19 LHB coaches. For rake having 24 number LHB AC coaches, there is need to enhance the current carrying capacity of the inter vehicular coupler up to 500 Amps. Therefore, it has been decided to develop high capacity Inter Vehicular Coupler for use in LHB type rake having 24 numbers EOG type coaches.

1.0 SCOPE

- 1.1 This specification covers the design, manufacture and test requirement of IV coupler unit for EOG type AC coaches for transmission of 3 phase, 5 wires, 750 V, 50 Hz power supply from power car to individual coaches.

1.2 SCOPE OF SUPPLY

The scope of supply for each IV coupler unit shall include the following unless otherwise stipulated in the tender:

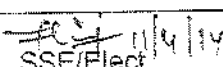
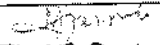
1	Jumper plug assembly	2 Nos.
2	Coupling socket assembly	2 Nos.
3	Dummy socket assembly	2 Nos.
4	Jumper cable duly crimped with each jumper plug and covered with flexible polyamide conduits and its fittings.	2.6 meters
5	Jumper cables duly crimped with each coupler socket	400 mm

2.0 GOVERNING SPECIFICATION

- 2.1 The IV coupler unit shall, unless otherwise Specified here in, conform to the Indian Standards Specification/IEC recommendations as indicated below and the Indian Electricity rules, wherever applicable.

In case, there is any revision/amendment to these specifications/ rules/recommendations, the latest version shall be applicable.

S.N	Standards	Description
1	ASTM A351/Gr-CF8	Specification for stainless steel casting
2	IS: 319	Free cutting leaded brass bars, rods and sections
3	IS: 613	Copper rods & bars for electrical purposes
4	IS: 617	Cast Aluminum & its alloys ingots and casting for general engineering purpose.
5.	IS:4454(IV) and	Cold rolled springs (stainless spring steel wires

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Page 4 of 17	File No. EL/7.1.108/ZS	Specification No. RDSO/PE/SPEC/ AC/0177 (Rev.0)-2013
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	IS:7906(I) and (II)	grade 2)
6.	AISI-304	Specification for Stainless steel Bars & section
7.	IEC 60947-1 2004	Specification for low voltage switchgear and control gear – part 1 General rules.
8.	IEC: 60529-1	Classification of degree of protection provided by enclosures.
9.	UIC: 532	Electric power supply for trains taken from the train vehicle
10.	UIC: 554-1	Power supply to electrical equipments on stationary railway vehicles from local mains system or another source of energy at 220 V or 380 V, 50 Hz
11.	DIN EN 15085-2-2008	Welding of Railway vehicles Part – 2: Qualification of manufacturer of welded rolling stock materials, Quality Assurance.
12.	EIA 364E-2008/IEC 60352	Method 2009.1 - Cable pull out
13.	EIA 364E-2008/IEC 60352	Method 2014 - Contact engagement and separation force
14.	RDSO/PE/SPEC/AC/013 8-2009(Rev-1) or latest	Flexible polyamide conduits with its accessories.
15.	ELRS/SPEC/ELC/0019 (Rev-2)-Feb-2011(latest)	Electron beam cable

2.2 Any deviation from this specification proposed by the firm, aimed to improve upon the performance, utility and reliability /efficiency of the equipment will be given due consideration, provided full particulars of the deviations with justification are furnished.

3.0 BASIC GENERAL REQUIREMENTS AND SERVICE CONDITIONS

3.1. The IV coupler unit shall be suitable for rugged service normally to be met within Railway Rolling Stock, where coaches are expected to run up to a maximum speed of 200 kmph in varying climatic conditions existing throughout India as under:-

Ambient	-4 to 55 deg C
Average ambient	35 deg. C
Train speed	200 Km/h
Relative Humidity	Upto 98%
Altitude	Max 1200 m above sea level
Atmosphere	Extremely dusty and desert weather. The dust contents in the air may reach as high value as 1.6 mg/cubic meter.
Annual rain fall	Very heavy in certain areas: between 1750 to 6250 mm.
Coastal area	The equipment shall be designed to work in humid salt laden and corrosive atmosphere. The maximum values of the condition shall be as under : Maximum pH value 8.5 Sulphate 7 mg/liter Max. concentration of chlorine 6 mg/liter

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	Max. conductivity	130 micro siemens/cm
Shocks and Vibration	The IV coupler shall withstand satisfactorily vibrations and shocks normally encountered in service as indicated below:	
	a) Max. vertical acceleration	- 3.0 g
	b) Max. lateral acceleration	- 3.0 g
	c) Max. longitudinal acceleration	- 3.0 g
	('g' being the value of acceleration due to gravity)	

3.2. The supplier shall be fully responsible for ensuring that all equipments forming part of the supply are entirely fit for purpose and no part of this specification shall in any way remove or reduce this obligation in this respect. In addition, it is the supplier's responsibility to under write the complete IV coupler unit design and ensure that it is compatible with, and will, in no way, compromise, the design and performance of IV coupler unit of this supply.

3.3 The supplier shall provide "In the field" service support during the guarantee period."

3.4 The supplier shall supply any purpose built or special tools or equipment that may be necessary for the correct operation, servicing, testing or installation of the IV coupler unit.

3.5 The supplier will provide assistance, both material and technical, in the development of the system as a whole to ensure that when this IV coupler unit is installed as part of the integrated vehicle system the performance of the unit meets or exceeds the requirements specified.

3.6 Should the IV coupler unit fail to achieve these requirements, then the unit shall be modified at the supplier's expense and within a time scale to be agreed with purchaser/consignee/RDSO.

4.0 DESIGN AND TECHNICAL REQUIREMENTS



4.1 The mounting dimensions of Jumper plug assembly, Coupling socket assembly and (Dummy) socket assembly of the coupler shall generally confirm to RCF drawing no. LW71301 alt a, LW71300 alt nil, LW 71302 alt nil respectively. The dimensions of other parts like insulating base, design of pin contact & socket contact, circular ribs around contact pin holes of plug assembly and sub-assemblies shall be approved at design stage. The jumper plug assembly shall be in one piece.

4.2 Insulating base for jumper plug shall be modified by providing circular rib of 2mm height and thickness around each contact pins hole on mating surface area to increase creepage distance as per drawing no. LW71304 Alt "c".

4.3 There shall be 5mm collar in the upper half of socket housing assembly as per drawing no. LW71306 Alt "b".

4.4 The hinged cover for socket assembly shall as per drawing no. LW71309 Alt "a" and blind socket housing shall be as per drawing no. LW71341 Alt "b".

4.5 The jumper plug housing shall be as per drawing no. LW71380 alt nil.


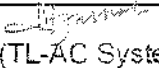
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- 4.6 The fixed/mobile contact pins shall be rated for a continuous current rating as detailed below :

Phase (R, Y, B)	500 AMPS at 0.8 P.F, 750 V, 50 Hz.
Neutral (N)	400 Amps at 0.8 P.F, 750 V, 50 Hz.
Earth pin (E)	260 Amps at 0.8 P.F., 750 V, 50 Hz.
Control pins (C1&C2)	25 Amps at 0.8 P.F., 750 V, 50 Hz.

Above current ratings are taken at 50°C ambient temperature.

- 4.7 The terminal connections on jumper plug unit and coupling unit shall be of crimping type suitable for the appropriate sizes of cables. Heat shrinkable polyolefin sleeves or similar insulating material shall be provided over the terminations of each core of cable to prevent any accidental contact between the adjacent terminals.
- 4.8 The complete coupler assembly shall have IP protection IP65 as per IEC 60529(latest version).
- 4.9 There shall be a provision of bus bar on the cover of coupling socket for shorting of control contacts (C1 & C2) when they are not in use.
- 4.10 The dummy socket shall be used when plug is not connected between coach to coach and shall have terminals for control contacts shorted with the help of 4 mm² electron beam cable. The electron beam cable shall be as per RDSO specification ELRS/SPEC/ELC/0019 (Rev-2)-Feb-2011. Suitable locking arrangement shall be provided so that the plug does not come out due to its own weight and vibration.
- 4.11 Locking arrangement shall be provided on the IV coupler socket and dummy socket so the inserter/extractor ratchet arrangement does not disengage due to its own weight (including inter connecting cables) and vibration encountered in service during running of the train.
- 4.12 The design of the coupler unit shall be of waterproof construction and when the jumper plug and coupling socket are coupled together they shall be completely water tight so that water does not find access to the internal assembly. The coupler assembly shall be provided with fire retardant high quality neoprene / EPDM gasket between the mating surfaces to avoid water ingress. It shall be ensured that in any circumstances, neoprene/EPDM rubber gasket between the mating surfaces could not come out.
- 4.13 Plug pin contact and socket contact shall be of self-adjusting type, so that they align themselves to establish a firm contact between pins & socket tube by providing multi point contacts. The displacement, loosening and extraction of the spring shall be checked after 500 mating cycles.
- 4.14 With a view to ensure interchangeability, all parts shall strictly conform to the requirement of the detail drawing of each component prepared by the firm and duly approved by RDSO so that the corresponding part of one coupler unit can be assembled in any other make coupler unit and shall also apply to manufacture of the component spares for all sub-assemblies of the coupler unit.

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- 4.15 The insulating material shall have the fire/flammability retardant property of V0 when tested as per UL94. The manufacturer shall submit the certificate from any NABL approved laboratory.
- 4.16 Necessary partition/bridges shall be made in jumper plug and coupling socket. The insulating barriers shall be moulded with main insulating base in one single piece. Firm shall submit the detailed drawing during prototype testing to the inspecting official.
- 4.17 Cable shall be crimped at minimum 4 points in plug pins & socket tubes, so that possibilities of loosening of cable & presence of air may be eliminated during service. The arrangement to escape air from the tube & pins shall be provided.
- 4.18 The cables shall be crimped on both plug pins and socket tubes. The crimping socket shall be of appropriate size to match the cables. A heat shrinkable, fire retardant polyteflin sleeve shall be provided covering some portion of lugs and cables.
- 4.19 There shall be a suitable guide in plug and socket to ensure its mating in one direction only.
- 4.20 Notching of size 20 x 20 x4mm shall be provided on the screw side of the pins to lock with the slot provided in insulation base and thus prevent the rotation of the pins during assembly. This shall be as per RCF drawing no. LW 71303 Alt-b, LW 71304 Alt-c, LW 71316 Alt-b, LW 71318 Alt-b, LW 71337 Alt-b.
- 4.21 Stainless steel fasteners as per SS 304 shall be provided to prevent from corrosion & rusting.
- 4.22 The coupler unit shall have seven (7) pin contacts in the plug pin and corresponding seven (7) socket pin contacts in the socket.
- 4.23 The identification, size & length of jumper cable shall be as under:

S. N	Circuit/identification	Cable size in mm ²	Length of jumper cable on plug side	Length of jumper cable on socket side
1.	R – Phase	150	2.6 meters	400 millimeters
2.	Y – Phase	150	2.6 meters	400 millimeters
3.	B – Phase	150	2.6 meters	400 millimeters
4.	N - Neutral	95	2.6 meters	400 millimeters
5.	E – Earth	70	2.6 meters	400 millimeters
6.	Body earth	35	10"	8"
7.	C-1 Control	4.0	2.6 meters	400 millimeters
8.	C-2 Control	4.0	2.6 meters	400 millimeters

The jumper cables shall be electron beam cables as per RDSO specification ELRS/SPEC/ELC/0019 (Rev 2.)-Feb-2011 or latest.

- 4.24 Fire retardant, halogen free polyamide flexible conduit along with their accessories shall be used. The flexible polyamide conduit and its accessories shall confirm to RDSO/PE/SPEC/AC/0138-2009(Rev-1) or latest.


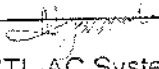
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Page 8 of 17	File No. EL/7.1.108/ZS	Specification No. RDSO/PE/SPEC/ AC/0177 (Rev.0)-2013
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- 4.25 Terminals for phases, neutral, earth & control shall be suitably marked with legible letters (R, Y, B, N, E, C1 & C2) corresponding to the letter (1, 2, 3, 4, 5E, 7 & 10) on the insulating base in prescribed color.
- 4.26 The tip diameter of fixed contact pin C1&C2 shall be as per drawing LW 71338Alt 'a'.
- 4.27 The drawing for mobile contacts, fixed contacts and insulator blocks shall be as per LW 71316 Alt-b and LW 71318Alt-b, and the material of the flexible braided wire shall be suitable for 500Amps current rating at 50°C ambient temperature.

5.0 MATERIAL OF COMPONENTS

- 5.1 The fixed and mobile contacts shall be made of tough pitch copper as per IS: 613 with silver cadmium oxide tips. The material of the spring inside the mobile contacts shall be SS 304 with CF-8 grade. The pin contact and socket contact shall be made of copper with silver plating. The thickness of plating shall not be less than 1.0 microns. All pins shall be silver plated for atmospheric protection from moisture and oxidation.
- 5.2 The control pins contact shall be made of brass as per IS:319 with silver plating having thickness of 1.0 microns.
- 5.3 The housing of jumper plug, coupling socket and dummy socket along with covers shall be protected against rust by giving suitable anti-corrosive and anti-rust treatment with epoxy based powder to shade No. 632 (DA gray) of M/s Nerolac or equivalent to meet the service condition as specified in clause 3.0. Before the application of primer, all the surfaces shall be thoroughly cleaned repeatedly with cleaning agent to ensure removal of rust and greasiness etc. The detailed process to clean surfaces shall be furnished by the firm.
- 5.5 The compression springs must withstand minimum 1 million load cycles.
- 5.6 A compression spring should be preferably designed buckle proof.
- 5.7 The load test shall be in accordance clause no. 7.1 of IS: 7906(part-II) and compression test as per clause no.7 of IS: 7906(part-I).
- 5.8 The coupler socket, plug housing, dummy socket housing and their covers shall be made of die cast Aluminum grade 4600 confirming to IS: 617. Firm will submit the material conformity to the specification along with its test report from any NABL accredited laboratory during prototype inspection. If any other material is used for housing of IV coupler, it shall be require prior approval of RDSO. Firm shall submit the comparative technical justification to RDSO for approval.
- 5.9 The assembly of coupler unit shall be provided with an inserter/extractor ratchet arrangement to enable insertion and extraction of the coupler plug
- 5.10 The complete ratchet assembly shall be made of stainless steel (SS304) as per RCF drawing no. LW 71330 Alt "a".

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- 5.11 The insulating base plate shall be of FRP/SMC materials and properties of FRP/SMC components or any other insulating material suitable for withstanding continuous temperature of 50°C above the ambient at full load shall be furnished to RDSO.
- 5.12 The cleating for securing of feeder cables in plug housing assembly shall be of fire retardant high quality neoprene / EPDM gasket with UL 94 V0 (drawing no.LW 71374 Alt nil).
- 5.13 The material of the 'O' ring of the mating surface between socket and plug shall be neoprene/EPDM with UL 94 V0.
- 5.14 The complete material used in IV coupler shall be of fire retardant properties.
- 5.15 The material of the contacts conforming to the specifications and relevant latest standards shall be submitted by the firm.

6.0 MARKING:

- 6.1 The IV coupler assembly shall be marked with the following information at suitable location.

Make/rating
Serial No.
Month and year of manufacture
Specification No.

7.0 TESTS

7.1 Type test:

- 7.1.1 Only after the detail drawings & the design of coupler and its accessories have been approved and the clearance given to this effect, the manufacturer shall take up the manufacture of the prototype. It is to be clearly understood that any changes, required to be done in the prototype or any additional tests other than specified herein are required to be conducted on the prototype unit or its components, they shall be done expeditiously. During the process of manufacture of the equipment, if the purchaser so desires, he may conduct/repeat any of the routine or additional tests to satisfy himself that the quality of the module being manufactured is of the required standards.

- 7.1.2 The test protocol indicating relevant clause of the test, condition of the test, specified value and observed value of the parameter for IV coupler shall be submitted by the firm before offering the sample for testing.

- 7.1.3 The type tests shall be carried out by RDSO representative on prototype unit either totally or in part under the following conditions without any additional cost:

- A manufacturer undertakes to manufacture for the first time as per this specification
- An important change in the design of equipment has been introduced.
- Specification is modified necessitating re-designing of equipment.
- Unsatisfactory performance reported by user Railways.
- Resumption of production after an interruption of more than two years.

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7.1.4 RDSO may conduct surprise checks on manufacturing process and quality control along with any of the tests to ensure quality of product and its conformance to RDSO's specification.

7.1.5 The suitability of the IV coupler unit shall be ascertained by inspection & bench test at the firm's premises, that in stationary coach and service trial of the coach.

7.1.6 The tests shall be carried out at the works of the manufacturer or a reputed testing laboratory in presence of Indian Railway representative on the prototype unit of the IV coupler unit as per the relevant governing specifications. Manufacturer shall have all possible necessary arrangement for testing of IV coupler.

7.2 Routine test:

7.2.1 Routine tests are to be carried out on each unit to verify that properties & design of the product are in the line to those measured during type test. Proper documentation of routine tests results shall be made available by the firm and will be produced before the inspecting official on demand.

7.3 Acceptance test:

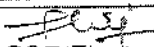
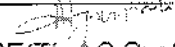
7.3.1 Every unit of Inter Vehicle coupler shall be subjected to acceptance tests as given in clause no. 7.4 or sample picked up by inspecting official at manufacturer's works nominated by purchaser/RDSO.

7.3.2 Manufacturer, on demand by inspecting official shall produce the internal/routine test report carried out by manufacturer.

7.3.3 All the tests shall be carried out at firms premises and manufacturer's cost. Inspecting official shall witness the test on each unit. A copy of these internal tests conducted by the firm shall be supplied to the inspecting/purchasing authority. Notwithstanding above RDSO reserves the right to have these equipments also tested as per the specification and mentioned standards at any reputed house in India at firm's cost.

7.4 Test description

S.N.	Description of test	Cl No.	Type test	Routine test	Acceptance test
1.	Dimensional and visual inspection	7.4.1	Yes	Yes	Yes
2.	Millivolt test (Voltage drop test)	7.4.2	Yes	Yes	Yes
3.	Temperature rise test	7.4.3	Yes	Yes	--
4.	Insulation resistance test	7.4.4	Yes	Yes	Yes
5.	High voltage test	7.4.5	Yes	Yes	Yes
6.	Cable pull out	7.4.6	Yes	-	--
7.	Test on spring	7 and 7.1 of IS:7906(I) &(II)	Yes	-	Yes

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8.	Contact pressure test for individual fixed/mobile contacts	7.4.7	Yes	-	-
9.	Mating cycle test	7.4.8	Yes	-	-
10.	Salt fog test	7.4.9	Yes	-	-
11.	Clearance & creepage distance test	7.4.10	Yes	-	-
12.	Degree of protection test	7.4.11	Yes	-	Yes*
13.	Endurance test	7.4.12	Yes	-	-
14.	Test for withstanding shock & vibration	7.4.13	Yes	-	-

* Tests to be done on annually basis from NABL accredited lab.

NOTE:

1. Testing/measuring instruments shall be duly calibrated from any NABL recognized laboratory and shall be furnished during type test.
2. Acceptance tests to be conducted on 5% unit of the lot offered, subject to minimum 2 sets.

7.4.1 Dimensional and visual inspection

The coupler assembly and its components shall be inspected visually and the dimensions shall be measured and recorded as per the relevant drawings approved by RDSO. The castings shall be free from cracks, blow holes and shall have smooth finish. Firm shall also submit the detailed chemical report of the chemical analysis of the material confirming to the specification from reputed govt /NABL accredited lab.

7.4.2 Milivolt drop test

The Millivolt drop shall be measured across the terminals by passing the rated current when the steady state condition is achieved. The steady state condition is reached when last 3 consecutive readings are approximately constant. The Millivolt drop between two contacts should not be more than 45 Millivolt.

7.4.3 Temperature rise test

This test shall be conducted with all the cable connected to their respective terminals and lug inserted in socket tube and alternating current of the value shown in the table shall be passed through phase, neutral, earth & control pins for a period of three hours at an ambient temperature of 50°C. Firm shall create the facility to maintain the ambient of 50 °C. The temperature rise of the terminals shall not exceed 50°C, when measured with thermocouple or any other means (such as laser thermometer etc).

S.N	Nomenclature of contact	Test current(Amp)
1	Phase	650
2	Neutral	520
3	Earth	340
4	Control	32

7.4.4 Insulation Resistance (IR) test

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The insulation resistance shall be measured by 1500 V,DC megger. The insulation resistance shall be measured in the following combinations;

- Between all live poles connected together and earth & housing.
- Between each live pole (inclusive of earth & neutral) and housing.
- Between live pole as R-Y,Y-B,R-B,R-E,R-N etc.

In each case, the IR shall not be less than 100 M Ω before HV and after HV test.

7.4.5 High voltage (HV) test

High voltage test shall be conducted by applying test voltage and the combination between different poles as mentioned below in table.

S.N	Description	Test voltage	Duration
1.	Phase to phase	4.5 KV	One minute
2.	Phase to neutral	4.5 KV	One minute
3.	Phase to earth	4.5 KV	One minute
4.	Phase to control	2.5 KV	One minute
5.	Control to earth	2.5 KV	One minute
6.	Control to control	2.5 KV	One minute

The IR value recorded after the test shall not be less than 100 M Ω .

7.4.6 Cable pull – out test

Cable pull out test shall be conducted as per EIA 364E-2008/IEC 60352-2 to determine the axial tensile load.

7.4.7 Contact pressure test for individual fixed/mobile contacts

The contact pressure test shall be conducted on the pins by applying a force on the pins longitudinally and measuring the deflection of compression in the springs. The pressure exerted and deflection thus resulted shall not be more than the values indicated below:-

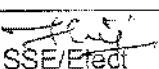

S.N	Pressure/load/weight on the pin	Maximum deflection
1.	12kg	5.0 mm
2.	18 kg	7.0 mm

7.4.8 Mating cycle test

In this test, 500 cycles of surface mating shall be carried out by connecting and disconnecting the plug and socket of IV coupler. After completing 500 cycles, the coupler shall be subjected to IR test, HV test, contact engagement & separation force test and Millivolt test as per relevant Para's of this specification.

7.4.9 Salt fog test

The complete unit is subjected to pass 96 hours salt fog test as per ASTM 117 B/IEC 60512-11-6.

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Page 13 of 17	File No. EL/7.1.108/ZS	Specification No. RDSO/PE/SPEC/ AC/0177 (Rev.0)-2013
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7.4.10 Clearance & creepage distance test

The Clearance & creepage distance shall be measured between various parts as mentioned in annexure – A. The creepage distance shall be as per pollution degree 4, material group II (Table XV), whereas the clearance shall be as per class A, pollution degree 4 (Table XIII) specified in IEC 60947 -1.

7.4.11 Degree of protection test

Degree of protection for the complete unit shall be got tested by the firm from any NABL recognized laboratory as per IEC 60529 conforming to IP-65. The test results shall be submitted at the time of prototype testing. This test shall be conducted after vibration withstanding test and test to simulate the effect of shunting shock, specified in clauses 7.4.13 & 7.4.14.

7.4.12 Endurance test

The endurance test shall be conducted on the complete unit when the plug and socket are connected together and an alternating current of 500 Amps, having sine wave form of 50 Hz, shall be applied for a period of minimum 10 hrs at an ambient temperature of 50°C. After completion of the test, the contact tips shall be checked visually for any sign of pitted contact tip and contact resistance.

7.4.13 Test for withstanding shock and vibration

Test for withstanding vibration for the complete unit shall be got tested by the firm either in-house or from any Govt. /NABL accredited laboratory as per IEC 61373 location 'O' cat. 1, class 'A' as mentioned in Annexure –C of IEC 61373. The test results shall be submitted at the time of prototype testing. The 18 shocks (three positive and three negative in each of the three orthogonal planes) shall be applied to the equipment as per clause No.10.6 of IEC 61373.

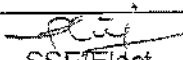
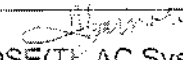
8.0 TECHNICAL DATA

8.1 The technical information as per Annexure A "Questionnaire on offer of IV Coupler" complete in all respect should be furnished before prototype test.

8.2 The firm shall indicate its compliance or otherwise against each clause and sub-clause of the technical specification and submit before prototype test.

8.3 The manufacturer shall also supply the following drawings in CAD software:

- a) Dimensional drawings of complete plug and socket assembly along with ratchet assembly.
- b) Component drawings in line with RCF drawings enclosed with specifications along with the material and specification.
- c) One set of the following documents will be supplied with every 50 units:-

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- i) Operating and trouble-shooting manual.
- ii) Parts illustrated catalogue-indicating sources.

9.0 Manufacturer's responsibility

The manufacturer's responsibility will extend to the following:

- 9.1 The supplier shall supply the detailed instructions for proper installation of the equipment on Rolling stock. For this purpose, the supplier shall depute his engineers/supervisors to purchaser's site during installation of the equipment.
- 9.2 The supplier shall be responsible for commissioning, testing and field trials of the equipment in service and depute team of engineers/supervisors for this purpose during developmental stage.
- 9.3 The supplier shall be responsible for carrying out improvements and modifications at his own expense on all the equipments supplied, provided such modifications/improvements are decided to be necessary for meeting the requirements of reliability, performance and safety etc., jointly by manufacturer and purchaser.
- 9.4 For the purpose of technical decisions on improvements/ modifications etc. on equipment, the final authority from the purchaser's side will be RDSO.

10.0 Warranty period and liability

The supplier/manufacturer shall be responsible for any damage to the products due to defective design, materials and workmanship for a period as per Indian Railway stores (IRS) condition of contract.

11.0 Infringement of patent right

Indian Railways shall not be responsible for infringement of patent rights arising due to similarity in design manufacturing process, use of similar components in the design & development of this item and any other factor not mentioned herein which may cause such a dispute. The entire responsibility to settle any such disputes/matters lies with the manufacturer/ supplier.

Details / design/documents given by them are not infringing any IPR and they are responsible in absolute and full measure instead of railways for any such violations. Data, specifications and other IP as generated out of interaction with railways shall not be unilaterally used without the consent of RDSO and right of Railways / RDSO on such IP is acceptable to them.

12.0 Schedule of Technical Requirement (STR)

- 12.1 Firm intended to manufacture and supply of IV coupler to Indian railway should have all the manufacturing & testing facilities as per RDSO's STR No. RDSO/PE/AC/STR/0033-2011(Rev-0).

13.0 Maintenance Manual

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13.1 Firm will submit the general maintenance recommendations on maintenance requirement of the unit, which should contain periodicity, work content and justification for each maintenance requirement. Firm will also submit the catalogue indicating sources during prototype test.

14.0 Enclosures

- a) Annexure A: Questionnaire on offer for IV coupler.
- b) Drawing of jumper plug assembly LW 71301 Alt "a"
- c) Drawing of Coupling socket assembly LW 71300 Alt "nil"
- d) Drawing of blind socket assembly LW 71302 Alt "nil"
- e) Drawing of jumper plug housing LW 71380 Alt "nil".
- f) Drawing of insulating base for jumper plug LW71304 Alt "c".
- g) Drawing of socket housing assembly LW71306 Alt "b".
- h) Drawing of hinged cover for socket assembly . LW71309 Alt "a"
- i) Drawing of blind socket housing no. LW71341 Alt "b".

ANNEXURE - A

QUESTIONNAIRE ON OFFER FOR IV COUPLER FOR LHB EOG TYPE AC COACHES
(To be furnished by the firm at the time of prototype testing)

S.No.	Description	To be furnished by the firm
1.	Manufacturer's name & Address	
2.	Model/Type	
3.	Rating <ul style="list-style-type: none"> a) Voltage b) Current c) Power factor 	
4.	Temperature rise at rated current	
5.	Cable pull out	
6.	Material and parameters of the spring	
7.	Mating cycle	
8.	Weight <ul style="list-style-type: none"> a) Plug assembly b) Socket assembly c) Blind Socket assembly d) Total wt.of Plug, socket & blind socket with cables 	
9.	Materials along with relevant specification & drawing <ul style="list-style-type: none"> a) Plug assembly b) Socket assembly c) Ratchet assembly d) Blind Socket assembly e) Fixed contact pin f) socket Tube g) Control pin 	
10.	Degree of protection for complete coupler unit	

Note: All the columns shall be filled in along with the relevant documents, drawings, specifications and other details.

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Page 17 of 17	File No. EL/7.1.108/ZS	Specification No. RDSO/PE/SPEC/ AC/0177 (Rev.0)-2013
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DISTRIBUTION**CHIEF ELECTRICAL ENGINEER:**

1	Northern Railway, Baroda House, New Delhi – 110 001.
2	Central Railway, II Floor, Parcel office, CST Mumbai – 500 001.
3	Eastern Railway, Fairlie Place, Kolkata – 700 001.
4	South Eastern Railway, Garden Reach, Kolkata – 700 043
5	Southern Railway, Park Town, Chennai – 600 003.
6	Western Railway, Churchgate, Mumbai – 500 020.
7	South Central Railway, Rail Nilayam, Secunderabad – 500 371.
8	East Central Railway, Dighi Distt- Vaishali, Hajipur Bihar- 844 101.
9	North Central Railway, Subedarganj, Allahabad- 211 001.
10	South Western Railway, 1 st Floor, DRM Office, Hubli 580 020
11	South East Central Railway, Bilaspur.495004
12	North East Frontier Railway, Maligaon, Guwahati – 781001
13	North Eastern Railway, Gorakhpur – 273001
14	North Western Railway, Jaipur – 302006
15	West Central Railway, Jabalpur – 482001
16	East Coast Railway, Bhuvneshwar, Orissa – 751016
17	Konkan Railway, Belapur Bhavan, Sector-11, Belapur, Mumbai – 500614
18	Metro Railway, 33 /1 J.L. Nehru road, Kolkata- 700071
19	Integral coach factory, Perambur, Chennai – 600038
20	Rail Coach Factory, Kapurthala (Punjab) – 144 602
21	Rail Coach Factory, Lalganj, Bareilly (U.P) – 144 602

CHIEF WORKS MANAGER:

1	Matunga Workshop, Central Railway, Mumbai 500 019.
2	Liluah Workshop, Eastern Railway, Howrah
3	C&W Workshop, Northern Railway, Alambagh, Lucknow-226 05
4	C & W Workshop, N. Rly., Jagdhari – 135 002
5	Mechanical Workshop, NER, Gorakhpur – 273 012
6	Carriage Workshop, Southern Railway, Perambur, Ayanavaram, Chennai-600023.
7	SCR, Lallagudda Workshop, Lallaguda, Secunderabad - 500017
8	Carriage Workshop, Western Railway, Lower Parel, Mumbai-500013
9	CRWS, W. C. Railway, Nishatpura, Bhopal-462010
10	Carriage Workshop, NW Rly., Ajmer - 305001
11	Carriage Repair Workshop, Gadag Road, SWR, Hubli – 580 020
12	Carriage Workshop, S.W. Railway, Mysore Vishwanath.
13	Carriage Workshop, SE Rly., Kharagpur - 721301
14	New Bongaigaon, Railway Workshop, Danttal, Distt. Bongaigaon, Assam-783380
15	Carriage and Wagon Workshop, N. C. Rly., Jhansi – 248003
16	Carriage and Wagon Workshop, WC Rly., Kota - 325002
17	Carriage and Wagon Workshop, Eeastern Rly., Liluha - 711204
18	Carriage and Wagon Workshop, W. Rly., Pratap Nagar, Vadodara - 390004
19	Carriage and Wagon Workshop, N Rly., Amritsar - 143001
20	Central Workshop, Goldenrock, S. Rly., Trichi - 620004

OTHERS:

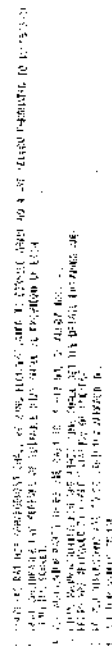
1	Director, IRIEEN, Nasik Road (Maharashtra). - 422101
2	Senior Professor (Elect.), Railway Staff College, Lalbaug, Vadodara. - 390004
3	Director, IRCAMTECH, Maharaipur, Gwalior – 474 020.

Prepared by

SSE/Elect

Checked by

DSE(TL-AC System Design)



FOR THE TYPE COACHES

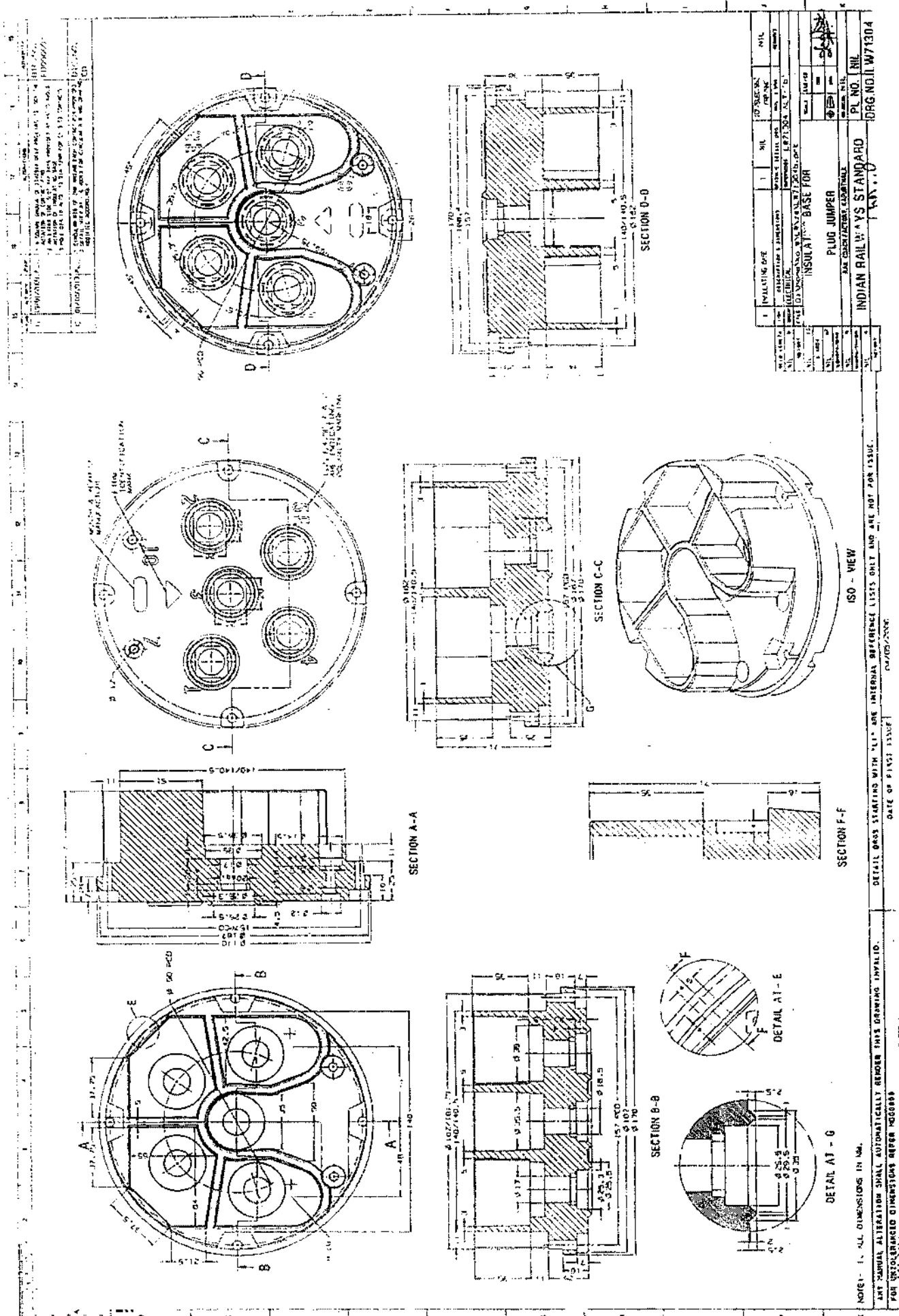
DE COURTESY

INDIAN RAILWAYS STANDARD

PL NO. 111

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PL NO. 111



NOTE- 1. ALL DIMENSIONS IN MM.

068000N WGBH SOUTHEASTERN DISASTER RELIEF
#000000WGBH INFORMATIONALLY REMOVED THIS GROWING INVALID.

DETAIL ORGS STATING WITH "1" ARE INTERNALS REFERENCE LISTS ONLY AND ARE NOT FOR ISSU.

DATE OF FIRST ISSUE

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MAIN - OSI

SECTION F-F

SECTION 8-A

REF ID: A66666

DETAIL A1-E

SECTION A-A

SECTION C-C

SECTION D-0

INSULATION BASE FOR

PLUG JUMPER

THE COACH FACTORY, STAMFORD
STAMFORD, CAMBS ST10 0AB

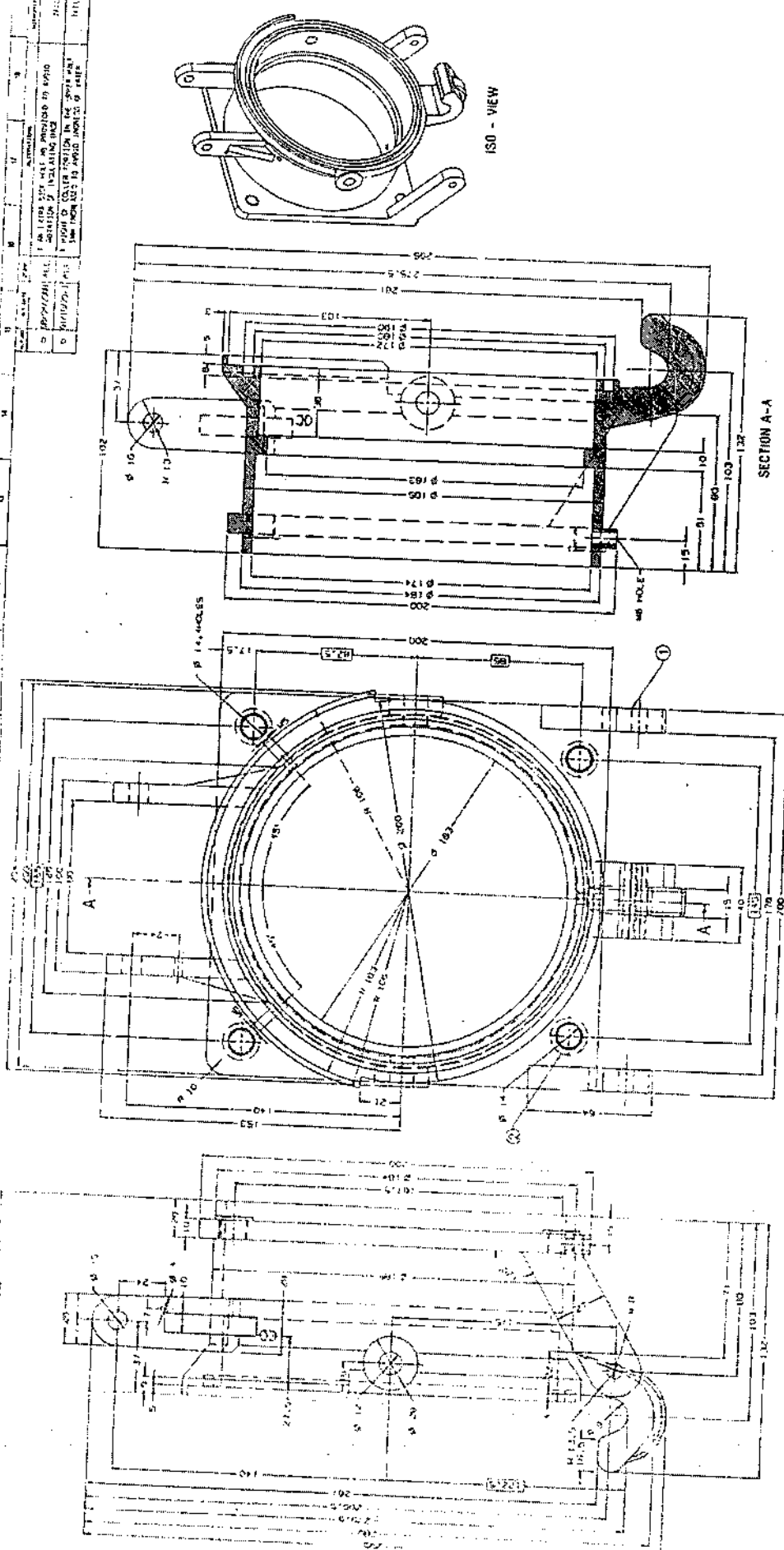
INDIAN HAIL: 15 STANDARD

PL NO. 1112

RG, NO. IL W7

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71304

[illegible]

3. STAIN-LESS STEEL OR/ALUMINUM SURFACES SHALL BE PROVIDED IN THE MOUNTING HOLES FOR RIGIDITY TO 151601; Q-1, 302.

2. MATERIAL SHALL BE ALLOWED TO 150:7.04 CR. DEC.

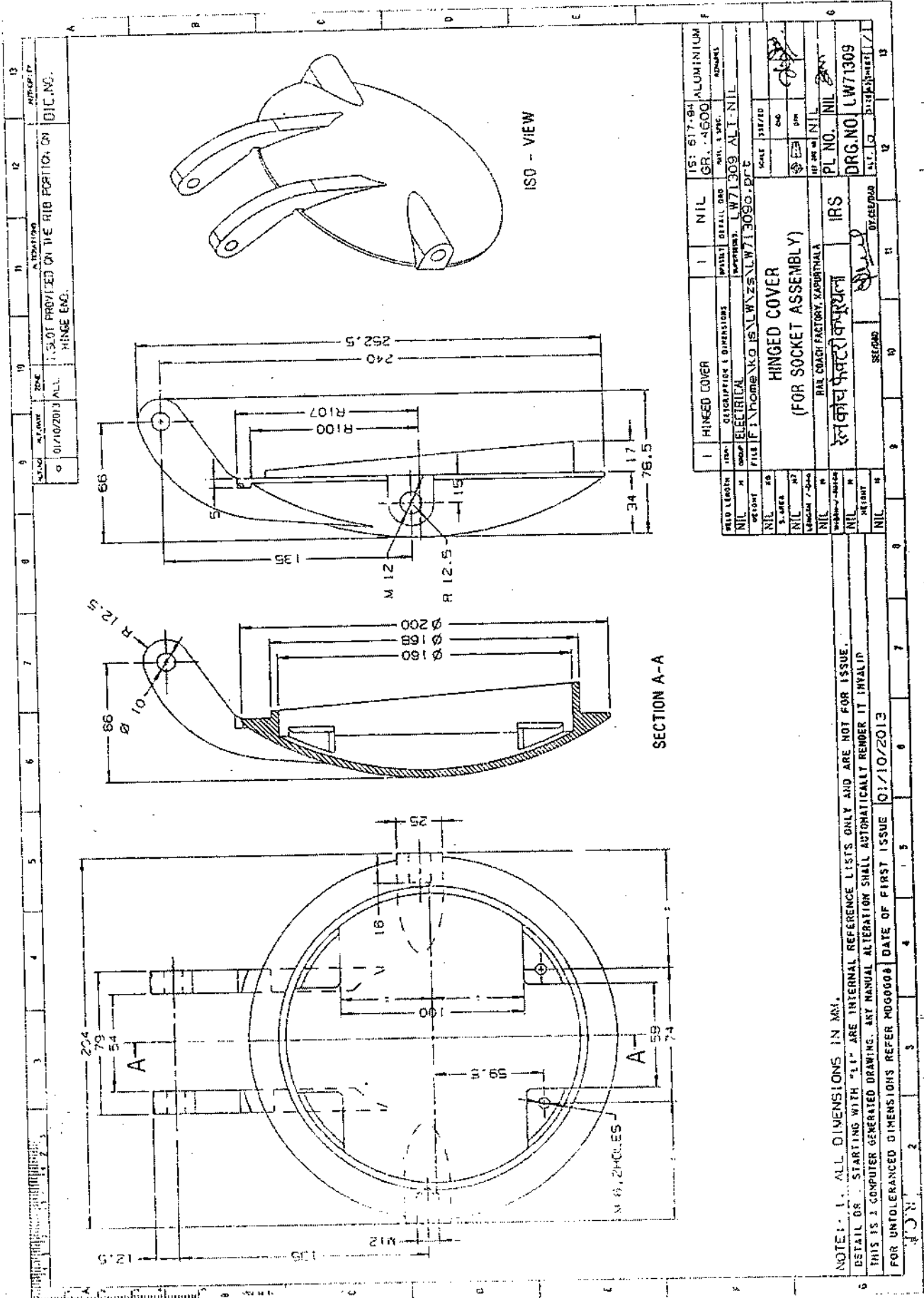
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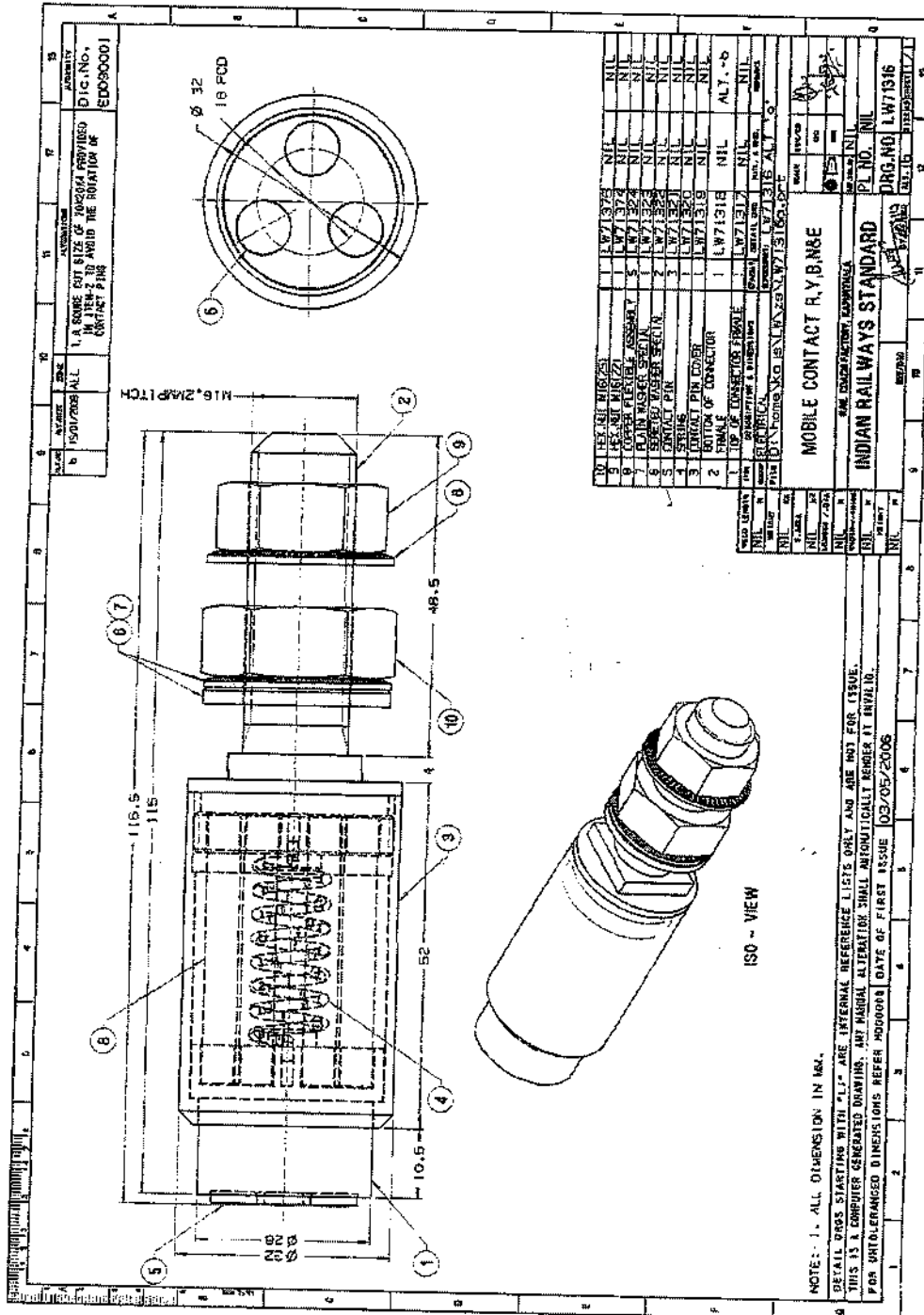
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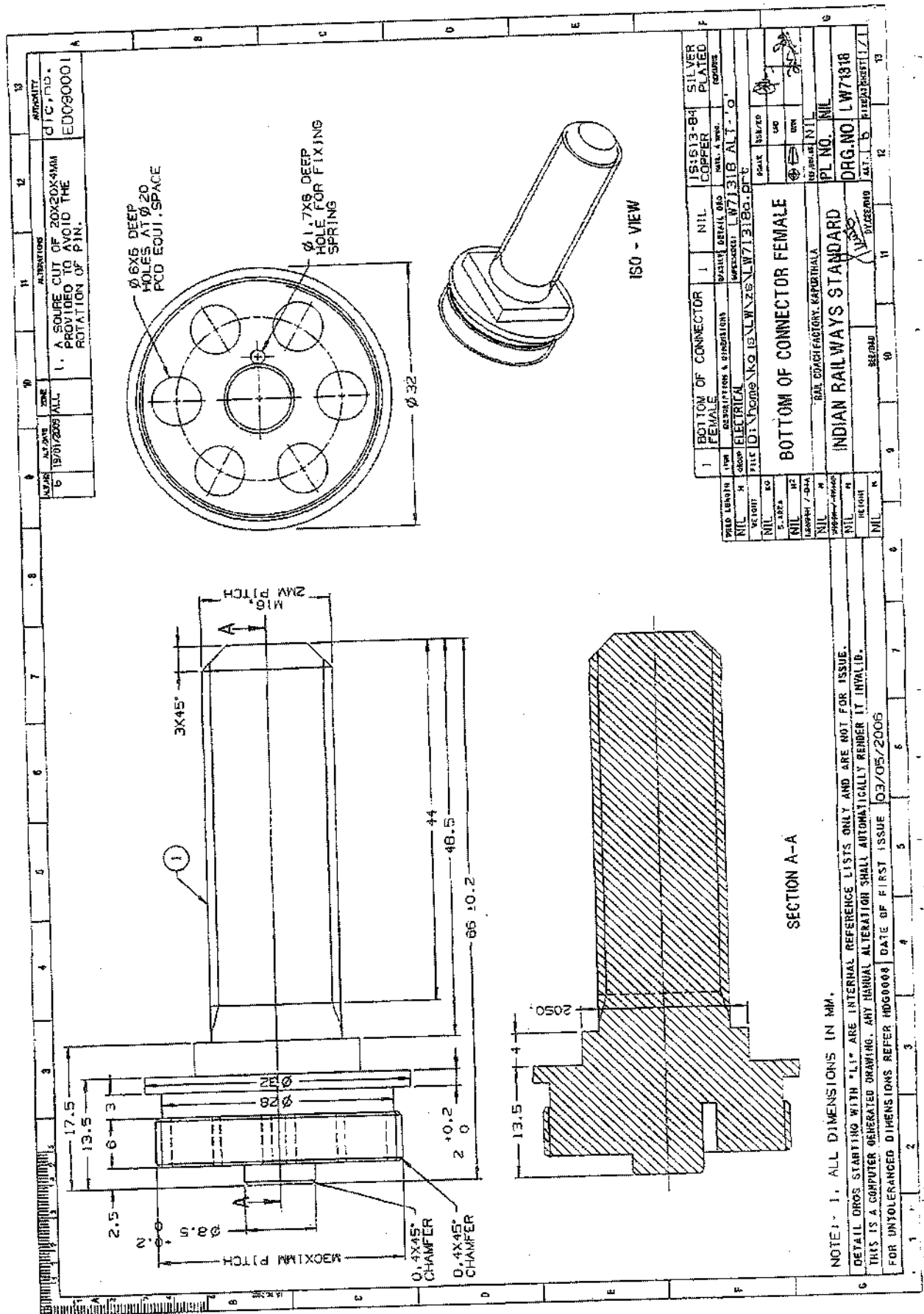
DATE OF FIRST ISSUE	INTERNAL REFERENCE LIST ONLY AND ARE NOT FOR ISSUE.

DATE OF FIRST ISSUE

DATE OF FIRST ISSUE







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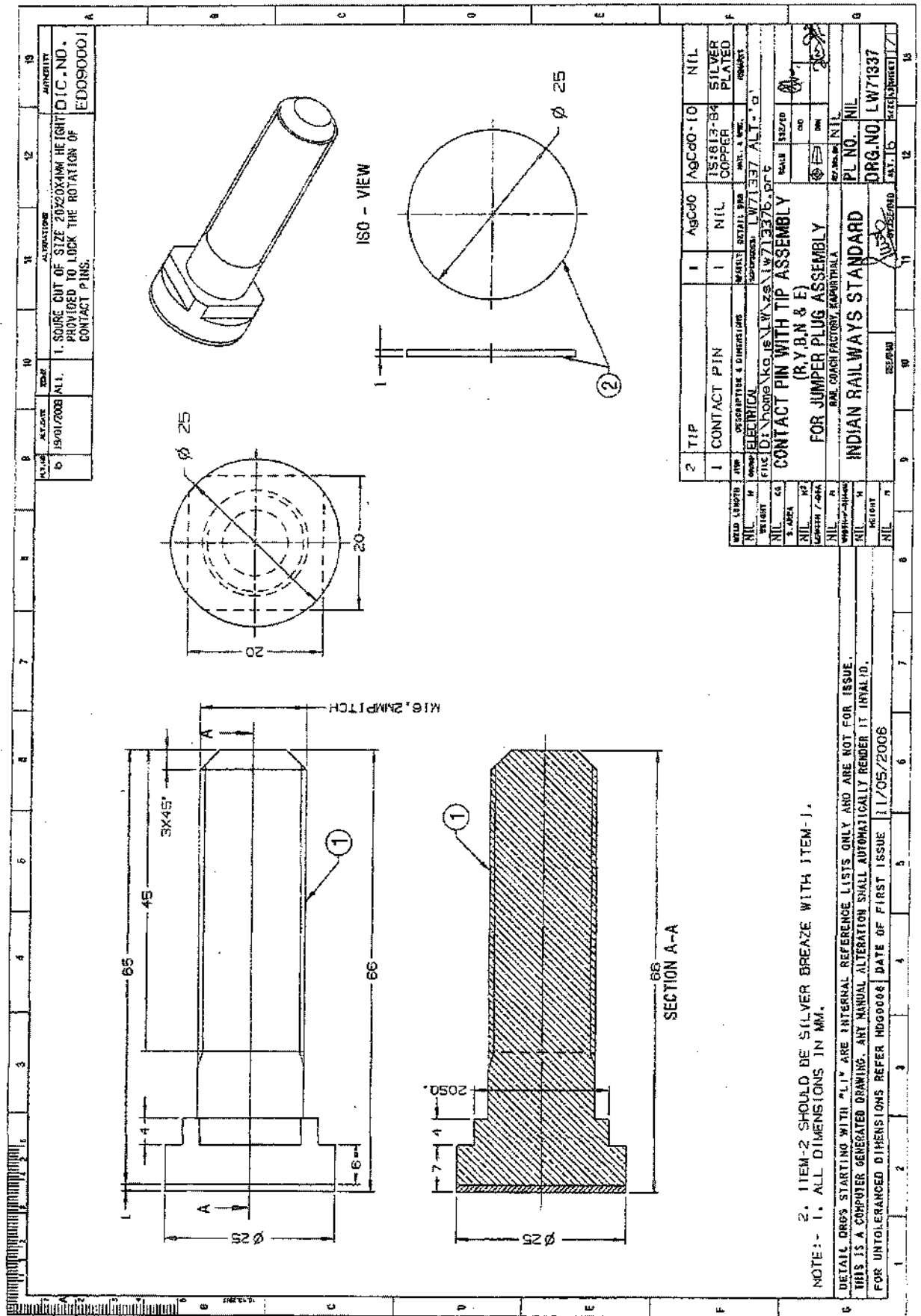
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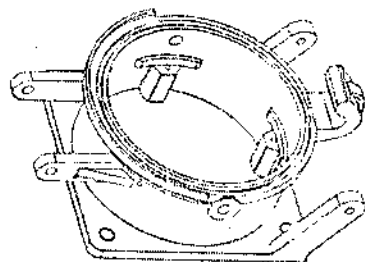
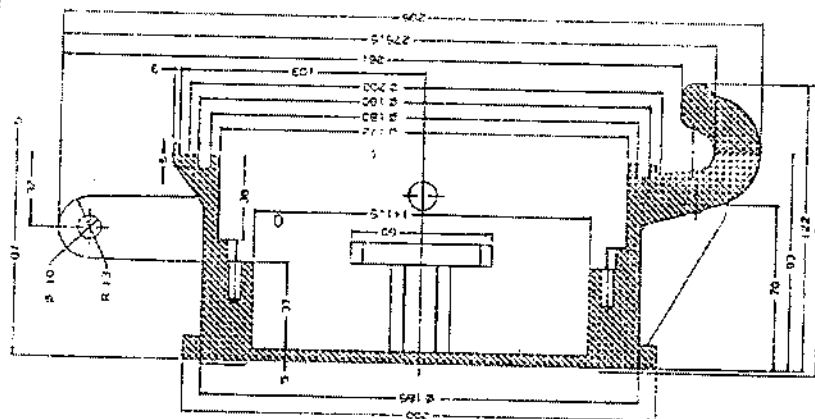
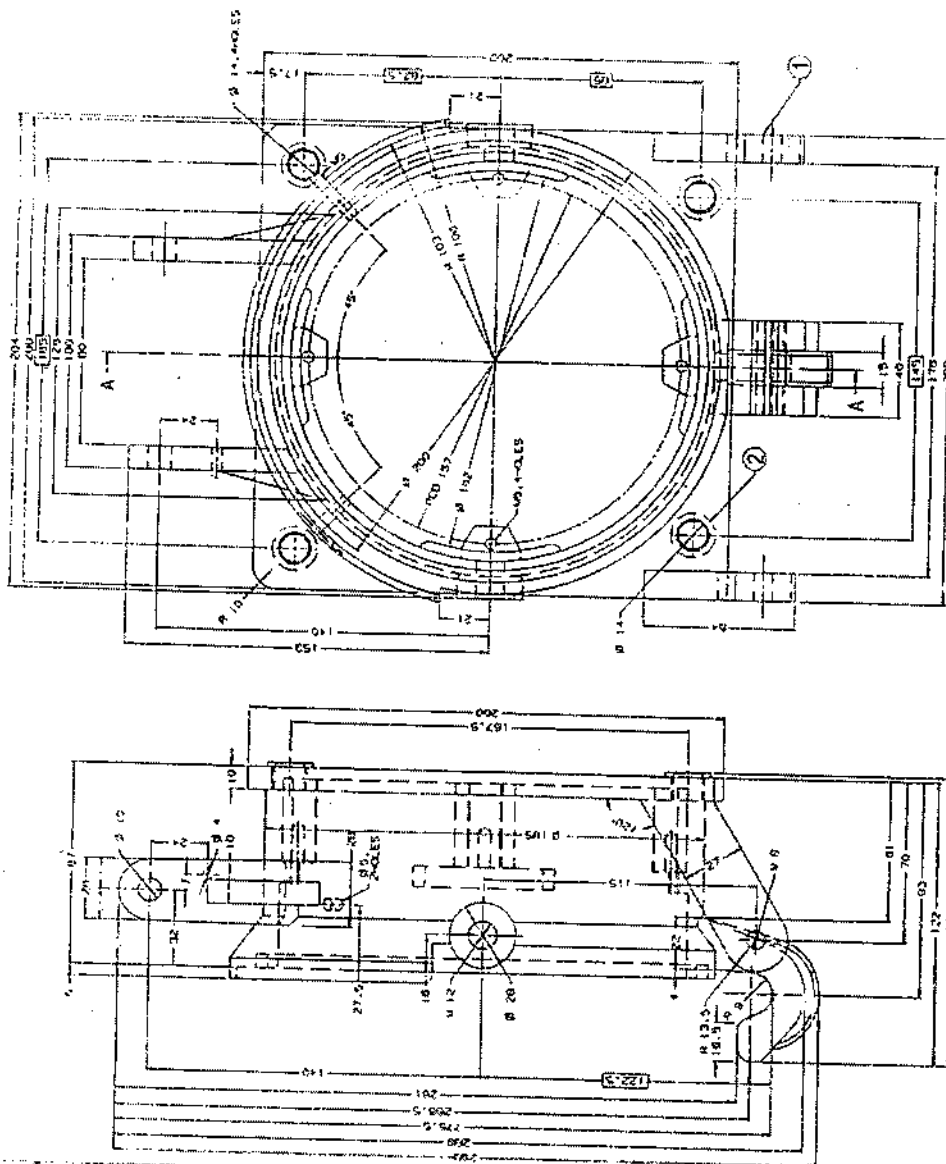
FOR UNTOLERANCED DIMENSIONS REFER H060008 DATE OF FIRST ISSUE 03/05/2006



NOTE:- 1. ALL DIMENSIONS IN MM.
2. ITEM-2 SHOULD BE SILVER BREAZE WITH ITEM-1.

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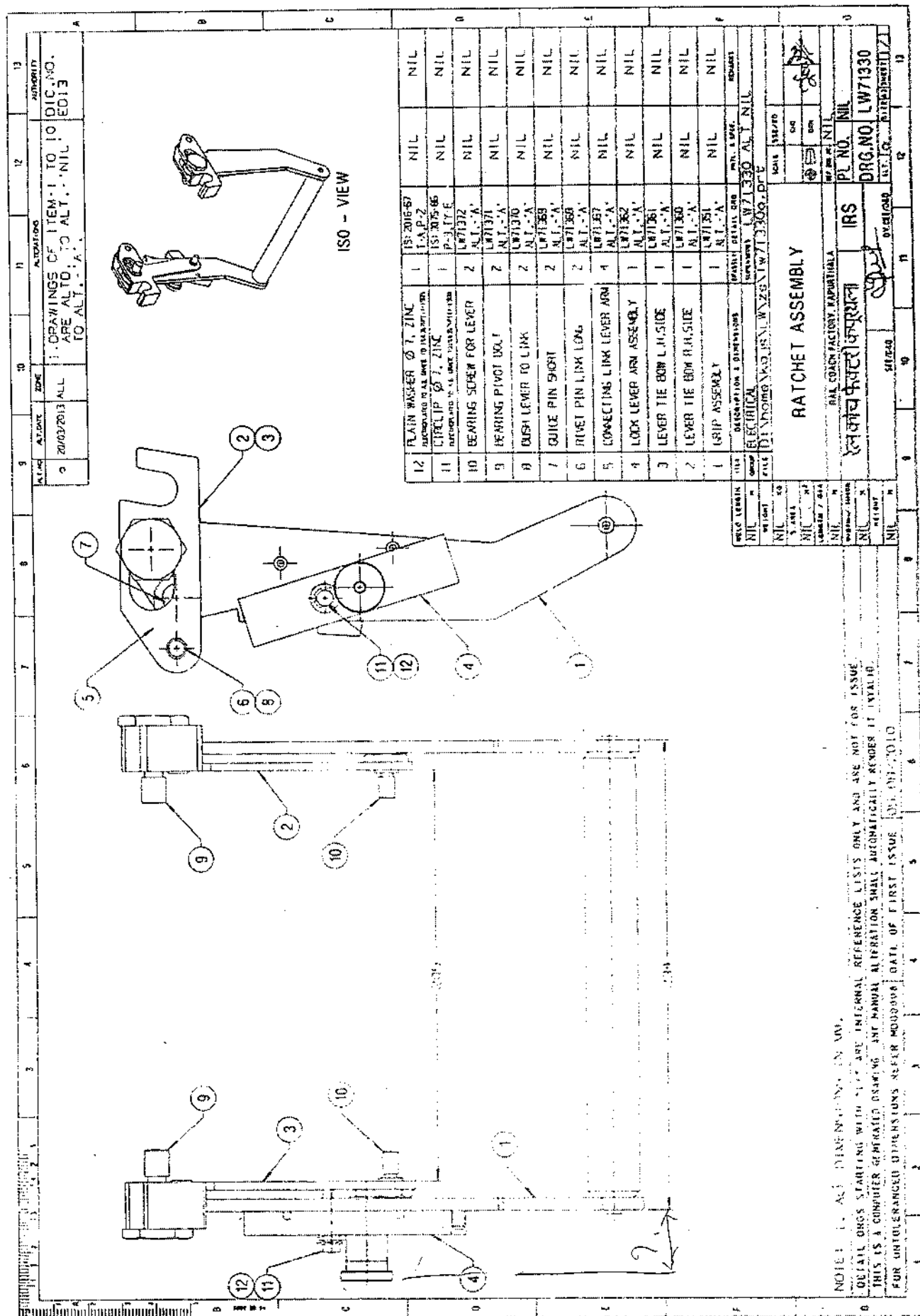
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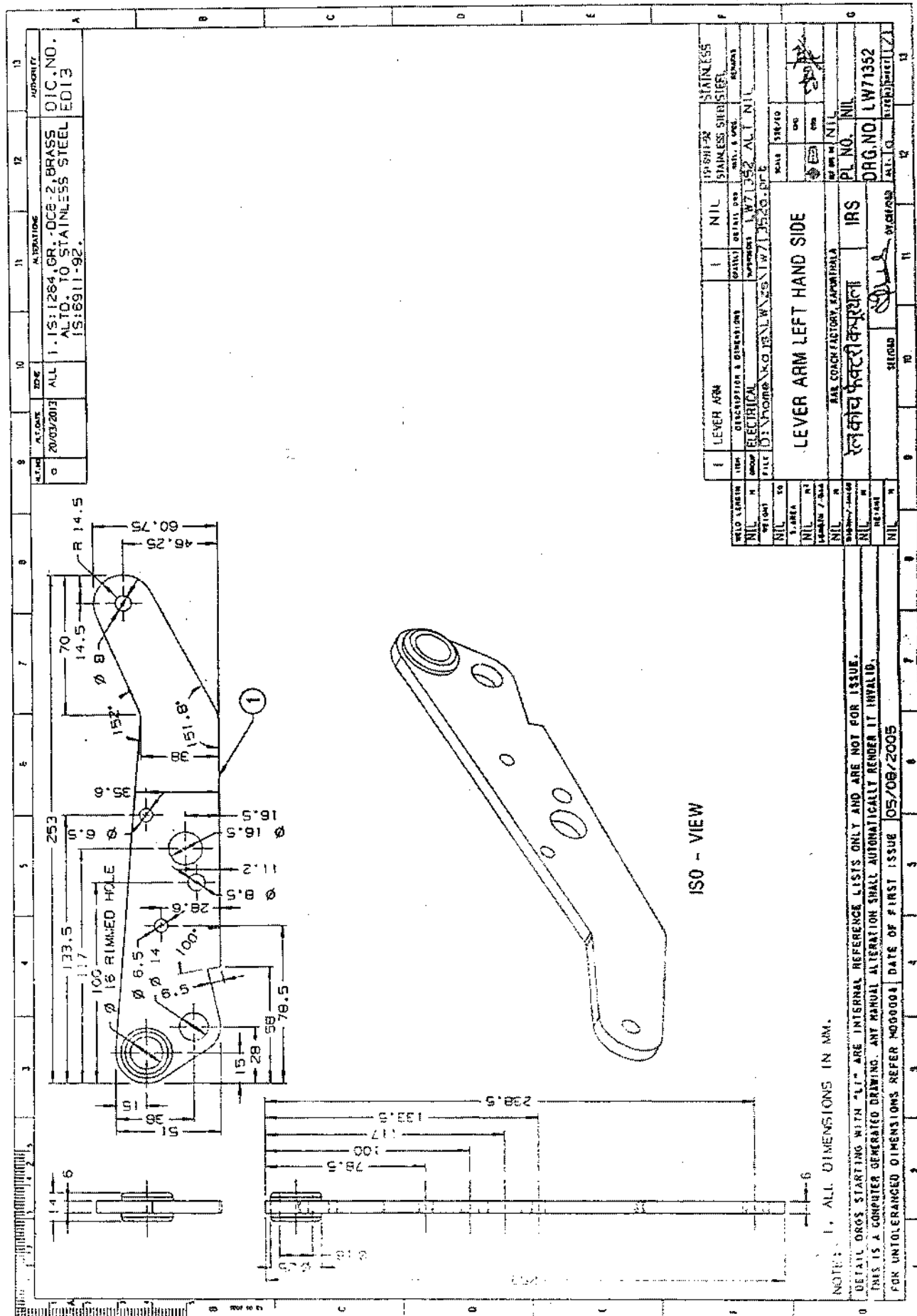
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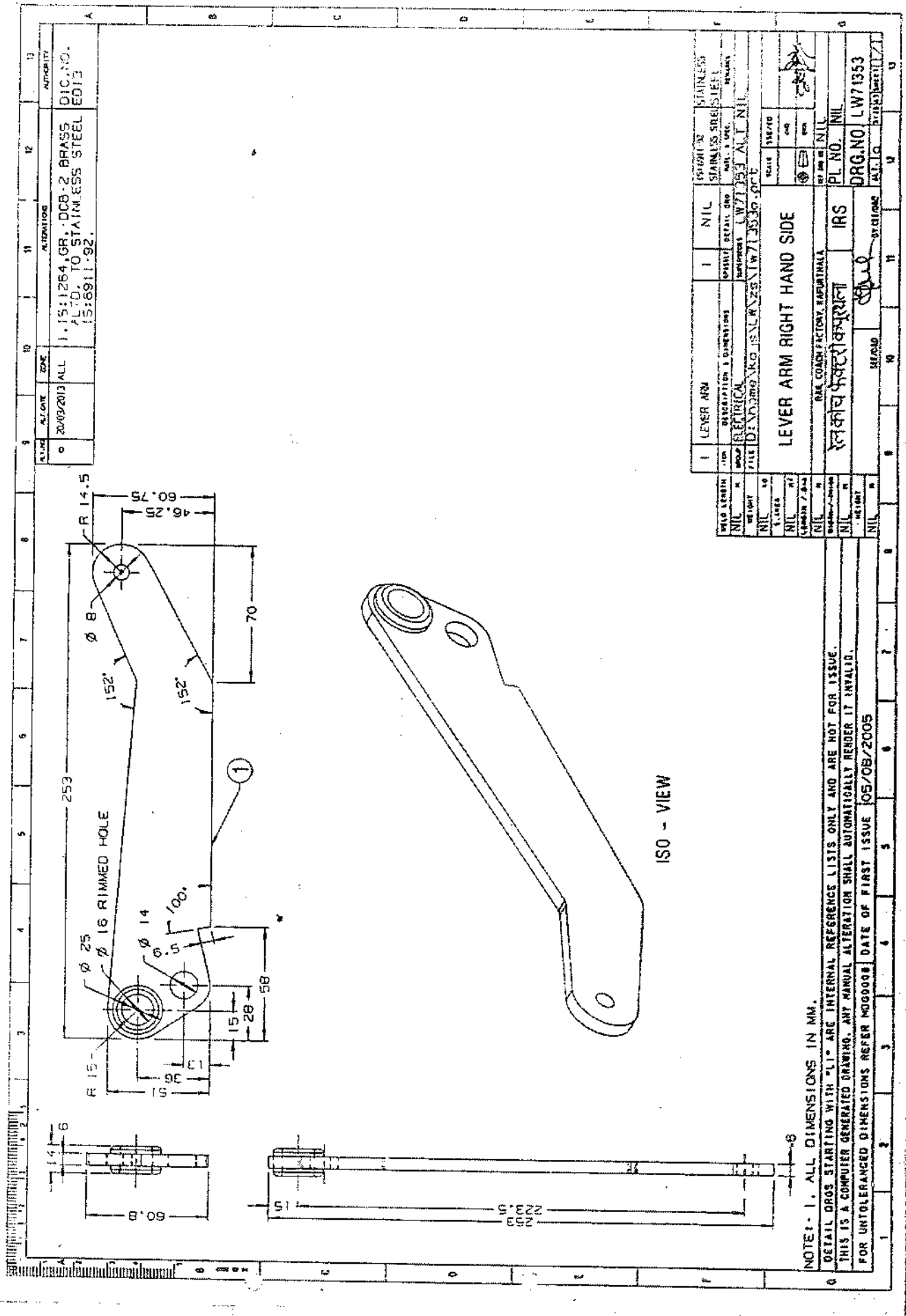
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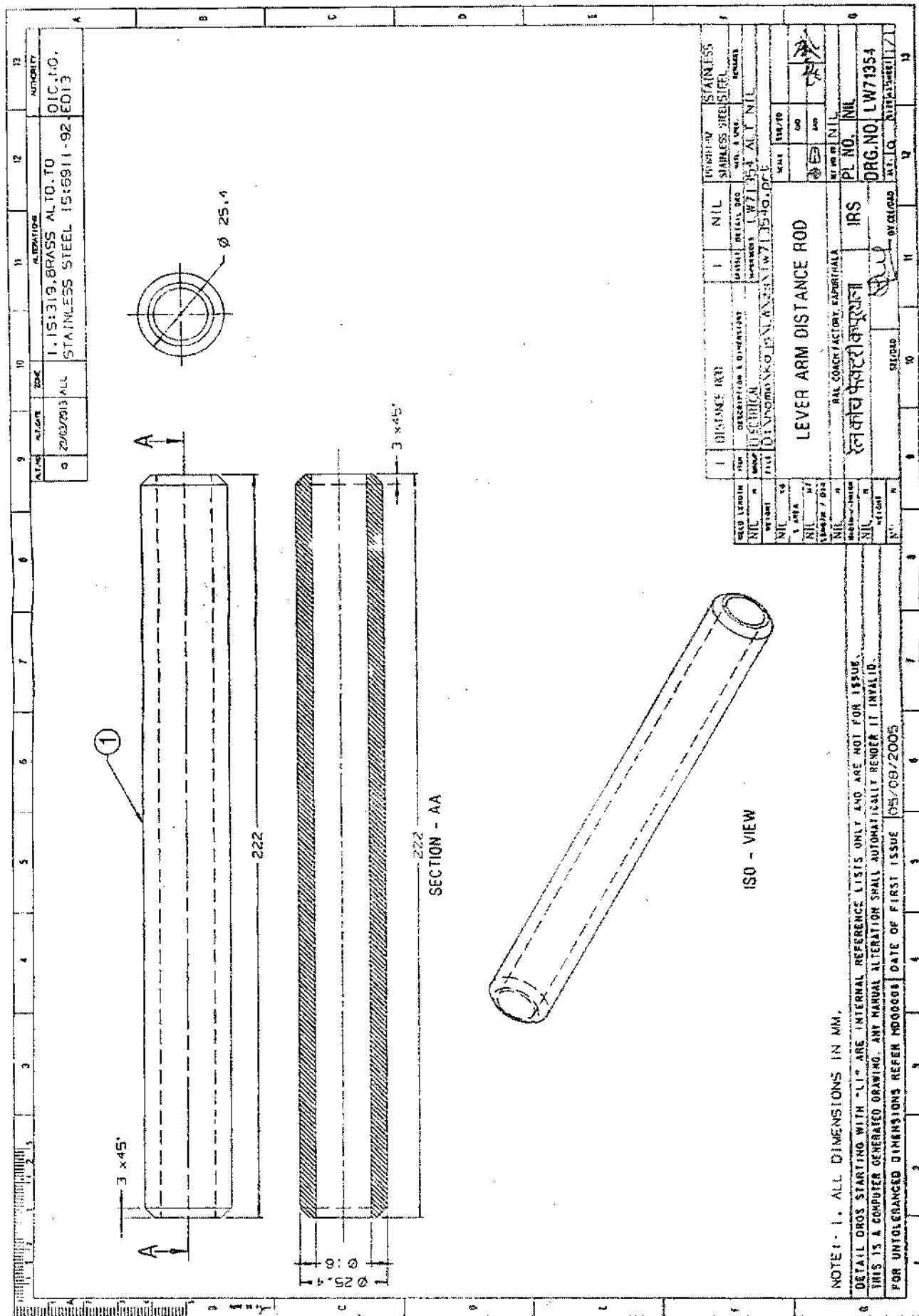
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2. MATERIAL SHALL BE ALUMINIUM TO IS 817-04 G-3-4800.
ALL DIMENSIONS IN MM.

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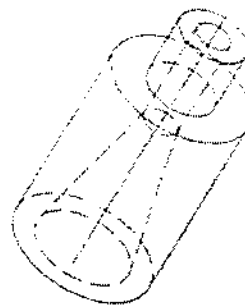
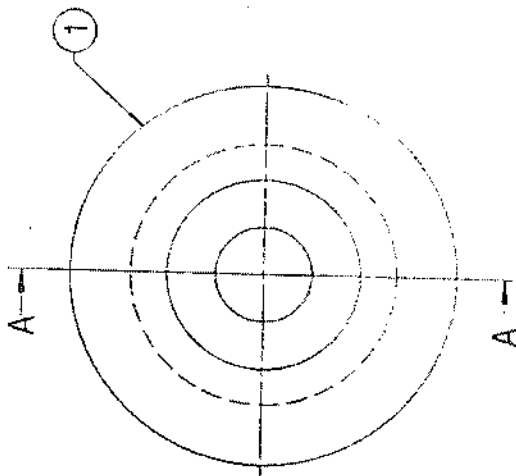




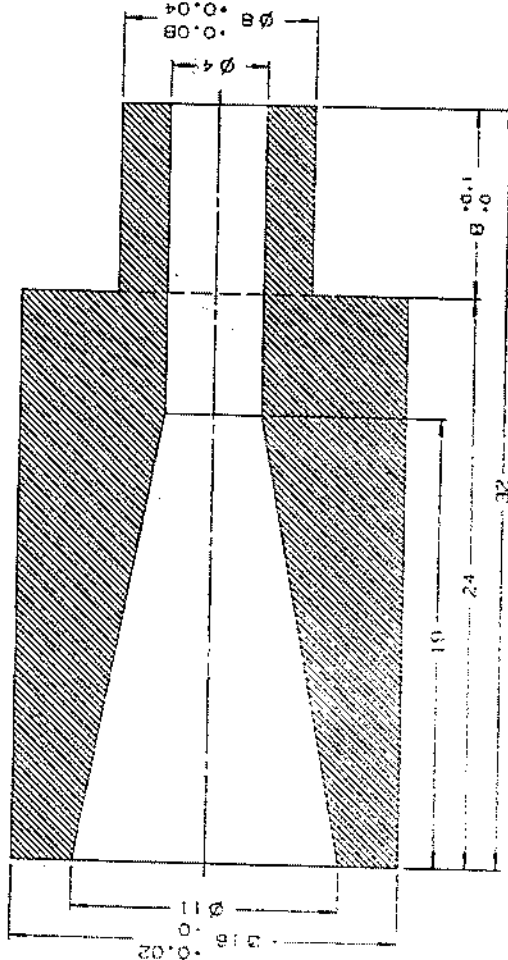
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SECTION A-A

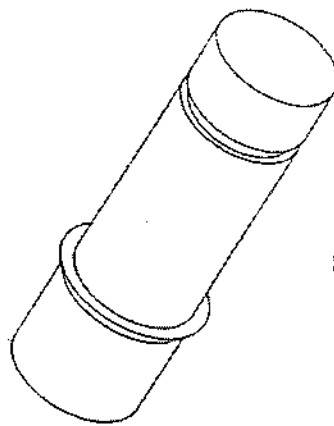
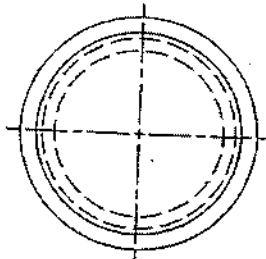
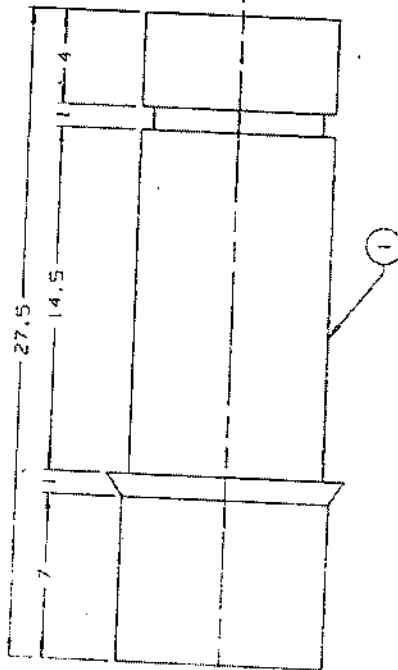
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1	20/03/2013	ALL			1. IS: 319, BRASS AL TO. 3 STAINLESS STEEL IS: 6911-92.

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2	DESCRIPTION & DIMENSIONS	2	DETAILS	DETAILS	DETAILS	DETAILS
3	DESIGN	3	DESIGN	DESIGN	DESIGN	DESIGN
4	FILE	4	FILE	FILE	FILE	FILE
5	DATE	5	DATE	DATE	DATE	DATE
6	BY	6	BY	BY	BY	BY
7	CHK	7	CHK	CHK	CHK	CHK
8	APP	8	APP	APP	APP	APP
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10	DRG NO.	10	DRG NO.	DRG NO.	DRG NO.	DRG NO.

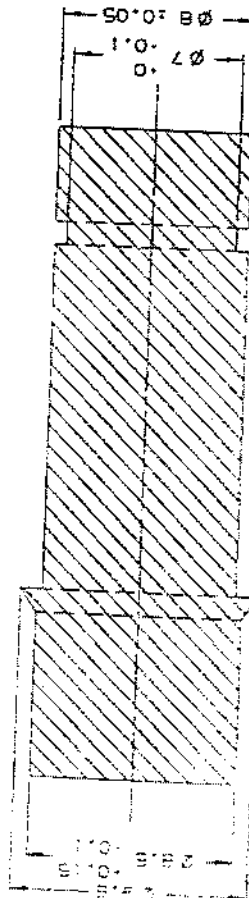
NOTE: 1. ALL DIMENSIONS IN MM.

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SECTION - AA

NOTE: 1. ALL DIMENSIONS IN MM.

2. DETAIL DROS STARTING WITH "L1" ARE INTERNAL REFERENCE LISTS ONLY AND ARE NOT FOR ISSUE.

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FOR UNTOLENCED DIMENSIONS REFER MDG0004 DATE OF FIRST ISSUE 05/08/2005

ITEM NO.	ITEM	DESCRIPTION & DIMENSIONS	DETAIL NO.	STAINLESS	STAINLESS
1	PIN FOR LOCK ARM SMALL	1	NIL	IS: 6911-92	STEEL
2	DESCRIPTION & DIMENSIONS	1	NIL	IS: 6911-92	STEEL
3	FILE	DI THOMAS NO. 18 LW 2.5 LW 71357 ALT. N1	1	NIL	STEEL
4	WEIGHT	1	NIL	IS: 6911-92	STEEL
5	AREA	1	NIL	IS: 6911-92	STEEL
6	PERM	1	NIL	IS: 6911-92	STEEL
7	PERM	1	NIL	IS: 6911-92	STEEL
8	PERM	1	NIL	IS: 6911-92	STEEL
9	PERM	1	NIL	IS: 6911-92	STEEL
10	PERM	1	NIL	IS: 6911-92	STEEL
11	PERM	1	NIL	IS: 6911-92	STEEL
12	PERM	1	NIL	IS: 6911-92	STEEL
13	PERM	1	NIL	IS: 6911-92	STEEL

PIN FOR LOCK ARM SMALL

RSR, ROACH FACTORY, RAIPUR, INDIA

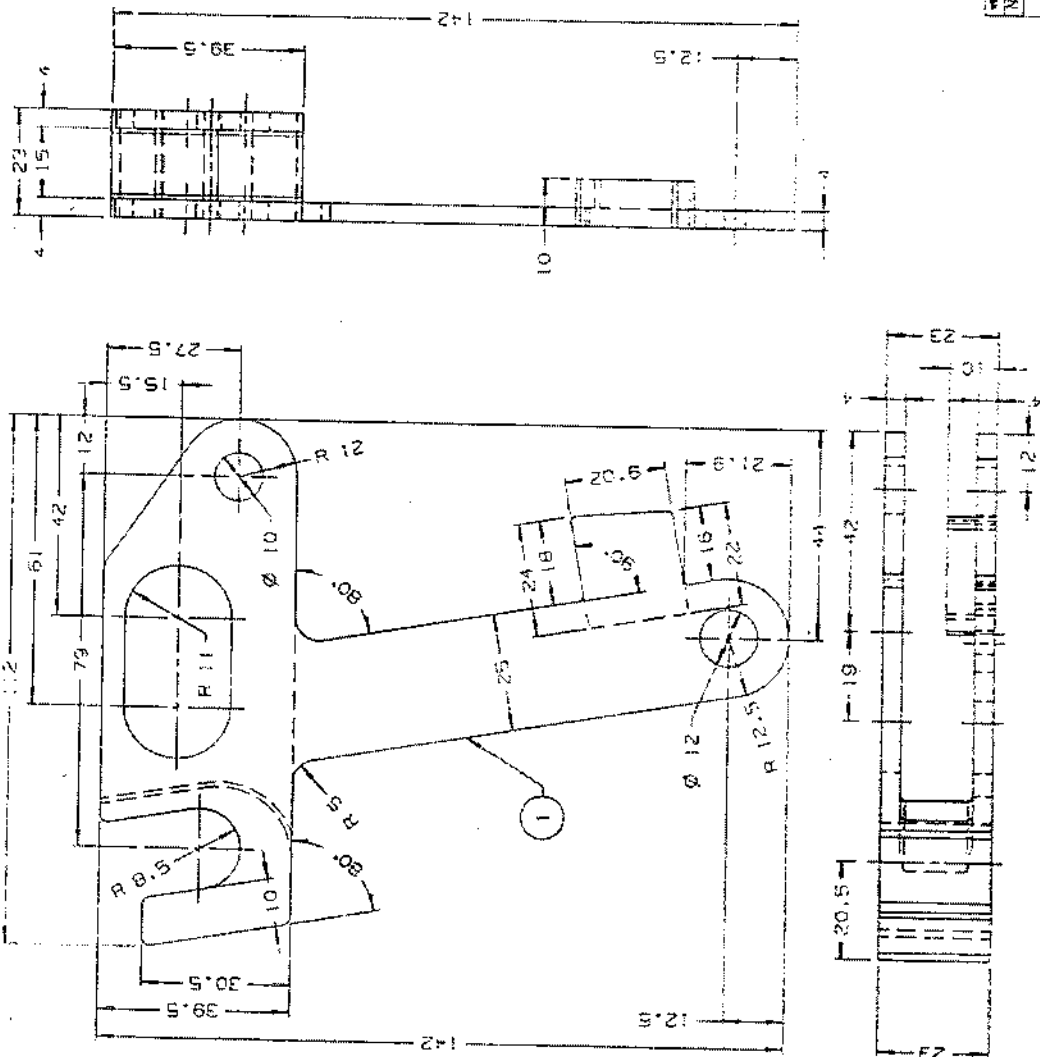
रलकाच फाक्टरी कपूरल

IRS

PL NO. NIL

ORG. NO. LW71357

DATE	20/03/2013	ALL	1.511264 251-UCB-2 8-SSS	QTC NO.	ED13
REVISION			10 STAINLESS STEEL		
			15:5911:32		

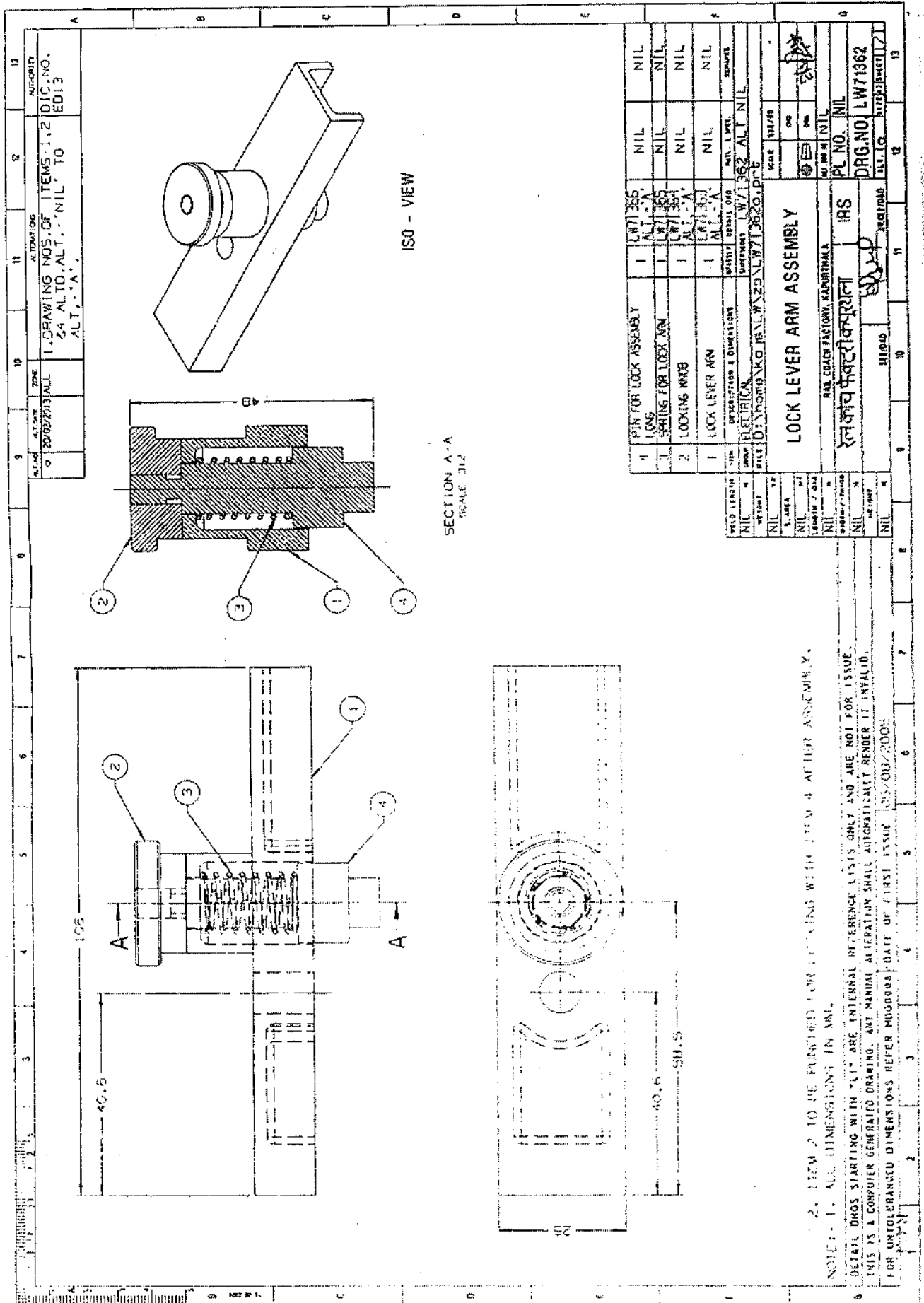


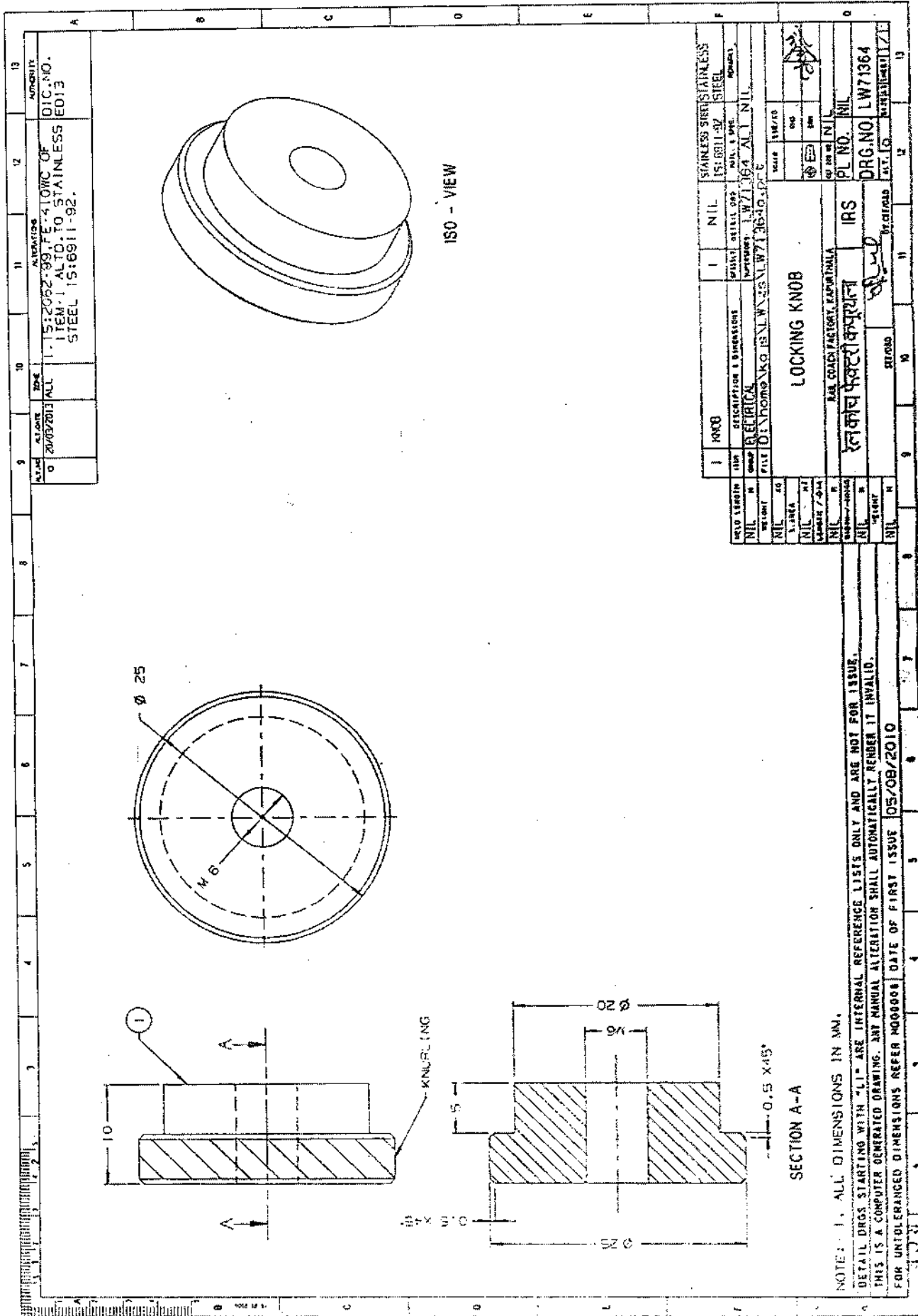
ISO - VIEW

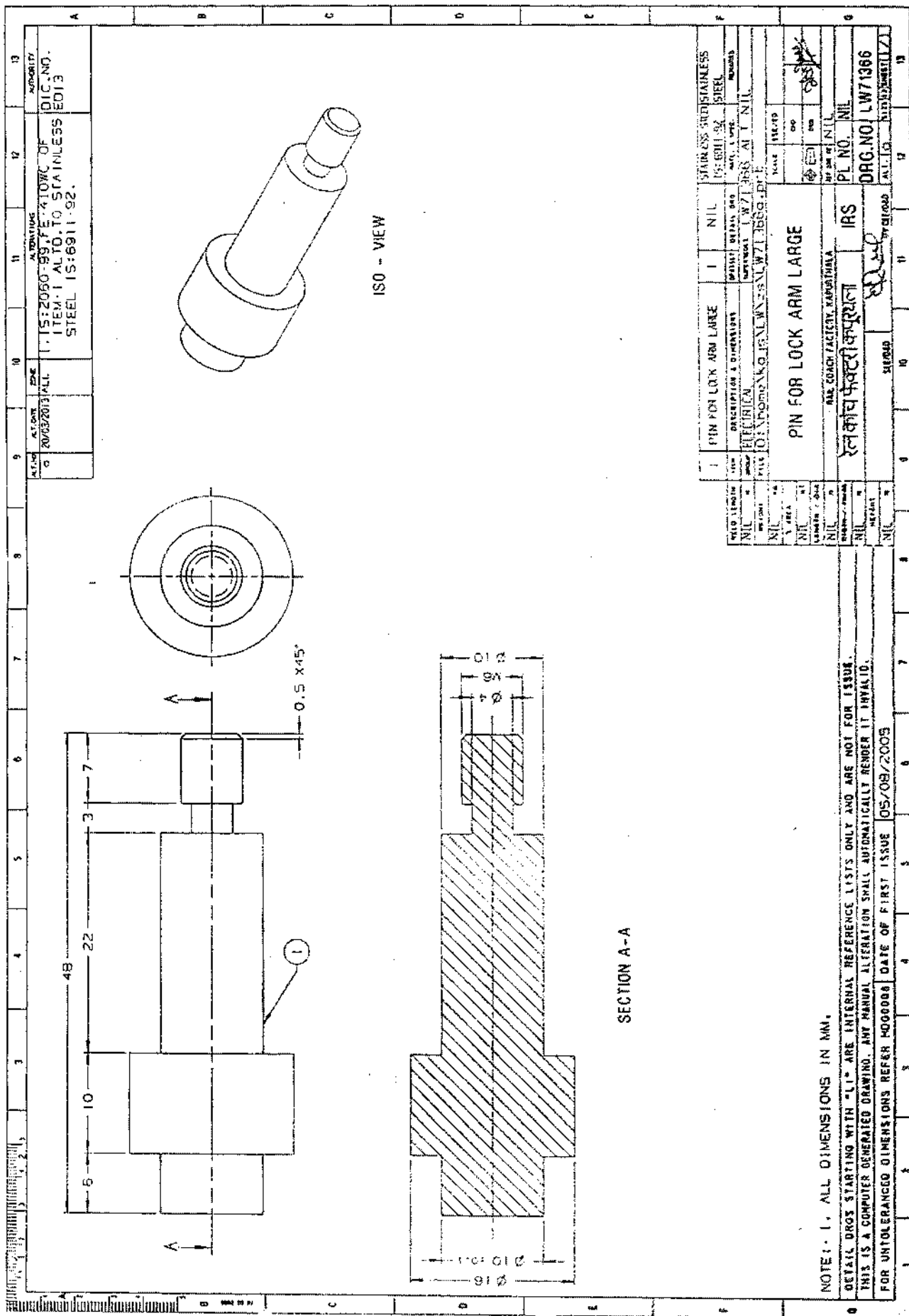
1	LEVER TIE BOW LEFT HAND SIDE	NIL	STAINLESS STEEL
2	DESCRIPTION & DIMENSIONS	DETAILS	STAINLESS STEEL
3	REVISION	W/L	ALL
4	FILE	15:5911:32	15:5911:32
5	DATE	20/03/2013	20/03/2013
6	BY	ED	ED
7	PL NO.	NIL	PL NO.
8	DRG NO.	LW71361	DRG NO.
9	REVISED		REVISED
10	BY		BY
11	DATE		DATE
12	PL NO.		PL NO.
13	DRG NO.		DRG NO.

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FOR UNTOLERANCED DIMENSIONS REFER M000008 DATE OF FIRST ISSUE 05/08/2005







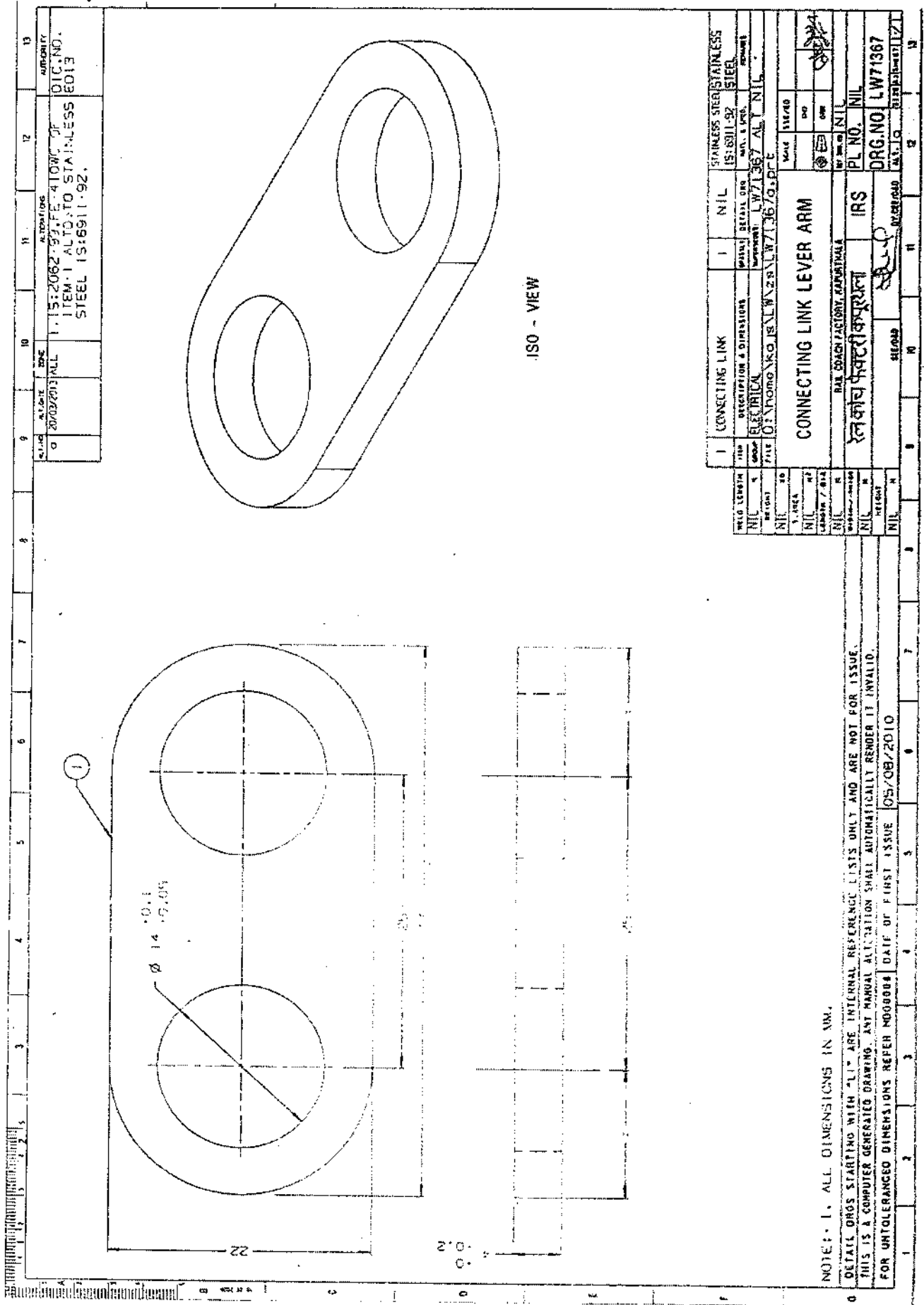
ITEM NO.	DESCRIPTION & DIMENSIONS	UNIT	QTY	REMARKS
1	PIN FOR LOCK ARM LARGE	1	NIL	STAINLESS STEEL
2	DETAIL DROPS	1	NIL	STAINLESS STEEL
3	DETAIL DROPS	1	NIL	STAINLESS STEEL
4	DETAIL DROPS	1	NIL	STAINLESS STEEL
5	DETAIL DROPS	1	NIL	STAINLESS STEEL
6	DETAIL DROPS	1	NIL	STAINLESS STEEL
7	DETAIL DROPS	1	NIL	STAINLESS STEEL
8	DETAIL DROPS	1	NIL	STAINLESS STEEL
9	DETAIL DROPS	1	NIL	STAINLESS STEEL
10	DETAIL DROPS	1	NIL	STAINLESS STEEL
11	DETAIL DROPS	1	NIL	STAINLESS STEEL
12	DETAIL DROPS	1	NIL	STAINLESS STEEL
13	DETAIL DROPS	1	NIL	STAINLESS STEEL

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FOR UNTOLERANCED DIMENSIONS REFER M000004 DATE OF FIRST ISSUE 05/08/2010

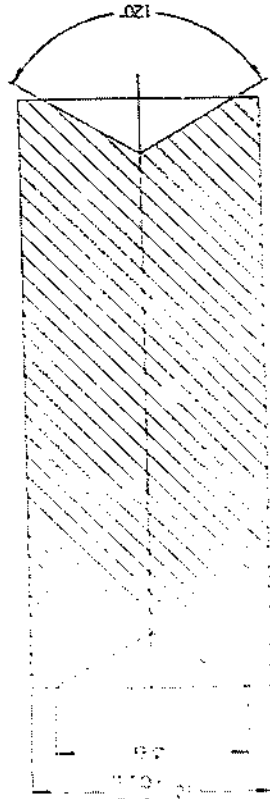
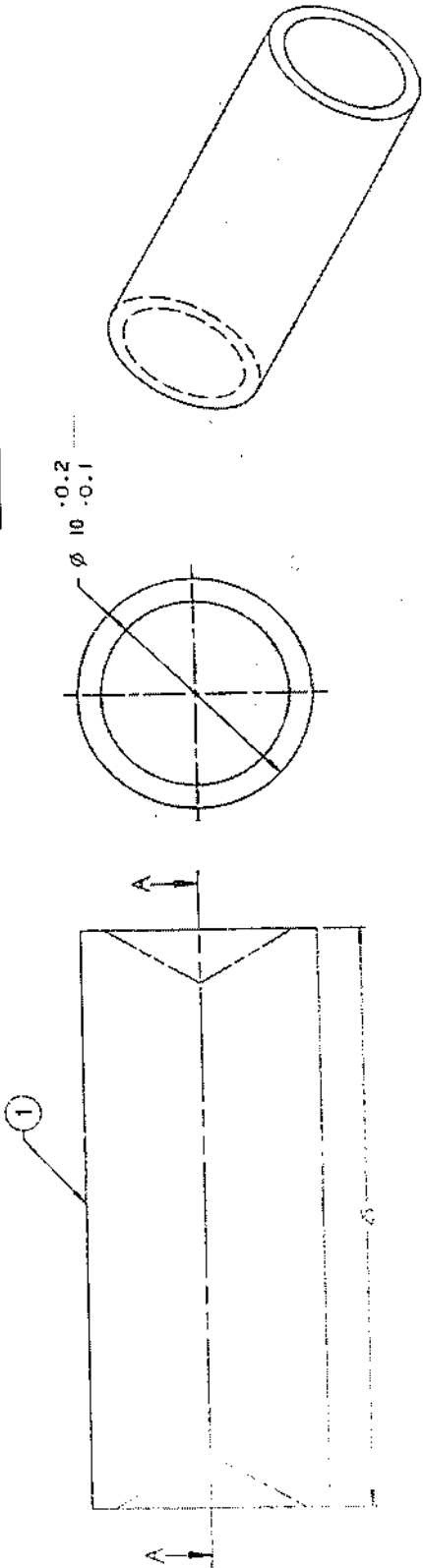
ITEM	DESCRIPTION & DIMENSIONS	1	NIL	STAINLESS STEEL
1	CONNECTING LINK			
2	DESCRIPTION & DIMENSIONS			
3	DETAIL DRO			
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CONNECTING LINK LEVER ARM

PL NO. NIL

DRG NO. LW71367

1	2	3	4	5	6	7	8	9	10	11	12	13
ALLOY: AL-202 DATE: 20/02/2005 ALL: 1. IS:2062-99, FE-410WC OF ITEM-1 ALTO. TO STAINLESS ED13 STEEL IS:6011-92.									ALTERATIONS NO. 1 DATE: 20/02/2005 BY: 1. IS:2062-99, FE-410WC OF ITEM-1 ALTO. TO STAINLESS ED13 STEEL IS:6011-92.			



SECTION A-A

1	2	3	4	5	6	7	8	9	10	11	12	13
RIVET PIN DESCRIPTION & DIMENSIONS MATERIAL: STAINLESS STEEL FINISH: POLISHED TOLERANCES: ±0.1 FILE: D:\Home\KQ\B\LW\28\LW71368.PRT									RIVET PIN DESCRIPTION & DIMENSIONS MATERIAL: STAINLESS STEEL FINISH: POLISHED TOLERANCES: ±0.1 FILE: D:\Home\KQ\B\LW\28\LW71368.PRT			
RIVET PIN LINK LONG ALL COACH T-CLINT, KAPUTRALA RSN KACH KETTERI KAPUTRALA PL NO. NIL DRG. NO. LW71368 DATE: 05/08/2005									RIVET PIN LINK LONG ALL COACH T-CLINT, KAPUTRALA RSN KACH KETTERI KAPUTRALA PL NO. NIL DRG. NO. LW71368 DATE: 05/08/2005			

NOTE: 1. ALL DIMENSIONS IN MM.

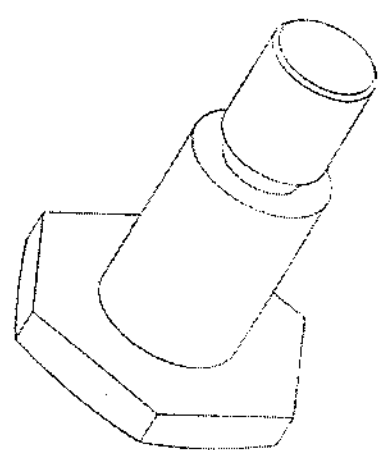
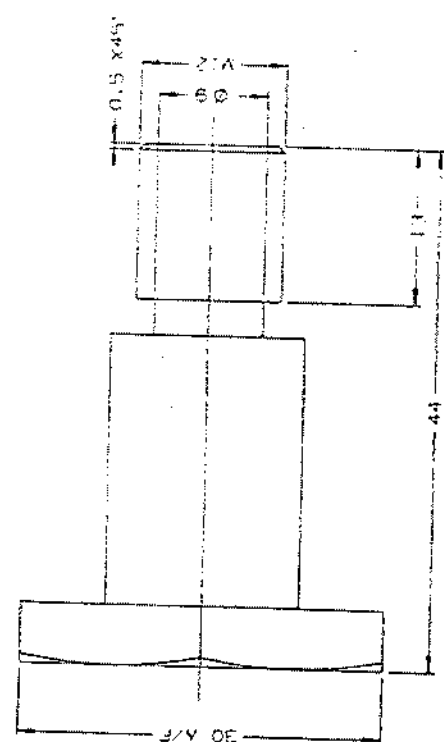
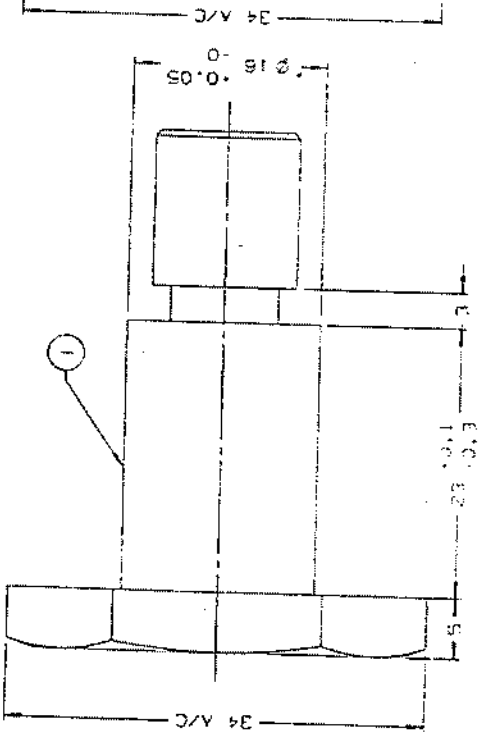
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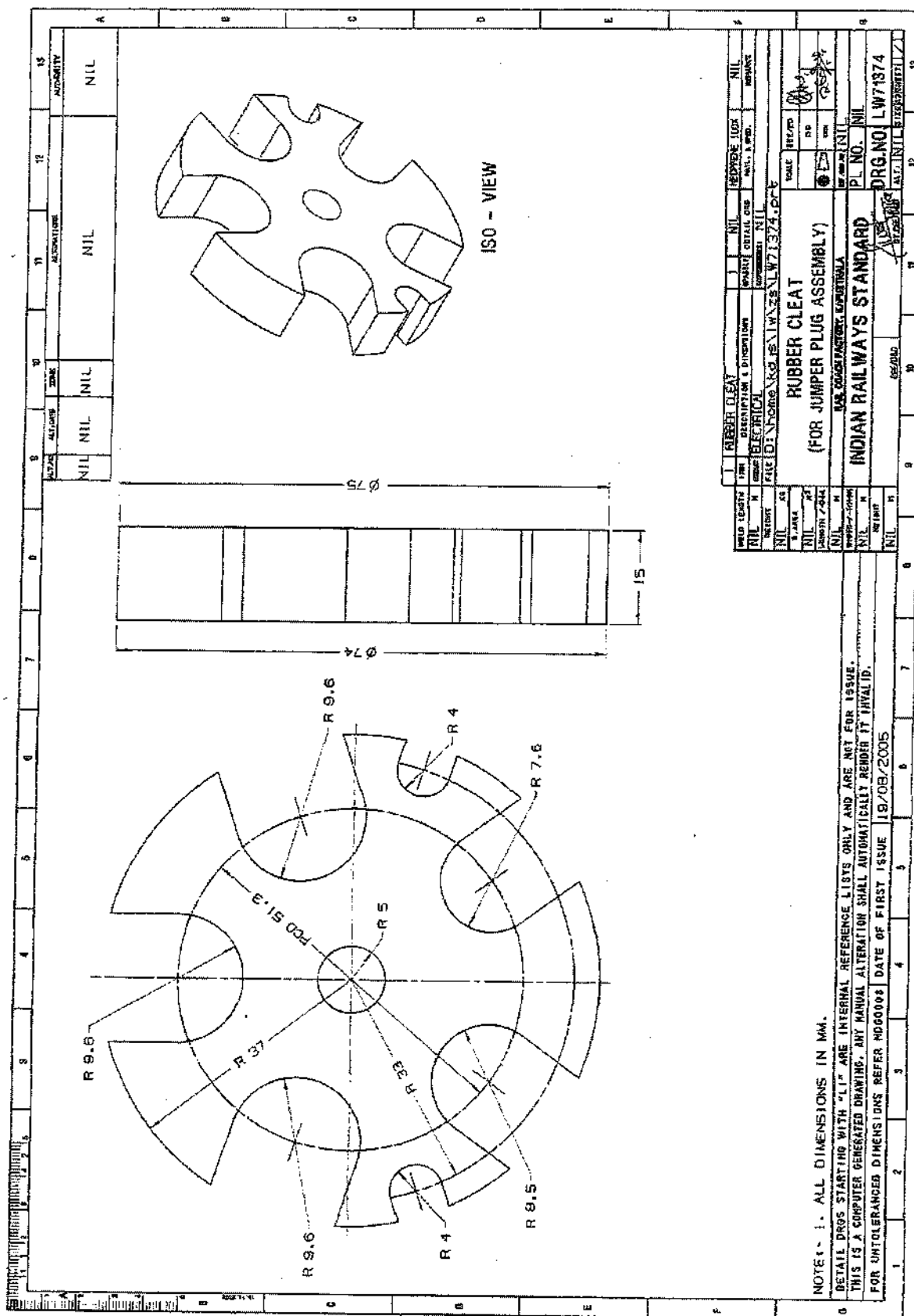


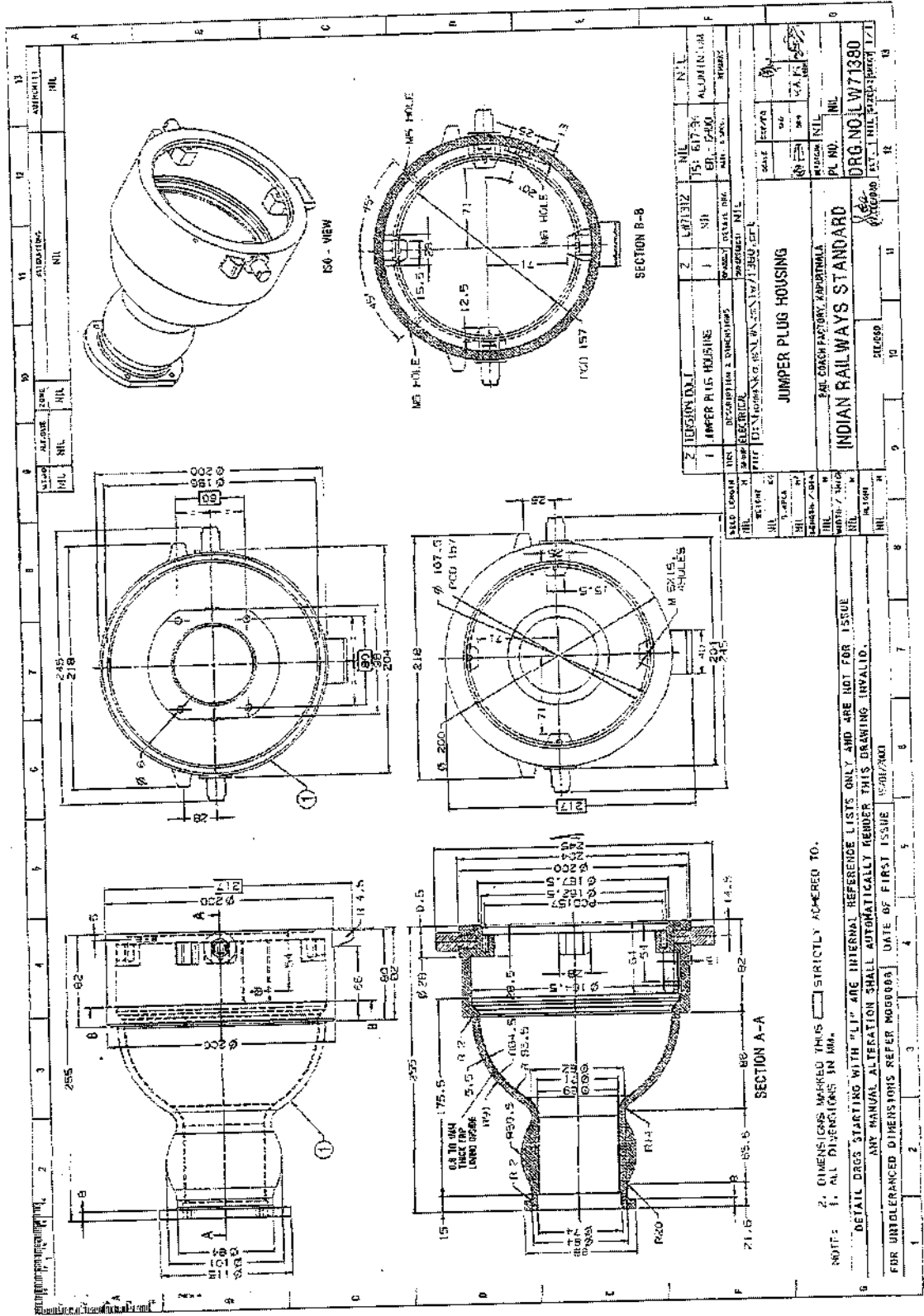
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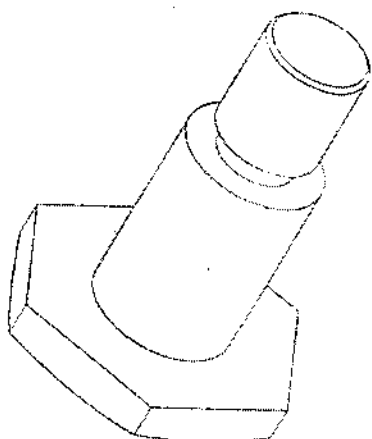
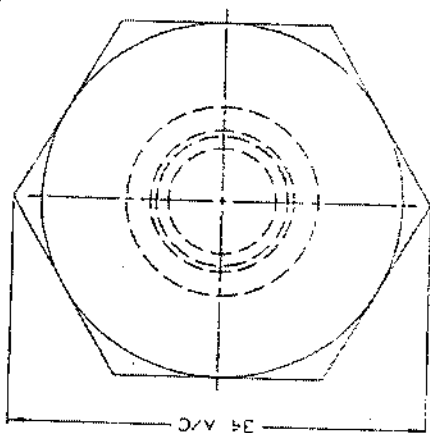
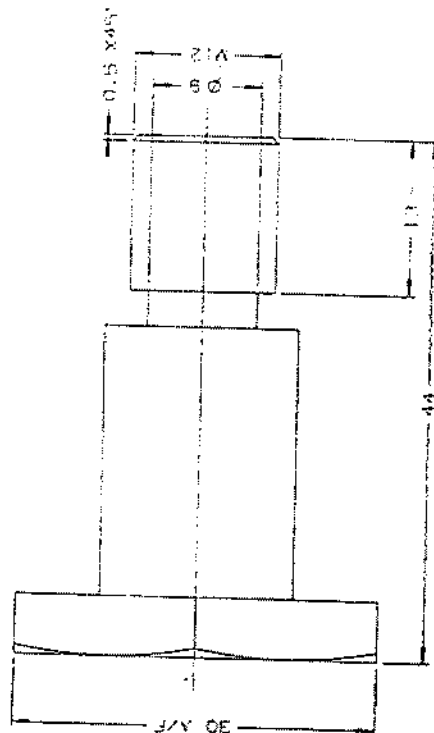
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DETAIL DROS STARTING WITH "1" ARE INTERNAL REFERENCE LISTS ONLY AND ARE NOT FOR ISSUE.
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 FOR UNTOLERANCED DIMENSIONS REFER M000004 DATE OF FIRST ISSUE 05/08/2005

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BEARING PIVOT BOLT AAK COACH FACTORY, KAPURTHALA रलकच फेवरी कपूरला PL NO. NIL ORG. NO. LW71371												







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NOTE: - 1. ALL DIMENSION IN MM.

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FOR UNLOADED DIMENSIONS REFER APPROX.

FOR UNTOLERANCED DIMENSIONS REFER H000000	DATE OF FIRST ISSUE	05/08/2005
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Annexure-A

RCF Annexure-A to RDSO specification No.RDSO/PE/Spec/AC/0177 Rev.0 -2013.

This Annexure is applicable for LHB EOG AC Coaches and is prepared due to requirement of increased cable length in LHB coaches due to provision of biotoilets.

The scope of supply mentioned in clause 1.2 shall be as below.

1	Jumper Plug Assembly	2 Nos.
2	Coupling socket assembly	2 Nos.
3.	Dummy Socket Assembly	2 Nos
4.	Jumper cable duly crimped with each jumper plug and covered with flexible polyamide conduits and its fittings	3.0 meters
5.	Jumper cable duly crimped with each coupler socket	0.6 meters

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RCF Annexure	Date	SSE/CAD	SEE/D	Dy CEE/D&D	Page

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Annexure-B

RCF Annexure-B to RDSO specification No.RDSO/PE/Spec/AC/0177 Rev.0 -2013.

This Annexure is applicable for LHB Power Car and is prepared due to provision of Head on Generation Power Supply System and requirement of increased cable length due to provision of Bio-Toilets in LHB Power Cars.

The scope of supply mentioned in clause 1.2 shall be as below.

1	Jumper Plug Assembly	3 Nos.
2	Coupling socket assembly	1 No.
3.	Dummy Socket Assembly	3 Nos
4.	Jumper cable duly crimped with each jumper plug and covered with flexible polyamide conduits and its fittings	3.0 meters
5.	Jumper cable duly crimped with each coupler socket	0.6 meters

B	05.10.15	<i>Indu</i>	<i>Indu</i>	<i>Shruti</i>	1 of 1
RCF Annexure	Date	SSE/CAD	SEE/D	Dy CEE/D&D	Page

RAIL COACH FACTORY, KAPURTHALA

No. ED-2011

Dated : 05.09.2016.

Sub: Procurement of High Capacity Inter Vehicular Coupler Unit (500 Amp.).

Ref: PSL for LHB Type Generator Car for year 2017-18.

The procurement advice for High Capacity Inter Vehicular Coupler Unit (500 Amp.) was sent as per RDSO specification No. RDSO/PE/SPEC/AC/0177 with RCF Annexure B, Corrigendum-1.

High Capacity Inter Vehicular Coupler Unit (500 Amp.) may now be procured as per RDSO specification No. RDSO/PE/SPEC/AC/0177 with RCF Annexure B.

Necessary action may be taken accordingly.


Dy. CEE/D&D

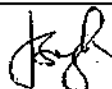

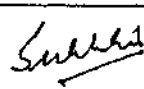
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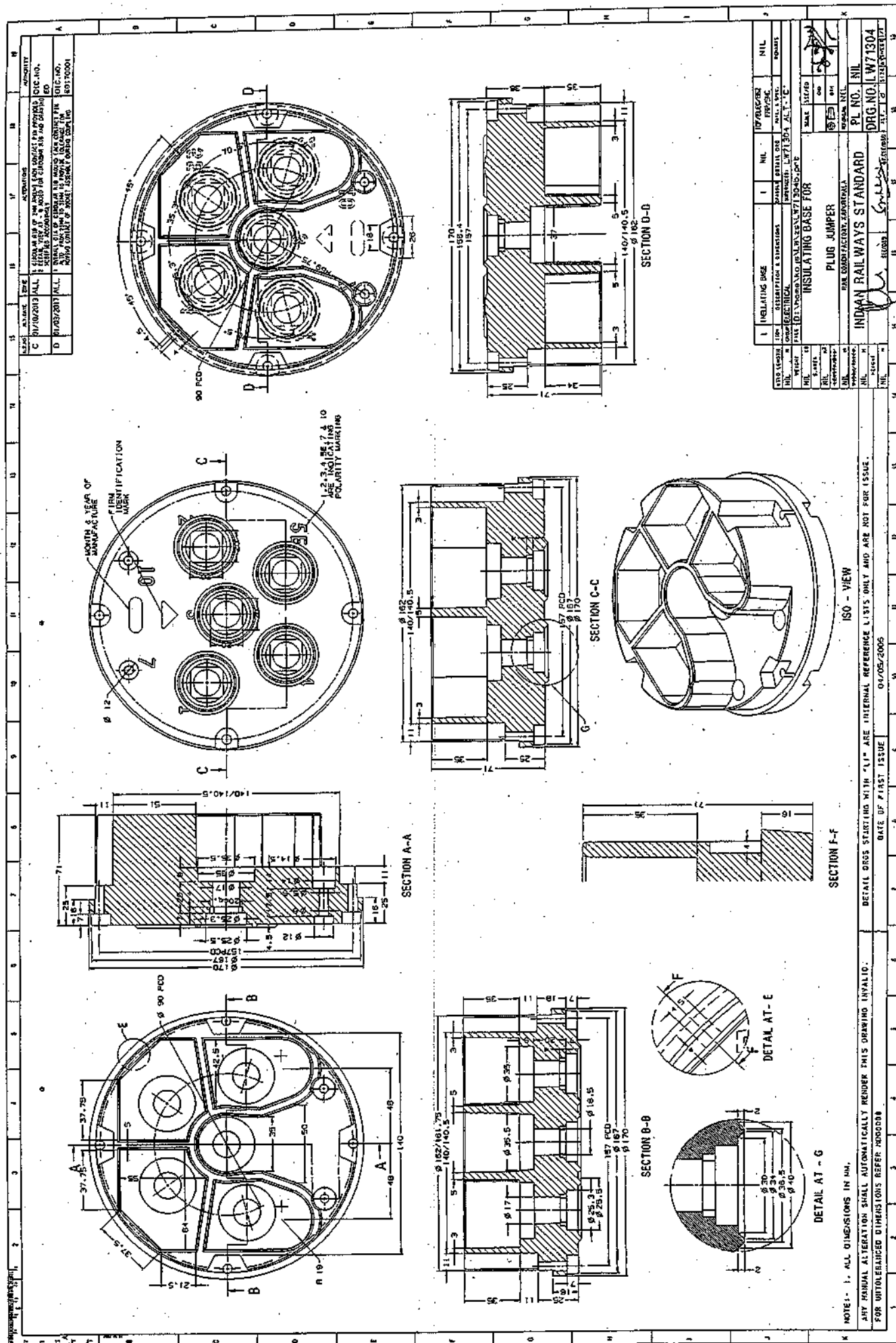
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Dy. CPLE-II

Corrigendum-1

This corrigendum is issued to specification no. RDSO/PE/SPEC/AC/0177,Rev-'0'-2013 with RCF Annexure-A & B to modify clause no.4.2,4.20 & 14.0 of the specification wherein the drawing no.LW71304, Alt-'c' may be read as LW71304,Alt-'d'.

RDSO/PE/SPEC/AC/ 0177,Rev-'0' with RCF Annexure-A & B	1	02/03/2017				1 of 1
Spec.no.	Corr.	Date	SSE/CAD	SEE/D	DY.CEE/D&D	Sheet






RCF Annexure-C to RDSO Specification no. RDSO/PE/SPEC/AC/0177-2013,Rev-0,Corr-1.

This annexure is applicable for LHB Inspection carriage (Administrative) RA Coach and is prepared due to provision of Head on Generation Power Supply system and requirement of increased cable length due to provision of Bio-Toilets in LHB Inspection carriage (Administrative) RA Coach.

The scope of supply mentioned in clause 1.2 shall be as below:

1.	Coupling socket assembly	4 Nos.
2.	Jumper Plug assembly. (Plug provided in both side of jumper cable)	4 Nos.
3.	Jumper cable duly crimped with each jumper plug and covered with flexible polyamide conduits and its fittings	3.0 meters each
4.	Jumper cable duly crimped with each coupler socket	0.6 meters

RDSO/PE/SPEC /AC/0177- 2013, Rev-0.	C	29.04.19				1 of 1
Doc. No.	RCF Annx.	Date	SSE/CAD	SEE/D	Dy.CEE/D&D	Page No.

**RCF Annexure-D to RDSO Specification no. RDSO/PE/SPEC/AC/0177-2013, Rev-0,
for LHB type High Capacity Parcel Van coaches.**

This annexure is applicable for LHB Type High Capacity Parcel Van coaches only wherein, separate jumper plug at both ends is required for inter-connection to Loco in Head on Generation Power Supply system. As such cable length is also changed to optimum requirement to avoid grinding/rubbing against metal parts.

1. The scope of supply mentioned as in clause 1.2 shall be read as under:



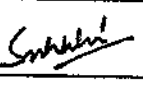
S.NO	Description	QPC
1.	Jumper plug assembly with Jumper cable duly crimped with jumper plugs on both side of jumper cable duly covered with flexible polyamide conduits and its fittings as per drawing no. CC71515, Alt 'Nil'.	02 Nos.
2.	Coupling socket assembly	04 Nos.
3.	Dummy socket assembly	04 Nos.
4.	Jumper cable duly crimped with each coupling socket	0.5 meters.

2. Accordingly Jumper cable length is modified for LHB Type High Capacity Parcel Van coaches only as under:-

S.No.	Jumper cable, Circuit/Identification	Cable Size in mm ²	Length of jumper cable on Plug side	Length of jumper cable on Socket side
1.	R-Phase	150	2.0m	500mm
2.	Y-Phase	150	2.0m	500mm
3.	B-Phase	150	2.0m	500mm
4.	N-Neutral	95	2.0m	500mm
5.	E-Earth	70	2.0m	500mm
6.	Body Earth	35	10"	8"
7.	C-1 Control	4.0	2.0m	500mm
8.	C-1 Control	4.0	2.0m	500mm

Enclosure:



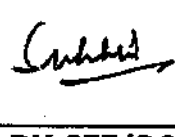
1. Drg. No. CC71515, alt 'nil'

RDSO/PE/SPEC/AC/0177-2013, Rev-0.	D	17.07.2020				1 of 1
Spec. No.	RCF Annexure	Date	SSE/CAD	SEE/D	Dy.CEE/D&D	Page No.

Corr-2 is issued to RDSO specification no.RDSO/PE/SPEC/AC/0177,Rev-0,2013 with RCF Annexure-A,B & C and Corr-1 for modification of jumper cable length.

Jumper cable length modified as under:-

S.No.	Description	Existing Length	Revised Length
1	Jumper cable duly crimped with each jumper plug and covered with flexible polyamide conduits and its fittings	3.0 meters	2.4 meters
2	Jumper cable duly crimped with each coupler socket	0.6 meters	0.5 meters

RDSO/PE/SPEC/ AC/0177,Rev-'0' and RCF Annexure-A,B & C with Corr-1	2	17/03/20				1 of 1
Spec.no.	Corr	DATE	SSE/CAD	SEE/D	DY.CEE/D&D	SHEET

