

PURCHASE SPECIFICATIONS
FOR
1000A, 1000 V PLUG & SOCKET
FOR
OIL RIG APPLICATIONS



SPECIFICATION NO. : OR 12250
REVISION NO. : Rev 00
DATE : 12.08.2002
DISTRIBUTION : PI - 4 copies
O/C - 1 copy

PREPARED BY

CHECKED BY

APPROVED BY

R. K. AGRAWAL
DY. MGR (D)

DIPAK SARMA
SR. MGR (D)

D. K. THAKUR
DY. G. M.

ISSUED BY

CONTROL EQUIPMENT ENGINEERING DIVISION
BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL

GENERAL SPECIFICATIONS FOR 1000A, 1000 VOLTS AC/DC PLUG AND SOCKET FOR OIL RIGS

1. SCOPE :

This specification applies to plug and socket, with a rated operational voltage not exceeding 1000 V and 50/60 Hz AC/DC and a rated current not exceeding 1000A, primarily intended for indoor industrial / drilling rig use when the ambient temperature does not normally exceed 50 deg C.

2. DESIGN & CONSTRUCTION :

The body of Plug & Socket shall be made of tough, non-corroding, non-ignitable Polyester mouldings with glass filled nylon (upto 30%). The material shall have good electrical insulation & mechanical properties and shall exhibit self extinguishing properties if ignited. These units shall be weather- proof and of robust construction. Socket shall have flange for surface mounting on a socket board with rear cable entry with protective cap or cover on plug side. These units shall be suitable for use in dusty, salt laden, oily and 100% damp atmosphere.

Plugs tube shall be designed and shaped in such a way and made of such a material that can be easily be unscrewed by hand from the relevant socket housing. Material of Plug tube & socket housing shall be suitable to withstand temperature rise occurs due to current flowing through the assembly and threads of plug tube & socket housing should not get locked due to fusion of material.

Plug tube shall have a threaded plug terminal cover tube made of insulating material as stated above to cover the crimped cable connection on plug side. The terminal cover tube on plug is to be provided with a cable bush suitable for 300 sqmm copper cable at the rear cable entry side to prevent ingress of dust, oil & moisture in the plug. There should be no sharp bent at the point of entry of the cable.

Socket contact assembly shall have sufficient resiliency to ensure adequate contact pressure on the plug pins. Socket with contact pressure spring type design to be followed. The design and properties of pin and contact assembly shall be such that connections do not slacken or overheat under the normal conditions of use and after repeated insertion and removal. All parts of male & female contacts shall be of sufficient cross-section/size suitable relative to the rated current of the plugs and socket outlets. Pin of plug, contact & cable terminal of socket outlets shall have adequate mechanical strength & should be silver plated to 15 microns thickness. The cable terminal of socket contact shall have 2 holes of dia 11mm with 25.4mm spacing for cable lug connection. All items used in plug and socket assemblies shall be resistant to corrosion & abrasion.

The pin contact must have slight free circular movement after tightening with lock nut in plug tube / housing. This shall ensure easy tightening of plug tube with cable crimped, over socket housing and proper contact between pin & socket of the assembly i.e. pin of the plug shall be fully inserted in to the socket without any torsional pressure on the crimped pin and cable assembly. After checking of free circular movement of pin contact in plug housing, the locknut should be punch marked to prevent loosening of pin contact during service.

The crimp portion length of pin contact should be suitable for crimping (two/three crimps) 300 sq mm multi strand flexible copper cable and should be annealed to hardness of 50-60 HV to ensure crack free crimping of pin contact with cable.

The engagement face of the plugs shall have no projection other than the pin & locking nut, when the plug is wired as in normal use.

3. **SIZE & DRAWINGS :**

Detailed drawings of plugs & sockets indicating overall dimensions, mounting details mode of cable termination at plug & socket terminals and approximate weight to be furnished by supplier. The drgs shall also indicate the major sub-assemblies of the plug & socket arrangement. The plugs and sockets shall be suitable for the cables and mounting PCD as per following chart.

DESCRIPTION	SUITABLE CABLE	DIA OF CABLE	MOUNTING HOLES ON SOCKET HOUSING
1000 A, 1000V, single Pin Plug & socket	300 sqmm 1000 V grade 1525 strands of 0.5mm dia. copper cable	26 mm conductor diameter (Approx) 35.2mm overall diameter	4 threaded inserts of size M8 x 12mm deep to be provided on socket housing for rear side mounting with 88mm +/- 0.5mm PCD and equispaced.

Note : The internal diameter of the cable bush should match the cable overall diameter to ensure proper sealing.

Following BHEL Drgs are enclosed (For reference purpose only)

- | | |
|--|--------------------|
| 1) Insulated Components of 1000A plug & socket | Drg No 15721010119 |
| 2) Components for 900A plug & socket | Drg No 25721010141 |
| 3) Cable Bush | Drg No 45721010054 |

4. **MARKINGS :**

The following shall be marked clearly and indelibly on both plug & socket outlets:

- i) Continuous current rating
- ii) Voltage rating
- iii) Manufacturer name, type no of the assembly, month & year of manufacture.

The markings shall be durable and easily legible.

5. **TESTS :**

The following tests are to be conducted as per the method mentioned in the respective clause :

5.1 **ACCEPTANCE TEST** (to be conducted on 10% of the lot size unless specified)

- 5.1.1 Visual examination : Plugs & Sockets to be checked for dimension conformity, any cracks and compliance with design requirements as stated in CL. No. 2 of the specification.

- 5.1.2 Interchangeability : Plugs and sockets should be checked for inter changibility by selecting atleast 6 pairs. Plugs and sockets should be inter-changeable with plug or socket of other pairs.
- 5.1.3 Effectiveness of contact : (to be conducted on 5% of lot size)
The effectiveness of contact between a plug pin and the corresponding socket shall be such that in the completely engaged position, the voltage drop at full current rating i.e. 1000A shall not exceed 10 millivolts measured between the crimped terminal of the plug pin and the cable terminal of socket. The voltage drop should be measured after approx. 2 hours of starting the test (so that temperature rise of terminals stabilized).
- 5.1.4 Insulation resistance & Electric Strength Test :
Connect Plug & Socket assy. together. Provide 4 mounting screws on the socket housing and short them with a copper wire. Measure IR value with a 1000 V Meggar between shorted screws and plug/socket terminal. Value should not be less than 100 Mega Ohms.
- 3.9 kV AC RMS 50 Hz voltage to be applied between shorted screws & plug/socket terminal for 1 minute. No flash over should take place. Maximum leakage current allowed should be 10 mA during H V test.
- 5.1.5 Moisture resistance test : (to be conducted on 2% of lot size)
This test should be carried out as per CL No 15.2 of IS 1293-1988. IR Value should be measured after the test as per above CL. No 5.1.4. and value should be more than 5 mega ohms.
- 5.1.6 Temperature rise test : (To be carried out only on two samples)
Plug and socket under test to be connected to a 1000A source with cables of 300 sqmm size with length not exceeding 2 meters. After achieving steady state temperature (3 consecutive readings with interval of 15 mins do not differ by 1 deg C after atleast 3 hours of test), the final temperature rise within plug and socket housing measured by a direct reading temperature meter shall not exceed 20 deg C and temperature rise of plug & socket cable terminals shall not exceed 35 deg C.

5.2 ROUTINE TESTS :

Following routine tests to be conducted as per details in respective CL. of Acceptance test.

- 5.2.1 Visual examination (To be conducted on full lot)
- 5.2.2 Interchangeability (To be conducted on 6 pairs other than acceptance test)
- 5.2.2 Insulation resistance & electric strength (To be conducted on full lot)

6. TEST CERTIFICATE :

The necessary test certificate showing the compliance with the above acceptance and routine tests shall be furnished by supplier. Witnessing of tests shall be at the discretion of BHEL Bhopal and shall be as per PO terms and conditions.

7. REFERENCES :

Supplier should be a regular manufacturer and supplying above plugs and sockets assemblies to any O.N.G.C.L or O.I.L installations in India or abroad, a reference list of last two years of supplies made, including type, quantity, PO No & customer to be sent along with the offer.

Note : Supplier to furnish Technical offer giving clause wise comments on the specification. Any deviation from the requirement in the specification to improve the design shall be acceptable provided full details are furnished with the offer.