

**Scope Of Supply\_ ENSOF12294**

SI No.	Material	Matl Desc	Enquiry Qty (Nos.)	Drawing No./Rev No.	TDC No./Rev No.	Delivery Period From PO date	Supplier's Response (Quoted/not Quoted)
1	414060002000	MCN WASHER-M20 -IS2016	2580	NA	BPS:41406	8 weeks	
2	415010602000	PL KEY-6x6x20 -IS2048-A	585	NA	BPS:41501	8 weeks	
3	417045004000	SPLIT PIN-5x40 -IS549	920	NA	BPS:41704	8 weeks	
4	419020004000	EXT CIRCLIP-A40 -IS3075P1-N-d36.5	508	NA	BPS:41902	8 weeks	
5	963531060000	CIRCLIP A85X3-N IS:3075(P-1)	271	NA	NA	8 weeks	
6	964523500000	RETAINER RING-4116	116	3V411607725/01	NA	8 weeks	
7	964523510000	RETAINER RING-4115	130	3V411507725/01	NA	8 weeks	
8	964524210000	HINGE 11"-5 1/2"-4126	252	4V412607520/04	NA	8 weeks	
9	964524220000	DRIVE PIN-6.4x51 -B16-4126-HFGRV-ZINC	510	4V412613124/00	NA	8 weeks	
10	964524230000	PIN W/RING-Ø9.5x82(F/SLIP13-3/8CSG)-4129	59	4V412907525/02	NA	8 weeks	
11	964524240000	PIN WITH RING-6.4x60 -4126	85	4V412607522/02	NA	8 weeks	
12	964525180000	RETAINING RING-4167	206	3V416707725/01	NA	8 weeks	
13	964526550000	RETAINER RING-4235	113	3V423507725/01	NA	8 weeks	
14	964526590000	SOC.HEAD SET SCREW-#10-24UNCx4.8 -4235	508	4V423507617/01	NA	8 weeks	
15	964526600000	ALLEN KEY -2.4 -4235	260	4V423507621/01	NA	8 weeks	
16	964529040000	RETAINER RING-4345	31	3V434507725/01	NA	8 weeks	
17	964645240000	PIPE PLUG-1/2"NPT -410-4879	2596	4V487907964/02	TDC:0:410/16	10 weeks	
18	964646860000	RETAINER RING INT-4B52	3	3V4B5207730/00	NA	8 weeks	

Date:

Seal and Signature of authorized signatory



# BHARAT HEAVY ELECTRICALS LIMITED

Tiruchirapalli-620014

## List of documents to be submitted in part 1 bid

### **Enquiry No: ENSOF12294**

To be eligible for award of contract, Bidder/OEM must possess following Certificates/Test Reports on the date of bid opening (to be uploaded with bid):

1. Signed Scope of supply
2. Signed schedule of deviation
3. Signed Confirmation to terms and conditions
4. Signed Drawings and TDC applicable for respective items quoted
5. Documents mentioned in PQR
6. Signed General terms and conditions

### Schedule of Deviations\_ ENSOF12294

Sl No.	Material	Matl Desc	Enquiry Qty (Nos.)	Technical Deviation taken (if no deviation is taken, mention "No deviation")
1	414060002000	MCN WASHER-M20 -IS2016	2580	
2	415010602000	PL KEY-6x6x20 -IS2048-A	585	
3	417045004000	SPLIT PIN-5x40 -IS549	920	
4	419020004000	EXT CIRCLIP-A40 -IS3075P1-N-d36.5	508	
5	963531060000	CIRCLIP A85X3-N IS:3075(P-1)	271	
6	964523500000	RETAINER RING-4116	116	
7	964523510000	RETAINER RING-4115	130	
8	964524210000	HINGE 11"-5 1/2"-4126	252	
9	964524220000	DRIVE PIN-6.4x51 -B16-4126-HFGRV-ZINC	510	
10	964524230000	PIN W/RING-Ø9.5x82(F/SLIP13-3/8CSG)-4129	59	
11	964524240000	PIN WITH RING-6.4x60 -4126	85	
12	964525180000	RETAINING RING-4167	206	
13	964526550000	RETAINER RING-4235	113	
14	964526590000	SOC.HEAD SET SCREW-#10-24UNCx4.8 -4235	508	
15	964526600000	ALLEN KEY -2.4 -4235	260	
16	964529040000	RETAINER RING-4345	31	
17	964645240000	PIPE PLUG-1/2"NPT -410-4879	2596	
18	964646860000	RETAINER RING INT-4B52	3	

\* If any deviation, Supplier has to mention " Devation Required". If no deviation, then supplier has to mention" no deviation" mandatory.

Date:

Seal and Signature of authorized signatory



# BHARAT HEAVY ELECTRICALS LTD

VALVES PURCHASE

Trichy - 620 014. India

CONFIRMATION TO TERMS AND CONDITIONS

**Enquiry Reference:** ENSOF12294

<b><u>TERMS &amp; CONDITION</u></b>	<b><u>VENDOR CONFIRMATION</u></b>
a. Quotation No and date	
b. Supplier shall be indigenous supplier.	
c. Vendor should give confirmation to BHEL's Technical Specification. Any deviations from the specification are to be furnished separately as "Schedule of Deviation". If there is no deviation vendor should indicate "No Deviation".	
d. The offer has to be submitted as a <b>Two-part bid</b> i.e. 1. Techno-commercial 2. Price bid	
e. The tender will be finalized on item wise basis	
f. <b>Terms of Payment:</b> <u>Indigenous Supplier (Non-MSE):</u> 100% direct EFT Payment after 60 days from the date of receipt and acceptance of materials at BHEL stores / against site acknowledgement. <u>Indigenous Supplier (MSE):</u> Payment will be as per MSMED Act, 2006. Suppliers quoting for MSE payment must produce Udyam registration certificate in part 1 bid documents.	
g. <b>Liquidated Damage:</b> Liquidated damages shall be 0.5% of the undelivered portion per week of the delay or part thereof subject to a maximum of 10% of the total order value.	
h. <b>Delivery Terms:</b> Prices shall be quoted on " <b>FIRM PRICE</b> " basis only. <u>For Indigenous Supplies:</u> FOR BHEL Trichy	
i. <b>Validity of Offer:</b> Prices should be valid for 90 days from the date of part-1 bid opening of this tender. The delay in responding to BHEL technical clarification beyond four days will be subsequently added to the validity period, Revised Price Bids will not be encouraged	
j. <b>Delivery period:</b> Delivery period should be as below <b>8 weeks for Enquiry SI no 1-16, 18 and</b> <b>10 weeks for enquiry SI no 17 (refer scope of supply documents)</b> from the date of purchase order. If supplier offers more than the required delivery period BHEL will operate 0.5% loading factor for evaluation of their offer for every week delay subject to a maximum of 2%. Any other delivery period after loading to maximum will be rejected.	
k. <b>Risk Purchase:</b> Risk purchase penalties as per clause 5 of general terms and conditions is applicable for this enquiry. Non acceptance to risk purchase clause the offer is liable for rejection.	
l. <b>Guarantee Clause:</b> The vendor shall give a guarantee for the performance of his supplies for a period of eighteen months from the date of dispatch or twelve months from the date of commissioning whichever is earlier.	
m. <b>Performance Bank Guarantee:</b> Performance Bank Guarantee is not applicable for this enquiry	
n. <b>Counter-offering</b> Counter-offering is not applicable for this enquiry.	

Supplier Seal and Sign



**BHARAT HEAVY ELECTRICALS LIMITED**  
Tiruchirapalli-620014

**PQR**

**Enquiry Ref: ENSOF12294:**

**Pre-Qualification Requirement (To be submitted in Part-I bid):**

1. Bidder shall submit the supply records for items manufactured with each type of materials indicated in the scope of supply: To fulfil this criteria vendor shall submit previous PO copy not more than 5 years old from date of part 1 bid opening.
2. Bidder to provide Certificate of Compliance for meeting the requirements of tendered items.
3. Bidders are requested to detail out the deviations from this specification while submitting the offer. Even If no deviation is taken, vendor shall explicitly mention "No Deviation".
4. Authorised Resellers / Distributors to submit "Authorised Reseller / Distributor certificate" mandatorily.



# BHARAT HEAVY ELECTRICALS LTD

## VALVES PURCHASE

Trichy - 620 014, India

### GENERAL TERMS AND CONDITIONS

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#### **1. QUOTATIONS:**

- a. **BID system:** Offers are invited in any one of the below formats. The no. of bids to be submitted is mentioned in "Confirmation to the Terms and Conditions" attached.
- Two part bid:** The offers are invited in Two part bid system (Part I will be Techno-commercial bid and part II will be Price Bid). Techno-commercially suitable vendors alone will be intimated for price bid opening.
  - ~~Single part bid:~~ ~~The offers are invited in Single part bid system (Price Bid alone). The vendor shall confirm to all of BHEL's technical & commercial conditions.~~

b. **Submission of offer:**

- i. ~~Offer called through e-Procurement mode:~~ ~~The bidder shall submit the bid online in BHEL e-Procurement portal at~~

<https://eprocurebhel.co.in/nicgep/app>

~~The bidder would be required to register on the above e-procurement portal for submitting their bids. Offers through email and hardcopy are not acceptable.~~

- ii. **Offer called through Non-e-Procurement mode:** Each part of offer should be sent in a double cover separately and the same should be sealed and super scribed with details such as enquiry reference, name of the vendor, item of supply and due date of opening. Two or more quotations should not be sent in one cover. Price Bid should contain only "Price per unit" for each type. Offer should be sent to the below mentioned address:

The Tender Opening Cell / Valves  
Room No. -26, Building -24  
Bharat Heavy Electricals Limited  
Tiruchirappalli - 620014, Tamil Nadu, India  
Or  
Email ID: [tender\\_cell@bhel.in](mailto:tender_cell@bhel.in)

- c. **Late offers:** Offer received after 2.00 pm on due date will be considered as Late offers. Late offers will not be considered under any circumstance.
- d. **Regulations:** Offers should be free from correction and erasures. Corrections if any must be attested. All amounts shall be indicated both in words as well as figures. In case of a difference between the amount quoted in words and figures, the amount quoted in words shall prevail.
- e. **PVC:** Price Variation clause not acceptable. Prices should be firm.
- f. **Catalogue:** Manufacturer's name, Trade Mark or Patent No. if any should be specified. Illustrative leaflets giving technical particulars are required along with quotation.
- g. **Samples:** Samples should be submitted separately, if specially requested in tender, before the due date of the enquiry. They should be clearly marked with the enquiry reference and date on the enclosing cover to facilitate identification.
- h. **GST Number:** GST registration number, HSN number (Item wise) with applicable taxes should be mentioned in the offer. If the vendor is not GST registered the offer is liable for rejection.
- i. **Deviation.** Any deviations from the specification are to be furnished separately as "Schedule of Deviation". If there is no deviation, vendor should indicate "No Deviation" in the offer.
- j. **Confirmation:** Confirmation for compliance is to be given in the offer for all the techno commercial conditions specified in the tender.

#### **2. COMMERCIAL TERMS & CONDITIONS:**

a. **Terms of Payment:**

**For Indigenous Suppliers:**

If the materials are receivable at BHEL Stores, Trichy:

Payment term is 100% direct Payment after 60 days from the date of receipt and acceptance of materials. (if PBG is not applicable)

(or)



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Trichy - 620 014, India

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Payment term is 100% direct payment after 60 days from the date of receipt and acceptance of materials and against 10% PBG valid for the warranty period. (if PBG is applicable)

If the materials are receivable at site:

Payment term is 100% direct payment after 60 days from the date of dispatch against site acknowledgement (if PBG is applicable)

(or)

Payment term is 100% direct payment after 60 days from the date of dispatch against site acknowledgement and against 10% PBG valid for the warranty period (if PBG is applicable)

Any deviation in the above payment terms, any other conditions in payment terms or any other payment terms will not be accepted and offers will not be considered.

~~For Foreign Suppliers: Payment term is 100% payment on CAD basis after 60 days from the date of receipt of documents, specified in PO, at BHEL bank. Respective bank charges to respective account.~~

~~If supplier insists for LC, only Usance LC with 60 days' credit will be opened, one month prior to material readiness. Further loading will be considered @ 1.5% on the offered value. Hence, supplier shall intimate the material readiness accordingly for opening LC. LC validity period will be 90 days and for any extension, applicable charges will be to suppliers account.~~

Any deviation in the above payment terms, any other conditions in payment terms or any other payment terms will not be accepted and offers will not be considered.

**For New Suppliers:** For new suppliers not registered with BHEL, Trichy for the product, payment shall be made 60 days after receipt and acceptance of materials.

~~In case of foreign supplier, first lot of mutually agreed quantities shall be supplied with payment as CAD basis after 60 days from the date of receipt and acceptance of material. If insisted for LC after acceptance of first lot, only usance LC with 60 days' credit will be opened one month prior to material readiness.~~

**b. Liquidated Damage:** Liquidated damages shall be 0.5% of the undelivered portion per week of the delay or part thereof subject to a maximum of 10% of the total order value.

Any deviation from the above LD clause, loading will be applied to the extent to which it is not agreed by the bidder (at offered value)

Under GST regime, BHEL has to discharge GST liability on LD recovered from suppliers. Hence applicable GST shall also be recoverable from suppliers on LD amount. Debit note will be issued by BHEL for this amount, indicating the respective supply invoice number.

**c. Delivery Terms:**

For Indigenous Suppliers: FOR BHEL Trichy inclusive of freight and insurance

For Foreign Suppliers: CFR/CIF Chennai seaport as per Incoterms 2010.

**d. Validity of Offer:** Prices should be fixed and should be valid for period as mentioned in the "Confirmation to the Terms and Conditions" attached.

**e. Delivery period:** Delivery schedule will be as mentioned in the "Confirmation to the Terms and Conditions" attached. If supplier offers more than the required delivery period BHEL will operate 0.5% loading factor for evaluation of their offer for every week delay subject to a maximum of **2% (4 weeks' delay)**. Any other delivery period after loading to maximum will be rejected.

**f. Guarantee period:** The vendor shall give a guarantee for the performance of his supplies for a period of **eighteen months** from the date of dispatch or **twelve months** from the date of commissioning whichever is earlier.

**g. Miscellaneous:** Any conditions which might have been quoted by the seller and are in contravention to the terms of PO and which have not been specifically accepted by Purchaser will not be applicable to the contract/PO.

**h. Performance Bank Guarantee:** If tender calls for Performance Bank Guarantee, vendor should provide a performance bank guarantee (PBG) in BHEL format for 10% of the total Purchase order value valid for warranty/guarantee period with an additional claim period of 2 months. PBG should be issued from list of consortium banks.



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### GENERAL TERMS AND CONDITIONS

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- i. **Counter Offering:** If counter offering is applicable for the enquiry, the L1 rates will be counter-offered to other eligible vendors as per below points
- In case there are only two qualified offers for any item, the L1 rate will be counter-offered to the L2 vendor.
  - In case of more than two qualified offers for any item, the L1 rates will be counter-offered to maximum (n-1) vendors (where 'n' is the no. of techno-commercially qualified vendors) or the no. of vendors required (as mentioned in the "Confirmation to the Terms and Conditions" attached), whichever is lower.
  - In case a lower ranked vendor does not accept the counter-offered rates, the rates may be offered to next higher ranked vendor.
  - The manner of splitting of the enquiry quantity across L1 and counter-offer accepted vendors will be as per the ratios mentioned in the "Confirmation to the Terms and Conditions" attached.

### **3. COMPLIANCE / ACCEPTANCE REQUIRED FOR FOLLOWING POINTS TO ENSURE INPUT TAX CREDIT**

- a. Response to Tenders for Indigenous supplier/Vendor will be entertained only if the vendor has a valid GST registration No (GSTIN) which should be clearly mentioned in the offer. If the Vendor is exempted from GST registration, a declaration with due supporting documents need to be furnished for considering the offer. Vendor under composition scheme should declare that he is a composition Vendor supported by the screen shot taken from GST portal. The dealer has to submit necessary documents if there is any change in status under GST.
- b. Supplier shall mention their GSTIN in all their invoices (incl. credit Notes, Debit Notes) and invoices shall be in the format as specified/prescribed under GST laws. Invoices shall necessarily contain Invoice number (in case of multiple numbering system is being followed for billing like SAP invoice no, commercial invoice no etc., then the Invoice No. which is linked/uploaded in GSTN network shall be clearly indicated), Billed to party (with GSTIN) & Shipped to party details, item description as per PO, Quantity, Rate, Value, applicable taxes with nomenclature (like IGST, SGST, CGST & UTGST) separately, HSN/ SAC Code, Place of Supply etc.
- c. Invoices will be processed only upon completion of statutory requirement and further subject to following:
- i. Vendor declaring such invoice in Form GST ANX-1
  - ii. Receipt of Goods or Services and Tax invoice by BHEL
- d. All invoices shall bear the HSN Code for each item separately (Harmonized System of Nomenclature)/ SAC code (Services Accounting Code).
- e. As the continuous uploading of tax invoices in GSTN portal (in GST ANX-1) is available for all (i.e. both Small & Large) tax payers under proposed new GST Return System, all invoice raised on BHEL may be uploaded immediately in GST portal on despatch of material /rendering of services. The supplier shall ensure availability of Invoice in GST portal before submission of invoice to BHEL. Invoices will be admitted by BHEL only if the invoices are available in GSTN portal (in BHEL's GST ANX-2).
- f. A declaration to the effect that all invoice particulars are/were uploaded in the GSTN network/ portal & all tax liability as per GST rules and regulations have been and will be discharged, shall be mentioned in the invoice. If not mentioned in the invoice, a separate declaration shall be submitted as per the requirement of BHEL.
- g. All documents like Test Certificate, LR copy, any other document mentioned in PO, shall be sent along with the vehicle/consignment. For all consignments received within the calendar month, input credit will be availed within that month in line with monthly returns filing cycle. In case of any discrepancy in the document or non-submission of documents mentioned in the PO, then BHEL will not be able to accept or account the material, in such case availing of tax credit will be deferred to next month or so.
- h. In case of discrepancy in the data uploaded by the supplier in the GSTN portal or in case of any shortages or rejection in the supply, then BHEL will not be able to avail the tax credit and will notify the supplier of the same. Supplier has to rectify the data discrepancy in the GSTN portal or issue credit note or debit note (details also to be uploaded in GSTN portal) for the shortages or rejections in the supplies or additional claims, within the calendar month informed by BHEL.
- i. In cases where invoice details have been uploaded by the vendor but failed to remit the GST amount to GST Department (Form PMT-08 or Form GST RET-01 to be submitted) within stipulated time, then GST paid on the invoices pertaining to the month for which GST return not filed by the vendor will be recovered from the vendor along with the applicable



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interest (currently 24% p.a) and all subsequent bills of the vendor will not be processed till filing of the GST return by the vendor.

- j. Under GST regime, BHEL has to discharge GST liability on LD recovered from suppliers/contractors. Hence applicable GST shall also be recoverable from suppliers/contractors on LD amount. For this, debit note will be issued by BHEL indicating the respective supply invoice number.
- k. In case any changes in taxes and duties as per Gov. Notification (including GST), the same shall be applicable from time to time.
- l. Duplicate copy of the Invoice meant for the transporter should accompany the material as stipulated under CE Rules 52A and 172C OR 57CE.
- m. TDS on GST shall be applicable as per the GST Act.
- n. In case GST credit is denied to BHEL due to non-receipt or delayed receipt of goods and/ or tax invoice or expiry of timeline prescribed in GST law for availing such ITC, or any other reasons not attributable to BHEL, GST amount claimed in the invoice shall be disallowed to the vendor.
- o. Where any GST liability arising on BHEL under Reverse Charge (RCM), the vendor has to submit the invoices to BHEL well within the timeline prescribed in GST Law, to enable BHEL to discharge the GST liability. If there is a delay in submission of invoice by the vendor resulting in delayed payment of GST by BHEL along with Interest, then such Interest payable or paid shall be recovered from the vendor.
- p. GST TDS will be deducted as per Section 51 of CGST Act 2017 and in line with Notification 50/2018 – Central Tax dated 13.09.2018. GST TDS certificate which will be generated in GST portal subsequent to vendor accepting the TDS deduction in the GST portal, will be issued to the vendor.

#### **4. SPECIAL PROVISIONS FOR MICRO AND SMALL ENTERPRISES (MSE):**

- a. 25% of the tendered quantity is earmarked for MSE suppliers in this tender.
- b. If L1 vendor (or) Counter offer accepted vendor/s is from a Micro / Small enterprise which put together covers 25% of the total tendered quantum, the 25% earmarking provision is not applicable.
- c. Out of the 25% tendered quantity reserved for MSE suppliers, 6.25% shall be earmarked for procurement from MSE owned by SC / ST entrepreneurs. In the event of failure of such Micro and Small enterprises to participate in the tender process or meet the tender requirements and the L1 price, the 6.25% sub-target for procurement ear-marked MSE owned by SC / ST entrepreneurs shall be met with other MSE enterprise/s.
- d. 3% reservation for women owned MSEs within the above mentioned 25% reservation. In the event of failure of such Micro and Small enterprises to participate in the tender process or meet the tender requirements and the L1 price, the 3% sub-target for procurement ear-marked MSE owned by women entrepreneurs shall be met with other MSE enterprise/s. The definition for MSEs owned by Women Entrepreneurs is clarified as:
  - i. In case of proprietary MSE, proprietor shall be woman.
  - ii. In case of partnership MSE, the women partners shall be holding at least 51% share in the unit.
  - iii. In case of private limited companies, at least 51% share shall be held by the women promoters.
- e. In case MSE vendor participating in the tender quotes within the price band of LI +15%, they will be allowed to supply the portion of the requirement subject to acceptance of LI price by MSE vendor. In case of more than one such MSE, the supply shall be shared proportionately, provided the available quantum can be split.
- f. In a tender where both MSE and Non-MSE Vendors have participated and non-MSE Vendor has become the lowest bidder and the quantum envisaged in the tender cannot be split, then the MSE vendor will be given preference for ordering the 100% quantum provided the MSE vendor quoted price is within L1 + 15%, and if the MSE vendor accepts the L1 rate.
- g. MSE suppliers can avail the intended benefits only if,  
The vendor submits along with offer, a copy of the Udhog Aadhar and a certificate, as per the format in Annexure-A, issued by a chartered accountant during the financial year of the date of part-1 bid opening, certifying that the quantum of investment in plant and machinery is within the permissible limit as per the act for relevant status (Micro or small).

(or)

The vendor has already submitted the above documents for the financial year of the date of part-1 bid opening and the MSE status has been updated in BHEL Trichy's records.



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Non submission of such documents will lead to consideration of their bids at par with other bidders and MSE status of such suppliers shall be shifted to Non MSE supplier till the supplier submits these documents.

- h.** Definitions of MSEs owned by SC/ST is under:
- In case of proprietorship firm, proprietor must be SC/ST.
  - In case of partnership firm, the SC/ST partners must be holding at least 51% shares in the unit.
  - In case of private limited companies, at least 51% share must be held by SC/ST promoters.
  - The caste/Tribe/Community certificate issued by the following authorities in the prescribed form for SCs/STs can be considered.
- i.** Authorized to Issue SC/ST certificate:
- District Magistrate/Additional District Magistrate/Collector/Deputy commissioner/Additional Deputy Commissioner/Deputy collector/1st class stipendiary magistrate/Sub divisional Magistrate/Taluka Magistrate/Executive magistrate/Extra Assistant commissioner.
  - Chief Presidency magistrate/Additional chief presidency magistrate/Presidency magistrate.
  - Revenue Officer not below the rank of tehsildar.
  - Sub-Divisional officer of the area where the individual and / or his family normally resides.
- j.** To avail the benefits of MSE under SC/ST category, the related documents as stated above should be submitted along with tender documents.
- k.** Payment for MSE vendors will be as per MSMED Act, 2006.

## **5. RISK PURCHASE PENALTIES**

- a.** In case of delay in delivery beyond PO delivery /mutually agreed delivery, or vendor fails /refuses to complete the PO as per terms, or insufficient facilities at vendor's works to execute a PO, BHEL has the right to get the items ordered elsewhere at the risk and cost of the vendor with notice to the vendor and the additional expenditure / difference in cost, if any, including consequential cost shall be recovered from the defaulted vendor. Also, in such case of withdrawal of orders, BHEL shall recover the additional expenditure / difference from vendor by adjusting against amount due to vendor and/or by invoking the BG and/or by any other suitable means as decided by BHEL. In addition, BHEL may recover from the defaulter vendor any loss to BHEL arising due to withdrawal of orders in such case, and action shall be taken as per latest revision of BHEL Guidelines for Suspension of Business dealings with Suppliers / Contractors.
- b.** BHEL has the right to divert/cancel the order if the vendor has not procured minimum 50% of the quantity of raw materials within 60 days from PO date. Purchase order placed on steel mills and with proper payment voucher/proof will be considered for not cancelling the PO by BHEL. The submission of data by vendor for DB clearance by BHEL/QC shall be the proof of procurement. This is to avoid delay in project schedule due to delay in raw material procurement by vendors. In case the vendor fails to procure at least 50% of the quantity of raw materials within 60 days from PO date, BHEL has the right to get the items ordered elsewhere at the risk and cost of the defaulting Vendor and the additional expenditure / difference in cost, if any, including consequential cost shall be recovered from the defaulting Vendor and action shall be taken as per latest revision of BHEL Guidelines for Suspension of Business dealings with Suppliers / Contractors and SEARP.
- c.** The defaulted vendor shall be liable for any loss, which BHEL may sustain by reason of such risk purchases in addition to liquidated damages as mentioned under LD clause.
- d.** Vendors pending payments shall be withheld to cover the liabilities of BHEL towards risk purchase, if any.
- e.** Reasons like power cut, labour issues, machine break down, etc. which are controllable by the sub-contractor shall not be accepted as reason for delay for delivery extension purposes.
- f.** If PO delivery needs to be extended for reason attributable to BHEL, vendor may request BHEL in writing for delivery extension with justifications within 15 days from date of PO closure and before invoice.
- g.** Process of calculating the risk and cost amount is as follows:

$$\text{Risk \& Cost Amount} = [(A-B) + (A \times H/100)]$$

Where,

A= Value of Balance scope of Work/ Supply (\*) as per rates of new contract



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B= Value of Balance scope of Work/ Supply (\*) as per rates of old contract being paid to the contractor/ supplier at the time of termination of contract i.e. inclusive of PVC & ORC, if any.

H = Overhead Factor to be taken as 5

In case (A-B) is less than 0 (zero), value of (A-B) shall be taken as 0 (zero).

\*(Balance scope of work/ supply)

Difference of Contract Quantities and Executed Quantities as on the date of issue of Letter for 'Termination of Contract', shall be taken as balance scope of Work/ Supply for calculating risk & cost amount. Contract quantities are the quantities as per original contract. If, Contract has been amended, quantities as per amended Contract shall be considered as Contract Quantities. Items for which total quantities to be executed have exceeded the Contract Quantities based on drawings issued to contractor from time to time till issue of Termination letter, then for these items total Quantities as per issued drawings would be deemed to be contract quantities. Substitute/ extra items whose rates have already been approved would form part of contract quantities for this purpose. Substitute/ extra items which have been executed but rates have not been approved, would also form part of contract quantities for this purpose and rates of such items shall be determined in line with contractual provisions. In-case portion of work is being withdrawn, contract quantities pertaining to portion of work withdrawn shall be considered as 'Balance scope of work/supply' for calculating Risk & Cost amount.

- h.** Vendors are cautioned that, withdrawal after price bid opening or after contract signing or PO/LOI acceptance will be construed as tampering with BHEL's tender process. Suitable action for suspension of further business with the vendor may be taken as per BHEL corporate procedures.
- i.** Abridged version of extant 'Guidelines for suspension of business dealings with suppliers/ contractors' has now been uploaded on [www.bhel.com](http://www.bhel.com) on "supplier registration page" at the following link: [http://www.bhel.com/vender\\_registration/vender.php](http://www.bhel.com/vender_registration/vender.php) (Guidelines for suspension of business dealings with suppliers/ contractors).

## **6. GENERAL CONDITIONS**

- a.** The manner of finalization will be as mentioned in the "Confirmation to the Terms and Conditions" attached. Separate orders will be released for each project and documents should be supplied for each order separately.
- b.** BHEL reserves the right to reduce the tender quantity and to NOT to order for some or all material based on the changes in project.
- c.** BHEL shall have the right to visit vendor works during the execution of contract along with end customer for verifying status, inspection and testing of the material.
- d.** BHEL reserves the right to negotiate or re-float the tender in case the quoted prices are not acceptable.
- e.** Supplier shall arrange packing to avoid lose or damages during Road Transport, Site handling & Storage.
- f.** BHEL reserves the right to reject the offer of a particular bidder due to unsatisfactory past performance in the execution of a contract at any of BHEL projects / units.
- g.** The Drawings and Technical documents given in this enquiry are the sole property of BHEL. This should not be misused in any form.
- h.** Purchase Order, PO Item serial number, Material code, Quantity should be clearly marked on the packing
- i.** Confirmation for compliance is to be given in the offer for all the conditions specified above and to the respective Purchase Specification.
- j.** The bidder along with its associate/collaborators/sub-contractors/sub-vendors/consultants/service providers shall strictly adhere to BHEL fraud prevention policy (refer [www.bhel.com](http://www.bhel.com)) and shall immediately bring to the notice of the BHEL management about any fraud or suspected fraud as soon as it comes to their notice.
- k.** For this procurement, Public Procurement (Preference to Make in India), Order 2017 dated 15.06.2017, 28.05.2018, 29.05.2019 and 04.06.2020, issued by DPIIT, Ministry of Commerce and Industry. If any subsequent Orders issued by the respective Nodal Ministry shall be applicable even if issued after issue of this NIT but before finalization of contract / PO / WO against this NIT. In the event of any Nodal Ministry prescribing higher or lower percentage of purchase and / or local content in respect of this procurement, same shall be applicable. Default purchase preference shall be 20% to local suppliers with default minimum local content of 50%.



# BHARAT HEAVY ELECTRICALS LTD

## VALVES PURCHASE

Trichy - 620 014, India

### GENERAL TERMS AND CONDITIONS

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- I. The bidder declares that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s). This applies in particular for prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process. In case, the Bidder is found having indulged in above activities, suitable action shall be taken by BHEL as per extant policies/ guidelines.

#### **7. DOCUMENTATION:**

- a. **With Consignment:** Duplicate for transporter copy, Original Invoice, Packing List, Delivery Challan, O&M manual (if applicable) Material Test Certificate, Test Certificates, Compliance Certificate, Guarantee/Warranty Certificate and other documents mentioned in PO/TDC/Drawing.
- b. **To Purchase:**
  - i. FOR BHEL TRICHY case- Original Invoice, Duplicate for transporter copy, Packing list, LWB and Delivery challan, GST declaration as mentioned in point 3c.
  - ii. FOR Site case- Original Invoice, Original LWB, Original Packing List, Original IBR documents, Original despatch clearance Certificate and Inspection report, Test certificates as per PO, Original Site Acknowledgment etc.
- c. **Identification:** Material code, Purchase Order, PO item serial number, Unique serial number if any should be provided in all despatch documents, materials and packing clearly.

#### **8. TENDER EVALUATION:**

##### **a. Techno-commercial Bid.**

- i. All vendors should submit General arrangement drawing, datasheet and C&I diagram (if any) of the offered product
- ii. Point by point technical confirmation of all pages of our technical specifications and commercial conditions are required with your sign and seal along with techno commercial offer.
- iii. Offers from supplier not having technical capability or not agreed for commercial terms, will be rejected.

##### **b. Price Bid.**

- i. Bidders qualified for part I will be intimated for participating in priced bid opening.
- ii. L1 bidder will be decided based on landed cost for the equipment to BHEL.

##### **Indigenous Vendors**

Total Landed cost/rate for each item = FOR Rate in INR (A) + Applicable Taxes (B) + Loading non-acceptance of commercial terms (C) – Applicable input tax credit (D)

A - Indigenous vendors submit offers on Free on Road (FOR), Stores, HPBP BHEL Trichy in INR.

B - Applicable GST and any other charges quoted by indigenous vendors will be added to the base price.

C - Loading for non-acceptance of payment terms, delivery schedule & liquidated damages (LD) will be added to the F.O.R. value for arriving the landed rate.

D - However, input tax credit shall be availed for GST, hence the same is excluded for arriving at the landed cost.

##### **Foreign Vendors**

Total Landed cost = CFR Rate in INR (A) + Applicable Duties (B) + Incidental Charges (C) + Loading for Container Shipment (D) + Loading for non-acceptance of commercial terms (E)

A - Foreign vendors to submit offers on CFR (Cost & Freight), Chennai port (LILLO – Liner In; Liner Out) basis per item wise in foreign currency, which will be converted to INR by multiplying with the Exchange rate (SBI TT Selling rate) as on the technical bid opening date. If the date of opening happens to be a bank holiday, then the forex rate as on previous bank (SBI) working day shall be taken.

B - Customs duty, Safe guard duty (as per the notification No 02/2014-Customs (SG) dated 13th August 2014) and antidumping duty (as per the notification No 18/2016-Customs (ADD) dated 17.05.2016) as if applicable will be added to the INR price.



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C - Incidental charges will be added to the CFR Value. The incidental charge is inclusive of port handling charges, & freight charges for movement from Chennai port to BHEL, Trichy.

D - In case of shipment through containers, if 14 free days for Container detention is not provided in the offer, a loading of 22% on the freight rate per MT shall be considered by BHEL for arriving at the Total Landed Cost.

E - Loading for non-acceptance of payment terms, delivery schedule & Liquidated Damages (LD) will be added to the CFR value for arriving at the landed cost.

**iii.** In case of tie for the L1 positions,

- In the course of evaluation, if more than one bidder happens to occupy L1 status, effective L1 will be decided by soliciting discounts from respective L1 bidders.
- In case more than one bidder happens to occupy the L1 status even after soliciting discounts, the L1 bidder shall be decided by a toss/draw of lots, in the presence of the respective L1 bidders(s) or their representative(s).
- Ranking will be done accordingly, BHEL's decision in such situation shall be final and binding.

**iv.** If counter-offer is applicable and before counter offer process, if there is tie for ranking position other than L1 in respective enquiry items, then Lot shall be done to break the tie. Based on the outcome of LOT, subsequent tender ranking will be revised. Load distribution shall be based on revised ranking. The LOT process to break tie in tender ranking will be based on random number generation in MS-Excel sheet.

Tie breaking procedure has been explained below with an example:

There is an item (item sl. no. 210) for which tie breaking has to be conducted. Hence, the lot will be based on random number generation in MS-Excel sheet.

- Item wise excel sheet in which all ranks for which tie is present shall be opened.
- Random number shall be generated against each entry in the excel sheet. Once random number is generated, the values will be frozen against each entry.
- The rank order shall be sorted in the following manner.  
Sorting -> 1. Item -> 2. Actual rank -> 3. Random number wise (from lowest to highest).  
Once sorting is done, each vendor shall be ranked as per the sorting order.

• **Illustration:**

Step-1: Before Sorting:

Item No.	Vendor code	ORIGINAL Rank before CO
210	A	L01
210	B	L02
210	C	L03
210	D	L03
210	E	L04
210	F	L05
210	G	L05
210	H	L06

Step-2: After random number generation

Item No.	Vendor code	ORIGINAL Rank before CO	Random Number
210	A	L01	0.639156
210	B	L02	0.931402
210	C	L03	0.560449



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210	D	L03	0.507298
210	E	L04	0.621819
210	F	L05	0.620683
210	G	L05	0.504936
210	H	L06	0.793407

#### Step-3: Final sorting and revised ranking:

Item No.	Vendor code	ORIGINAL Rank before CO	Random Number	Final Revised Rank
210	A	L01	0.639156	L01
210	B	L02	0.931402	L02
210	D	L03	0.507298	L03
210	C	L03	0.560449	L04
210	E	L04	0.621819	L05
210	G	L05	0.504936	L06
210	F	L05	0.620683	L07
210	H	L06	0.793407	L08

Final revised ranking shall be intimated to vendors. Final revised ranking shall be worked out based on the result of tie-breaking and counter offering process shall be based on the final revised ranking.

L1 rate shall be counter offered to eligible Vendors in respective enquiry items in order of the distinct ranking arrived after tie-breaking process has been concluded.

#### **9. Reverse Auction**

~~"BHEL shall be resorting to Reverse Auction (RA) (Guidelines as available on [www.bhel.com](http://www.bhel.com)) for this tender. RA shall be conducted among the techno-commercially qualified bidders.~~

~~Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered for RA. In case any bidder(s) do(es) not participate in online Reverse Auction, their sealed envelope price bid along with applicable loading, if any, shall be considered for ranking."~~

#### **Reverse Auction Process:**

~~Reverse Auction will be conducted if two or more bidders are techno-commercially qualified. In case of two or three qualified bidders, there shall be no elimination of H1 bidder (whose quote is highest in sealed envelope price bid). In case of four qualified bidders, the H1 bidder shall be eliminated whereas in case of five qualified bidders, H1 & H2 bidders shall be eliminated. However, in case of six or more qualified bidders are available, RA would be conducted amongst first 50% of the bidders arranged in the order of prices from lowest to highest. Number of bidders eligible for participating in RA would be rounded off to next higher integer value if number of qualified bidders is odd (e.g. if 7 bids are qualified, then RA will be conducted amongst lowest four bidders). However, there will be no elimination of qualified bidders who are MSE or qualifying under PPP-MII, Order 2017, irrespective of the number of bidders qualifying techno-commercially. In case of multiple H1 bidders, all H1 bidders (excluding MSEs and bidders qualifying under PPP-MII, Order 2017) shall be removed provided minimum two bidders remain in fray, else no H1 removal.~~

#### **10. ARBITRATION & CONCILIATION:**

Except as provided elsewhere in this Contract, in case amicable settlement is not reached between the Parties, in respect of any dispute or difference; arising out of the formation, breach, termination, validity or execution of the Contract; or, the respective rights and liabilities of the Parties; or, in relation to interpretation of any provision of the Contract; or, in any manner touching upon the Contract, then, either Party may, by a notice in writing to the other Party refer such dispute or difference to the sole arbitration of an arbitrator appointed by Head of the BHEL, Trichy.



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The Arbitrator shall pass a reasoned award and the award of the Arbitrator shall be final and binding upon the Parties. Subject as aforesaid, the provisions of Arbitration and Conciliation Act 1996 (India) or statutory modifications or re-enactments thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceedings under this clause. The seat of arbitration shall be at BHEL premises, Trichy.

The cost of arbitration shall be borne as per the award of the Arbitrator.

Subject to the arbitration in terms of Clause above, the Courts at TRICHY shall have exclusive jurisdiction over any matter arising out of or in connection with this Contract.

Notwithstanding the existence or any dispute or differences and/or reference for the arbitration, the Contractor shall proceed with and continue without hindrance the performance of its obligations under this Contract with due diligence and expedition in a professional manner except where the Contract has been terminated by either Party in terms of this Contract.

**In case of Contract with Public Sector Enterprise (PSE) or a Government Department, the following shall be applicable:**

In the event of any dispute or difference relating to the interpretation and application of the provisions of the Contract, such dispute or difference shall be referred by either Party for arbitration to the sole arbitrator in the Department of Public Enterprises to be nominated by the Secretary to the Government of India in-charge of the Department of Public Enterprises. The Arbitration and Conciliation Act, 1996 shall not be applicable to arbitration under this clause. The award of the arbitrator shall be binding upon the Parties to the dispute, provided, however, any Party aggrieved by such award may make further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs, Ministry of Law and Justice, Government of India. Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary or Additional Secretary when so authorized by the Law Secretary, whose decision shall bind the Parties hereto finally and conclusively. The Parties to the dispute will share equally the cost of arbitration as intimated by the Arbitrator.

### **11. IMPORTANT INFORMATION FOR FOREIGN SUPPLIERS:**

- a. Port of loading should be indicated in the offer without fail.
- b. Port of discharge should be Chennai Sea/Air Port, India.
- c. The preferred shipment mode "Containerized Cargo or Break Bulk" shall be specified clearly in the offer.
- d. **In case of CFR INCO TERMS - CONTAINERIZED CARGO**
  - i. In case of CFR terms, moved through CONTAINERS (Suppliers should clearly specify this in their offer) it would be presumed by BHEL that the freight charges quoted is on LILO (LINER IN LINER OUT) basis including extra charges, if any, like Container Imbalance Charges, Trade Imbalance charges or any other charges payable to the Liner. No other charges other than the quoted Freight rate will be paid by BHEL excepting applicable Terminal Handling Charges, Container cleaning Charges, DO charges to Shipping Liner at Discharge Port. 14 FREE DAYS for Container detention shall be provided. If any deviation is taken by Tenderer, a loading of 22% on the freight rate per MT shall be considered by BHEL for arriving at the Total Landed Cost.
  - ii. In case of shipment through Containers on CFR basis, the BL should bear the endorsement that "14 free days for Container Detention is applicable".
- e. **In case of CFR INCO TERMS - BREAKBULK CARGO:** In case of CFR terms, moved through BREAK BULK BASIS (Suppliers should clearly specify this in their offer) it would be presumed by BHEL that the freight charges quoted is on LILO (LINER IN LINER OUT) basis. The materials will be Custom cleared from Port itself.
  - i. The Indian Customs imposed, a penalty on late filing of Bill of Entries (Air/Sea Shipments) by the importer. The maximum free time allowed is 24 hrs from the time of arrival of cargo at final port of discharge. Rs.5000/- per day (for Initial 03 days) & Rs.10000/- per day (thereafter)
  - ii. The vendor should furnish the Non-Negotiable Documents (Air Way Bill/Bill of Lading, Commercial Invoice, Packing List, and Certificate of Origin) either by email or post/courier to BHEL well before the landing of cargo at final port of discharge.
  - iii. Vendor will be held responsible for the penalty arises against the late filing of Bill of entry due to:
    - a. Non availability of Non-Negotiable Documents (NNDs) before the cargo arrival
    - b. Discrepancy in documents
    - c. Short landing of Consignments (For shipments on CFR/CPT/CIF/CIP – Chennai Port)



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- iv. All the shipments for the contracts (POs) finalized on CFR -Chennai Port basis
- Delivery Orders involving multiple agencies like liners/freight forwarders are not allowed. There must be a single agency office at the final discharge Port (Chennai) for issuing the Delivery Order to BHEL.
  - The detention/demurrage charges arise due to the delay in collection of Delivery Orders from multiple agencies of liner/freight forwarder also whose offices are not at available Chennai, the same amount will be deducted from Vendor's bills only.
  - Apart from the normal charges like Terminal Handling Charges, Container cleaning Charges, Delivery Order Charges at final port of discharge no other charges will be borne by BHEL.
  - The liner/freight forwarders should be properly communicated by the Vendor for not to claim such charges for issuing Delivery Order. If the liner/freight forwarder claims such charges in their invoices, the same amount will be deducted from the Vendor bills without any prior intimation in order to avoid the delay in Customs clearance.

The likely additional/hidden costs or charges are:

- CIC - Container Imbalance Charges/Surcharges
- EIC - Equipment Imbalance Charge/Surcharges
- CAF - Container/Currency Adjustment Factor
- BAF - Bunker adjustment Factor
- RDS - Rupee Depreciation Surcharge
- CDS - Currency Depreciation Surcharge

**f. Transport Conditions for Import:**

The Original Documents (Bill of Lading, Invoice, Packing List, Certificate of Origin & Test Certificate) shall reach BHEL well in advance before the vessel arrival. The soft copies of the above shall be forwarded to BHEL immediately after shipment.

- In the event of delayed submission of documents by the supplier, an amount up to 5% of the invoice value will be retained towards demurrage & other charges and the difference if any between actual charges and recovery will be settled separately through supplementary invoice.
- In such cases, the Supplier shall authorize the Steamer / Shipping agent / transporter to freely release the consignment to BHEL by providing a "Surrender Bill of Lading".
- Otherwise, No-objection Certificate shall be issued to the Liner, authorizing BHEL to get the Delivery Order without producing the Original Bill of Lading.
- This is required to ensure avoidance of demurrage at Chennai Sea-port that may arise in case of delayed presentation of documents by the Seller.

**Following details to be endorsed in OBL**

- Import & Export Code (IEC) of importer: 0588138690
- GST Identification No (GSTIN) of importer: 33AAACB4146P2ZL
- Official email id of importer: [sivabala@bhel.in](mailto:sivabala@bhel.in) ; [sivama@bhel.in](mailto:sivama@bhel.in)

**d. Indian Agent & Agency commission:**

- An Indian Agent can represent / submit offer of only one original equipment manufacturer (OEM) against a particular Tender. If any Indian Agent represents two or more than one OEM against the same tender, then the Offer will be rejected.
- The CFR - Cost and Freight Chennai Sea Port, price quoted by the Foreign Bidder shall also include the Agency commission. The bidder shall furnish authenticated copy of the Agency Agreement detailing the precise relationship between them and their mutual interest in the business so as to consider the offer of the Indian Agent for the indigenous portion of the supply. For the main equipment, the offer should be from the Principal / OEM. The bidders have to furnish the original Authorization Letter for the Indian Agent along with the Techno-Commercial Offer.

**12. INTEGRITY PACT (IP)**

- IP is a tool to ensure that activities and transactions between Company and its Bidders/Contractors are handled in a fair, transparent and corruption free manner. Following Independent External Monitors (IEMs) on the present panel have been appointed by BHEL with the approval of CVC to oversee implementation of IP in BHEL.

Sl.	IEM	Email
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### GENERAL TERMS AND CONDITIONS

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1	Shri Arun Chandra Verma, IPS (Retd.)	<a href="mailto:acverma1@gmail.com">acverma1@gmail.com</a>
2	Shri Virendra Bahadur Singh, IPS (Retd.)	<a href="mailto:vbsinghips@gmail.com">vbsinghips@gmail.com</a>

- b. If IP is applicable for the enquiry, the IP as enclosed with the tender is to be submitted (duly signed by authorized signatory) along with the techno-commercial bid (Part-I, in case of two/three part bid). Only those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this pact would be a preliminary qualification.
- c. Please refer Section-8 of the IP for Roles and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to any of the above IEM(s). All correspondence with the IEMs shall be done through email only.

**Note:**

No routine correspondence shall be addressed to the IEM (phone/post/email) regarding the clarifications, time extensions or any other administrative queries etc. on the tender issued. All such clarifications / issues shall be addressed directly to the tender issuing (procurement) department's officials whose contact details are provided below

(1)

Neeraj Kumar  
Sr. Engineer  
Valves Purchase  
24 Building, 3<sup>rd</sup> Floor,  
BHEL, Trichy-620014  
+91 431 2578256  
[neerajkumar@bhel.in](mailto:neerajkumar@bhel.in)

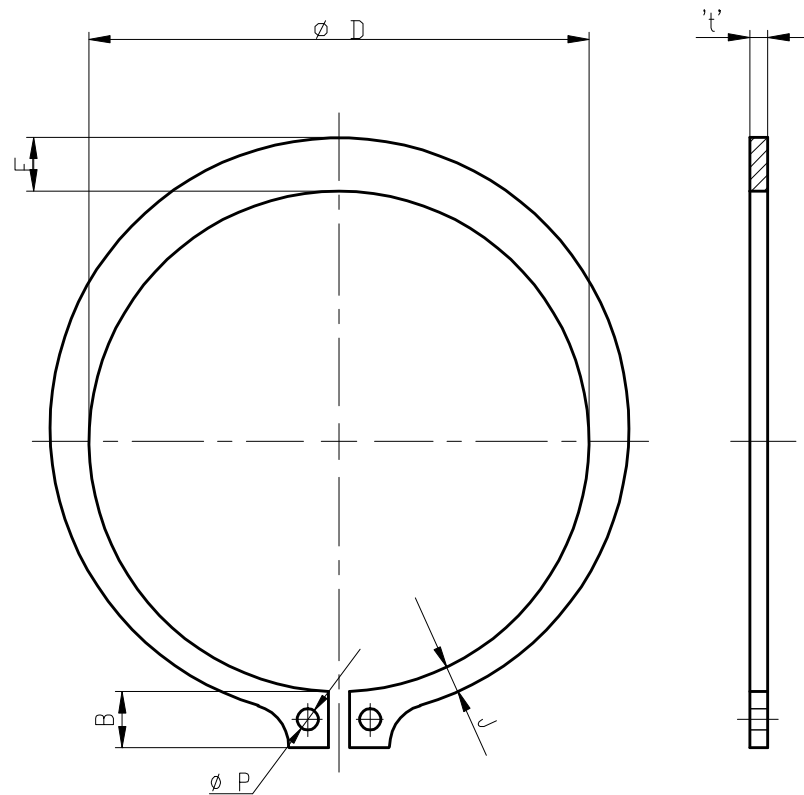
(2)

Ajay Kumar Gupta  
AGM  
Valves Purchase  
24 Building, 3<sup>rd</sup> Floor,  
BHEL, Trichy-620014  
+91 431 2578156  
[ajaykumar.gupta@bhel.in](mailto:ajaykumar.gupta@bhel.in)

\*\*\*\*\*

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

SL No.	DRAWING NUMBER	MATERIAL CODE ON DIMENSIONS	MATL. SPECN.	TRUE ARC TYPE No.	DIMENSIONS						Wt (Kg)	BHEL PART No.	ALTERNATE EQUIVALENT IS No. (NOTE-2)	SUPERSEDED DRG.
					∅ D	t	B	E	J	∅ P				
01	3-V-4115-07725/01	96 452 351	CARBON SPRING STEEL SAE 1075	5100-300	70.49 <sup>+0.50</sup> / <sub>-0.76</sub>	2.36 ±0.07	7.82 ±0.12	6.71 ±0.17	3.51 ±0.17	3.18 <sup>+0.37</sup> / <sub>-0.05</sub>	0.024	4115005	A 75	VPS-001-9009/01
02	3-V-4116-07725/01	96 452 350		5100-362	85.14 <sup>+0.50</sup> / <sub>-0.76</sub>	2.77 ±0.07	8.33 ±0.12	7.52 ±0.20	3.89 ±0.20	3.18 <sup>+0.37</sup> / <sub>-0.05</sub>	0.035	4116005	A 90	VPS-002-9009/01
03	3-V-4167-07725/01	96 452 518		5100-450	107.27 <sup>+0.50</sup> / <sub>-0.76</sub>	2.77 ±0.07	10.26 ±0.20	7.24 ±0.25	3.25 ±0.25	3.18 <sup>+0.37</sup> / <sub>-0.05</sub>	0.048	4167005	A 115	VPS-003-9009/01
04	3-V-4190-07725/01	96 452 546		5100-550	131.11 <sup>+0.50</sup> / <sub>-1.01</sub>	3.18 ±0.09	12.62 ±0.18	9.91 ±0.25	5.31 ±0.25	3.96 <sup>+0.50</sup> / <sub>-0.12</sub>	0.08	4190005	A 140	VPS-004-9009/01
05	3-V-4235-07725/01	96 452 655		5100-162	38.18 <sup>+0.32</sup> / <sub>-0.50</sub>	1.58 ±0.07	5.97 ±0.10	4.57 ±0.15	2.46 ±0.14	3.18 <sup>+0.37</sup> / <sub>-0.05</sub>	0.01	4235004	-	VPS-005-9009/01
06	3-V-4345-07725/01	96 452 904		-	44.5 <sup>+0.39</sup> / <sub>-0.78</sub>	0 1.75 -0.06	6.9 MAX.	5 (APPROX)	-	2.5 min.	0.01	4345004	A 48 x 1.75	VPS-006-9009
07	3-V-4769-07725/01	96 464 355	AISI 302	-	36.5 <sup>+0.39</sup> / <sub>-0.78</sub>	0 1.75 -0.06	6.0 MAX.	4.4(APPROX)	-	2.5 min.	0.01	4769046	A 40 x 1.75 W/MATL. AISI 302	VPS-007-9009/01
08	3-V-R922-07725/01	96 464 577	CARBON SPRING STEEL SAE-1075	-	94.5 <sup>+0.50</sup> / <sub>-1.08</sub>	3.18 ±0.09	9.6 MAX.	9.0 ±0.25	-	3.5 min.	0.01	R922	A 100 x 3.18	-
09	3-V-4000-07725/01	96 464 658		5100-375	88.10 <sup>+0.50</sup> / <sub>-0.76</sub>	2.77 ±0.07	8.43 ±0.12	7.87 ±0.20	4.06 ±0.20	3.18 <sup>+0.37</sup> / <sub>-0.05</sub>	0.037	4000027	-	F/RMFR
10	3-V-4B75-07725/01	96 464 700		5100-315	73.5 ±0.50	2.36 ±0.07	7.82 ±0.12	6.95 ±0.17	3.50 ±0.20	3.12 <sup>+0.4</sup> / <sub>-0.05</sub>	0.03	4B75003	-	LANDING MANDREL 2-7/8"
11	3-V-4L10-07725/00	96 469 094		-	23.20 <sup>+0.21</sup> / <sub>-0.42</sub>	0 1.20 -0.05	4.4 MAX.	3.0 (APPROX)	-	2.0 min.	0.01	4L10046	-	F/ 2-1/16"-15M CLE. PIN



**NOTES:-**

1. TO BE BLACKENED. (EXCEPT SL No. 07)
2. ALTERNATE RETAINER RINGS SHALL CONFORM TO "IS 3075"  
-CIRCLIPS FOR SHAFTS NORMAL TYPE.

NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
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TYPE OF PRODUCT  
OR NAME OF  
CUSTOMER/PROJECT



**BHARAT HEAVY ELECTRICALS LTD.,**  
UNIT: HIGH PRESSURE BOILER PLANT.  
TIRUCHIRAPALLI-620014.

DRN	NAME	SIGN	DATE	NO.OF VAR.
CHD	R.NATARAJAN	<i>[Signature]</i>	18-12-2010	
APPD	R.ELAYARAJA	<i>[Signature]</i>	18-12-2010	

DCP No.	ALTERED <i>[Signature]</i>	APPD <i>[Signature]</i>
	CHD <i>[Signature]</i>	DATE 18-12-'10

REV	SL. No. 11 ADDED.
05	REVISED & REDRAWN IN CAD
ZONE	<i>[Symbol]</i>

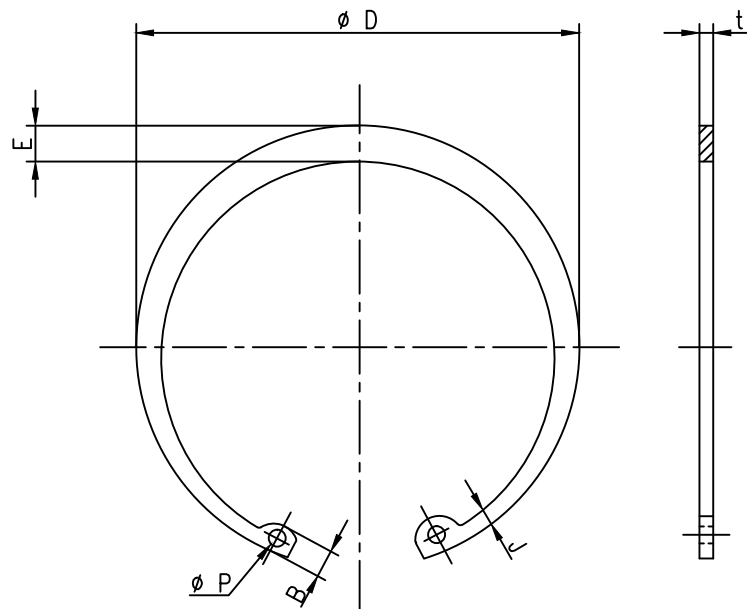
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DEPT VL	SCALE N T S	WEIGHT (KG)	REFERENCE INFORMATION	NO. OF ITEMS
CODE 340	<i>[Symbol]</i>			
TITLE	CARD CODE	DRAWING NO.	REV	
<b>RETAINER RING</b> (EXTERNAL SERIES)	U 01	<b>3-V-0000-07725</b>	<b>05</b>	

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

3-V-0000-07730  
DRAWING NO.

SL No.	DRAWING NUMBER	MATERIAL CODE	MATL SPECN	TRUE ARC TYPE No.	DIMENSIONS						Wt (kg)	BHEL PART No.	ALTERNATE EQUIVALENT IS No. (NOTE-2)	SUPERSEDED BY
					∅ D	t	B	E	J	∅ P				
01	3-V-4146-07730/01	96 452 471	CARBON SPRING STEEL SAE-1075	N5000-225	63.2 <sup>+1.0</sup> <sub>-0.7</sub>	1.98 ±0.07	6.86 ±0.12	5.15 ±0.17	2.51 ±0.17	2.40 <sup>+0.30</sup> <sub>-0.05</sub>	0.007	4146015	B 58	VPS-001-9015
02	3-V-4780-07730/01	96 452 669		N5000-162H	46.0 <sup>+0.7</sup> <sub>-0.8</sub>	1.58 ±0.07	5.76 ±0.12	4.17 ±0.17	2.09 ±0.17	2.00 <sup>+0.30</sup> <sub>-0.05</sub>	0.005	4780015	B 42	VPS-002-9015
03	3-V-4A15-07730/01	96 464 558		N5000-262	74.0 <sup>+0.9</sup> <sub>-0.8</sub>	2.36 ±0.06	7.36 ±0.12	5.74 ±0.17	2.82 ±0.17	2.80 <sup>+0.30</sup> <sub>-0.05</sub>	0.016	4A15059	-	-
04	3-V-4A95-07730	96 464 589	AISI 302	-	46.0 <sup>+0.7</sup> <sub>-0.8</sub>	1.58 ±0.07	5.76 ±0.12	4.17 ±0.17	2.09 ±0.17	2.00 <sup>+0.30</sup> <sub>-0.05</sub>	0.005	4A95015	-	-
05	3-V-4B18-07730	96 464 631	CARBON SPRING STEEL SAE-1075	N5000-875	243 ±2.0	4.75 ±0.12	16.8 ±0.2	15 ±0.17	7.3 ±0.2	4.8 <sup>+0.4</sup> <sub>-0.1</sub>	0.4	4B18018	-	-
06	3-V-4109-07730	96 464 661		N5000-825	231 ±2.0	4.75 ±0.12	15.2 ±0.2	14.2 ±0.2	6.9 ±0.2	4.8 <sup>+0.4</sup> <sub>-0.1</sub>	0.3	4109018	-	-
07	3-V-4B52-07730	96 464 686		-	282 ±2.0	4.75 ±0.12	18.7 ±0.2	16.00 ±0.2	8.0 ±0.2	5.0 <sup>+0.4</sup> <sub>-0.1</sub>	0.45	4B52018	-	-



NOTES :-

1. TO BE CADMIUM PLATED. (FOR CARBON SPRING STEELS)
2. ALTERNATE RETAINER RINGS SHALL CONFORM TO "IS 3075"

CAD REF No. o307730

NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No	
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT										
BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. 365-121 TIRUCHIRAPALLI-620014.						DRN	NAME	SIGN	DATE	NO.OF VAR.
						CHD	T.RAJARAMAN	<i>T.Rajaraman</i>	9-4-97	
						APPD	K.S. SANKAR	<i>K.Sankar</i>	9-4-97	
						APPD	J.ABRAHAM	<i>J.Abraham</i>	9-4-97	
DEPT	VL	SCALE	WEIGHT (KG).	REFERENCE INFORMATION			NO. OF ITEMS			
CODE	340	NTS	-	-						
TITLE						CARD CODE	DRAWING NO.	REV		
RETAINER RING (INTERNAL SERIES)						U 01	3-V-0000-07730	06		

UNLESS OTHERWISE SPECIFIED	
BREAK SHARP CORNERS	: 0.25
FILLET RADII	: 0.76±0.12
CONCENTRICITY	: 0.25 FIM
SQUARNESS	: 0.25 IN 254
PARALLELISM	: 0.25 IN 254
RFS EXCEPT WHEN (M) MODIFIED.	

DCP No.	ALTD : <i>PL</i>	APPD : <i>P. Arj</i>
801784	CHD : <i>PL</i>	DT : 26-6-14

REV	06	REVISED AND REDRAWN IN CAD.
ZONE	<i>06</i>	

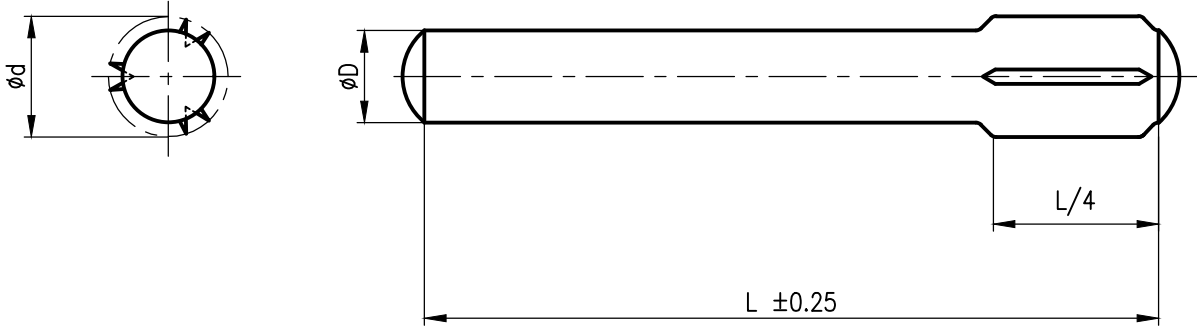
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FOR TOLERANCES OF UNTOLERANCED DIMENSIONS

ALL DIMENSIONS ARE IN MILLIMETRES.  
DURING MANUFACTURE REFER RELEVANT QCP/QP

DCP No.	ALTERED : G.V	CHD : R.N
802107	DATE :03-11-15	APPD : R.E
REV	REVISED AND REDRAWN IN CAD	
03		
ZONE		



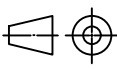
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02	6.40 <sup>0</sup> <sub>-0.05</sub>	51.0	6.7	6.35 <sup>+0.07</sup> <sub>0</sub>
01	9.50 <sup>0</sup> <sub>-0.05</sub>	63.5	9.8	9.53 <sup>+0.07</sup> <sub>0</sub>
SL.No.	$\phi D$	L	$\phi d$	RECOMMENDED HOLE SIZE
DIMENSIONS				

**NOTE:-**

- CHROME VANADIUM STEEL (SAE 6150) 45-50 HRC,-ZINC PLATED.  
OR  
ASTM A193 -B16 30-35 HRC,-ZINC PLATED.

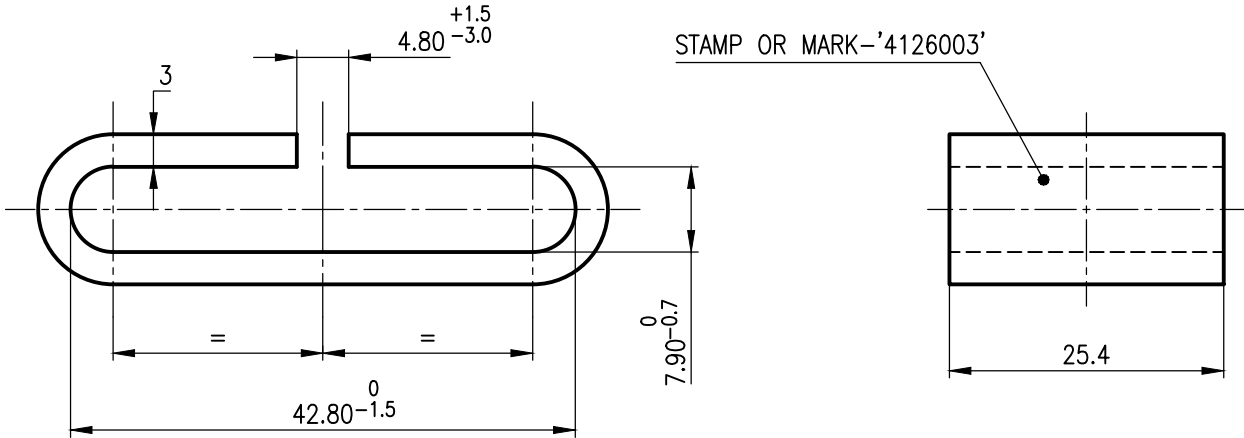
02		96 452 422	NOTE-1			0.013		4-V-4126-13124/00			
01		96 415 044	NOTE-1			0.035		4-V-9641-13124/01			
SL.No.	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No		
 <b>BHARAT HEAVY ELECTRICALS LTD.,</b> UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI 620014. 365-122						DRN	R.L	NAME	SIGN R.L	DATE	NO.OF VAR
						CHD	S.S	S.S	S.S	03.10.1989	—
						APPD	D.K	D.K	D.K	03.10.1989	—
DEPT VL			SCALE	WEIGHT (KG).		REFERENCE INFORMATION					NO. OF ITEMS
CODE 340			NTS	—		DRESSER DRG. NO. 303(1942) (REV: EJ 182) DRESSER PART NO. 3030206					—
TITLE						CARD CODE	DRAWING NO.				REV
DRIVE PIN						U 01	4-V-0000-13124				03
(FOR CONVENTIONAL SLIP) 9-5/8" CASING.											

FOR TOLERANCES OF UNTOLERANCED DIMENSIONS

ALL DIMENSIONS ARE IN MILLIMETRES.  
DURING MANUFACTURE REFER RELEVANT QCP/QP



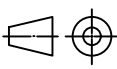
DCP No. 802107	ALTERED : G.V DATE :08.10.15	CHD : R.N APPD : R.E
REV 04	REVISED AND REDRAWN IN CAD	
ZONE		

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**NOTES:-**

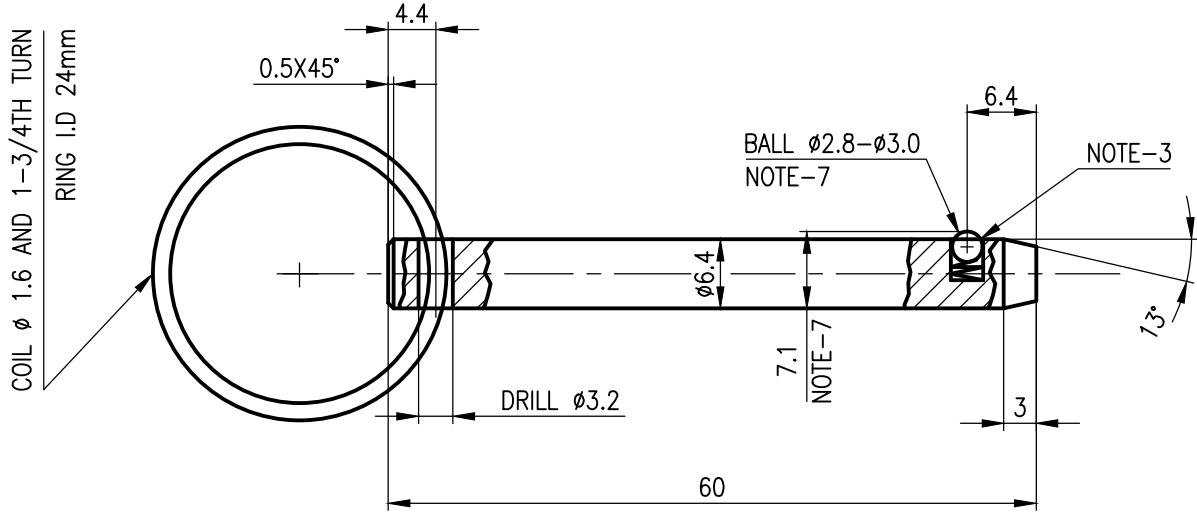
1. COAT: ZINC PHOSPHATE COATING.
2. MATL: CARBON STEEL WITH 0.2 TO 0.35 CARBON CONTENT.

	--	96 452 421	NOTE-2		-	0.06	-	-	003
NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
 <b>BHARAT HEAVY ELECTRICALS LTD.,</b> UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI 620014.				DRN	NAME		SIGN	DATE	NO. OF VAR
365-122				CHD	K.SIVASANKAR		K.S	16.01.1986	—
				APPD	V.ALAGARSWAMI		V.A	16.01.1986	—
					K.RAMALINGAM		K.R	16.01.1986	—
DEPT VL			SCALE	WEIGHT (KG).	REFERENCE INFORMATION				NO. OF ITEMS
CODE 340			NTS	—	NATIONAL DRG No. 526702 2RI- REV.-				—
TITLE				CARD CODE	DRAWING NO.				REV
<b>HINGE</b> (FOR 5-1/2" CONV. SLIP)				U 01	<b>4-V-4126-07520</b>				<b>04</b>

FOR TOLERANCES OF UNTOLERANCED DIMENSIONS

ALL DIMENSIONS ARE IN MILLIMETRES.  
DURING MANUFACTURE REFER RELEVANT QCP/QP

DCP No.	ALTERED : G.V	CHD : R.N
802107	DATE :03-11-15	APPD : R.E
REV	REVISED AND REDRAWN IN CAD	
02		
ZONE		



**NOTE:-**

1. UNSPECIFIED ANGLE TOLERANCES  $\pm 1/2^\circ$
2. UNSPECIFIED MACHINING TOLERANCES  $\pm 0.25\text{mm}$
3. BY PUNCHING TO PREVENT THE BALL FROM COMING OUT.
4. TO BE CHROMIUM PLATED.
5. HARDNESS 29 HRC TO 32 HRC.
6. MATERIAL:- AISI 1040 OR AISI 4140 OF HIGH CARBON STEEL.
7. THIS DIMENSION (BALL IN PRESSED CONDITION) SHOULD SUIT TO THE MATING HOLE  $\phi 6.7$ .
8. SUPPLY THE PIN WITH TAG MARKED - '4126.'

		96 452 424	NOTE-6			0.02			
NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
	<p><b>BHARAT HEAVY ELECTRICALS LTD.,</b> UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI 620014.</p>								
		DRN	T.RAJARAMAN	SIGN	T.R	DATE	16.01.1986	NO.OF VAR	
		CHD	V.ALAGARSWAMI	SIGN	V.A	DATE	16.01.1986		
		APPD	K.RAMALINGAM	SIGN	K.R	DATE	17.01.1986		
DEPT VL			SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS				NO. OF ITEMS
CODE			NTS		NATIONAL PART No. 7915040				
340					DRAWING NO.				REV
TITLE				CARD CODE	4-V-4126-07522				02
(FOR CONVENTIONAL SLIP) 9-5/8" CASING.				U 01					

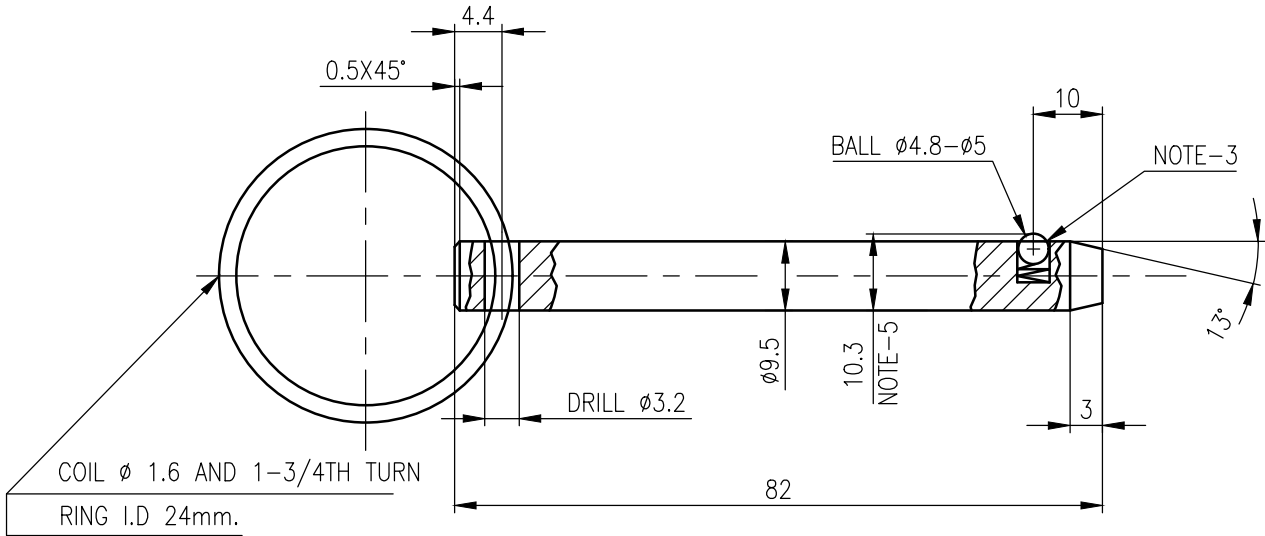
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FOR TOLERANCES OF UNTOLERANCED DIMENSIONS


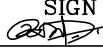
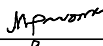
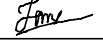

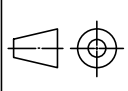
ALL DIMENSIONS ARE IN MILLIMETRES.  
DURING MANUFACTURE REFER RELEVANT QCP/QP

DCP No. 802322	ALTD: A.K.P. CHD: R.E.	APPD: R.E. DT: 08.02.18
REV 02	REVISED AND REDRAWN IN CAD	
ZONE 02		



**NOTES:-**

- UNSPECIFIED ANGLE TOLERANCE  $\pm 1/2^\circ$
- UNSPECIFIED MACHINING TOLERANCE  $\pm 0.25\text{mm}$ .
- BY PUNCHING TO PREVENT THE BALL FROM COMING OUT.
- TO BE CHROMIUM PLATED.
- THIS DIMENSION (BALL IN PRESSED CONDITION) SHOULD SUIT TO THE MATING HOLE  $\phi 9.9$
- MATERIAL:- AISI 1040
- ALTERNATE MATERIAL : AISI 4140
- HARDNESS (29-32) HRC.
- SUPPLY THE PIN WITH TAG MARKED '4129'

-	-	964524230000	NOTE-6 & 7	-	-	0.04	-	-	-
NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
 <b>BHARAT HEAVY ELECTRICALS LTD.,</b> UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI 620014. 365-122				DRN	NAME T.RAJARAMAN		SIGN 	DATE 16-01-86	NO. OF VAR
				CHD	V.ALAGARSWAMI			16-01-86	—
				APPD	K.RAMALINGAM			17-01-86	—
DEPT VL CODE 340			SCALE NTS	WEIGHT (KG). -	REFERENCE INFORMATIONS NATIONAL PART NO. 7915041				NO. OF ITEMS —
TITLE PIN 13 3/8" CASING (FOR CONVENTIONAL SLIP)					CARD CODE U 01	DRAWING NO. 4-V-4129-07525			REV 02

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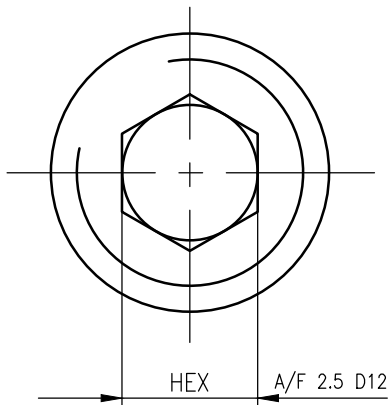
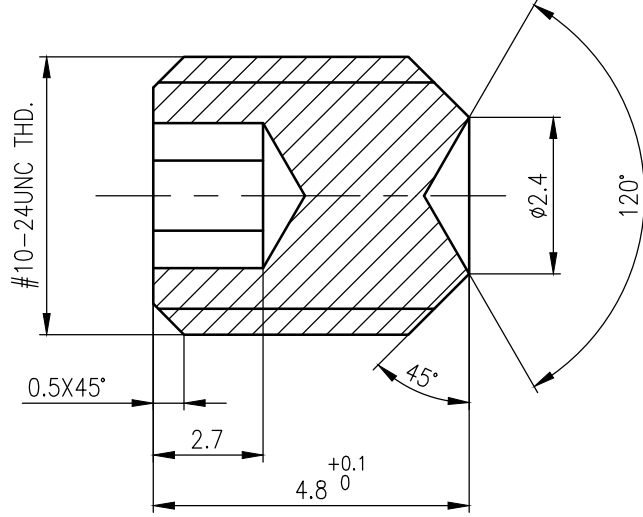
FOR TOLERANCES OF UNTOLERANCED DIMENSIONS

ALL DIMENSIONS ARE IN MILLIMETRES.  
DURING MANUFACTURE REFER RELEVANT QCP/QP

DCP No. 802322	ALTD: A.K.P. CHD: R.E.	APPD: R.E. DT: 08.02.18
REV 01	REVISED AND REDRAWN IN CAD	
ZONE 		

3.2 /

2.5 D12	+0.12
	+0.02



**NOTES :-**

1. UNSPECIFIED MACHINING TOLERANCE  $\pm 0.1$
2. UNSPECIFIED ANGLE TOLERANCE  $\pm 1/2^\circ$
3. MATERIAL : STEEL (SULFUR 0.05%MAX., PHOSPHORUS 0.04% MAX.)

-	-	964526590000	NOTE-3	-	Q&T	-	-	-	005	
NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No	
	BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI 620014.	365-122	VL	SCALE	WEIGHT (KG).	DRN	R.NATARAJAN	SIGN	DATE	NO. OF VAR
						CHD	K.RAMALINGAM		01.01.87	
						APPD	D.KRUSHNAMURTHY		01.01.87	
DEPT	VL			SCALE	WEIGHT (KG).	REFERENCE INFORMATION				NO. OF ITEMS
CODE	340			NTS	-	-				-
TITLE					CARD CODE	DRAWING NO.			REV	
SOC.HD.CAP SCREW					U 01	4-V-4235-07617			01	

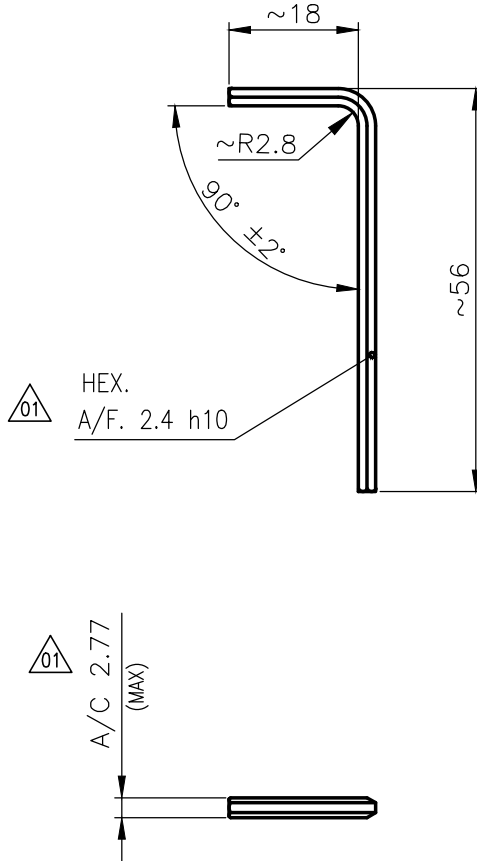
FOR TOLERANCES OF UNTOLERANCED DIMENSIONS

ALL DIMENSIONS ARE IN MILLIMETRES.  
DURING MANUFACTURE REFER RELEVANT QCP/QP

DCP No. 801941	ALTERED <del>ASD</del>	CHD : P. Arj.
	DATE : <del>ASD</del>	APPD : 29.05.2015
REV 01	A/F 2.4 h10 WAS 2.5 h10 REVISED & REDRAWN IN CAD	

2.5 h10	0 -0.040
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**NOTES:-**

1. THE WRENCH SHOULD GENERALLY CONFORM TO IS 3082-1965
2. MATERIAL HEAT TREATED ALLOY STEEL RC. 47 MIN
3. TO BE BLACKENED

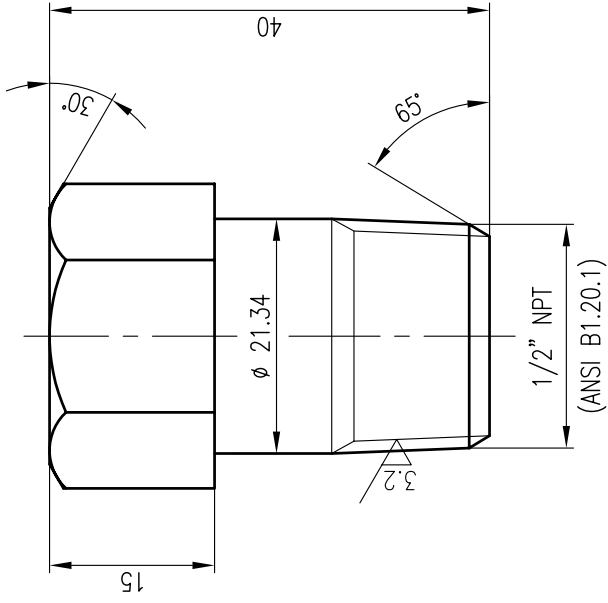
-	-	96 452 660	IS: 1570 55 Cr 70	-	-	0.002	-	-	011
NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
	BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI 620014. 365-122	DRN	R.NATARAJAN	SIGN	<del>ASD</del>	DATE	29.05.2015	NO.OF VAR	
		CHD	R.NATARAJAN	SIGN	<del>ASD</del>	DATE	29.05.2015		
		APPD	P.ARUNKUMAR	SIGN	P. Arj.	DATE	29.05.2015		
DEPT VL	—		SCALE	WEIGHT (KG).	REFERENCE INFORMATION	NO. OF ITEMS			
CODE	340		NTS	—					
TITLE	ALLEN WRENCH			CARD CODE	DRAWING NO.	REV			
				U 01	4-V-4235-07621	01			

FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP/QP

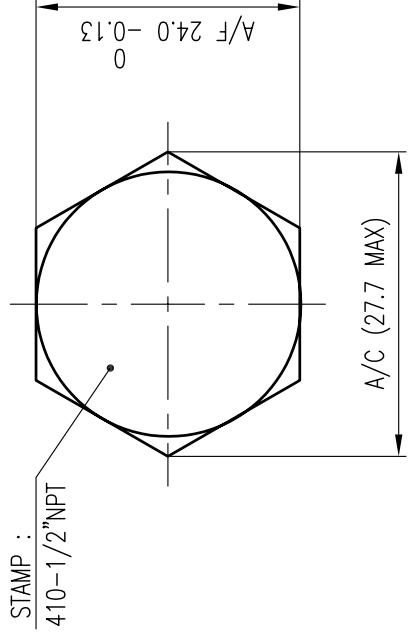
ALL DIMENSIONS ARE IN MILLIMETRES.

DCP No. 800479	ALT: <i>Resi</i>	APPD: <i>Mparaman</i>
REV	CHD: <i>Resi</i>	DATE: 27-6-05
<b>02</b>	REVISED AND REDRAWN IN CAD.	
ZONE		

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6.3 / / 3.2 /



**NOTES:-**

1. UNSPECIFIED MACHINING TOLERANCE  $\pm$  0.25.
2. HARDNESS : 197 TO 235 BHN.

CAD REF No. o407964

NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
		96 464 524	ASI-410-75K	H & T		0.12			
<b>BHARAT HEAVY ELECTRICALS LTD.,</b> UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI 620014.									
DEPT VL				SCALE		WEIGHT (KG)		REFERENCE INFORMATIONS	
CODE 340				N T S		---		---	
TITLE									
PIPE PLUG 1/2" NPT				CARD CODE		DRAWING NO.		REV	
				U 01		4-V-4879-07964		02	
Size A4									



# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS:41406

PAGE 1 of 4

Based on IS: 2016

## MACHINED WASHERS

### 1.0 SCOPE:

Covers the requirements for machined washers in the size range 1.7 to 155mm.

### 2.0 SPECIFICATION AND REFERENCES STANDARDS

Dimensions and tolerances	Table 1 of this standard	
Material	Suitable Steel	
Finish	Natural finish	
Sampling and Acceptability	Indian standard	IS: 6821 & IS: 5369
General requirements	Washers shall comply with IS: 2016 in respect of requirements not covered in this standards	

### 2.1 Referred standards (only the current versions are applicable).

IS: 2016 Specification for Plain washers

IS: 5369 General requirements for plain washers and lock washers

IS: 6821 Methods for sampling non-threaded fasteners

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Revisions			Approved STANDARDS SECTION ENGINEERING AND DEVELOPMENT CENTER HPBP TIRUCHIRAPALLI		
Rev. No.	Amd. No.	Reaffirmed	PREPARED	Issued	Dt of 1st Issue
Dt.	Dt.	Year	HPBP TIRUCHY	Standards /EDC	



# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41406

PAGE 2 of 4

## 3.0 DESIGNATION

A machined washers to this standard for bolt/screw size M10 shall be designated as:

### 3.1 On Drawings

- 1) Material Specification column : IS: 2016
- 2) Description Column : WASHER MCD 10
- 3) Drawing Number column : 4140610000
- 4) Material code Column : 4140600010

### 3.2 Ordering Description

For placing indents, issuing enquiries and on Purchase order, the Ordering Description given below shall be followed:

Machined Washer 10. 5\* IS: 2016 – steel

## 4.0 ADDITIONAL INFORMATION

4.1 These washers can be used for product grades A and B of general purpose bolts and screws.

\*4.2 While preparing ordering Description only the actual hole size (corresponding to bolt/screw size) shall be filled in referring to Table.



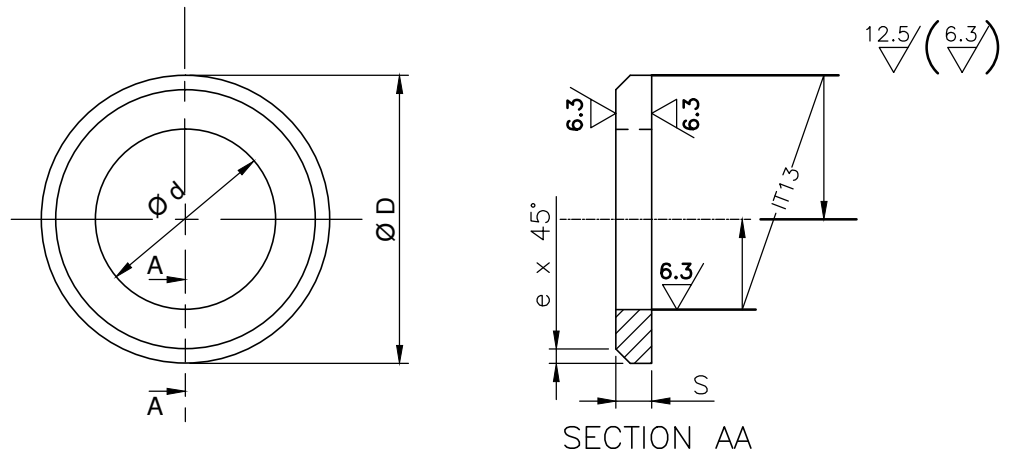
# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41406

PAGE 3 of 4

TABLE 1– DIMENSION FOR MACHINED WASHERS



(All dimension are in millimeters)

d H12	D		S		e Nom	For bolt/ screw size	weight
	Basic	Tol	Basic	Tol			
1.7	4	$\begin{matrix} 0 \\ -0.3 \end{matrix}$	0.3	$\pm 0.1$	0.1	M1.6	
2.2	5	$\begin{matrix} 0 \\ -0.3 \end{matrix}$	0.3	$\pm 0.1$	0.1	M2	
3.2	7	$\begin{matrix} 0 \\ -0.3 \end{matrix}$	0.5	$\pm 0.1$	0.2	M3	
4.3	9	$\begin{matrix} 0 \\ -0.3 \end{matrix}$	0.8	$\pm 0.1$	0.3	M4	0.3
5.3	10	$\begin{matrix} 0 \\ -0.3 \end{matrix}$	1.0	$\pm 0.1$	0.4	M5	
6.4	12.5	$\begin{matrix} 0 \\ -0.4 \end{matrix}$	1.6	$\pm 0.2$	0.6	M6	1.1
8.4	17	$\begin{matrix} 0 \\ -0.4 \end{matrix}$	1.6	$\pm 0.2$	0.6	M8	
10.5	21	$\begin{matrix} 0 \\ -0.5 \end{matrix}$	2	$\pm 0.2$	0.6	M10	4
13	24	$\begin{matrix} 0 \\ -0.5 \end{matrix}$	2.5	$\pm 0.3$	0.6	M12	6.2
17	30	$\begin{matrix} 0 \\ -0.5 \end{matrix}$	3	$\pm 0.3$	0.6	M16	11.1
21	37	$\begin{matrix} 0 \\ -0.8 \end{matrix}$	3	$\pm 0.3$	1.0	M20	16.7
25	44	$\begin{matrix} 0 \\ -0.8 \end{matrix}$	4	$\pm 0.3$	1.0	M24	31.7
(28)	50	$\begin{matrix} 0 \\ -0.8 \end{matrix}$	4	$\pm 0.3$	1.0	(M27)	41.7
31	56	$\begin{matrix} 0 \\ -1.0 \end{matrix}$	4	$\pm 0.3$	1.0	M30	52.9
(34)	60	$\begin{matrix} 0 \\ -1.0 \end{matrix}$	5	$\pm 0.6$	1.0	(M33)	

**NOTE:**

1. Sizes in brackets are non-preferred.
2. Weights are given in kg per 1000 numbers only.
3. For stocked sizes refer BPS components booklet.

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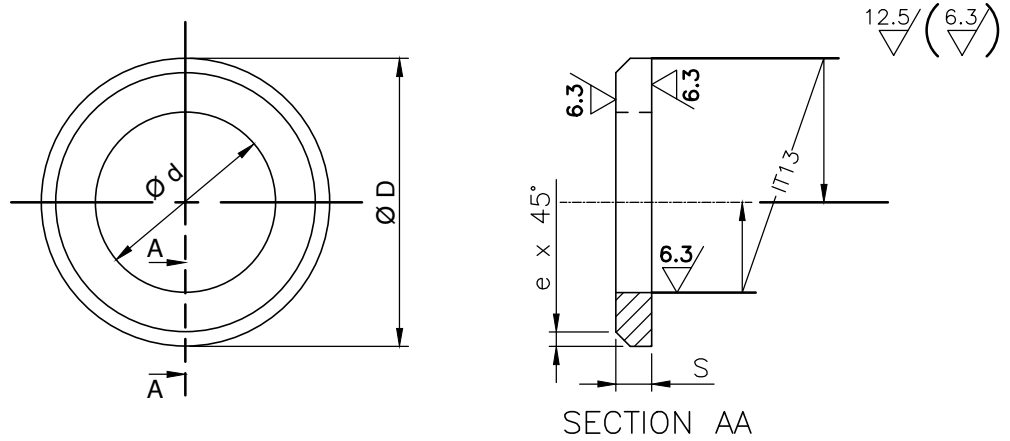
# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41406

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TABLE 1- DIMENSION FOR MACHINED WASHERS (Contd.)



(All dimension are in millimeters)

d H12	D		S		e Nom	For bolt/ screw size	weight
	Basic	Tol	Basic	Tol			
37	66	$\begin{matrix} 0 \\ -1.0 \end{matrix}$	5	$\pm 0.6$	1.6	M36	89.9
(40)	72	$\begin{matrix} 0 \\ -1.0 \end{matrix}$	6	$\pm 0.6$	1.6	(M39)	
43	78	$\begin{matrix} 0 \\ -1.0 \end{matrix}$	7	$\pm 1.0$	1.6	M42	180
(46)	85	$\begin{matrix} 0 \\ -1.5 \end{matrix}$	7	$\pm 1.0$	1.6	(M45)	243
50	92	$\begin{matrix} 0 \\ -1.5 \end{matrix}$	8	$\pm 1.0$	1.6	M48	291
(54)	98	$\begin{matrix} 0 \\ -1.5 \end{matrix}$	8	$\pm 1.0$	1.6	(M52)	
58	105	$\begin{matrix} 0 \\ -1.5 \end{matrix}$	9	$\pm 1.0$	1.6	M56	
(62)	110	$\begin{matrix} 0 \\ -1.5 \end{matrix}$	9	$\pm 1.0$	2.0	(M60)	
66	115	$\begin{matrix} 0 \\ -1.5 \end{matrix}$	9	$\pm 1.0$	2.0	M64	486.5
74	125	$\begin{matrix} 0 \\ -1.8 \end{matrix}$	10	$\pm 1.0$	2.0	M72	
82	140	$\begin{matrix} 0 \\ -1.8 \end{matrix}$	12	$\pm 1.2$	2.5	M80	
93	160	$\begin{matrix} 0 \\ -1.8 \end{matrix}$	12	$\pm 1.2$	3.0	M90	
104	175	$\begin{matrix} 0 \\ -1.8 \end{matrix}$	14	$\pm 1.2$	3.0	M100	
(124)	210	$\begin{matrix} 0 \\ -2 \end{matrix}$	16	$\pm 1.2$	3.0	(M120)	
(155)	250	$\begin{matrix} 0 \\ -2 \end{matrix}$	18	$\pm 1.2$	4.0	(M150)	

**NOTE:**

1. Sizes in brackets are non-preferred.
2. Weights given are in kg per 1000 numbers only.
3. For stocked sizes refer BPS components booklet.

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# PLANT STANDARD

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BPS:41501

PAGE : 1 OF 5

Based on IS: 2048

## PARALLEL KEYS – TYPE-A

### 1.0 SCOPE:

Covers the requirements for keys with bolt ends round (type A)

### 2.0 SPECIFICATION AND REFERENCES STANDARDS

Dimensions and tolerances	Table 1 of this standard	
Preferred length and Size combination	Table 2 of this standard	
Material	Steel of tensile strength not less than 600 MPa	
Finish	Natural finish	
Sampling and Acceptability	Indian standard	IS: 6821
General requirements	Keys shall comply with IS :2048 in respect of requirement not covered in this standards	

### 2.1 Referred standards (only the current version are applicable)

IS: 2048 Specification for parallel keys and keyways

IS: 6821 Methods for sampling non-threaded fasteners

Revisions			Approved Standing Committee		
Rev. No.	Amd. No.	Reaffirmed	Prepared	Issued	Dt of 1st Issue
Dt.	Dt.	Year	Standards	Standards	06.11.2013

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# PLANT STANDARD

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### 3.0 DESIGNATION:

A parallel key to this standard of width 12mm, height 8mm and length 56mm shall be designated as:

### 3.1 On Drawings:

- 1) material specification column : IS: 2048-A
- 2) Description column : KEY PRL RND END 12X8X56
- 3) Drawing number column : 4150108056
- 4) Material code column : 4150112056

### 3.2 Ordering Description:

For placing indents, issuing enquiries and on purchase order, the ordering Description given below shall be followed:

parallel key A 12x8x56

### 4.0 ADDITIONAL INFORMATION:

4.1 for keyways to these keys refer IS: 2048 or AA 023 15 08.

Revisions			Approved		
Rev. No.	Amd. No.	Reaffirmed	Prepared	Issued	Dt of 1st Issue
Dt.	Dt.	Year			



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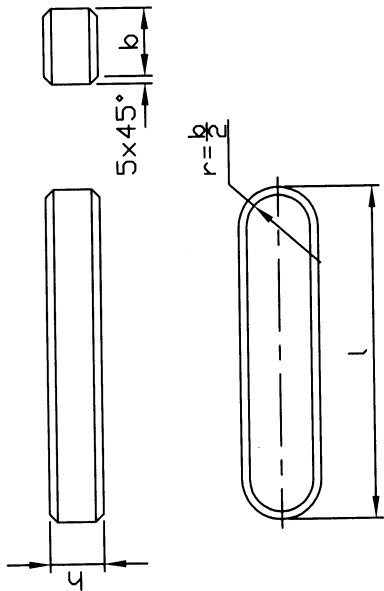
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BPS:41501

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TABLE 1 – DIMENSIONS FOR PARALLEL KEYS



NOTE:

\* 1.Tolerance on 'h':  
square section-h9  
rectangular section-h11

ALL DIMENSIONS ARE IN MILLIMETRES

WIDTH	2	3	4	5	6	8	10	12	14	16	18	20	22	25	28	32	36	40	45	50	56	63	70	80	90	100
b																										
TOL ON b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H9	-0.025	-0.025	-0.030	-0.030	-0.036	-0.036	-0.043	-0.043	-0.052	-0.052	-0.062	-0.062	-0.074	-0.074	-0.087	-0.087	-0.100	-0.100	-0.110	-0.110	-0.130	-0.130	-0.160	-0.160	-0.160	
HEIGHT	2	3	4	5	6	7	8	8	9	10	11	12	14	14	16	18	20	22	25	28	32	36	40	45	50	
h																										
TOL ON h*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
h* see note-1	-0.025	-0.025	-0.030	-0.030	-0.036	-0.036	-0.043	-0.043	-0.052	-0.052	-0.062	-0.062	-0.074	-0.074	-0.087	-0.087	-0.100	-0.100	-0.110	-0.110	-0.130	-0.130	-0.160	-0.160	-0.160	
s	Min	0.16	0.16	0.25	0.25	0.25	0.40	0.40	0.40	0.40	0.40	0.60	0.60	0.60	0.60	0.60	1.00	1.00	1.00	1.00	1.60	1.60	1.60	2.50	2.50	
	Max	0.25	0.25	0.40	0.40	0.40	0.60	0.60	0.60	0.60	0.60	0.80	0.80	0.80	0.80	1.20	1.20	1.20	1.20	1.20	2.00	2.00	2.00	3.00	3.00	
RANGE OF KEY LENGTH 'l'	Min	6	6	8	10	14	18	22	28	36	45	50	56	63	70	80	90	100	110	125	140	160	180	200	250	280
	Max	20	36	45	56	70	90	110	140	160	180	200	220	250	280	320	360	400	400	400	400	400	400	400	400	400

Revisions

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# PLANT STANDARD

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BPS:41501

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**TABLE 2- PREFERRED LENGTH-SIZE COMBINATION FOR PARALLEL KEYS**

(ALL DIMENSIONS ARE IN MILLIMETERS)

Preferred length (l)	WEIGHTS														
	2x2	3x3	4x4	5x5	6x6	8x7	10x8	12x8	14x9	16x10	18x11	20x12	22x14	25x14	
10															
12			1.402												
14															
16															
18															
20				3.709	5.286		13.1								
22															
25				4.719		10.245			21.6						
28			3.412												
32					8.676					41.0					
36															
40				7.639	10.936				36.63		56.7	66.0			
45						19.045									
50										58.49					
56					15.436										
63									59.33						
70															
80									76.13						205.3
90															
100															
110															
125															
140															

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# PLANT STANDARD

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**TABLE 2- PREFERRED LENGTH-SIZE COMBINATION FOR PARALLEL KEYS (CONT.)**

(ALL DIMENSIONS ARE IN MILLIMETERS)

Preferred length (l)	22X14	25X14	28X16	32X18	36X20	40X22	45X25	50X28	56X32	63X32	70X36	80X40	90X45	100X50
	WEIGHTS													
63														
70														
80														
90														
100														
110														
125														
140														
160														
180														
200														
220														
250														
280														
320														
360														
400														

NOTE:

1. weights are given in kg per 1000 numbers only.
2. for stocked sizes refer BPS components book-let.
3. Preferred length are in between the stepped bold lines.

Revisions			Approved		
Rev. No.	Amd. No.	Reaffirmed	Prepared	Issued	Dt of 1st Issue
Dt.	Dt.	Year			



# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41704

PAGE 1 OF 4

Based on IS: 549-1974

## SPLIT PINS

### 1.0 SCOPE

Covers the requirements for Split Pins in the diameter range 0.6 to 20mm.

### 2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and tolerances	Table 1 of this standard	
Preferred length and size combination	Table 2 of this standard	
Material	Mild Steel Wire (Half round)	
Finish	Bright self colour finish	
Sampling and Acceptability	Indian standard	IS: 6821
General requirements	Pins shall comply with IS: 549 in respect of requirements not covered in this standard	

### 2.1 Referred Standards (Only the current versions are applicable)

IS: 549 Specification for Split Pins.

IS: 6821 Methods for sampling non-threaded fasteners

REVISIONS

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STANDARDS SECTION  
ENGINEERING AND DEVELOPMENT CENTRE  
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# PLANT STANDARD

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BPS: 41704

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## 3.0 DESIGNATION

A Split Pin to this standard of nominal diameter 5mm and nominal length 56mm shall be designated as:

## 3.1 On Drawings:

- i) Material Specification column: IS: 549
- ii) Description column : PIN SPLIT 5x56
- iii) Drawing Number column : 4170405056
- iv) Material Code column : 4170450056

## 3.2 Ordering Description

For placing indents, issuing enquiries and on purchase order, the Ordering Description given below shall be followed.

Split Pin 5x56 IS: 549

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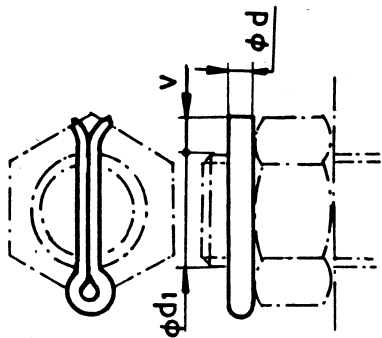
# PLANT STANDARD

HPBP TIRUCHIRAPALLI

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**TABLE 1 - DIMENSIONS FOR SPLIT PINS**  
(All dimensions in millimetres)



Dimensions	Nominal size																
	0.6	0.8	1.0	1.2	1.6	2.0	2.5	3.2	4.0	5.0	6.3	8.0	10	13	16	20	
d	Max	0.5	0.7	0.9	1.0	1.4	1.8	2.3	2.9	3.7	4.6	5.9	7.5	9.5	12.4	15.4	19.3
	Min	0.4	0.6	0.8	0.9	1.3	1.7	2.1	2.7	3.5	4.4	5.7	7.3	9.3	12.1	15.1	19.0
a	Max	1.6	1.6	1.6	2.5	2.5	2.5	3.2	4.0	4.0	4.0	4.0	4.0	6.3	6.3	6.3	6.3
	≈	2.0	2.4	3.0	3.0	3.2	4.0	5.0	6.4	8.0	10	12.6	16	20	26	32	40
c	Max	1.0	1.4	1.8	2.0	2.8	3.6	4.6	5.8	7.4	9.2	11.8	15	19	24.8	30.8	38.6
	Min	0.9	1.2	1.6	1.7	2.4	3.2	4.0	5.1	6.5	8.0	10.3	13.1	16.6	21.7	27.0	33.8
Corresponding diameter	Over	--	2.5	3.5	4.5	5.5	7.0	9.0	11	14	20	27	39	56	80	120	170
	Up to	2.5	3.5	4.5	5.5	7.0	9.0	11	14	20	27	39	56	80	120	170	--
Bolts	Over	--	2	3	4	5	6	8	9	12	17	23	29	44	69	110	160
	Up to	2	3	4	5	6	8	9	12	17	23	29	44	69	110	160	--
Clevis pins	Over	3	3	4	5	5	6	6	8	8	10	12	14	16	20	25	32
	Up to	3	3	4	5	5	6	6	8	8	10	12	14	16	20	25	32



# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41704

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**TABLE 2 - PREFERRED LENGTH-SIZE COMBINATION  
FOR SPLIT PINS**

(All dimensions in millimetres)

l Nom ±½ IT 17	Nominal size															
	0.6	0.8	1.0	1.2	1.6	2.0	2.5	3.2	4.0	5.0	6.3	8.0	10	13	16	20
4																
5																
6																
8																
10																
12																
14																
16						0.4										
18																
20																
22																
25									2.7							
28																
32										5.5						
36									3.6							
40										6.5						
45									4.6		11.4					
50																
56									5.6	8.4	13.4					
63										9.2						
71											17.2					
80																
90																
100																
112																
125																
140																
160																
180																
200																
224																
250																
280																

**NOTE:**

- 1 Weights are given in kg per 1000 numbers only
- 2 For stocked sizes refer BPS components booklet
- 3 Preferred lengths are in between the stepped bold lines



# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41902

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Based on IS: 3075-1965

## EXTERNAL CIRCLIPS (Type A, Light Series)

### 1.0 SCOPE

Covers the requirements for Light Series External Circlips (type A), suitable for shaft diameter range 8 to 300mm.

### 2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and tolerances	Table 1 of this standard	
Material	High Carbon Steel C80	IS: 1570 Part II
Mechanical properties	(Hardness after tempering)	
		<u>Min</u> <u>Max</u>
	Upto and including 38mm	480HV    558HV
	Above 38mm upto 200mm	440HV    510HV
	Above 200mm	392HV    453HV
Finish	Sharp edges shall be removed, free from burrs, cracks, laminations and other defects. Chemically or thermally blackened.	
Sampling and Acceptability	Indian Standard	IS: 6821
General requirements	Circlips shall comply with IS: 3075 in respect of requirements not covered in this standard.	

### 2.1 Referred Standards (Only the current versions are applicable)

- IS: 1570    Schedule for wrought steels  
Part II    Part II Carbon steels (unalloyed steels)
- IS: 3075    Dimensions for circlips
- IS: 6821    Methods for sampling non-threaded fasteners.

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	PREPARED HPBP TIRUCHY
	ISSUED STANDARDS ENGG.
	DATE DEC 1986



# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41902

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## 3.0 DESIGNATION

A Circlip to this standard suitable for shaft diameter 20mm shall be designated as:

### 3.1 On Drawings:

- i) Material Specification column : IS: 3075-A
- ii) Description column : CIRCLIP LIGHT A 20
- iii) Drawing Number column : 4190202000
- iv) Material Code column : 4190200020

### 3.2 Ordering Description

For placing indents, issuing enquiries and on purchase order, the Ordering Description given below shall be followed.

Circlip A 20x1.2\* IS: 3075

## 4.0 ADDITIONAL INFORMATION

- \*4.1 While preparing Ordering Description, the corresponding thickness for shaft diameter shall be filled in referring from Table.

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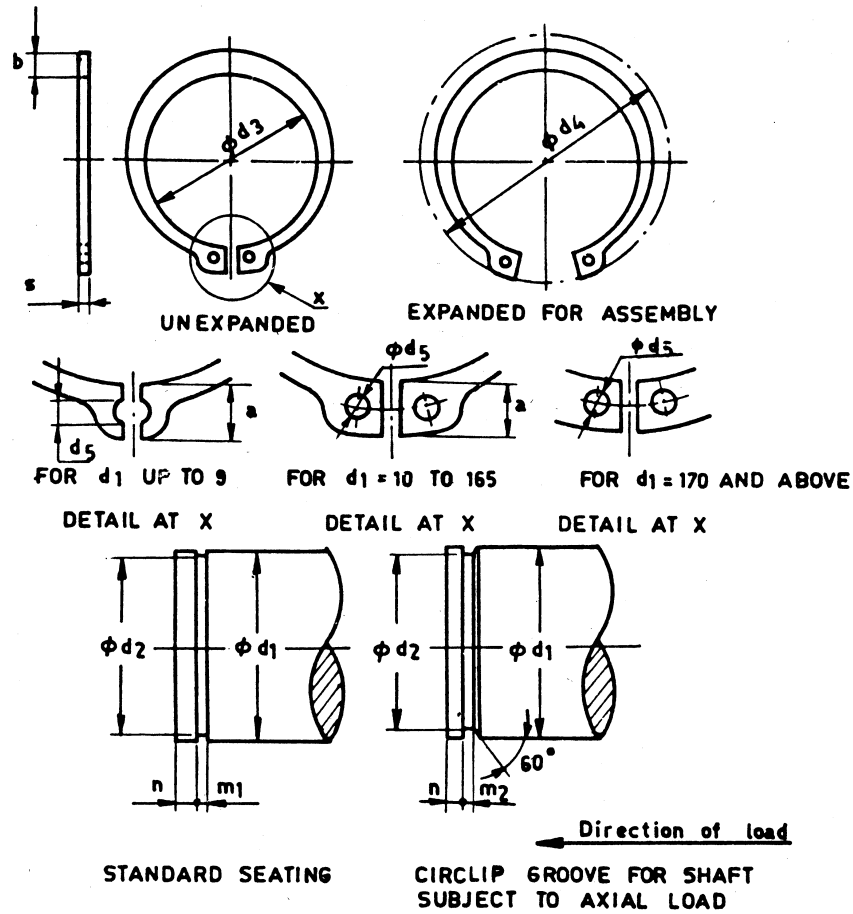
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TABLE 1 - DIMENSIONS FOR INTERNAL CIRCLIPS,  
TYPE B - LIGHT SERIES



(All dimensions in millimetres)

Bore dia $d_1$	Circlip							Bore groove					Axial force kgf
	s h11	a Max	b	$d_3$	Tol on $d_3$	$d_4$ Com- pres- sed	$d_5$ Min	$d_2$	Tol on $d_2$	$m_1$ H13	$m_2$ Min	n Min	
8	0.8	3.2	1.5	7.4	+0.09	15.2	1.2	7.6	h11	0.9	1.0	0.6	120
9			1.7	8.4	-0.18	16.4	1.2	8.6					138
10		3.3	1.8	9.3	+0.15 -0.30	17.6	1.5	9.6					153
12	1.0	3.5	1.8	11.0	+0.18 -0.36	19.6	1.7	11.5	h11	1.1	1.2	0.75	230
14			2.1	12.9		22.0		13.4				0.9	325
15			2.2	13.8		23.2		14.3				1.1	400
16		3.7	2.2	14.7		24.4		15.2			1.2	490	
19		3.9	2.5	17.5		27.8		18.0				725	
20		4.0	2.6	18.5		29.0		19.0			1.5	770	
22	1.2	4.2	2.8	20.5		31.4		21.0	h12	1.3	1.4		845
24		4.4	3.0	22.2		33.8		22.9				1.7	1010
25		4.4	3.0	23.2	+0.21 -0.42	34.8	2.0	23.9				1.7	1060
28		4.7	3.2	25.9		38.4		26.6			2.1	1500	
30	1.5	5.0	3.5	27.9		41.0		28.6	h12	1.6	1.7	2.1	1620
32		5.2	3.6	29.6		43.4	2.5	30.3				2.6	2100
35		5.6	3.9	32.2	+0.25 -0.50	47.2		33.0				3.0	2670

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38		5.8	4.2	35.2	+0.25	50.6		36.0					2910
40	1.75	6.0	4.4	36.5	-0.50	53.0		37.5		1.85	2.0	3.0	3810
45		6.7	4.7	41.5	+0.39	59.4		42.5				3.8	4300
50		6.9	5.1	45.8	-0.78	64.8	2.5	47.0					5700
56	2.0	7.3	5.5	51.8		71.6		53.0		2.15	2.3		6400
60		7.4	5.8	55.8		75.8		57.0				4.5	6900
70		8.1	6.6	65.5	+0.46	87.2		67.0	h12				8050
78	2.5	8.6	7.3	73.5	-0.92	96.2	3.0	75.0		2.65	2.8		9000
80		8.6	7.4	74.5		98.2		76.5					10700
85		8.7	7.8	79.5		104.0		81.5					11400
90	3.0	8.8	8.2	84.5		109.0		86.5		3.15	3.3	5.3	12100
95		9.4	8.6	89.5	+0.54	115.0	3.5	91.5					12800
100		9.6	9.0	94.5	-1.08	121.0		96.5					13500
110		10.1	9.6	103.0		132.0		106.0					17000
120		11.0	10.2	113.0		143.0		116.0					18500
130		11.6	10.7	123.0		155.0		126.0				6.0	20100
140		12.0	11.2	133.0		165.0		136.0					21700
150	4.0	13.0	11.8	142.0	+0.63	177.0		145.0		4.15	4.3		28900
160		13.3	12.2	151.0	-1.26	188.0		155.0					31000
170			12.9	160.5		197.0	4.0	165.0				7.5	32900
180			13.5	170.5		208.0		175.0	h13				34800
190				180.5		219.0		185.0					33500
200			14.0	190.5	+0.72	229.0		195.0					31900
220				208.0	-1.44	249.0		214.0				9.0	51200
240				228.0		269.0		234.0					52900
260	5.0			245.0		293.0		252.0		5.15	5.3		54400
280		16.0		265.0	+0.81	313.0	5.0	272.0				12.0	50800
300				285.0	-1.62	333.0		292.0					47300

**Notes:**

1. For stocked sizes and weights refer BPS component book-let.



**Product: Steel Forgings & Bars for Pressure Containing parts of OFE for API-6A**

#### Revisions Record:

Rev 08: 24/03/15: Edition numbers for reference standards added. CI 2 – Edition added, Temperature rating 'R' deleted, CI 6 – Impact test modified, CI 8 – Personnel qualification added, calibration modified, exception on test method in MPI added, term '... finished component' removed, CI 11 – modified  
Rev:09 : Dt: 20/10/2015 CI.1, 2, 3, 5.0, 6.0, 8.0, 11.0 modified.  
Rev 10: Dt: 22/12/2015 CI 1, 2, 3, 4, 5, 6, 8, 10, 11 & 12 modified.  
Rev 11: Dt: 19/08/2016 CI 2 (100K Added), 5 (Table 2 modified) & 6 (Table 3 & 4 modified), CI 8 modified to include definitions for relevant, linear and rounded indications.  
Rev 12 Dt: 07/02/2017: CI 1 changed to indicate the use of latest revisions of referred codes, standards, specifications, drawings, procedures, etc; CI 5 revised to include HT Furnace calibration procedure; CI 1, 2, 3, 4, 5, 6, 8, 10 & 11 revised to bring better clarity.  
Rev 13 Dt: 04/05/2019 – CI 2, 3, 5, 6 & 8 modified as per API 6A 21<sup>st</sup> Ed.  
Rev 14 Dt: 02/07/2020- CI.2- Temperature rating for API 16C updated.CI.3. modified.CI 4 & 8-reference std metric version added.CI5d modified based on API 6A 21<sup>st</sup> Ed Errata 2.  
Rev.15 Dt.20/10/2020 – Latest version of the referred Standards/Specifications indicated in TDC. CI.1,2,11 modified.CI.5.c&e added  
Rev.16 Dt.16/10/2021 – Since separate TDC for API 16C components is made, API 16C requirements are removed from this TDC.Latest version of the referred Standards/Specifications indicated in TDC; CI.1,2,3,5,6,7,8,11 modified

## 1. MATERIAL SPECIFICATIONS

All the Codes, Standards, Specifications, drawings & procedures, etc., referred to in this TDC shall be of latest revision as on the date of Purchase Order, unless specified otherwise.

Product Specifications : API-6A 21<sup>st</sup> Ed 2018 Errata 3 *Addendum 2*

#### Ferromagnetic Material:

- a) Carbon Steel (CS) : AISI 1040 : 60K
- b) Low Alloy Steel (LAS) : AISI 4130 : 60K & 75K & AISI 4140 : 60K, 75K, 100K & 105K
- c) Martensitic SS (MSS) : AISI 410 : 60K & 75K

#### Non-Ferromagnetic Material:

- a) Precipitation Hardened SS : ASTM A564-19A Type 630 (17-4 PH) Condition: H1150D:105K

Additional Requirements : As listed below (Supplementary to above material specifications/standards)  
Size and Quantity : As per Purchase order & Drawing.

## 2. APPLICATION

Pressure containing parts of oil field equipment meeting API-6A 21<sup>st</sup> Ed 2018 Errata 3 *Addendum 2*, National Oil Well Spec MS 204, 382, 383, 384, 385, 386, 388 & 389, NACE Standard MR-0175 2015 Ed with

Product specification level (PSL) : API-6A : 1, 2, 3 & 4  
Temperature Class rating : API-6A : P, S, T, U, V, X & Y  
Material Class & Service : As per applicable drawing  
Material designation : 60K, 75K, 100K & 105K

## 3. CHEMICAL COMPOSITION & PROCESS

Steel shall be of Fully killed and fine-grained with Pressure vessel quality using any one of the following:

#### Melting Process:

- 1) Electric furnace or Basic oxygen process or Induction melting followed by any one of the secondary steel cleaning processes such as vacuum degassing or vacuum processing, Argon Stirred Degassing, Argon Oxygen Decarburisation (AOD), Electroslag Remelting (ESR), Vacuum Arc Remelting (VAR), Ladle refining.
- 2) Vacuum induction melting.
- 3) Melting practice used for PSL 4 material shall be documented by the manufacturer and reported in MTC.



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Ladle and product analysis, on a heat basis, in mass percentage per heat shall be as per Table 1:

**Table 1. Chemical Requirements**

Elements	Chemistry for various Material Specifications				
	AISI 1040	AISI 4130	AISI 4140	AISI 410	ASTM A564 Type 630
<b>C</b>	0.37-0.45	0.27-0.35	0.37-0.45	0.07-0.15	0.07 max.
<b>Mn</b>	0.60-1.00	0.40-0.80	0.60-1.00	0.50-0.90	1.00 max.
<b>Si</b>	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.50	1.00 max.
<b>P</b>	For PSL 1 & 2 - Phosphorous and Sulphur: 0.04% max. each.				0.035 max.
<b>S</b>	For PSL 3 - Phosphorous and Sulphur: 0.025% max. each. For PSL 4 - Phosphorous: 0.015% max. & Sulphur: 0.010% max.				0.030 max.
<b>Ni*</b>	0.50 max.	0.50 max.	0.50 max.	1.00 max.	3.00-5.00
<b>Cr*</b>	0.50 max.	0.80-1.30	0.80-1.30	11.5-13.5	15.0-17.5
<b>Mo*</b>	0.20 max.	0.15-0.35	0.15-0.35	0.20 max.	---
<b>V*</b>	0.10 max.	0.30 max.	0.10 max.	0.10 max.	---
<b>Cu*</b>	0.40 max.	---	---	---	3.00-5.00
<b>Cb+Ta*</b>	---	---	---	---	0.15-0.45
<b>Fe</b>	Remainder				

Notes to Table 1:

- \*The total of these elements shall not exceed 1% for AISI 1040.
- Tolerance for the above chemistry shall be as per the applicable material specifications/industry standards.

If UT is not possible at the final stage, material to be Ultrasonic tested (UT) as per standard in Cl.8.b before forging to ensure freedom from defect. Wherever ingots are used, the ingot shall be forged to an intermediate billet/bloom & UT tested before forging to final size & shape.

**Hot forging:** Forging shall be ensured for uniform wrought structure & strength with a minimum 3:1 reduction ratio in the area from ingot to finished forging, close to final size and shape. Grain flow lines parallel to the axial length of forging. A forging plan shall be prepared & used indicating stages of forging and reduction ratio at each stage and the final reduction ratio shall be prepared for each type & size of forging.

#### 4. DIMENSIONS AND TOLERANCES

Dimensions & their tolerances shall be as per applicable drawings. For untoleranced dimensions: CS & AS: as per ASTM A 29/A 29M-20; SS: as per ASTM A 484/A 484M-20B.

#### 5. HEAT TREATMENT (HT)

- Equipment/Furnace used for heat treatment to be qualified as per the latest version of SIP:OF:01
- Items to be Normalised, Quenched & Tempered, or to be Solution annealed & hardened as per the table below together with Qualification Test Coupons (QTC).
- Batch-type Furnace Heat-treatment:
  - For material heat treated in a batch furnace, the QTC shall qualify only material and parts produced from the same heat.



**Product: Steel Forgings & Bars for Pressure Containing parts of OFE for API-6A**

- ii. *For PSL 1, PSL 2 & PSL 3, the QTC shall experience the same specified heat-treatment processing as the part(s) it qualifies. The QTC shall be heat-treated as per Table 2. The QTC shall be heat-treated in the same heat-treat furnace and same quench tank as the production parts that it qualifies.*
  - iii. *For PSL 4, a prolongation or production part shall only be used as QTC.*
- d) **Continuous-type Furnace Heat-treatment:**
- For material heat treated in a continuous furnace, the QTC shall qualify only material and parts produced from the same heat and heat-treat lot.
- e) In no case shall the QTC be processed using a melting practice(s) cleaner than that of the material it qualifies. The QTC shall be heat-treated in the same heat-treat furnace and same quench tank as the production parts that it qualifies. *Remelt-grade material removed from a single remelt ingot may be used to qualify other remelt-grade material that is from the same primary melt; no additional alloying shall be performed on these individual remelt ingots. However, remelt-grade (consumable electrode process) material used to fabricate parts having a PSL 4 shall be qualified on a remelt-ingot basis.*
- f) Welding on the QTC is not permitted.
- g) Equivalent Round (ER) (determined as below) of QTC to be equal to or greater than the dimensions of the part it qualifies.
- i. ER need not be > 63 mm (2.5") for PSL 1 & 2 parts.
  - ii. For PSL 3 *carbon and low-alloy steel*, for parts that require a yield strength of 75K or greater and where the part's weight during heat treatment is > 454 kg, the QTC ER shall be the same or greater than the part it qualifies but, is not required to exceed 254 mm (10").
  - iii. ER need not be > 127 mm (5") for PSL 3 parts not covered in Cl.5.g.ii.
  - iv. For PSL 4, a prolongation or production part shall only be used.
- h) Determination of ER (applicable to PSL 1, 2 & 3): based on actual part size & shape in "as heat-treated condition".
- i. **Standard Shapes:**
    - a) Round: ER = Diameter
    - b) Hexagon: ER = 1.1 x Thickness
    - c) Square: ER = 1.25 x Thickness
    - d) Rectangle/Plate: ER = 1.5 x Smallest thickness
    - e) Hollow shapes: ER = 2 x Wall thickness
  - ii. **Complex shapes: valve body etc.:**
    - a) Internal & external as forged surface within 13 mm of finished surface: ER = 1.25 x T
    - b) Surface not within 13 mm as above: ER = 2 x T
- (T = maximum thickness of Flange for flanged component / Body thickness for the flange-less component)
- i) **Heat sink for PSL 4:**
- Temperature levels for PSL 4 are to be determined using a heat sink made of the same alloy type as the part. ER (determined as above) of the heat sink to be  $\geq$  largest ER of any single part in a HT load. A production part may serve as a heat sink provided all requirements of this section are met. The temperature sensing tip of the thermocouple shall be within the part or heat sink and shall be no closer than one inch to any external or internal surface.
- j) Temperature of quench media (water/water-based – polymer) at the start of quenching shall not exceed 38°C. In the case of oil, the start temperature shall be greater than 38°C.
- k) For bath-type quenching, the temperature of the water or quench media shall not exceed 49°C at any time during the quench cycle.
- l) HT temperatures as below (Table 2): Tempering temperature range, wherever not provided, to be appropriately chosen to get required Mechanical properties meeting the minimum specified temperature in Table 2.



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Table 2. Heat Treatment Requirements

Material	Heat Treatment Type	Temperature (°C)	Soaking Time (minutes/inch* of maximum thickness)	Cooling medium of forging
AISI 1040 60K	Normalise	885-910	30	Air cool
	Quenching	830-870	30	Quenching in water or oil or polymer
	Tempering	530 (minimum)	60 (minimum 60)	Air cool
AISI 4130 60K & 75K	Normalise	885-925	30	Air cool
	Quenching	830-870	30	Quench in oil or water polymer
	Tempering	635 (minimum)	60 (minimum 60)	Air cool
AISI 4140 60K,75K, 100K & 105K	Normalise	860-910	30	Air cool
	Quenching	820-870	30	Quenching in water or oil or polymer
	60K, 75K: Tempering	664 (minimum)	60 (minimum 60)	Air cool
	100K, 105K: Tempering	552 (minimum)	60 (minimum 60)	Air cool
AISI 410 60K & 75K	Quenching	955-1010	30	Quenching in air, water, oil or polymer
	I Tempering	663 (minimum)	60	Air cool
	II Tempering	621 (minimum)	60	Air cool
	Second tempering temperature shall be less than the first tempering temperature			
ASTM A564 Type 630 (17-4 PH) Cond: H1150D 105K	Solution anneal	1038 ± 14	15	Air / liquid cool to < 32°C
	Furnace must be at 1038 ± 14°C before loading the parts. This steel is to be heated rapidly through 843-954 deg C			
	1 <sup>st</sup> Hardening	621±8	Total 240 minutes (for any thickness)	Air cool to < 32°C
	2 <sup>nd</sup> Hardening	621±8	Total 240 minutes (for any thickness)	Air cool to < 32°C

\*1 inch= 25.4 mm

## 6. MECHANICAL TESTS:

- a) **Extent of test:** One specimen for each size *per heat per HT batch.*
- b) *Test specimen shall be removed from acceptable Qualification Test coupon (QTC) forged in similar manner and after final QTC heat-treatment cycle as below:*
  - i. **Solid QTC:** from the centre core of the coupon with the longitudinal centreline axis of specimen wholly within the centre core ¼ thickness envelope.
  - ii. **Hollow QTC:** Longitudinal centreline of the specimen to be within 3 mm of the mid thickness of the thickest section.
  - iii. Tensile specimen Gauge Length (GL) and Charpy V-notch root to be at least ¼ of the thickness of coupon from each end of the coupon.
  - iv. When the actual production part is used as a coupon, the specimen is to be taken from the thickest section of the part.
  - v. For PSL 4, a prolongation or production part shall be used. *The test specimens shall be removed from a prolongation or production part from each heat and each heat-treat lot. Individual prolongations or production parts corresponding to each quench shall be used for multiple quench batches from the same furnace load.*

- c) **Tensile Testing shall be performed at a temperature between 4 °C and 50 °C as per ASTM A370-20 and acceptance as per Table 3:**

**Table 3. Mechanical Property Requirements**

Material	Material Designation	Yield Strength, psi (minimum)	Tensile Strength, psi (minimum)	% Elongation on 2" GL (minimum)	% Reduction in area (minimum)
AISI 1040	60K	60,000	85,000	18	35
AISI 4130, AISI 4140, AISI 410	60K	60,000	85,000	18	35
AISI 4130, AISI 4140, AISI 410	75K	75,000	95,000	17	35
AISI 4140	100K	100,000	125,000	16	50
AISI 4140	105K	105,000	125,000	16	50
ASTM A564 Type:630	105K	105,000	125,000	16	50

All yield strengths shall be determined using the 0.2% offset method of ASTM A370-20.

**Retesting:** If the results of the tensile test(s) do not satisfy the above requirements, two additional tests on two additional test specimens (removed from the same QTC with no additional heat treatment) to be performed in an effort to qualify the material. The results of each of these tests shall satisfy the applicable requirements.

- d) **Tensile Tests at Elevated temperatures for materials of X & Y temperature ratings (Refer applicable drawing):**

The elevated-temperature tensile test(s) shall be performed on specimens removed from the same QTC used for room-temperature tensile testing. At least one elevated temperature tensile test shall be performed each at 180°C for X temperature rating and 345°C for Y temperature rating, using methods of ASTM E21-20 and shall meet the requirements of below Table 4.

**Table 4. Elevated Temperature Yield & Tensile Strengths**

Material	Material Designation	Minimum Yield Strength for X Temp rating (psi)	Minimum Yield Strength for Y Temp rating (psi)	Minimum Tensile Strength for X Temp rating (psi)	Minimum Tensile Strength for Y Temp rating (psi)
AISI 1040	60K	51,000	45,000	72,250	63,750
AISI 4130, 4140 & 410	60K	51,000	45,000	72,250	63,750
AISI 4130, 4140 & 410	75K	63,750	56,250	80,750	71,250
AISI 4140	100K	85,000	75,000	1,06,250	93,750
AISI 4140	105K	89,250	78,750	1,06,250	93,750
ASTM A564 Type:630	105K	89,250	78,750	1,06,250	93,750

All yield strengths shall be determined using 0.2% offset method of ASTM A370-20.

**Retesting:** If the results of the test do not conform to the requirement, two additional tests on two additional test specimens (removed from the same QTC with no additional heat treatment) to be performed in an effort to qualify the material. Results of each of the tests shall satisfy the above requirements.



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- e) **Hardness tests** as per ASTM E10-18 or E18-20: Minimum 2 tests are to be done on test coupon / QTC and on 100% of forgings & bars as per drawing after HT. Hardness acceptance values, if not mentioned in the drawing, as given below:

As per Material Designation: For 60K: 174- 235 HBW; For 75K: 197-235 HBW;  
For 100K: 269-311 HBW; For 105K: 255-311 HBW;

Location of hardness check shall be as per the *latest version* of the drawing. No. 4-V-4000-08373.

- f) **Impact (Charpy V-notch) test** as per ASTM A370-20: From QTC for PSL 1, 2, 3 & 4: Minimum 3 specimens shall be tested at -29°C.

**Acceptance:**

- a) *three impact specimens shall be tested to qualify a heat of the material.*
- b) *minimum average Impact value in the Transverse direction is 20 Joules (or) minimum average Impact value in the Longitudinal direction is 27 Joules.*
- c) *in no case shall an individual impact value fall below two-thirds of that required as a minimum average.*
- d) *no more than one of the three test results shall be below the required minimum average.*

**Retesting:** *If a test fails, a retest of three additional specimens (removed from the required location within the same QTC with no additional heat treatment) may be made, each of which shall exhibit an impact value equal to or exceeding the required minimum average value and a lateral expansion not less than the required minimum value.*

**Note:** Sub-size specimens shall not be used for PSL 4.

**7. WORKMANSHIP AND FINISH**

Items to be machined *as per the drawing*. To be examined visually & to be free from scales & defects like laps, seams, folds, cracks, etc. Forgings to be clean, trimmed of flash & shot blasted to remove scales after HT.

**8. NON-DESTRUCTIVE TESTING**

NDE personnel qualification: As per ISO 9712 Ed.2012 /ASNT SNT-TC-1A Ed.2020.

a) **Surface NDE:**

- i. CS , LAS & MSS: PSL 1,2,3 & 4: 100 % MPI on all accessible wetted surfaces and all accessible sealing surfaces of *finished part* after final heat-treatment and final machining operations, if any.  
*PSL 3 & 4: 100% MPI additionally on all accessible surfaces.*
- ii. SS: PSL 1,2,3 & 4: 100 % LPI on all accessible wetted surfaces and all accessible sealing surfaces of *finished part* after final heat-treatment and final machining operations, if any.  
*PSL 3 & 4: 100% LPI additionally on all accessible surfaces.*
- iii. **Method:**  
**MPI :** ASTM E 709-21 for PSL 1 & 2. Prod method is not permitted.  
**Wet fluorescent MPI:** ASTM E709-21 for PSL 3 & 4.  
**LPI :** ASTM E 165/ E 165M-18.
- iv. **linear indication:** Surface NDE indication whose length is equal to or greater than 3 times its width.  
**relevant indication:** Surface NDE indication with major dimensions greater than 1.6 mm.  
**rounded indication:** Surface NDE indication that is circular or elliptical, having a length less than three times its width.
- v. **Acceptance Criteria (MPI):**
  - a) Linear indications (like cracks, laps, folds & other injurious defects) are unacceptable.
  - b) no relevant indication with a major dimension equal to or greater than 5 mm.
  - c) no more than ten relevant indications in any continuous 40 cm<sup>2</sup> area.
  - d) four or more relevant rounded indications in a line separated by less than 1.6 mm (edge to edge) are unacceptable.
  - e) no relevant indications are permitted on any pressure contact sealing surface.



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vi. **Acceptance Criteria (LPI):**

- a) Linear indications (like cracks, laps, folds & other injurious defects) are unacceptable.
- b) no relevant rounded indication with a major dimension equal to or greater than 5 mm.
- c) no more than ten relevant rounded indications in any continuous 40 cm<sup>2</sup> area.
- d) four or more relevant rounded indications in a line separated by less than 1.6 mm (edge to edge) are unacceptable.
- e) no relevant indications are permitted on any pressure contact sealing surface.

b) **Volumetric NDE:**

- i. **PSL 1 & 2:** 100% Ultrasonic test(UT) on bars of Dia  $\geq$  50 mm & forgings of thickness  $\geq$  10 mm as per ASTM A 388/A 388M-19.

**Acceptance:** Item shall be unacceptable if examination result shows one or more reflectors which produce indications accompanied by complete loss of back reflection.

- ii. **PSL 3 & 4:** *as far as practical, the entire volume of each part shall be ultrasonically tested after heat-treatment for mechanical properties and prior to machining operations that limit effective interpretation of the results of the examination. For quench-and-tempered products, ultrasonically test shall be performed after heat-treatment for mechanical properties exclusive of stress-relief treatments or re-tempering to reduce hardness.*

100% UT on all rolled/forged bars and forgings as per flat bottomed hole procedure of ASTM A 388/A 388M-19 and ASTM E127-20. Immersion method shall not be used.

*Where variation in acoustic response of 2 dBs occurs due to surface finish difference between the test block and the part to be examined, a coupling compensation of up to 12 dB maximum shall be performed.*

**Calibration (other than stem):**

Distance amplitude curve (DAC) to be based on maximum 1.6 mm flat bottom hole (Straight – beam technique) for metal thickness up to 38 mm; On maximum 3.2 mm flat bottom hole for metal thicknesses from 38 mm to 150 mm and on maximum 6.4mm flat bottom hole for thickness exceeding 150 mm.

**Calibration (stem):**

*Each stem (or bar from which stems are machined) shall be ultrasonically inspected from the outside diameter and ends by the straight-beam technique. Stems that cannot be examined axially using the straight-beam technique shall be examined using the angle-beam technique.*

*The DAC shall be based on a maximum 3.2 mm (1/8 in.) flat-bottom hole (straight-beam technique) and a maximum 1.6 mm (1/16 in.) side-drilled hole, 25 mm (1 in.) deep (angle-beam technique).*

**Acceptance:**

- a) No single indication exceeding reference DAC.
- b) No multiple indications exceeding 50% of the reference DAC. Multiple indications are defined as two or more indications each > 50% of the reference DAC within 13 mm of each other in any direction.
- c) For PSL 4, in addition to above a) & b) - no continuous cluster of indications on the same plane, regardless of amplitude, shall be found over an area twice the diameter of the search unit.

9. **REPAIR**

Repairs by fusion welding are prohibited. Surface defects can be removed by mechanical means and defective areas smoothly dressed up with the adjacent surface. Minimum thickness after repair to meet drawing / Specification.

	<b>BHEL – Tiruchirappalli - 620014, India.</b> <b>Quality Assurance Department</b> <b>TECHNICAL DELIVERY CONDITIONS</b>	Doc No: <b>TDC:0:410</b> Rev No: <b>16</b>
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<b>Product: Steel Forgings &amp; Bars for Pressure Containing parts of OFE for API-6A</b>		

### 10. MARKING AND PACKING

Details of stamping on each item with low-stress stamps and border by paint:

- (1) Heat number, (2) Material Specification & grade, (3) Size, Maker's emblem/code, (4) Identification details as per drawing.

Items to be coated with a layer of rust preventive coating before despatch. Forgings to be properly packed and despatched to avoid damage during transit.

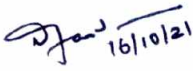


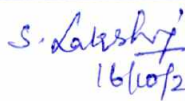
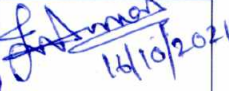
### 11. INSPECTION AND CERTIFICATION

All tests specified shall be carried out by forger and test results shall be furnished in the test certificate of type 3.1 or 3.2 as per BS EN 10204 4<sup>th</sup> Ed 2019. The applicable versions of the referred Codes, Standards and Specifications shall be reported in the Test Certificates and NDE reports. Test certificate shall contain the following information in English language only:

1. Purchase Order No. (BHEL), TDC No & its revision no, Test certificate no & date, Part name.
2. Material Specification & Grade with year of code, Heat Number, Drawing No., Quantity & Size.
3. Applicable API Specification, PSL No, Temperature Rating, Material Designation.
4. Melting process (for PSL 4 only).
5. Forging process, Chemistry with incidental elements- Heat wise ladle & Product analysis.
6. Heat treatment details of the material and test bars like – actual soaking temperature, soaking time, rate of heating & cooling, cooling medium etc. For PSL 4, actual recorded HT chart shall be submitted.
7. Mechanical test results: Room temperature Tensile Strength, Yield Strength (0.2% offset), %Elongation, %Reduction in Area, Impact, Hardness; Elevated temperature tensile & yield (0.2% offset) strength values, including the location and orientation of test specimens, as applicable.
8. NDE reports with NDE Personnel qualification records, all relevant NDE operating parameters and NDE test results with reference & acceptance standard (surface, volumetric).
9. Repair details, if any *are to be mentioned*.
10. Certified copy of TC for starting material.
11. Dimensional reports (for PSL 3 & 4 only).

### 12. AUDIT CHECKS AT BHEL

BHEL reserves the right to carry out audit checks for chemistry, HT condition, mechanical test and NDT on representative test bars or jobs. Items found defective during check or subsequent processing at BHEL will be rejected.

				
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MGR/QA	DM/Valves Engg	AGM/Valves/Purchase	SDGM/QA	AGM/QA
<b>Prepared By</b>	<b>Reviewed By</b>			<b>Approved By</b>