PURCHASE SPECIFICATIONS

FOR

4 PIN PLUGS & SOCKETS
16A-250A, 500 VAC

FOR

OIL RIG APPLICATIONS

SPECIFICATION NO.	:	**OR 12262**
REVISION NO.	:	**REV 00**
DATE	:	21.11.02
DISTRIBUTION	:	AS PER REQUIREMENT O/C –1

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GENERAL SPECIFICATIONS FOR 4 PIN, 16A-250A, 500 VOLTS AC INSULATED BODY PLUGS AND SOCKETS FOR OIL RIGS

1. **SCOPE** :

This specification applies to plugs and sockets, with a rated operational voltage not exceeding 500 VDC or AC and 50/60Hz AC and a rated current ranging from 16A to 250A, for indoor/outdoor industrial use with maximum ambient temperature 55 deg C. These units shall be suitable for use in 100% dusty, salt laden and damp atmosphere in oil rigs and should be designed to bear rough handling under continued usage.

Following International / National Standards may also be referred for meeting the requirements of plugs and sockets covered in this specification :

1) IEC – 309-1 1988
2) IS – 1293-1988 Second Revision - Amd. No 8 - May 2002

2 **DESIGN & CONSTRUCTION** :

The design & construction of the plugs & sockets should cover following features :

2.1 **Plug & Socket Body / outer shell** :

The Plugs & Sockets shells or outer housings shall be of moulded design & made of around 30% glass filled nylon. Colour of the mouldings should be black. The material for housing shall have good electrical insulation, mechanical strength, shall exhibit self extinguishing properties if ignited .These units shall be weather- proof and of robust construction. The mouldings should be free from porosity, cracks or any moulding defects. The surface of the moulded components should be smooth and do not require any further treatment. Sockets shall have flanges for mounting on the socket boards and removable protective caps or covers on other side to be provided with nylon / aluminium wire braided rope for protection of contacts when not in use. The engagement face of the plugs & sockets shall have no projection other than the pins on plugs, when the assemblies are in normal use.

The design should ensure that effectiveness of electrical contact between pins & sockets is not fully dependent on the tightness of the plug body with socket, this is to eliminate chances of loose connection due to under tightening of plug over the socket. The plug body should be provided with a coupling / jacking nut so that plug and socket are tightened together to prevent accidental removal of plug from socket in energized condition. Plugs shall be designed and shaped in such a way that can easily be withdrawn by hand from the relevant socket-outlet by unscrewing the coupling nut. In addition the gripping surfaces shall be so designed that the plug can be withdrawn without having to pull on the flexible cable or cord and there is no stress exerted on the terminations while doing so.

2.2 **Internal Insulator for pin & socket contacts** :

The internal insulators for carrying pin & socket contacts shall be of moulded design and made of Electrical grade thermosetting plastic (DMC). The mouldings should have good electrical insulation, mechanical strength, shall exhibit self extinguishing properties if ignited. The mouldings should be free from porosity, cracks or any

moulding defects. The surface of the moulded components should be smooth and do not require any further treatment.

The internal insulators should be integrally bonded with the outer shells of plugs & sockets and there should not be any need to remove the internal insulator from outer shell while terminating external connections on the contacts (Refer details in 2.3).

2.3 **Pin & socket contacts** :

Pin & socket contacts should be made of high conductive copper / brass alloy for assemblies upto 60A and should be made of high conductive copper for assemblies beyond 60A rating.

The pin & socket contacts should be designed covering feature as given below :

i) All terminals shall be of sufficient size and cross section suitable relative to the rated current of the plugs and socket outlets.

ii) The contacts should be projected on the termination sides (rear side) of internal insulators for termination of crimped lug type terminations (This shall ensure proper connection between cable and contacts and there will be no need to remove the internal insulator while termination of cables on contacts).

iii) The contacts shall be provided with a threaded hole (hole size to be decided with respect to the hole size of crimping terminal). The required solderless copper conductor crimping terminals of M/s Dowells or equivalent should be supplied alongwith plugs & sockets duly screwed with cadmium plated MS slotted round / hex head screws.

iv) Proper electrical clearance & creepage to be ensured in design so that no flashover should take place when the sockets are mounted on the metallic socket boards having cutouts nearly equal to the dia. of internal insulators during use. To ensure the same each terminal should be provided with a 70-80 mm long heat shrinking sleeve (size of sleeve should be suitable for cable OD as applicable to respective plug & socket as given in the specification). Heat shrinking of the sleeve shall be done while doing termination of cables by BHEL. This shall ensure that there is no risk of accidental contact between live parts of different polarity or between such parts and accessible metal parts of socket board.

v) The socket contacts should be of spring loaded type design with springs made of special alloy to retain spring properties during elevated temperatures while in use and thereby resulting prolonged life of the contacts. The spring should be circular and wrapped over the sockets to ensure the proper contact and pin is securely gripped within socket contact.

vi) Plugs & Sockets shall be so designed that, when inserting the plug the earth connection is made before the current carrying contacts of the plug become live. When withdrawing the plug, the current carrying contacts shall get disconnected before the earth connection is broken.

vii) Pins and socket contacts should be polarized (for e.g earth terminal of higher diameter). Also they should be locked against rotation in the respective internal insulator.

2.4 **Plating of contacts** :

Contacts of plugs and sockets shall be silver plated to minimum thickness of 15 microns in line BHEL process specification No AA 067 36 13 Rev 03. **The quality of plating shall be tested in line with above process specification and in case there is any problem detected on the silver plating i.e thickness of deposit is**

not as specified or flaking/blistering of the coating during inspection, it shall be taken as evidence of unsatisfactory quality.

2.5 **Cable entries in plugs** :

Rear cable entry in the plugs shall be provided. Plugs shall be provided with cable glands with rubber rings, which shall be capable of accepting and gripping the flexible cable in order to prevent any stress on the connection to the terminal while preventing ingress of moisture. There should be no sharp bent at the point of entry of the cable. Refer details of cables for cable entry holes & cable glands as given in Clause No 3 of the specification.

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.

SL.	DESCRIPTION	SUITABLE CABLE	OVERALL DIA OF CABLE	MOUNTING HOLES & PCD
001	16 A, 500V, 4 Pin Plugs & sockets	1.5 sqmm. 3/4 core cable OR 2.5 sqmm 3/4 core cable	13.5-15.5 mm	3 Holes dia 6.2mm equally spaced at PCD 54mm
002	32 A, 500V, 4 Pin Plugs & sockets	6 sqmm. 3/4 core cable	19-21 mm	3 Holes dia 6.2mm equally spaced at PCD 70.5mm
003	63 A, 500V, 4 Pin Plugs & sockets	16 sqmm. 3/4 core cable	27-29 mm	3 Holes dia 6.5mm equally spaced at PCD 95.5mm
004	125 A, 500V, 4 Pin Plugs & sockets	35 sqmm. 3.5 core cable 50 sqmm 3.5 core cable (spare cable gland to be supplied with each plug for this size of cable)	36 mm 43.5 mm	4 Holes dia 8mm equally spaced at PCD 98mm
005	150 A, 500V, 4 Pin Plugs & sockets	35 & 50 sqmm. 3.5 core cable	36 mm/ 43.5 mm	4 Holes dia 8mm equally spaced at PCD 98mm
006	250 A, 500V, 4 Pin Plugs & sockets	50 sqmm. 3.5 core cable	43.5 mm	4 Holes dia 10.2mm equally spaced at PCD 140mm

Note : The diameter of the rubber grommet in cable gland should match the respective cables to ensure tight grip.

4. **MARKINGS** :

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

i) Continuous current rating
ii) Voltage rating
iii) The socket pins shall be marked L1, L2, L3 and E respectively clockwise when the socket outlet is viewed from the front. The terminals of the plug pin shall also be marked L1, L2, L3 & E etc. corresponding to the terminals of the socket outlets.
Iv) 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 of IS:1293-1988 :

5.1 **ACCEPTANCE TEST** -

5.1.1 Visual examination (Clause 7.5) and to check compliance with design requirements as stated in Cl. No. 2 of this specification.

5.1.2 Interchangeability (Clause 8.5)

5.1.3 Effectiveness of contact (Clause 17)

5.1.4 Insulation resistance Test (Clause 16)

5.1.4.1 4 pin units are to be tested for IR measurement with 500 V meggar.
a) between shorted pins L1,2,3 and E.
b) between pins and earth connected together and socket assy mounted on a steel sheet with cutout equal to diameter of internal insulator.

5.1.4.2 4 Pin units to withstand 2.5 KV A.C. for 1 minutes without arcing or puncture
a) between shorted pins L1,2,3 and E.
b) between pins and earth connected together and socket assy mounted on a steel sheet with cutout equal to diameter of internal insulator.between shorted pins L1,2,3 & E and socket

5.1.5 Moisture resistance test (Clause 15)
(IR shall not be less than 2 Mega Ohms)

5.1.6 Temperature rise test (Clause 18)

5.1.7 Breaking capacity test (Clause 19) To be conducted on 16 A plug & socket only.

5.1.8 Test for water absorption (Clause 27) for vitreous ceramic material or moulded insulating materials as applicable.

Sampling procedure for acceptance tests shall be in accordance with appendix – C of the IS-1293-1988.

5.2 **ROUTINE TESTS** :

5.2.1 Visual examination (Clause 7.5)

5.2.2 Interchangeability (Clause 8.5)

5.2.3 Insulation resistance & electric strength (As per Cl No 7.1.4 of this specification)

6. **INSPECTION AT BHEL BHOPAL :**

After receipt of material at BHEL Bhopal Maximum 5 Nos of plug socket assy (randomly picked) of each rating shall be subjected for above routine tests and tests on silver plating for plating thickness, adhesion of plating and anti tarnishing. All items should pass the requirement of testing otherwise whole lot shall be rejected.

7. **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.

Supplier may be required to furnish test certificate for contacts raw material as per relevant standard & on the quality of silver plating at the time of Inspection.

8. **SAMPLE APPROVAL** :

Supplier should offer minimum 3 samples of Plug & socket assembly of each rating within 20-25 days after the placement of order for testing as per Cl 5 of the specification. After successful testing and acceptance of the results by BHEL sample approval shall be accorded by BHEL. Sample testing shall be applicable for vendors developing items referred in the specification for first time. However sample approval shall not be considered as clearance for supply of complete ordered qty. The bulk lot shall be accepted for testing in line with the requirements of the specifications only after sample approval.

Supplier should be a regular manufacturer & supplier of this type of plugs & sockets with insulated glass filled nylon outer shells to ONGCL and reference copies of PO from ONGCL should be enclosed to certify the same, other wise suppliers offer (techno-commercially suitable offer) shall be considered for developmental order (Maximum quantity for developmental order shall be limited to 10% of Tender requirement).

9. **DOCUMENTS TO BE FUNISHED ALONGWITH OFFER**

Following documents must be enclosed as Annexure 1 to 6 alongwith offer, otherwise offer may not be considered for technical evaluation.

a. Technical offer in line with requirements of Cl No 2 of the specification.
b. Drgs in line with Cl. No 3 of the specification.
c. Cl. Wise comments on the testing requirements as per Cl. No 5 of the specification.
d. Statement of any deviation with respect to specification.
e. List of testing equipment & instrumentation to carry out test in line with Cl 5.
f. Certification & reference list in line with Cl 10.

10. **REFERENCES** :

Supplier who are regularly manufacturing and supplying plugs and sockets assemblies with glass filled nylon outer shells to ONGCL are required to submit a certification from ONGCL confirming satisfactory performance of party's supplied plugs & sockets with glass filled nylon outer shells. A reference list of supplies made to ONGC, including type, quantity, PO No & customer to be sent along with the offer.

11. **ENCLOSURE :**

BHEL process specification No AA 067 36 13 Rev 03 for silver plating.

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