Bid Number/बोली क्रमांक (बिड संख्या):
GEM/2023/B/4043316
Dated/दिनांक : 05-10-2023

Bid Document/ बिड दस्तावेज़

Bid Details/बिड विवरण	
Bid End Date/Time/बिड बंद होने की तारीख/समय	16-10-2023 13:00:00
Bid Opening Date/Time/बिड खुलने की तारीख/समय	16-10-2023 13:30:00
Bid Offer Validity (From End Date)/बिड पेशकश वैधता (बंद होने की तारीख से)	90 (Days)
Ministry/State Name/मंत्रालय/राज्य का नाम	Ministry Of Heavy Industries And Public Enterprises
Department Name/विभाग का नाम	Department Of Heavy Industry
Organisation Name/संगठन का नाम	Bharat Heavy Electricals Limited (bhel)
Office Name/कार्यालय का नाम	10090001-edn Bangalore
Total Quantity/कुल मात्रा	121
Item Category/मद केटेगरी	TRFMR 4KVA 3PH YNYN0 415/165V (BHEL Material Code: SA0483024040) (Q3) , TRANSFORMER CT BAR PR 5VA 25/1A 5P10 (BHEL Material Code: SA0483107018) (Q3) , CT RESN CAST, BAR PRI RNG TYP: 2000A/500MA (BHEL Material Code: SA0653122209) (Q3) , TRFMR CNTRL 4KVA 3PH DYN11 DYN11 (BHEL Material Code: SA0653941242) (Q3) , TRFMR PWR DRY 5KVA, 3PH, 50HZ, DYN11 (BHEL Material Code: SA0653943663) (Q3) , TRANSFORMER DRY 5KVA 3PHASE (BHEL Material Code: SA0655870016) (Q3) , TRFMR 5KVA, 3PH YNYNO 220/415V (BHEL Material Code: SA0655940278) (Q3)
MSE Exemption for Years of Experience and Turnover/ अनुभव के वर्षों से एमएसई छूट	No
Startup Exemption for Years of Experience and Turnover/ अनुभव के वर्षों से स्टार्टअप छूट	No
Document required from seller/विक्रेता से मांगे गए दस्तावेज़	Additional Doc 1 (Requested in ATC) *In case any bidder is seeking exemption from Experience / Turnover Criteria, the supporting documents to prove his eligibility for exemption must be uploaded for evaluation by the buyer
Bid to RA enabled/बिड से रिवर्स नीलामी सक्रिय किया	No
ITC available to buyer/क्रेता के लिए उपलब्ध आईटीसी	Yes
Type of Bid/बिड का प्रकार	Two Packet Bid

Bid Details/बिड विवरण	
Primary product category	TRFMR 4KVA 3PH YNYN0 415/165V (BHEL Material Code: SA0483024040)
Time allowed for Technical Clarifications during technical evaluation/तकनीकी मूल्यांकन के दौरान तकनीकी स्पष्टीकरण हेतु अनुमत समय	2 Days
Inspection Required (By Empanelled Inspection Authority / Agencies pre-registered with GeM)	No
Payment Timelines	Payments shall be made to the Seller within **90** days of issue of consignee receipt-cum-acceptance certificate (CRAC) and on-line submission of bills (This is in supersession of 10 days time as provided in clause 12 of GeM GTC)
Evaluation Method/मूल्यांकन पद्धति	Item wise evaluation/

EMD Detail/ईएमडी विवरण

Required/आवश्यकता	No

ePBG Detail/ईपीबीजी विवरण

Required/आवश्यकता	No

Splitting/विभाजन

Bid splitting not applied/बोली विभाजन लागू नहीं किया गया.

MII Purchase Preference/एमआईआई खरीद वरीयता

MII Purchase Preference/एमआईआई खरीद वरीयता	Yes

MSE Purchase Preference/एमएसई खरीद वरीयता

MSE Purchase Preference/एमएसई खरीद वरीयता	Yes

1. Preference to Make In India products (For bids < 200 Crore):Preference shall be given to Class 1 local supplier as defined in public procurement (Preference to Make in India), Order 2017 as amended from time to time and its subsequent Orders/Notifications issued by concerned Nodal Ministry for specific Goods/Products. The minimum local content to qualify as a Class 1 local supplier is denoted in the bid document. If the bidder wants to avail the Purchase preference, the bidder must upload a certificate from the OEM regarding the percentage of the local content and the details of locations at which the local value addition is made along with their bid, failing which no purchase preference shall be granted. In case the bid value is more than Rs 10 Crore, the declaration relating

to percentage of local content shall be certified by the statutory auditor or cost auditor, if the OEM is a company and by a practicing cost accountant or a chartered accountant for OEMs other than companies as per the Public Procurement (preference to Make-in -India) order 2017 dated 04.06.2020. Only Class-I and Class-II Local suppliers as per MII order dated 4.6.2020 will be eligible to bid. Non - Local suppliers as per MII order dated 04.06.2020 are not eligible to participate. However, eligible micro and small enterprises will be allowed to participate .The buyers are advised to refer the OM No.F.1/4/2021-PPD dated 18.05.2023. OM_No.1_4_2021_PPD_dated_18.05.2023 for compliance of Concurrent application of Public Procurement Policy for Micro and Small Enterprises Order, 2012 and Public Procurement (Preference to Make in India) Order, 2017.

2. Purchase preference to Micro and Small Enterprises (MSEs): Purchase preference will be given to MSEs as defined in Public Procurement Policy for Micro and Small Enterprises (MSEs) Order, 2012 dated 23.03.2012 issued by Ministry of Micro, Small and Medium Enterprises and its subsequent Orders/Notifications issued by concerned Ministry. If the bidder wants to avail the Purchase preference, the bidder must be the manufacturer of the offered product in case of bid for supply of goods. Traders are excluded from the purview of Public Procurement Policy for Micro and Small Enterprises. In respect of bid for Services, the bidder must be the Service provider of the offered Service. Relevant documentary evidence in this regard shall be uploaded along with the bid in respect of the offered product or service. If L-1 is not an MSE and MSE Seller (s) has/have quoted price within L-1+ 15% (Selected by Buyer)of margin of purchase preference /price band defined in relevant policy, such Seller shall be given opportunity to match L-1 price and contract will be awarded for 25%(selected by Buyer) percentage of total QUANTITY.The buyers are advised to refer the OM No.F.1/4/2021-PPD dated 18.05.2023 OM_No.1_4_2021_PPD_dated_18.05.2023 for compliance of Concurrent application of Public Procurement Policy for Micro and Small Enterprises Order, 2012 and Public Procurement (Preference to Make in India) Order, 2017.
3. Estimated Bid Value indicated above is being declared solely for the purpose of guidance on EMD amount and for determining the Eligibility Criteria related to Turn Over, Past Performance and Project / Past Experience etc. This has no relevance or bearing on the price to be quoted by the bidders and is also not going to have any impact on bid participation. Also this is not going to be used as a criteria in determining reasonableness of quoted prices which would be determined by the buyer based on its own assessment of reasonableness and based on competitive prices received in Bid / RA process.

Evaluation Method (Item Wise Evaluation Method)

Contract will be awarded schedulewise and the determination of L1 will be done separately for each schedule. The details of item-consignee combination covered under each schedule are as under:

Evaluation Schedules	**Item/Category**	**Quantity**
Schedule 1	Trfmr 4kva 3ph Ynyn0 415/165v (bhel Material Code: Sa0483024040)	1
Schedule 2	Transformer Ct Bar Pr 5va 25/1a 5p10 (bhel Material Code: Sa0483107018)	3
Schedule 3	Ct Resn Cast, Bar Pri Rng Typ: 2000a/500ma (bhel Material Code: Sa0653122209)	111
Schedule 4	Trfmr Cntrl 4kva 3ph Dyn11 Dyn11 (bhel Material Code: Sa0653941242)	2
Schedule 5	Trfmr Pwr Dry 5kva, 3ph, 50hz, Dyn11 (bhel Material Code: Sa0653943663)	1
Schedule 6	Transformer Dry 5kva 3phase (bhel Material Code: Sa0655870016)	2
Schedule 7	Trfmr 5kva, 3ph Ynyno 220/415v (bhel Material Code: Sa0655940278)	1

TRFMR 4KVA 3PH YNYN0 415/165V (BHEL Material Code: SA0483024040) (1 pieces)

(Minimum 50% and 20% Local Content required for qualifying as Class 1 and Class 2 Local Supplier respectively/क्रमशः श्रेणी 1 और श्रेणी 2 के स्थानीय आपूर्तिकर्ता के रूप में अर्हता प्राप्त करने के लिए आवश्यक)

Technical Specifications/तकनीकी विशिष्टियाँ

Buyer Specification Document/क्रेता विशिष्टि दस्तावेज़	Download

Input Tax Credit(ITC)/इनपुट कर क्रेडिट(आईटीसी) and/ तथा Reverse Charge(RCM)/रिवर्स प्रभार (आरसीएम) Details

ITC on GST/जीएसटी पर इनपुट कर क्रेडिट	ITC on GST Cess/जीएसटी उपकर कर क्रेडिट
100%	NA

Consignees/Reporting Officer/परेषिती/रिपोर्टिंग अधिकारी and/ तथा Quantity/मात्रा

S.No./क्र. सं.	Consignee Reporting/Officer/ परेषिती/रिपोर्टिंग अधिकारी	Address/पता	Quantity/मात्रा	Delivery Days/डिलीवरी के दिन
1	Dinesh Kumar Bhagat	560026,MANAGER STORES,- GI Bharat Heavy Electricals Limited Electronics Division, Mysore Road, Bangalore - 560026 Karnataka India	1	30

TRANSFORMER CT BAR PR 5VA 25/1A 5P10 (BHEL Material Code: SA0483107018) (3 pieces)

(Minimum 50% and 20% Local Content required for qualifying as Class 1 and Class 2 Local Supplier respectively/क्रमशः श्रेणी 1 और श्रेणी 2 के स्थानीय आपूर्तिकर्ता के रूप में अर्हता प्राप्त करने के लिए आवश्यक)

Technical Specifications/तकनीकी विशिष्टियाँ

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ITC on GST/जीएसटी पर इनपुट कर क्रेडिट	ITC on GST Cess/जीएसटी उपकर कर क्रेडिट
100%	NA

Consignees/Reporting Officer/परेषिती/रिपोर्टिंग अधिकारी and/ तथा Quantity/मात्रा

S.No./क्र. सं.	Consignee Reporting/Officer/ परेषिती/रिपोर्टिंग अधिकारी	Address/पता	Quantity/मात्रा	Delivery Days/डिलीवरी के दिन
1	Dinesh Kumar Bhagat	560026,MANAGER STORES,- GI Bharat Heavy Electricals Limited Electronics Division, Mysore Road, Bangalore - 560026 Karnataka India	3	30

CT RESN CAST, BAR PRI RNG TYP: 2000A/500MA (BHEL Material Code: SA0653122209) (111 pieces)

(Minimum 50% and 20% Local Content required for qualifying as Class 1 and Class 2 Local Supplier respectively/क्रमशः श्रेणी 1 और श्रेणी 2 के स्थानीय आपूर्तिकर्ता के रूप में अर्हता प्राप्त करने के लिए आवश्यक)

Technical Specifications/तकनीकी विशिष्टियाँ

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Input Tax Credit(ITC)/इनपुट कर क्रेडिट(आईटीसी) and/ तथा Reverse Charge(RCM)/रिवर्स प्रभार (आरसीएम) Details

ITC on GST/जीएसटी पर इनपुट कर क्रेडिट	ITC on GST Cess/जीएसटी उपकर कर क्रेडिट
100%	NA

Consignees/Reporting Officer/परेषिती/रिपोर्टिंग अधिकारी and/ तथा Quantity/मात्रा

S.No./क्र. सं.	Consignee Reporting/Officer/ परेषिती/रिपोर्टिंग अधिकारी	Address/पता	Quantity/मात्रा	Delivery Days/डिलीवरी के दिन
1	Dinesh Kumar Bhagat	560026,MANAGER STORES,- GI Bharat Heavy Electricals Limited Electronics Division, Mysore Road, Bangalore - 560026 Karnataka India	111	30

TRFMR CNTRL 4KVA 3PH DYN11 DYN11 (BHEL Material Code: SA0653941242) (2 pieces)

(Minimum 50% and 20% Local Content required for qualifying as Class 1 and Class 2 Local Supplier respectively/क्रमशः श्रेणी 1 और श्रेणी 2 के स्थानीय आपूर्तिकर्ता के रूप में अर्हता प्राप्त करने के लिए आवश्यक)

Technical Specifications/तकनीकी विशिष्टियाँ

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Input Tax Credit(ITC)/इनपुट कर क्रेडिट(आईटीसी) and/ तथा Reverse Charge(RCM)/रिवर्स प्रभार (आरसीएम) Details

ITC on GST/जीएसटी पर इनपुट कर क्रेडिट	ITC on GST Cess/जीएसटी उपकर कर क्रेडिट
100%	NA

Consignees/Reporting Officer/परेषिती/रिपोर्टिंग अधिकारी and/ तथा Quantity/मात्रा

S.No./क्र. सं.	Consignee Reporting/Officer/ परेषिती/रिपोर्टिंग अधिकारी	Address/पता	Quantity/मात्रा	Delivery Days/डिलीवरी के दिन
1	Dinesh Kumar Bhagat	560026,MANAGER STORES,- GI Bharat Heavy Electricals Limited Electronics Division, Mysore Road, Bangalore - 560026 Karnataka India	2	30

TRFMR PWR DRY 5KVA, 3PH, 50HZ, DYN11 (BHEL Material Code: SA0653943663) (1 pieces)

(Minimum 50% and 20% Local Content required for qualifying as Class 1 and Class 2 Local Supplier respectively/क्रमशः श्रेणी 1 और श्रेणी 2 के स्थानीय आपूर्तिकर्ता के रूप में अर्हता प्राप्त करने के लिए आवश्यक)

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ITC on GST/जीएसटी पर इनपुट कर क्रेडिट	ITC on GST Cess/जीएसटी उपकर कर क्रेडिट
100%	NA

Consignees/Reporting Officer/परेषिती/रिपोर्टिंग अधिकारी and/ तथा Quantity/मात्रा

S.No./क्र. सं.	Consignee Reporting/Officer/ परेषिती/रिपोर्टिंग अधिकारी	Address/पता	Quantity/मात्रा	Delivery Days/डिलीवरी के दिन
1	Dinesh Kumar Bhagat	560026,MANAGER STORES,- GI Bharat Heavy Electricals Limited Electronics Division, Mysore Road, Bangalore - 560026 Karnataka India	1	30

TRANSFORMER DRY 5KVA 3PHASE (BHEL Material Code: SA0655870016) (2 pieces)

(Minimum 50% and 20% Local Content required for qualifying as Class 1 and Class 2 Local Supplier respectively/क्रमशः श्रेणी 1 और श्रेणी 2 के स्थानीय आपूर्तिकर्ता के रूप में अर्हता प्राप्त करने के लिए आवश्यक)

Technical Specifications/तकनीकी विशिष्टियाँ

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Input Tax Credit(ITC)/इनपुट कर क्रेडिट(आईटीसी) and/ तथा Reverse Charge(RCM)/रिवर्स प्रभार (आरसीएम) Details

ITC on GST/जीएसटी पर इनपुट कर क्रेडिट	ITC on GST Cess/जीएसटी उपकर कर क्रेडिट
100%	NA

Consignees/Reporting Officer/परेषिती/रिपोर्टिंग अधिकारी and/ तथा Quantity/मात्रा

S.No./क्र. सं.	Consignee Reporting/Officer/ परेषिती/रिपोर्टिंग अधिकारी	Address/पता	Quantity/मात्रा	Delivery Days/डिलीवरी के दिन
1	Dinesh Kumar Bhagat	560026,MANAGER STORES,- GI Bharat Heavy Electricals Limited Electronics Division, Mysore Road, Bangalore - 560026 Karnataka India	2	30

TRFMR 5KVA, 3PH YNYNO 220/415V (BHEL Material Code: SA0655940278) (1 pieces)

(Minimum 50% and 20% Local Content required for qualifying as Class 1 and Class 2 Local Supplier respectively/क्रमशः श्रेणी 1 और श्रेणी 2 के स्थानीय आपूर्तिकर्ता के रूप में अर्हता प्राप्त करने के लिए आवश्यक)

Technical Specifications/तकनीकी विशिष्टियाँ

Buyer Specification Document/क्रेता विशिष्टि दस्तावेज़	Download

Input Tax Credit(ITC)/इनपुट कर क्रेडिट(आईटीसी) and/ तथा Reverse Charge(RCM)/रिवर्स प्रभार (आरसीएम) Details

ITC on GST/जीएसटी पर इनपुट कर क्रेडिट	ITC on GST Cess/जीएसटी उपकर कर क्रेडिट
100%	NA

Consignees/Reporting Officer/परेषिती/रिपोर्टिंग अधिकारी and/ तथा Quantity/मात्रा

S.No./क्र. सं.	Consignee Reporting/Officer/ परेषिती/रिपोर्टिंग अधिकारी	Address/पता	Quantity/मात्रा	Delivery Days/डिलीवरी के दिन
1	Dinesh Kumar Bhagat	560026,MANAGER STORES,- GI Bharat Heavy Electricals Limited Electronics Division, Mysore Road, Bangalore - 560026 Karnataka India	1	30

Buyer Added Bid Specific Terms and Conditions/क्रेता द्वारा जोड़ी गई बिड की विशेष शर्तें

1. **Scope of Supply**

   Scope of supply (Bid price to include all cost components) : Only supply of Goods

2. **Generic**

   Data Sheet of the product(s) offered in the bid, are to be uploaded along with the bid documents. Buyers can match and verify the Data Sheet with the product specifications offered. In case of any unexplained mismatch of technical parameters, the bid is liable for rejection.

3. **Generic**

   OPTION CLAUSE: The Purchaser reserves the right to increase or decrease the quantity to be ordered up to 25 percent of bid quantity at the time of placement of contract. The purchaser also reserves the right to increase the ordered quantity by up to 25% of the contracted quantity during the currency of the contract at the contracted rates. Bidders are bound to accept the orders accordingly.

4. **Generic**

   Bidders are advised to check applicable GST on their own before quoting. Buyer will not take any responsibility in this regards. GST reimbursement will be as per actuals or as per applicable rates (whichever is lower), subject to the maximum of quoted GST %.

5. **Generic**

Supplier shall ensure that the Invoice is raised in the name of Consignee with GSTIN of Consignee only.

6. **Generic**

   While generating invoice in GeM portal, the seller must upload scanned copy of GST invoice and the screenshot of GST portal confirming payment of GST.

7. **Buyer Added Bid Specific ATC**

   Buyer Added text based ATC clauses

   A. PRE-QUALIFICATION REQUIREMENT (PQR)

   Bidder should submit documentary evidence for PQC, for evaluating the eligibility of Bidder as per **Buyer s pecification document** in this bid.

   B. Payment Timelines:

Type of Bidder	**Payment Terms (Number of days)**
Micro & Small Enterprises (MSEs)	45 days from CRAC date
Medium Enterprises	60 days from CRAC date
Non MSME	90 days from CRAC date

   C. Risk Purchase - In case of failure of supplier, BHEL at its discretion may make purchase of the materials/ services not supplied/ rendered in time at the RISK & COST of the supplier. Under such situation, the supplier who fails to supply the goods in time shall be wholly liable to make good to BHEL any loss due to risk purchase. In case of invocation of risk purchase, BHEL shall get Balance work/ supply done at supplier risk and cost, which shall be recovered from supplier out of dues of this contract, any other contract with BHEL and balance amount, if any shall be required to be deposited by supplier.

   D. Contact Details:

Engineering Dept.	**Tender Dept.**
Mr. Lalit Chandra/ Manager	Mr. Dinesh Kumar Bhagat/ Manager
e-mail: lalit.chandra@bhel.in	e-mail: dkbhagat@bhel.in
Tel: 080 26998113	Tel: 080 26998108

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Disclaimer/अस्वीकरण

The additional terms and conditions have been incorporated by the Buyer after approval of the Competent Authority in Buyer Organization, whereby Buyer organization is solely responsible for the impact of these clauses on the bidding process, its outcome, and consequences thereof including any eccentricity / restriction arising in the bidding process due to these ATCs and due to modification of technical specifications and / or terms and conditions governing the bid. Any clause(s) incorporated by the Buyer regarding following shall be treated as null and void and would not be considered as part of bid:-

1. Definition of Class I and Class II suppliers in the bid not in line with the extant Order / Office Memorandum issued by DPIIT in this regard.
2. Seeking EMD submission from bidder(s), including via Additional Terms & Conditions, in contravention to exemption provided to such sellers under GeM GTC.

3. Publishing Custom / BOQ bids for items for which regular GeM categories are available without any Category item bunched with it.
4. Creating BoQ bid for single item.
5. Mentioning specific Brand or Make or Model or Manufacturer or Dealer name.
6. Mandating submission of documents in physical form as a pre-requisite to qualify bidders.
7. Floating / creation of work contracts as Custom Bids in Services.
8. Seeking sample with bid or approval of samples during bid evaluation process.
9. Mandating foreign / international certifications even in case of existence of Indian Standards without specifying equivalent Indian Certification / standards.
10. Seeking experience from specific organization / department / institute only or from foreign / export experience.
11. Creating bid for items from irrelevant categories.
12. Incorporating any clause against the MSME policy and Preference to Make in India Policy.
13. Reference of conditions published on any external site or reference to external documents/clauses.
14. Asking for any Tender fee / Bid Participation fee / Auction fee in case of Bids / Forward Auction, as the case may be.

Further, if any seller has any objection/grievance against these additional clauses or otherwise on any aspect of this bid, they can raise their representation against the same by using the Representation window provided in the bid details field in Seller dashboard after logging in as a seller within 4 days of bid publication on GeM. Buyer is duty bound to reply to all such representations and would not be allowed to open bids if he fails to reply to such representations.

This Bid is also governed by the General Terms and Conditions/ यह बिड सामान्य शर्तों के अंतर्गत भी शासित है

In terms of GeM GTC clause 26 regarding Restrictions on procurement from a bidder of a country which shares a land border with India, any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority. While participating in bid, Bidder has to undertake compliance of this and any false declaration and non-compliance of this would be a ground for immediate termination of the contract and further legal action in accordance with the laws./जेम की सामान्य शर्तों के खंड 26 के संदर्भ में भारत के साथ भूमि सीमा साझा करने वाले देश के बिडर से खरीद पर प्रतिबंध के संबंध में भारत के साथ भूमि सीमा साझा करने वाले देश का कोई भी बिडर इस निविदा में बिड देने के लिए तभी पात्र होगा जब वह बिड देने वाला सक्षम प्राधिकारी के पास पंजीकृत हो।बिड में भाग लेते समय बिडर को इसका अनुपालन करना होगा और कोई भी गलत घोषणा किए जाने व इसका अनुपालन न करने पर अनुबंध को तत्काल समाप्त करने और कानून के अनुसार आगे की कानूनी कार्रवाई का आधार होगा।

---Thank You/धन्यवाद---

PRE-QUALIFICATION CRITERIA FOR SMALL RATING TRANSFORMER

Sl.No.	CRITERIA	DOCUMENT REQUIRED
1.	The bidder should be a manufacturer / supplier of small rating transformers (up to 15KVA) for two years or more.	Self-certification for OEM/OEM authorization for dealers.
2.	The bidder shall fully comply with all the clauses mentioned in the latest revision of specification ED7461195 (Current revision number is REV No..03).	Conformance for complying.
3.	The Bidder shall submit the documents indicated during bidding stage. OR The bidder should have supplied the item to BHEL against an earlier purchase order.	a) At least one end user performance certificate. b) Reference list of customers for dry type transformers. c) Relevant purchase order copies along with invoice and delivery challans. OR If supplier had already supplied transformer to BHEL, then supplier shall provide relevant purchase order details.
4.	On –site service support shall be provided at purchaser's works within 6 working days, if it is observed that the item requires rework /rectification.	Conformance for complying.

Technical specification

TRFMR 4KVA 3PH YNYN0 415/165V: SA0483024040

TRANSFORMER DRY TYPE
4 KVA
3 PHASE,50HZ
HV : 415V
LV1 : 165V, 3.5 KVA
LV2 : 110V, 0.5 KVA
VECTOR GROUP :YNYN0
IMPEDENCE :4%
INSULATION CLASS:B
INSULATION LEVEL:4KV
50HZ FOR 1 MIN.
NICKEL PLATED BRASS
STUD TERMINALS
TRANSPARENT POLY
CARBONATE SHEET 8MM
THICK OVER TERMINAL
BOARD
EARTHED SCREEN BETN
HV & LV WDGS TO BE
PROVIDED

REF.STD.:IS 2026 &
IS 11171

REVISION HISTORY SHEET

REV NO	DATE	NATURE OF CHANGE	REASONS	PREPARED BY	APPROVED BY
00	23/07/96	SUPERSEDES CN74500S	-	BS,NS	N.J
01	02/10/99	Cl.4.3 &Cl.12.3 Note added	F.B From GHC. Group	BKD,CCR	NS
02	14/07/03	C1.1.2,4.1,4.3 &12.3 Revised	F.B.(GHC) CE\GHC\2003 STDS\KVBR Dt.10/07/03	HRN	NS
03	17/11/21	Cl.16. Acceptance criteria included. Cl.15.Tests refined	FB FROM QS	Anusri S	R Rukmani

APPROVED:
R Rukmani

PREPARED: Anusri S
ISSUED: ENGG. SERV.
DATE: 17/11/21

SPECIFICATION FOR POWER AND CONTROL TRANSFORMER

1. SCOPE

1.1. This Standard details the specifications for single and polyphase drytype, power and control transformers.

1.2. This Standard shall be read in conjunction with IS:11171 and IS:2026

2. DEFINITIONS

For the purpose of this Standard following definitions shall apply.

2.1 Power transformer: Single phase transformer rated above 1KVA and 3 phase transformer rated above 5KVA shall be designated as power transformer.

2.2 Control transformer : Single phase transformer below 1KVA and 3 phase transformer below 5 KVA shall be designated as control transformer

3. SERVICE CONDITIONS

3.1 Max ambient temp	: 50°C
3.2 Cooling	: Air natural
3.3 Humidity	: 100 percent
3.4 Ventilation	: Restricted as it is mounted inside a cubicle (IP 21)

4. RATING

4.1 KVA Rating:
The rated KVA assigned taking into account the service condition as specified in 3.0

APPROVED:
R Rukmani

PREPARED: Anusri S ISSUED: ENGG. SERV, DATE: 17/11/21

The following shall be the preferred rated KVA
3 Phase Transformers:
0.25,1,1.5,2,2.5,3,4,5,6,7.5,10,12.5,15,20,25,30,35,40,45,
50,55,60,65,75,80,100,135,160,200,250,300,350 & 400 KVA

Single Phase Transformers:
50, 100, 150, 200, 300, 500, 750 VA
1,1.25,1.5,2,3,4,4.5,5,6,7.5,10,12.5,15,20 & 25 KVA

4.2 Rated Voltages :
The rated voltages assigned to the windings of the transformers may be operated at its rated KVA at any voltage within +/-10% of rated voltage.

4.3 No Load Current

SlNo.	Rating	Value
1.	up to 1KV	Less than 20% of Rated current
2.	above 1KVA to less than 5KVA	less than 15% of rated current
3.	above 5KVA to less than 10KVA	less than 10% of rated current
4.	Rating higher than above subject to approval of iron and copper losses by EDN.	

4.4 Rated Frequency
The frequency for the purpose of this standard shall be 50 Hz unless otherwise specified, with a tolerance of +/-3%.

5. TEMPERATURE RISE

The Transformer shall conform to the requirements of Temperature Rise specified in IS:2026 part II.

6. INSULATION LEVELS

The Transformer shall conform to the requirements of insulation Levels Specified in IS:2026 part III.

7. TAPPING

Unless otherwise specified all transformers shall be provided with off load tapings on +/-5% and+/-10% on primary.

8. CONNECTION

For the purpose of this standard the winding connections shall be in accordance with IS:2026 part - IV.

9. IMPEDANCE

Unless otherwise specified transformers shall have the following impedances.

Up to and including 250VA	-	6%
Above 250VA up to and including 150KVA	-	4%
Above 150KVA up to 400 KVA	-	5%

The tolerance for the impedance values shall be +/-10%

10. TERMINAL MARKINGS

For the purpose of this standard the various terminal markings shall be as stated below

10.1 The windings of the transformers shall be denoted by HV & LV. HV refers to high voltage winding and LV refers to low voltage winding.

10.2 Line terminals shall be marked as

For 3 phase transformers
1U, 1V, 1W for HV windings and
2U, 2V, 2W for LV windings

For Single phase Transformers
P1, P2 for HV winding and
S1, S2 for LV winding

The markings shall be started from left hand-side as viewed for HV side.

Neutral Terminal shall be marked as 1N for HV side and 2N for LV side.

10.3 The tapings shall be marked with natural ascending sequence as shown in the figure-1. The tapings shall be through tap selector for all transformers rated above 250VA.

10.4 The rated voltage of the transformer shall be marked by the side of respective terminals.

10.5 Earthing terminals shall be marked with earthing mark ( )

11. TERMINALS

All terminals except Bar type shall be of nickel plated Brass. Bar terminal shall be of pure copper of appropriate grade. Nut & Bolt shall be secured with vibration proof washers. The

appropriate size of the terminals shall be as given in Table-III.

TABLE – III

Type of terminal	Current rating							
	5A	10A	20A	50A	100A	200A	300A	500A
Screw/Stud	M6	M6	M8	M10	M12	-	-	-
Bar	-	-	-	-	-	20X6 1 hole M8	25X6 1 hole M8	40X6 1 hole M12

Note: All the terminals including hardware shall be free from rusting. After tightening the bolt, minimum 3 threads of bolt shall project outside the nut. Adequate clearances between phases shall be ensured and indicated in the drawing. Proper fixing arrangement with insulators shall be provided to ensure same clearances for the entire quantity of a purchase order.

12. FITTINGS

All transformers shall be provided with following fittings

12.1 Rating plate:

Transformers shall be provided with rating plates of weatherproof material. Rating plate shall be fixed along the breadth of the transformer & a provision shall be made to fix it along the length of the adjacent side.

For transformer rated 250VA & below rating plate shall be fixed along the breadth

The rating plate shall be marked legibly with following markings

A. Transformers rated above 250VA
   1) KVA rating
   2) Voltage Ratio
   3) HV/LV Current
   4) Tapings
   5) No. of Phases
   6) Vector grouping
   7) System Frequency
   8) Insulation Level
   9) Insulation Class

10) % Impedance
11) Reference Standard : IS:2026
12) Ambient temperature
13) Weight
14) Sl. No. & Year of manufacture
15) Manufacturer Name

B. Transformers rated below 250VA
1) KVA rating
2) Voltage ratio
3) Phase
4) Connection
5) Insulation class
6) Frequency

12.2 Diagram Plate:

Transformers shall be provided with diagram plate and shall be fixed along the breadth along with rating plate. It shall be legibly marked with a connection diagram.

12.3 Terminal board:

All the terminations of the transformers shall be brought out and fixed on the terminal board which is fixed on the top. The dimensions shall be as specified in corresponding Annexure for 1ph or 3ph transformer.

The material of the terminal board shall be of PRBC sheets (or any other better insulator) insulated and varnished. It shall be designated to take up the required torque. The terminals shall be rigidly fixed on the board with suitable fasteners, with adequate clearance as per table-IV.

Note: 8mm thick perspex cover shall be provided over the terminal board

TABLE -IV CLEARANCE DISTANCES

Rated Voltage	To earth in air (mm)	Between phases in air (mm)
415V	15.8	19.0
600V	19.0	19.0
3300V	50.8	50.8
6600V	63.5	88.9
11KV	76.2	127.0

12.4 Lifting lugs:

Lifting lugs shall be provided for transformers weighing more than 50Kgs. Two lifting lugs shall be provided at two ends diagonally opposite to each other for transformers weighing more than 50 Kgs but below 100 Kgs. For transformers weighing more than 100 Kgs four lifting lugs shall be provided at each end.

12.5 Earthing terminals:

Two earthing terminals shall be provided on all the transformers. The size of the earthing terminals may be less than the rated conductor size.

12.6 Top Supports

4 holes each of 12mm dia shall be drilled on the lower portion of the top frame of transformer, to facilitate rigid fixing to the enclosure. However, this shall be provided for transformers rated 10KVA and above. The details are shown in Fig.2.

Note: 'F' is taken approximately as 75% of 'B'

13. ADDITIONAL INFORMATION

The following are the materials recommended to be used for constructions of transformers

A. Core: CRGO grade 41/51 or any equivalent grade.
B. Winding: Pure copper of appropriate grade and with suitable insulation.
C. Insulation, Varnish etc: Shall be to appropriate class of insulation.

14. DIMENSIONAL DETAILS

All transformers should conform to dimensions specified in corresponding Annexure for 1ph or 3ph transformer. The values mentioned for overall dimensions are maximum values. The values for mounting holes are exact values. The dimensions shall be within tolerance mentioned therein.

15. TESTS

15.1 Following are the tests for power transformers

A. Type tests :
1. Temperature rise test
2. Lightning impulse test

B. Routine tests:
1. Measurement of winding resistance
2. Voltage ratio test
3. Check on vector grouping
4. Measurement of losses : Load & No load loss
5. Induced over voltage test
6. Measurement of short circuit Impedance (% Impedance)
7. High voltage test

15.2 Following are the test for control transformers

A. Type test :
1. Temperature rise test

B. Routine test:
1. Measurement of winding resistance
2. Voltage ratio and polarity check
3. Vector grouping test
4. Measurement of loss: Load & No load loss
5. Induced over voltage test
6. Insulation resistance test.

15.3 The manufacturer shall submit the test certificates for tests on transformers.

16. ACCEPTANCE CRITERIA

16.1 Conducting Routine tests and Submission of reports

16.2 Inspection/Acceptance by BHEL-EDN Quality Services

16.3 Conducting Type tests and Submission of reports (On one transformer)

16.4 Test certificates for major bought out items

17. SUPPLY CONDITIONS

Following information are to be supplied by the supplier

17.1 Iron and copper losses at specified temperature

17.2 Flux density in the core

17.3 Current density of the coil : HV & LV

17.4 Winding resistance

17.5 Supplier shall submit 6 copies of test guarantee certificates along with the materials

17.6 Transformers shall be suitably packed in wooden carters such that no damage is caused during transportation and handling.

Annexure-1

SINGLE PHASE TRANSFORMER

TYPE	KVA	A	B	C	KXE	O	X	Y
ST-1	0.05	100	130	85	80X60	5X10	95	85
ST-02	0.10	120	130	90	80X60	5X10	95	90
ST-03	0.15	120	150	90	95X60	5X10	115	90
ST-04	0.20	120	175	100	95X75	6X12	115	100
ST-05	0.25	120	175	100	95X90	6X12	115	100
ST-06	0.30	120	175	125	95X100	6X12	120	125
ST-07	0.50	150	190	150	125X100	8X15	150	145
ST-08	0.75	200	250	150	150X120	8X15	185	150
ST-09	1.00	200	250	160	160X130	8X15	185	160
ST-10	1.25	200	250	160	160X130	8X15	185	160
ST-11	1.50	280	300	175	160X130	10	200	160
ST-12	2.00	280	300	175	180X130	10	220	160
ST-13	3.00	300	350	200	200X150	10	220	180
ST-14	4.00	320	360	200	240X150	10	220	180
ST-15	4.50	320	400	200	240X170	10	250	200
ST-16	4.50	350	450	200	240X170	10	250	200
ST-17	5.00	350	450	200	240X170	10	250	200
ST-18	6.00	350	475	200	260X170	10	300	200
ST-19	7.50	350	500	240	290X200	10	300	250
ST-20	10.00	400	500	240	290X200	10	300	250
ST-21	12.50	400	600	250	330X200	10	300	250
ST-22	15.00	450	600	250	250X200	10	300	250
ST-23	25.00	500	600	250	400X200	10	300	250

Annexure-2

THREE PHASE TRANSFORMER

TYPE	KVA	A	B	C	KXE	O	X	Y
TT-01	0.25	250	220	150	150X100	10	230	120
TT-02	0.05	280	250	190	200X150	10	250	150
TT-03	1.00	300	280	200	200X150	10	280	160
TT-04	1.50	300	320	200	200X150	10	300	180
TT-05	2.00	320	300	200	200X150	10	300	180
TT-06	2.50	340	350	200	200X150	10	300	180
TT-07	3.00	380	350	200	200X150	10	350	180
TT-08	4.00	400	425	250	250X200	10	350	180
TT-09	5.00	450	425	250	250X200	10	350	200
TT-10	6.00	450	480	250	250X200	10	350	200
TT-11	7.70	450	480	250	250X200	10	350	200
TT-12	10.00	500	525	250	300X200	10	400	250
TT-13	12.50	620	550	250	350X200	10	450	250
TT-14	15.00	620	600	250	350X200	10	450	250
TT-15	20.00	650	600	300	400X250	10	450	250
TT-16	25.00	650	600	300	400X250	10	450	250
TT-17	30.00	700	600	300	400X250	10	450	250
TT-18	35.00	700	600	300	400X250	10	450	250
TT-19	40.00	700	650	300	400X250	10	450	250
TT-20	45.00	700	650	300	400X250	10	450	250
TT-21	50.00	750	650	300	450X250	10	500	300
TT-22	55.00	750	700	300	450X250	10	500	300
TT-23	60.00	750	700	300	450X250	10	500	300
TT-24	65.00	750	800	300	450X250	10	500	300
TT-25	75.00	800	850	300	500X300	10	600	300
TT-26	80.00	800	850	350	500X300	10	600	300
TT-27	100.00	850	900	350	550X300	10	600	300
TT-28	135.00	850	900	400	550X300	10	600	300
TT-29	160.00	1000	1000	400	600X400	10	600	400
TT-30	200.00	1100	1250	450	650X500	12	700	550
TT-31	250.00	1150	1400	600	650X550	12	700	550
TT-32	300.00	1200	1600	600	700X600	12	750	600
TT-33	350.00	1300	1700	650	800X600	12	800	650
TT-34	400.00	1400	1750	750	800X630	12	850	650

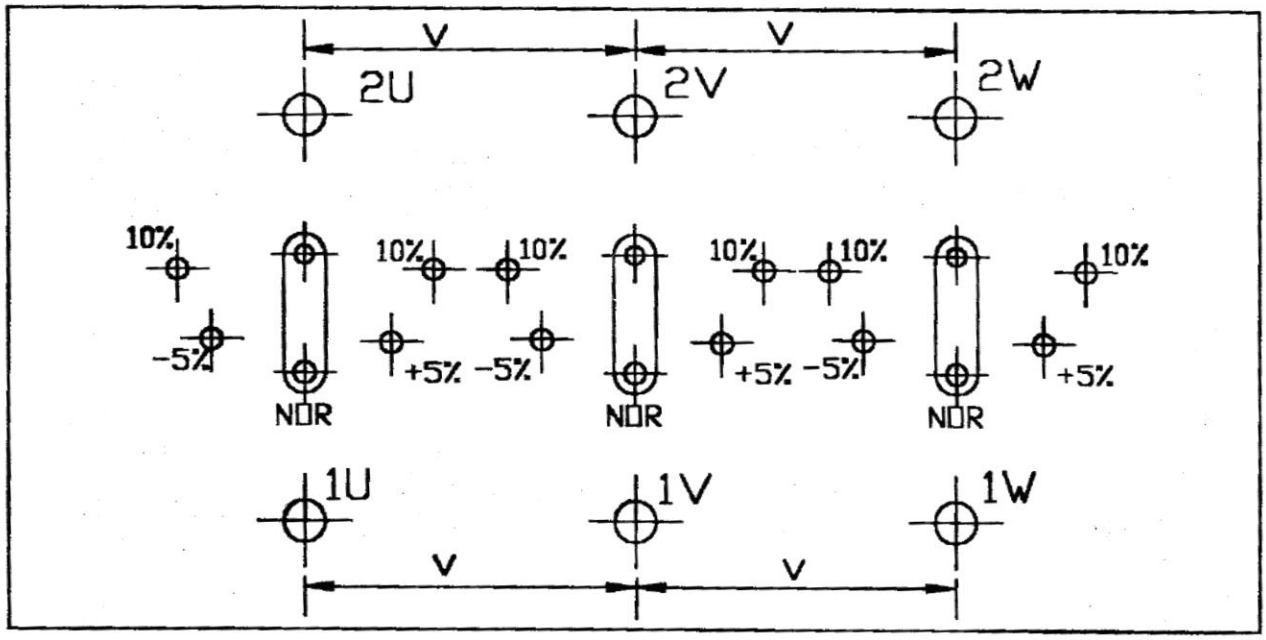
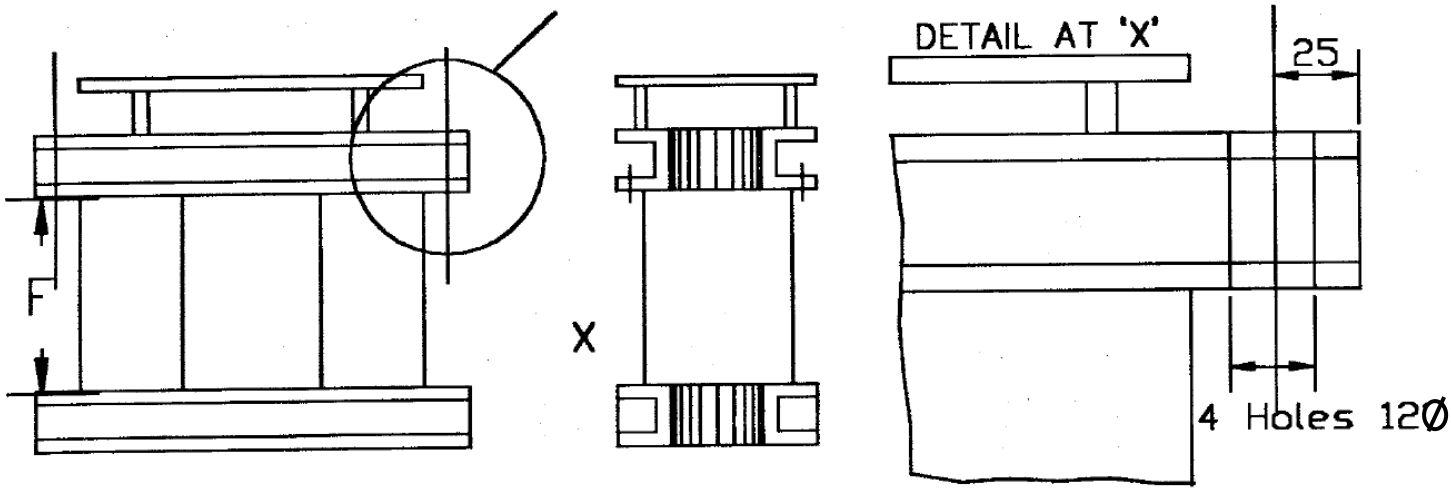


Fig. 1

FIG – 2



Note: 'F' is taken approximately as 75% of B

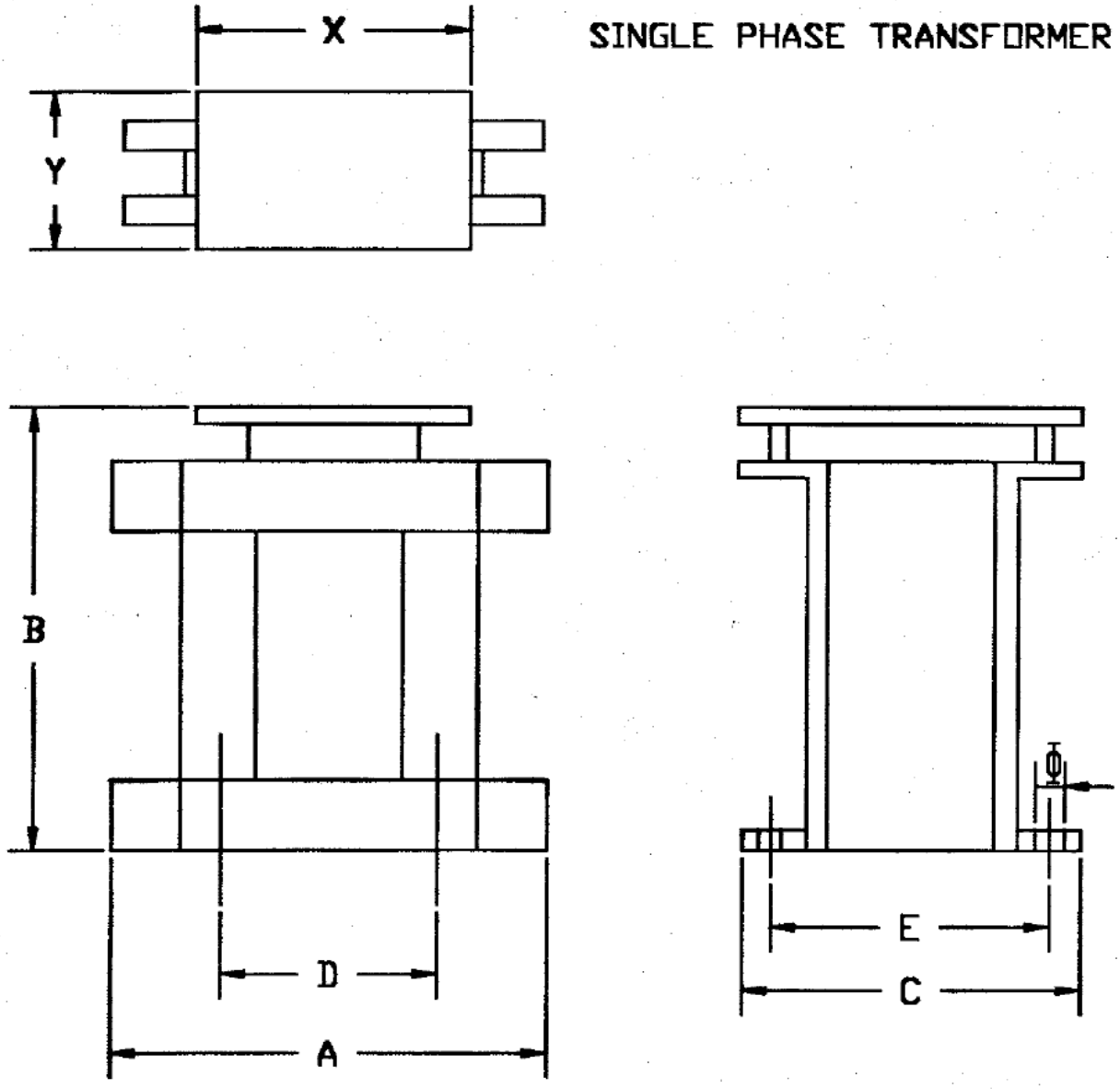


FIG – 3

NOTE: The tolerences for variosus dimensions shall be as per IS:2102 'coarse'

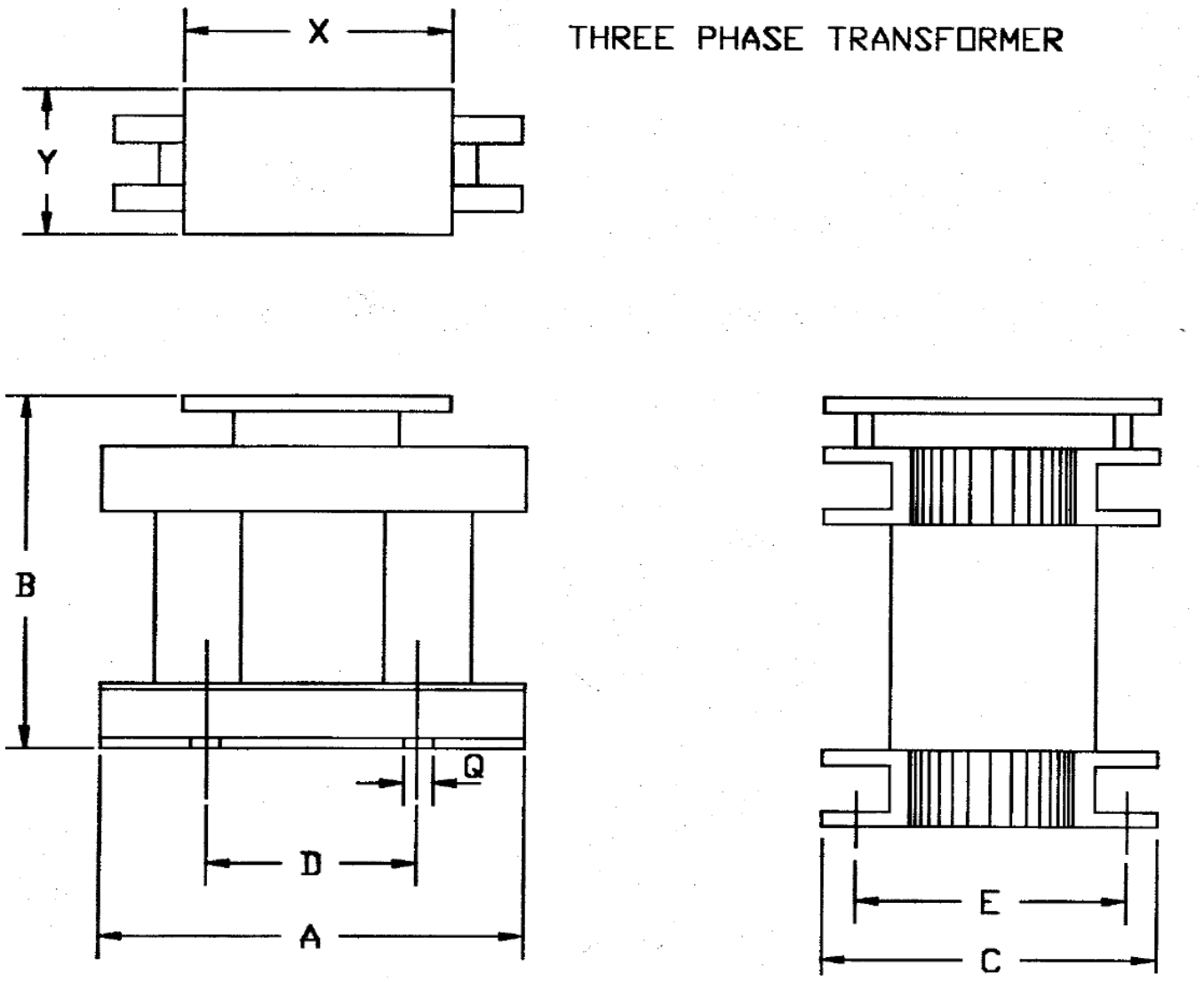


FIG - 4

NOTE: The tolerances for various dimensions shall be as per IS: 2102 'coarse'

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BHEL

PRE QUALIFICATION CRITERIA FOR
HT CURRENT TRANSFORMER

SL. NO.	CRITERIA	DOCUMENT REQUIRED
1.	The bidder should be a manufacturer of HT resin cast bar type current transformers for 2 years or more. This CT plays a vital role and used in conjunction with over current relay for protection of excitation circuit from over current.	Self-certification by OEM
2.	The bidder shall submit valid test certificates (i.e. Type test and Routine test) complying with relevant standard mentioned in the technical specification **PS/408/2095** Clause no. **09** on the date of submission of offer against the tender. Or Should have supplied the item to BHEL against an earlier purchase order.	Test certificates for similar item may be submitted. Or Purchase order copies along with invoice and delivery challan.
3.	The bidder shall submit the documents for current transformer. Or should have supplied the item to BHEL against an earlier purchase order.	a) Performance certificate of at least one end user / customer . b) Reference list of customers c) Purchase order copies along with invoice and corresponding delivery challans. Or Purchase order copies along with invoice and delivery challans.

Rev.00		Approved: RR
		Prepared: LC / Issued: GCE / Date: 13.05.2023

Technical specification

TRANSFORMER CT BAR PR 5VA 25/1A 5P10: SA0483107018

CURRENT TRANSFORMER
RESIN CAST,
SINGLE CORE
BAR PRIMARY WITH BUSBAR EMBEDDED.

BURDEN : 5VA
RATIO: 25A/1A
ACC. CLASS: 5P10
INSULATION CLASS:B
HIGHEST SYS VOLTAGE: 12KV
TEST VOLTAGE: 28KV RMS FOR 1 MIN
BIL VOLTAGE(PEAK): 75KV
SHORT TIME RATING: (1 SEC): 100KA
TYPE TEST CERTIFICATE FOR SHORT TIME CURRENT TEST DONE ON RESIN CAST CT
WITH BAR PRIMARY, TO BE PROVIDED ALONG WITH THE OFFER.
REF STD: IS2705

PURCHASE SPECIFICATION
FOR
HT RESIN CAST BAR TYPE CURRENT TRANSFORMER

1.0 APPLICATION:

This purchase specification is for HT Resin cast, bar primary, Current Transformer used in the Excitation system for sensing over current in the Excitation circuit. This current transformer plays a vital role and used in conjunction with over current relay for protection of excitation circuit from over current.

The supplier shall confirm in writing, the complete clause wise compliance with the specification. Suppliers shall be fully responsible for the supplied current transformer for its completeness, safe and satisfactory operation.

2.0 SERVICE CONDITIONS OF CURRENT TRANSFORMER:

1. Installation : Indoor & inside the cubicle
2. Max. ambient temperature :50 deg C (out side enclosure)
3. Cooling : Air natural
4. Humidity : 100% tropical non considering
5. Ventilation : Restricted as it is mounted inside the cubicle.

3.0 SPECIFCATION

Sl. No.	Description	Compliance
	Technical data	
1.	HT Resin cast, BAR type, Current Transformer	
2.	No. of Cores: As per RFQ/P.O.	
3.	Current Ratio: As per RFQ/P.O.	
4.	Burden: As per RFQ/P.O.	
5.	Accuracy Class: 5P10 (Unless otherwise specified)	
6.	Insulation Class : B (Unless otherwise specified)	
7.	Frequency: 50 Hz	
8.	Current density shall be suitable for 1.2 x rated current	
9.	Short time current: As per RFQ/P.O.	
10.	Highest system voltage: RFQ/P.O.	
11.	Test Voltage: RFQ/P.O	
12.	BIL Test: As per RFQ/P.O.	
13.	Reference Standard: IS 2705	

4.0 TERMINAL MARKINGS

Terminals shall be marked clearly for identifying primary and secondary windings. For Primary winding P1 and P2 and for Secondary winding S1 and S2.

5.0 SECONDARY TERMINALS

Secondary terminals of current transformer shall be brought out for easy external connection to be suitable for upto 4Sq.mm cable wiring and to be provided with cover for covering the live terminals. CT secondary terminals shall be nickel plated brass stud type.

6.0 RATING PLATE

CT shall carry at least following markings and shall be marked legibly with following

a. CT ratio
b. Rated Frequency
c. Burden
d. Basic Impels level
e. Short time current rating
f. Accuracy Class
g. Highest System Voltage
h. Insulation Class
i. Insulation Test Voltage
j. Reference standard: IS2705
k. Sl. No. & Year of manufacture
l. Manufacturer name

7.0 MAJOR MATERIALS:

Following are the major materials recommended to be used for construction of CT

a. Core: CRGO (Cold-Rolled Grain-Oriented steel)
b. Winding: Copper of 99.99% pure electrolytic grade.
c. Insulation: Shall be suitable for class of insulation indicated in RFQ/PO
d. Type : Epoxy Resin cast
e. Secondary terminal : 5mm pillar inside the casting, screwable from outside for 10mm length.

8.0 DIMENSIONAL DETAILS

Overall dimensional drawing clearly indicating overall dimensions, inner diameter as per RFQ/P.O., Outer diameter, base plate 5mm thick with mounting details shall be submitted along with the offer.

9.0 DOCUMENTS TO BE SUBMITTED ALONG WITH OFFER.

Supplier shall provide the following information along with the offer. *Bids without detailed and point wise compliance statement / documents required, will not be considered for further processing.*

a. Compliance to this specification and material description in the **R**equest **F**or **Q**uotation / **P**urchase **O**rder. List of deviations, if any, clause number-wise with reasons thereof, wherever applicable shall be clearly brought out.
b. **Type test and routine reports as mentioned in the clause no. 10 to be submitted**.
c. Overall Dimensional drawing as per clause no. 8.0
d. Materials used for process as per clause no. 7.0

10.0 TESTS

Following tests are to be performed on the current transformer as per IS 2705.

1. Type tests (Not required who has supplied to BHEL)
   a. Temperature rise test
   b. Short time current test
   c. Basic impels level test
2. Routine tests
   a. Verification of terminal marking and polarity test
   b. Dimensional check
   c. Power frequency dry withstand test on primary
   d. Power frequency dry withstand test on secondary.
   e. Over voltage Inter turn test
   f. Partial Discharge Measurement
   g. Current error and phase displacement
   h. Composite error test

11.0 AFTER PLACEMENT OF PURCHASE ORDER

a. Final dimensional drawing for BHEL-EDN approval before manufacturing.

12.0 PACKING

The item shall be properly packed to ensure that there are no damages / dislocation of parts during transit.

13.0 ACCEPTANCE CRITERIA

1. Conducting Routine tests and Submission of reports
2. Inspection/Acceptance by BHEL-EDN Quality Services
3. Conducting Type tests and Submission of reports (on current transformer)
4. Test certificates for major bought out items

	A4 - 10	**PRE-QUALIFICATION CRITERIA FOR SIGNAL CONDITIONING CURRENT TRANSFORMER FOR CMU**	PQC:408-0018 REV. NO. 00 Page 1 of 1

Sl. No.	CRITERIA	DOCUMENT REQUIRED
1.	The bidder should be a manufacturer/supplier of "LV Current transformer" in rectangular shape.	Self-certification for OEM/ OEM Certification for dealers.
2.	The bidder shall have valid test certificate complying with relevant standard mentioned in the technical specification **PS/408/064,** Clause **16** of **3.0 (Technical specification)** on the date of submission of offer against the tender.	Test certificates for similar item may be submitted.
3.	The bidder shall submit the documents indicated for "LV Current transformer in rectangular shape" or should have supplied the item to BHEL against an earlier purchase order.	a) At least one end user performance certificate from a power plant for 2 years satisfactory operation. b) Reference list of customers. c) Purchase order copies along with invoice and delivery challan
4.	On receipt at purchaser's works, if it is observed that the item requires rework / rectification, supplier shall arrange for the same at EDN works, Bangalore within 6 working days.	Conformance for complying.

REV 00	APPROVED R.RUKMANI		
	PREPARED R. Rajkumar RAJKUMAR RANGU	ISSUED 408	DATE 09/04/2021

Technical specification

CT RESN CAST,BAR PRI RNG TYP:2000A/500MA: SA0653122209

SIGNAL CONDITIONING
CURRENT TRANSFORMER
FOR CMU. SINGLE CORE
BAR PRIMARY RING TYPE
CT. RESIN CAST
CT RATIO:2000A/500MA
WITH +/- 10% TOLERANCE
BURDEN:
5VA (W.R.TO 4000A/1A)
LOAD RESISTANCE: 5 R
INSULATION CLASS: B
INSULATION LEVEL:
3 KV 50 HZ PER 1 MIN
HIGHEST SYSTEM
VOLTAGE: 1.1 KV
REF STD: IS2705
Refer PS-408-064 for
application only.

Overall dimension of CT : 140mm x 140mm
Dimension for busbar entry : 85 mm X 15mm
Mounting plate dimension : 82mm x 100mm

PURCHASE SPECIFICATION
FOR
SIGNAL CONDITIONING CURRENT TRANSFORMER
(FOR CONDUCTION MONITORING UNIT)

Revision: 02	Reviewed by: R.Rukmani		
	Prepared by Rajkumar Rangu	Issued by CE-Engg.(GCE) - 408	Date 09/04/2021

1.0 APPLICATION:

This signal conditioning current transformer is required for conduction monitoring of thyristor converters. It senses the flow of current through individual thyristors in the 3 phase full wave Thyristor Bridge by measuring the current flowing during conduction. The current waveform is a square wave in one direction for one third of a cycle. The CT's are mounted on the busbar of the positive and negative branch of the Thyristor Bridge (one no. each arm) and can be mounted directly on the busbar with a mounting plate.

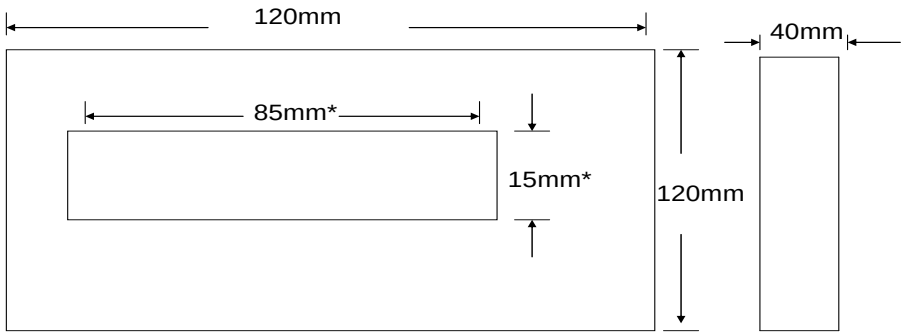
2.0 SPECIFICATION:

a. Electrical:

The design to be considered such that the CT secondary current start saturating beyond 500mA. However, CT rating to be designed for two times the rated current (i.e. in RFQ/PO if rated CT ratio is 1200A/500mA, then CT shall be designed for 2400A/1A). The CT shall be bar primary rectangular type. The percentage error of the current ratio shall be ±10%. Linearity is to be ensured at low currents i.e. from primary current about 50A. The secondary leads are to be brought out with a 4 meters screen cable (colour coded for polarity). The entire CT is to be casted in resin along with the terminal lead connection to the secondary winding.

b. Mechanical Dimensions:

As these CT's are to be mounted on the thyristor connecting busbars specific dimensions are to be maintained due to space limitations.



- * :Tolerance ± 2mm
- All other dimensions shall have ± 5mm Tolerance
- CTs shall be provided with necessary clamping / fixing arrangement for direct mounting on Busbars.

3.0 TECHNICAL SPECIFICATION :

The supplier shall confirm in writing, the complete clause wise compliance with the specification.

Sl. No.	Description	Compliance
	Technical data	
1.	Single core, bar primary, rectangular type & resin cast	
2.	Current transformer Ratio (for rated): As per RFQ / PO	
3.	Current transformer Frequency : 50 HZ	
4.	Burden : As per RFQ / PO	
5.	Load resistance: 5 ohms	
6.	Insulation class: B	
7.	Insulation level: 3 KV 50 HZ per 1 min.	
8.	Highest system voltage: 1.1 KV	
9.	Connecting cable: 2 core 0.75 sq.mm. screened color coded (Red & Black) cable with 1100V grade, FRLS PVC sheathed of reputed make. If terminals shall be identified as S1 (Red) & S2 (Black).	
10.	Connecting cable length: approximate 4 meters	
11.	Dimension of window [ref. clause 2.0 b]: 85mm (w) X 15mm (H) with Tolerance ±2mm	
12.	Overall dimension [Ref clause 2.0 b] : 120mm (W) X120mm (H) X 40mm (D) with Tolerance ±5mm. However for 1600A/500mA & 2000A/500mA CT's, overall dimension [Ref clause 2.0 b] can be acceptable up to 140mm (W) X140mm (H) X 40mm (D) with Tolerance ±5mm.	
13.	Reference standard : IS2705 / Equivalent IEC standard	
14.	CT mounting plate as per drawing no. 46532111266 to be supplied as a loose item for each CT.	
15.	Dimensional drawing to be enclosed	
16.	**Type tests as per IS 2705 / Equivalent IEC standard for similar rating CT** i) Temperature rise test ii) Short time current test	

4.0 SUPPLIER DOCUMENT REQUIREMENT SCHEDULE

4.1 BIDDING STAGE

Supplier shall provide the following information along with the offer. *Bids without detailed and point wise compliance statement / documents required, will not be considered for further processing.*

i) Compliance to this specification and material description in the **R**equest **F**or **Q**uotation / **P**urchase **O**rder. List of deviations, if any, clause number-wise with reasons thereof, wherever applicable shall be clearly brought out.

ii) Copper material & Resin cast material certificates to be provided. This is not required, if the item has already been supplied to BHEL against an earlier purchase order.

iii) **Type test reports** as mentioned in the Sl.no 16 of clause no. 3.0 (specification) to be submitted for similar item. Type test reports are not required, if the item has already been supplied to BHEL against an earlier purchase order.

5.0 TESTS

Routine tests (conducted on every item to be submitted before dispatch)

i. Visual Inspection
ii. Dimensional Check
iii. High voltage power frequency with stand test
iv. Polarity test
v. Inter turn insulation test
vi. phase angle error test
vii. Ratio test as follows

Primary current (A)	Excepted secondary current (mA)	Observed secondary current (mA)
0%	0	
25%	125mA	
50%	250mA	
75%	375mA	
100%	500mA	
120%	500mA	

6.0 AFTER PLACEMENT OF PURCHASE ORDER

a. Final dimensional drawing for BHEL-EDN approval before manufacturing.
b. Quality assurance plan' for BHEL-EDN approval before manufacturing. Quality Plan is not required, if the item has already been supplied to BHEL against an earlier purchase order.

7.0 PACKING

The item shall be properly packed to ensure that there are no damages / dislocation of parts during transit.

8.0 ACCEPTANCE CRETERIA

1. Verification of a) routine test reports b) raw material certificates for copper and resin submitted.
2. On receipt of item at BHEL-EDN final acceptance will be by quality services of purchaser, verifying the conformance of item to this purchase specification and Inspection of item as per specification / drawings / documents at purchaser's works.

PRE-QUALIFICATION CRITERIA FOR SMALL RATING TRANSFORMER

Sl.No.	CRITERIA	DOCUMENT REQUIRED
1.	The bidder should be a manufacturer / supplier of small rating transformers (up to 15KVA) for two years or more.	Self-certification for OEM/OEM authorization for dealers.
2.	The bidder shall fully comply with all the clauses mentioned in the latest revision of specification ED7461195 (Current revision number is REV No..03).	Conformance for complying.
3.	The Bidder shall submit the documents indicated during bidding stage. OR The bidder should have supplied the item to BHEL against an earlier purchase order.	a) At least one end user performance certificate. b) Reference list of customers for dry type transformers. c) Relevant purchase order copies along with invoice and delivery challans. OR If supplier had already supplied transformer to BHEL, then supplier shall provide relevant purchase order details.
4.	On –site service support shall be provided at purchaser's works within 6 working days, if it is observed that the item requires rework /rectification.	Conformance for complying.

Technical specification

TRFMR CNTRL 4KVA 3PH DYN11 : SA0653941242

TRANSFORMER DRY
4KVA
3PHASE, 50HZ

LV: 165V
HV: 575V
VECTOR GROUP:DYN11
HV TAP:+/-5%, +/-10%
IMPEDANCE: 4%
INSULATION CLASS:B
INSULATION LEVEL:
4KV 50HZ FOR 1MINUTE
NICKEL PLATED BRASS
STUD TERMINALS,
TRANSPARENT POLY
CARBONATE SHEET 8MM
THICK OVER TERMINAL
BOARD, EARTHED SCREEN
BETWEEN HV & LV
WINDINGS TO BE PROVIDED

IS 2026, IS 11171

STD:ED7461195

REVISION HISTORY SHEET

REV NO	DATE	NATURE OF CHANGE	REASONS	PREPARED BY	APPROVED BY
00	23/07/96	SUPERSEDES CN74500S	-	BS,NS	N.J
01	02/10/99	Cl.4.3 &Cl.12.3 Note added	F.B From GHC. Group	BKD,CCR	NS
02	14/07/03	C1.1.2,4.1,4.3 &12.3 Revised	F.B.(GHC) CE\GHC\2003 STDS\KVBR Dt.10/07/03	HRN	NS
03	17/11/21	Cl.16. Acceptance criteria included. Cl.15.Tests refined	FB FROM QS	Anusri S	R Rukmani

APPROVED:
R Rukmani

PREPARED: Anusri S
ISSUED: ENGG. SERV.
DATE: 17/11/21

SPECIFICATION FOR POWER AND CONTROL TRANSFORMER

1. SCOPE

1.1. This Standard details the specifications for single and polyphase drytype, power and control transformers.

1.2. This Standard shall be read in conjunction with IS:11171 and IS:2026

2. DEFINITIONS

For the purpose of this Standard following definitions shall apply.

2.1 Power transformer: Single phase transformer rated above 1KVA and 3 phase transformer rated above 5KVA shall be designated as power transformer.

2.2 Control transformer : Single phase transformer below 1KVA and 3 phase transformer below 5 KVA shall be designated as control transformer

3. SERVICE CONDITIONS

3.1 Max ambient temp	: 50°C
3.2 Cooling	: Air natural
3.3 Humidity	: 100 percent
3.4 Ventilation	: Restricted as it is mounted inside a cubicle (IP 21)

4. RATING

4.1 KVA Rating:
The rated KVA assigned taking into account the service condition as specified in 3.0

APPROVED:
R Rukmani

PREPARED: Anusri S ISSUED: ENGG. SERV, DATE: 17/11/21

The following shall be the preferred rated KVA
3 Phase Transformers:
0.25,1,1.5,2,2.5,3,4,5,6,7.5,10,12.5,15,20,25,30,35,40,45,
50,55,60,65,75,80,100,135,160,200,250,300,350 & 400 KVA

Single Phase Transformers:
50, 100, 150, 200, 300, 500, 750 VA
1,1.25,1.5,2,3,4,4.5,5,6,7.5,10,12.5,15,20 & 25 KVA

4.2 Rated Voltages :
The rated voltages assigned to the windings of the transformers may be operated at its rated KVA at any voltage within +/-10% of rated voltage.

4.3 No Load Current

SlNo.	Rating	Value
1.	up to 1KV	Less than 20% of Rated current
2.	above 1KVA to less than 5KVA	less than 15% of rated current
3.	above 5KVA to less than 10KVA	less than 10% of rated current
4.	Rating higher than above subject to approval of iron and copper losses by EDN.	

4.4 Rated Frequency
The frequency for the purpose of this standard shall be 50 Hz unless otherwise specified, with a tolerance of +/-3%.

5. TEMPERATURE RISE

The Transformer shall conform to the requirements of Temperature Rise specified in IS:2026 part II.

6. INSULATION LEVELS

The Transformer shall conform to the requirements of insulation Levels Specified in IS:2026 part III.

7. TAPPING

Unless otherwise specified all transformers shall be provided with off load tapings on +/-5% and+/-10% on primary.

8. CONNECTION

For the purpose of this standard the winding connections shall be in accordance with IS:2026 part - IV.

9. IMPEDANCE

Unless otherwise specified transformers shall have the following impedances.

Up to and including 250VA	-	6%
Above 250VA up to and including 150KVA	-	4%
Above 150KVA up to 400 KVA	-	5%

The tolerance for the impedance values shall be +/-10%

10. TERMINAL MARKINGS

For the purpose of this standard the various terminal markings shall be as stated below

10.1 The windings of the transformers shall be denoted by HV & LV. HV refers to high voltage winding and LV refers to low voltage winding.

10.2 Line terminals shall be marked as

For 3 phase transformers
1U, 1V, 1W for HV windings and
2U, 2V, 2W for LV windings

For Single phase Transformers
P1, P2 for HV winding and
S1, S2 for LV winding

The markings shall be started from left hand-side as viewed for HV side.

Neutral Terminal shall be marked as 1N for HV side and 2N for LV side.

10.3 The tapings shall be marked with natural ascending sequence as shown in the figure-1. The tapings shall be through tap selector for all transformers rated above 250VA.

10.4 The rated voltage of the transformer shall be marked by the side of respective terminals.

10.5 Earthing terminals shall be marked with earthing mark ( )

11. TERMINALS

All terminals except Bar type shall be of nickel plated Brass. Bar terminal shall be of pure copper of appropriate grade. Nut & Bolt shall be secured with vibration proof washers. The

appropriate size of the terminals shall be as given in Table-III.

TABLE – III

Type of terminal	Current rating							
	5A	10A	20A	50A	100A	200A	300A	500A
Screw/Stud	M6	M6	M8	M10	M12	-	-	-
Bar	-	-	-	-	-	20X6 1 hole M8	25X6 1 hole M8	40X6 1 hole M12

Note: All the terminals including hardware shall be free from rusting. After tightening the bolt, minimum 3 threads of bolt shall project outside the nut. Adequate clearances between phases shall be ensured and indicated in the drawing. Proper fixing arrangement with insulators shall be provided to ensure same clearances for the entire quantity of a purchase order.

12. FITTINGS

All transformers shall be provided with following fittings

12.1 Rating plate:

Transformers shall be provided with rating plates of weatherproof material. Rating plate shall be fixed along the breadth of the transformer & a provision shall be made to fix it along the length of the adjacent side.

For transformer rated 250VA & below rating plate shall be fixed along the breadth

The rating plate shall be marked legibly with following markings

A. Transformers rated above 250VA
   1) KVA rating
   2) Voltage Ratio
   3) HV/LV Current
   4) Tapings
   5) No. of Phases
   6) Vector grouping
   7) System Frequency
   8) Insulation Level
   9) Insulation Class

10) % Impedance
11) Reference Standard : IS:2026
12) Ambient temperature
13) Weight
14) Sl. No. & Year of manufacture
15) Manufacturer Name

B. Transformers rated below 250VA
1) KVA rating
2) Voltage ratio
3) Phase
4) Connection
5) Insulation class
6) Frequency

12.2 Diagram Plate:

Transformers shall be provided with diagram plate and shall be fixed along the breadth along with rating plate. It shall be legibly marked with a connection diagram.

12.3 Terminal board:

All the terminations of the transformers shall be brought out and fixed on the terminal board which is fixed on the top. The dimensions shall be as specified in corresponding Annexure for 1ph or 3ph transformer.

The material of the terminal board shall be of PRBC sheets (or any other better insulator) insulated and varnished. It shall be designated to take up the required torque. The terminals shall be rigidly fixed on the board with suitable fasteners, with adequate clearance as per table-IV.

Note: 8mm thick perspex cover shall be provided over the terminal board

TABLE -IV CLEARANCE DISTANCES

Rated Voltage	To earth in air (mm)	Between phases in air (mm)
415V	15.8	19.0
600V	19.0	19.0
3300V	50.8	50.8
6600V	63.5	88.9
11KV	76.2	127.0

12.4 Lifting lugs:

Lifting lugs shall be provided for transformers weighing more than 50Kgs. Two lifting lugs shall be provided at two ends diagonally opposite to each other for transformers weighing more than 50 Kgs but below 100 Kgs. For transformers weighing more than 100 Kgs four lifting lugs shall be provided at each end.

12.5 Earthing terminals:

Two earthing terminals shall be provided on all the transformers. The size of the earthing terminals may be less than the rated conductor size.

12.6 Top Supports

4 holes each of 12mm dia shall be drilled on the lower portion of the top frame of transformer, to facilitate rigid fixing to the enclosure. However, this shall be provided for transformers rated 10KVA and above. The details are shown in Fig.2.

Note: 'F' is taken approximately as 75% of 'B'

13. ADDITIONAL INFORMATION

The following are the materials recommended to be used for constructions of transformers

A. Core: CRGO grade 41/51 or any equivalent grade.
B. Winding: Pure copper of appropriate grade and with suitable insulation.
C. Insulation, Varnish etc: Shall be to appropriate class of insulation.

14. DIMENSIONAL DETAILS

All transformers should conform to dimensions specified in corresponding Annexure for 1ph or 3ph transformer. The values mentioned for overall dimensions are maximum values. The values for mounting holes are exact values. The dimensions shall be within tolerance mentioned therein.

15. TESTS

15.1 Following are the tests for power transformers

A. Type tests :
1. Temperature rise test
2. Lightning impulse test

B. Routine tests:
1. Measurement of winding resistance
2. Voltage ratio test
3. Check on vector grouping
4. Measurement of losses : Load & No load loss
5. Induced over voltage test
6. Measurement of short circuit Impedance (% Impedance)
7. High voltage test

15.2 Following are the test for control transformers

A. Type test :
1. Temperature rise test

B. Routine test:
1. Measurement of winding resistance
2. Voltage ratio and polarity check
3. Vector grouping test
4. Measurement of loss: Load & No load loss
5. Induced over voltage test
6. Insulation resistance test.

15.3 The manufacturer shall submit the test certificates for tests on transformers.

16. ACCEPTANCE CRITERIA

16.1 Conducting Routine tests and Submission of reports

16.2 Inspection/Acceptance by BHEL-EDN Quality Services

16.3 Conducting Type tests and Submission of reports (On one transformer)

16.4 Test certificates for major bought out items

17. SUPPLY CONDITIONS

Following information are to be supplied by the supplier

17.1 Iron and copper losses at specified temperature

17.2 Flux density in the core

17.3 Current density of the coil : HV & LV

17.4 Winding resistance

17.5 Supplier shall submit 6 copies of test guarantee certificates along with the materials

17.6 Transformers shall be suitably packed in wooden carters such that no damage is caused during transportation and handling.

Annexure-1

SINGLE PHASE TRANSFORMER

TYPE	KVA	A	B	C	KXE	O	X	Y
ST-1	0.05	100	130	85	80X60	5X10	95	85
ST-02	0.10	120	130	90	80X60	5X10	95	90
ST-03	0.15	120	150	90	95X60	5X10	115	90
ST-04	0.20	120	175	100	95X75	6X12	115	100
ST-05	0.25	120	175	100	95X90	6X12	115	100
ST-06	0.30	120	175	125	95X100	6X12	120	125
ST-07	0.50	150	190	150	125X100	8X15	150	145
ST-08	0.75	200	250	150	150X120	8X15	185	150
ST-09	1.00	200	250	160	160X130	8X15	185	160
ST-10	1.25	200	250	160	160X130	8X15	185	160
ST-11	1.50	280	300	175	160X130	10	200	160
ST-12	2.00	280	300	175	180X130	10	220	160
ST-13	3.00	300	350	200	200X150	10	220	180
ST-14	4.00	320	360	200	240X150	10	220	180
ST-15	4.50	320	400	200	240X170	10	250	200
ST-16	4.50	350	450	200	240X170	10	250	200
ST-17	5.00	350	450	200	240X170	10	250	200
ST-18	6.00	350	475	200	260X170	10	300	200
ST-19	7.50	350	500	240	290X200	10	300	250
ST-20	10.00	400	500	240	290X200	10	300	250
ST-21	12.50	400	600	250	330X200	10	300	250
ST-22	15.00	450	600	250	250X200	10	300	250
ST-23	25.00	500	600	250	400X200	10	300	250

Annexure-2

THREE PHASE TRANSFORMER

TYPE	KVA	A	B	C	KXE	O	X	Y
TT-01	0.25	250	220	150	150X100	10	230	120
TT-02	0.05	280	250	190	200X150	10	250	150
TT-03	1.00	300	280	200	200X150	10	280	160
TT-04	1.50	300	320	200	200X150	10	300	180
TT-05	2.00	320	300	200	200X150	10	300	180
TT-06	2.50	340	350	200	200X150	10	300	180
TT-07	3.00	380	350	200	200X150	10	350	180
TT-08	4.00	400	425	250	250X200	10	350	180
TT-09	5.00	450	425	250	250X200	10	350	200
TT-10	6.00	450	480	250	250X200	10	350	200
TT-11	7.70	450	480	250	250X200	10	350	200
TT-12	10.00	500	525	250	300X200	10	400	250
TT-13	12.50	620	550	250	350X200	10	450	250
TT-14	15.00	620	600	250	350X200	10	450	250
TT-15	20.00	650	600	300	400X250	10	450	250
TT-16	25.00	650	600	300	400X250	10	450	250
TT-17	30.00	700	600	300	400X250	10	450	250
TT-18	35.00	700	600	300	400X250	10	450	250
TT-19	40.00	700	650	300	400X250	10	450	250
TT-20	45.00	700	650	300	400X250	10	450	250
TT-21	50.00	750	650	300	450X250	10	500	300
TT-22	55.00	750	700	300	450X250	10	500	300
TT-23	60.00	750	700	300	450X250	10	500	300
TT-24	65.00	750	800	300	450X250	10	500	300
TT-25	75.00	800	850	300	500X300	10	600	300
TT-26	80.00	800	850	350	500X300	10	600	300
TT-27	100.00	850	900	350	550X300	10	600	300
TT-28	135.00	850	900	400	550X300	10	600	300
TT-29	160.00	1000	1000	400	600X400	10	600	400
TT-30	200.00	1100	1250	450	650X500	12	700	550
TT-31	250.00	1150	1400	600	650X550	12	700	550
TT-32	300.00	1200	1600	600	700X600	12	750	600
TT-33	350.00	1300	1700	650	800X600	12	800	650
TT-34	400.00	1400	1750	750	800X630	12	850	650

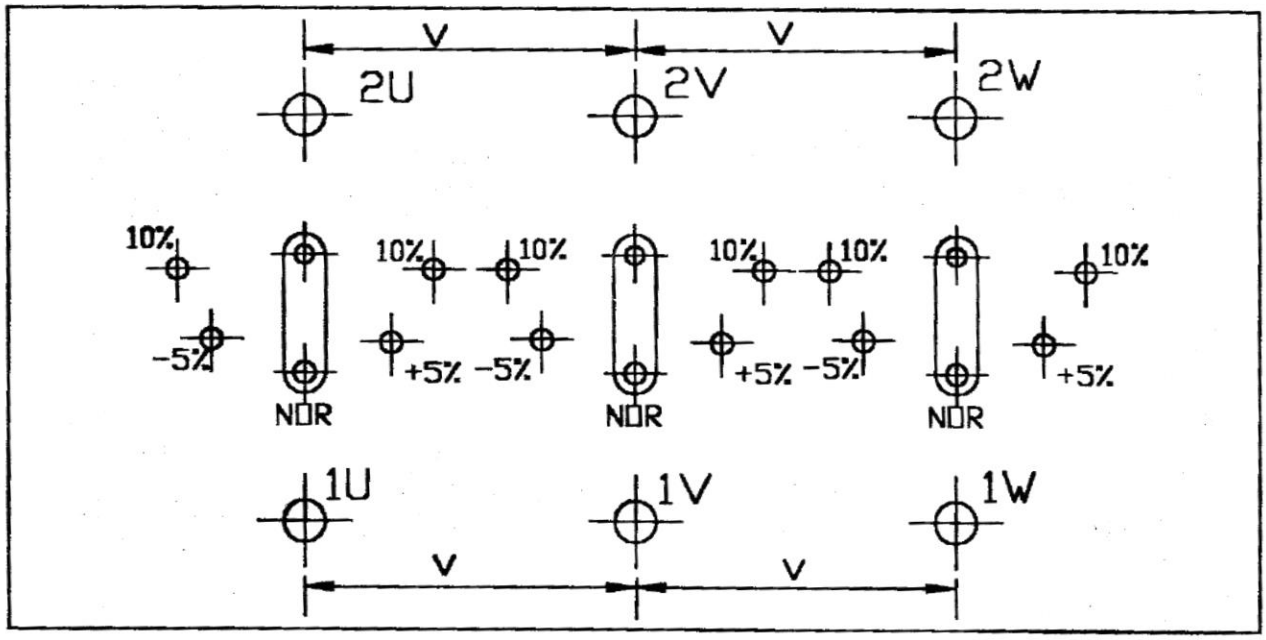
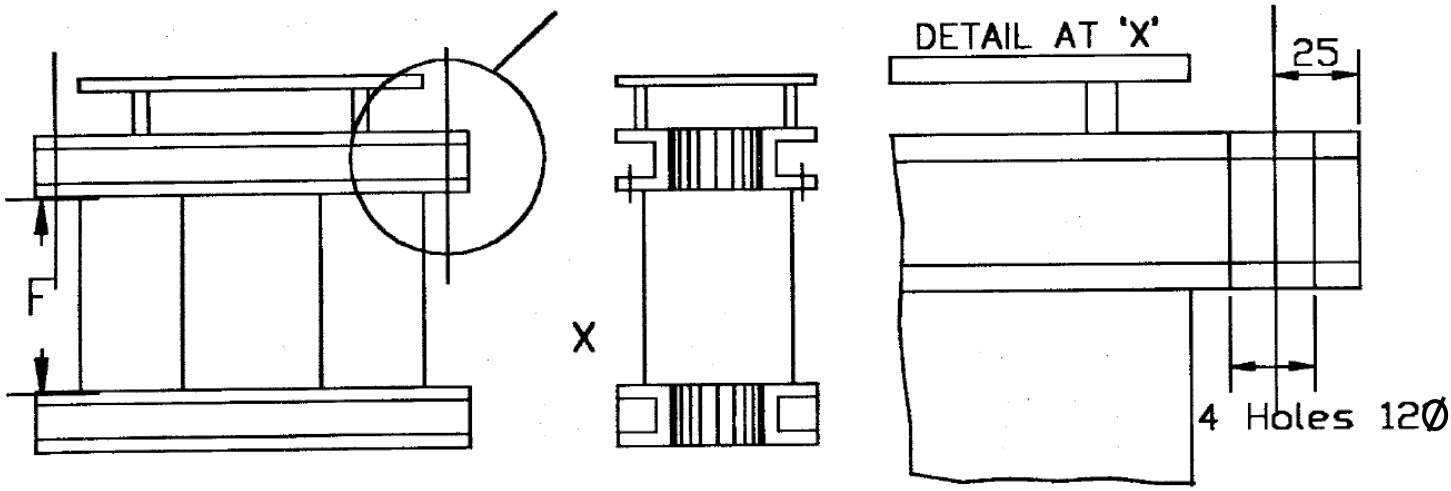


Fig. 1

FIG – 2



Note: 'F' is taken approximately as 75% of B

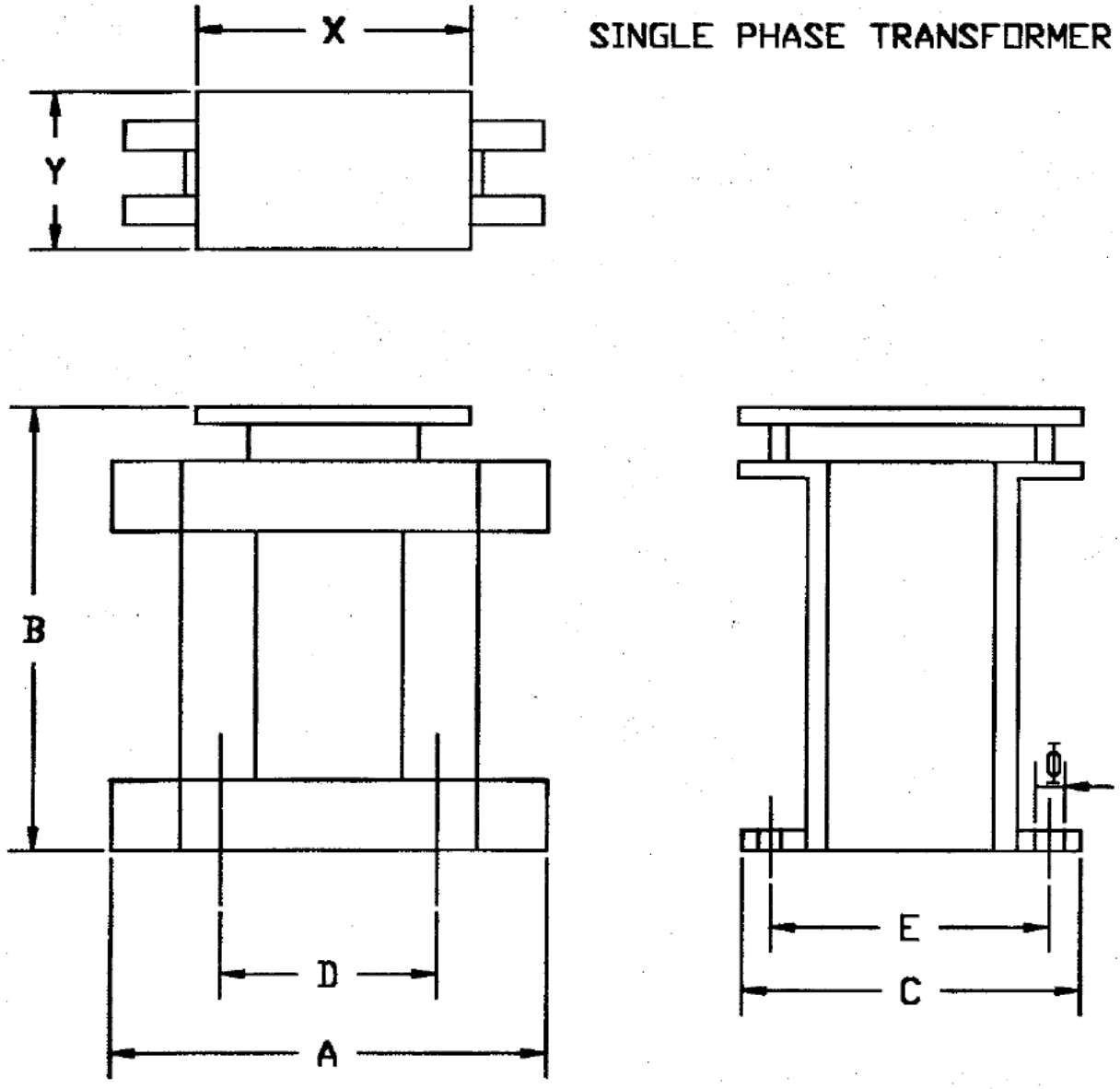


FIG – 3

NOTE: The tolerences for variosus dimensions shall be as per IS:2102 'coarse'

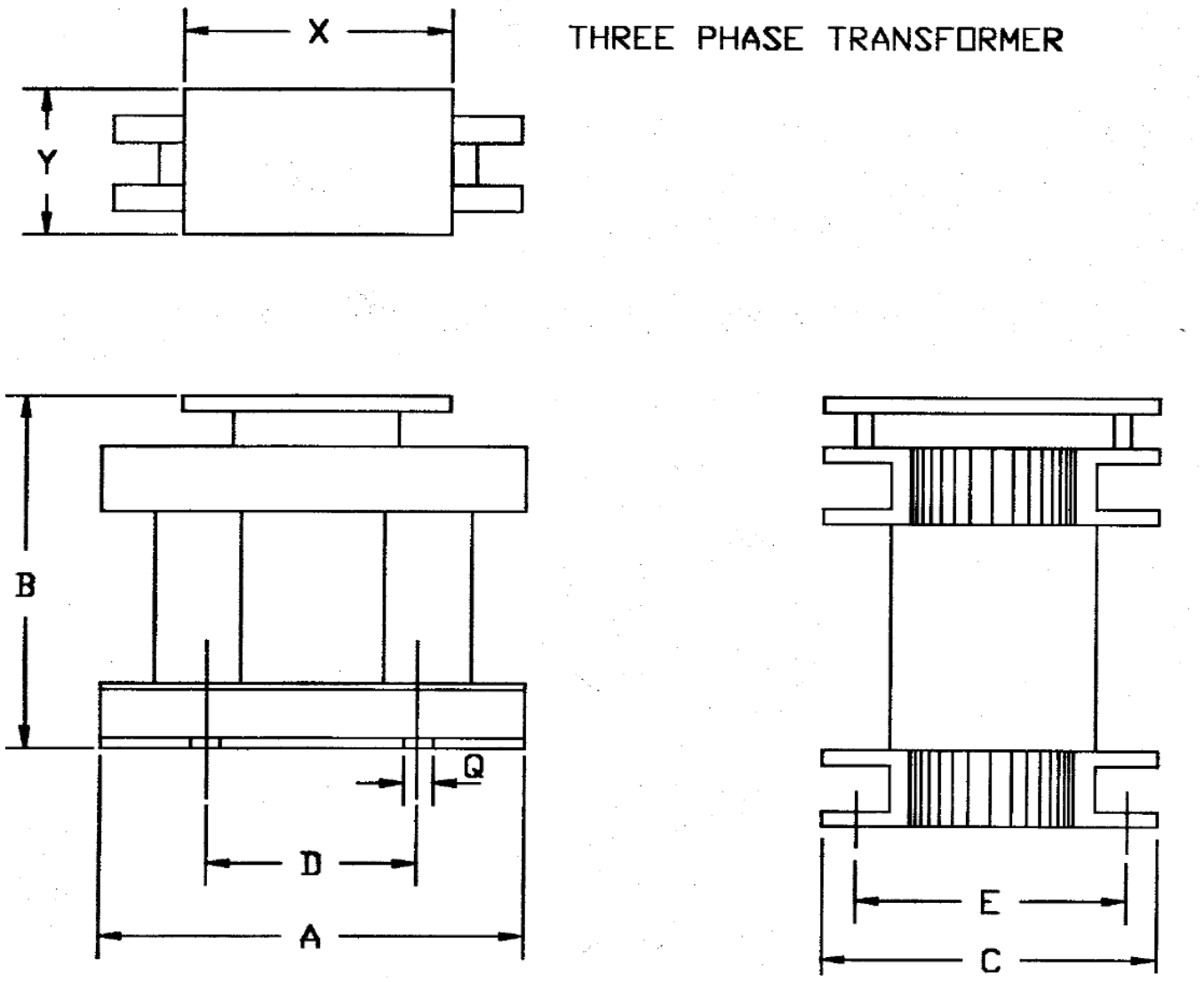


FIG - 4

NOTE: The tolerances for various dimensions shall be as per IS: 2102 'coarse'

PRE-QUALIFICATION CRITERIA FOR SMALL RATING TRANSFORMER

Sl.No.	CRITERIA	DOCUMENT REQUIRED
1.	The bidder should be a manufacturer / supplier of small rating transformers (up to 15KVA) for two years or more.	Self-certification for OEM/OEM authorization for dealers.
2.	The bidder shall fully comply with all the clauses mentioned in the latest revision of specification ED7461195 (Current revision number is REV No..03).	Conformance for complying.
3.	The Bidder shall submit the documents indicated during bidding stage. OR The bidder should have supplied the item to BHEL against an earlier purchase order.	a) At least one end user performance certificate. b) Reference list of customers for dry type transformers. c) Relevant purchase order copies along with invoice and delivery challans. OR If supplier had already supplied transformer to BHEL, then supplier shall provide relevant purchase order details.
4.	On –site service support shall be provided at purchaser's works within 6 working days, if it is observed that the item requires rework /rectification.	Conformance for complying.

Technical specification

TRFMR PWR DRY 5KVA,3PH,50HZ,DYN11: SA0653943663

TRANSFORMER PWR DRY
5KVA,3PH,50HZ
VECTOR GROUP :DYN11
HV1: 185V LV1: 85V
HV TAP:+/-5%,10%
IMPEDENCE:4%
INSULATION
CLASS:B
INS.LEVEL:
4KV,50HZ FOR 1 MIN.
NICKEL PLATED
BRASS STUD TERMINALS.
REF STD :IS2026 IS11171.
PERPLEX SHEET 4MM OVER
TERMINAL BOARD.
EARTHED SCREEN BETWEEN
HV & LV IS REQUIRED.

REVISION HISTORY SHEET

REV NO	DATE	NATURE OF CHANGE	REASONS	PREPARED BY	APPROVED BY
00	23/07/96	SUPERSEDES CN74500S	-	BS,NS	N.J
01	02/10/99	Cl.4.3 &Cl.12.3 Note added	F.B From GHC. Group	BKD,CCR	NS
02	14/07/03	C1.1.2,4.1,4.3 &12.3 Revised	F.B.(GHC) CE\GHC\2003 STDS\KVBR Dt.10/07/03	HRN	NS
03	17/11/21	Cl.16. Acceptance criteria included. Cl.15.Tests refined	FB FROM QS	Anusri S	R Rukmani

APPROVED:
R Rukmani

PREPARED: Anusri S
ISSUED: ENGG. SERV.
DATE: 17/11/21

SPECIFICATION FOR POWER AND CONTROL TRANSFORMER

1. SCOPE

1.1. This Standard details the specifications for single and polyphase drytype, power and control transformers.

1.2. This Standard shall be read in conjunction with IS:11171 and IS:2026

2. DEFINITIONS

For the purpose of this Standard following definitions shall apply.

2.1 Power transformer: Single phase transformer rated above 1KVA and 3 phase transformer rated above 5KVA shall be designated as power transformer.

2.2 Control transformer : Single phase transformer below 1KVA and 3 phase transformer below 5 KVA shall be designated as control transformer

3. SERVICE CONDITIONS

3.1 Max ambient temp	: 50°C
3.2 Cooling	: Air natural
3.3 Humidity	: 100 percent
3.4 Ventilation	: Restricted as it is mounted inside a cubicle (IP 21)

4. RATING

4.1 KVA Rating:
The rated KVA assigned taking into account the service condition as specified in 3.0

APPROVED:
R Rukmani

PREPARED: Anusri S ISSUED: ENGG. SERV, DATE: 17/11/21

The following shall be the preferred rated KVA
3 Phase Transformers:
0.25,1,1.5,2,2.5,3,4,5,6,7.5,10,12.5,15,20,25,30,35,40,45,
50,55,60,65,75,80,100,135,160,200,250,300,350 & 400 KVA

Single Phase Transformers:
50, 100, 150, 200, 300, 500, 750 VA
1,1.25,1.5,2,3,4,4.5,5,6,7.5,10,12.5,15,20 & 25 KVA

4.2 Rated Voltages :
The rated voltages assigned to the windings of the transformers may be operated at its rated KVA at any voltage within +/-10% of rated voltage.

4.3 No Load Current

SlNo.	Rating	Value
1.	up to 1KV	Less than 20% of Rated current
2.	above 1KVA to less than 5KVA	less than 15% of rated current
3.	above 5KVA to less than 10KVA	less than 10% of rated current
4.	Rating higher than above subject to approval of iron and copper losses by EDN.	

4.4 Rated Frequency
The frequency for the purpose of this standard shall be 50 Hz unless otherwise specified, with a tolerance of +/-3%.

5. TEMPERATURE RISE

The Transformer shall conform to the requirements of Temperature Rise specified in IS:2026 part II.

6. INSULATION LEVELS

The Transformer shall conform to the requirements of insulation Levels Specified in IS:2026 part III.

7. TAPPING

Unless otherwise specified all transformers shall be provided with off load tapings on +/-5% and+/-10% on primary.

8. CONNECTION

For the purpose of this standard the winding connections shall be in accordance with IS:2026 part - IV.

9. IMPEDANCE

Unless otherwise specified transformers shall have the following impedances.

Up to and including 250VA	-	6%
Above 250VA up to and including 150KVA	-	4%
Above 150KVA up to 400 KVA	-	5%

The tolerance for the impedance values shall be +/-10%

10. TERMINAL MARKINGS

For the purpose of this standard the various terminal markings shall be as stated below

10.1 The windings of the transformers shall be denoted by HV & LV. HV refers to high voltage winding and LV refers to low voltage winding.

10.2 Line terminals shall be marked as

For 3 phase transformers
1U, 1V, 1W for HV windings and
2U, 2V, 2W for LV windings

For Single phase Transformers
P1, P2 for HV winding and
S1, S2 for LV winding

The markings shall be started from left hand-side as viewed for HV side.

Neutral Terminal shall be marked as 1N for HV side and 2N for LV side.

10.3 The tapings shall be marked with natural ascending sequence as shown in the figure-1. The tapings shall be through tap selector for all transformers rated above 250VA.

10.4 The rated voltage of the transformer shall be marked by the side of respective terminals.

10.5 Earthing terminals shall be marked with earthing mark ( )

11. TERMINALS

All terminals except Bar type shall be of nickel plated Brass. Bar terminal shall be of pure copper of appropriate grade. Nut & Bolt shall be secured with vibration proof washers. The

appropriate size of the terminals shall be as given in Table-III.

TABLE – III

Type of terminal	Current rating							
	5A	10A	20A	50A	100A	200A	300A	500A
Screw/Stud	M6	M6	M8	M10	M12	-	-	-
Bar	-	-	-	-	-	20X6 1 hole M8	25X6 1 hole M8	40X6 1 hole M12

Note: All the terminals including hardware shall be free from rusting. After tightening the bolt, minimum 3 threads of bolt shall project outside the nut. Adequate clearances between phases shall be ensured and indicated in the drawing. Proper fixing arrangement with insulators shall be provided to ensure same clearances for the entire quantity of a purchase order.

12. FITTINGS

All transformers shall be provided with following fittings

12.1 Rating plate:

Transformers shall be provided with rating plates of weatherproof material. Rating plate shall be fixed along the breadth of the transformer & a provision shall be made to fix it along the length of the adjacent side.

For transformer rated 250VA & below rating plate shall be fixed along the breadth

The rating plate shall be marked legibly with following markings

A. Transformers rated above 250VA
   1) KVA rating
   2) Voltage Ratio
   3) HV/LV Current
   4) Tapings
   5) No. of Phases
   6) Vector grouping
   7) System Frequency
   8) Insulation Level
   9) Insulation Class

10) % Impedance
11) Reference Standard : IS:2026
12) Ambient temperature
13) Weight
14) Sl. No. & Year of manufacture
15) Manufacturer Name

B. Transformers rated below 250VA
1) KVA rating
2) Voltage ratio
3) Phase
4) Connection
5) Insulation class
6) Frequency

12.2 Diagram Plate:

Transformers shall be provided with diagram plate and shall be fixed along the breadth along with rating plate. It shall be legibly marked with a connection diagram.

12.3 Terminal board:

All the terminations of the transformers shall be brought out and fixed on the terminal board which is fixed on the top. The dimensions shall be as specified in corresponding Annexure for 1ph or 3ph transformer.

The material of the terminal board shall be of PRBC sheets (or any other better insulator) insulated and varnished. It shall be designated to take up the required torque. The terminals shall be rigidly fixed on the board with suitable fasteners, with adequate clearance as per table-IV.

Note: 8mm thick perspex cover shall be provided over the terminal board

TABLE -IV CLEARANCE DISTANCES

Rated Voltage	To earth in air (mm)	Between phases in air (mm)
415V	15.8	19.0
600V	19.0	19.0
3300V	50.8	50.8
6600V	63.5	88.9
11KV	76.2	127.0

12.4 Lifting lugs:

Lifting lugs shall be provided for transformers weighing more than 50Kgs. Two lifting lugs shall be provided at two ends diagonally opposite to each other for transformers weighing more than 50 Kgs but below 100 Kgs. For transformers weighing more than 100 Kgs four lifting lugs shall be provided at each end.

12.5 Earthing terminals:

Two earthing terminals shall be provided on all the transformers. The size of the earthing terminals may be less than the rated conductor size.

12.6 Top Supports

4 holes each of 12mm dia shall be drilled on the lower portion of the top frame of transformer, to facilitate rigid fixing to the enclosure. However, this shall be provided for transformers rated 10KVA and above. The details are shown in Fig.2.

Note: 'F' is taken approximately as 75% of 'B'

13. ADDITIONAL INFORMATION

The following are the materials recommended to be used for constructions of transformers

A. Core: CRGO grade 41/51 or any equivalent grade.
B. Winding: Pure copper of appropriate grade and with suitable insulation.
C. Insulation, Varnish etc: Shall be to appropriate class of insulation.

14. DIMENSIONAL DETAILS

All transformers should conform to dimensions specified in corresponding Annexure for 1ph or 3ph transformer. The values mentioned for overall dimensions are maximum values. The values for mounting holes are exact values. The dimensions shall be within tolerance mentioned therein.

15. TESTS

15.1 Following are the tests for power transformers

A. Type tests :
1. Temperature rise test
2. Lightning impulse test

B. Routine tests:
1. Measurement of winding resistance
2. Voltage ratio test
3. Check on vector grouping
4. Measurement of losses : Load & No load loss
5. Induced over voltage test
6. Measurement of short circuit Impedance (% Impedance)
7. High voltage test

15.2 Following are the test for control transformers

A. Type test :
1. Temperature rise test

B. Routine test:
1. Measurement of winding resistance
2. Voltage ratio and polarity check
3. Vector grouping test
4. Measurement of loss: Load & No load loss
5. Induced over voltage test
6. Insulation resistance test.

15.3 The manufacturer shall submit the test certificates for tests on transformers.

16. ACCEPTANCE CRITERIA

16.1 Conducting Routine tests and Submission of reports

16.2 Inspection/Acceptance by BHEL-EDN Quality Services

16.3 Conducting Type tests and Submission of reports (On one transformer)

16.4 Test certificates for major bought out items

17. SUPPLY CONDITIONS

Following information are to be supplied by the supplier

17.1 Iron and copper losses at specified temperature

17.2 Flux density in the core

17.3 Current density of the coil : HV & LV

17.4 Winding resistance

17.5 Supplier shall submit 6 copies of test guarantee certificates along with the materials

17.6 Transformers shall be suitably packed in wooden carters such that no damage is caused during transportation and handling.

Annexure-1

SINGLE PHASE TRANSFORMER

TYPE	KVA	A	B	C	KXE	O	X	Y
ST-1	0.05	100	130	85	80X60	5X10	95	85
ST-02	0.10	120	130	90	80X60	5X10	95	90
ST-03	0.15	120	150	90	95X60	5X10	115	90
ST-04	0.20	120	175	100	95X75	6X12	115	100
ST-05	0.25	120	175	100	95X90	6X12	115	100
ST-06	0.30	120	175	125	95X100	6X12	120	125
ST-07	0.50	150	190	150	125X100	8X15	150	145
ST-08	0.75	200	250	150	150X120	8X15	185	150
ST-09	1.00	200	250	160	160X130	8X15	185	160
ST-10	1.25	200	250	160	160X130	8X15	185	160
ST-11	1.50	280	300	175	160X130	10	200	160
ST-12	2.00	280	300	175	180X130	10	220	160
ST-13	3.00	300	350	200	200X150	10	220	180
ST-14	4.00	320	360	200	240X150	10	220	180
ST-15	4.50	320	400	200	240X170	10	250	200
ST-16	4.50	350	450	200	240X170	10	250	200
ST-17	5.00	350	450	200	240X170	10	250	200
ST-18	6.00	350	475	200	260X170	10	300	200
ST-19	7.50	350	500	240	290X200	10	300	250
ST-20	10.00	400	500	240	290X200	10	300	250
ST-21	12.50	400	600	250	330X200	10	300	250
ST-22	15.00	450	600	250	250X200	10	300	250
ST-23	25.00	500	600	250	400X200	10	300	250

Annexure-2

THREE PHASE TRANSFORMER

TYPE	KVA	A	B	C	KXE	O	X	Y
TT-01	0.25	250	220	150	150X100	10	230	120
TT-02	0.05	280	250	190	200X150	10	250	150
TT-03	1.00	300	280	200	200X150	10	280	160
TT-04	1.50	300	320	200	200X150	10	300	180
TT-05	2.00	320	300	200	200X150	10	300	180
TT-06	2.50	340	350	200	200X150	10	300	180
TT-07	3.00	380	350	200	200X150	10	350	180
TT-08	4.00	400	425	250	250X200	10	350	180
TT-09	5.00	450	425	250	250X200	10	350	200
TT-10	6.00	450	480	250	250X200	10	350	200
TT-11	7.70	450	480	250	250X200	10	350	200
TT-12	10.00	500	525	250	300X200	10	400	250
TT-13	12.50	620	550	250	350X200	10	450	250
TT-14	15.00	620	600	250	350X200	10	450	250
TT-15	20.00	650	600	300	400X250	10	450	250
TT-16	25.00	650	600	300	400X250	10	450	250
TT-17	30.00	700	600	300	400X250	10	450	250
TT-18	35.00	700	600	300	400X250	10	450	250
TT-19	40.00	700	650	300	400X250	10	450	250
TT-20	45.00	700	650	300	400X250	10	450	250
TT-21	50.00	750	650	300	450X250	10	500	300
TT-22	55.00	750	700	300	450X250	10	500	300
TT-23	60.00	750	700	300	450X250	10	500	300
TT-24	65.00	750	800	300	450X250	10	500	300
TT-25	75.00	800	850	300	500X300	10	600	300
TT-26	80.00	800	850	350	500X300	10	600	300
TT-27	100.00	850	900	350	550X300	10	600	300
TT-28	135.00	850	900	400	550X300	10	600	300
TT-29	160.00	1000	1000	400	600X400	10	600	400
TT-30	200.00	1100	1250	450	650X500	12	700	550
TT-31	250.00	1150	1400	600	650X550	12	700	550
TT-32	300.00	1200	1600	600	700X600	12	750	600
TT-33	350.00	1300	1700	650	800X600	12	800	650
TT-34	400.00	1400	1750	750	800X630	12	850	650

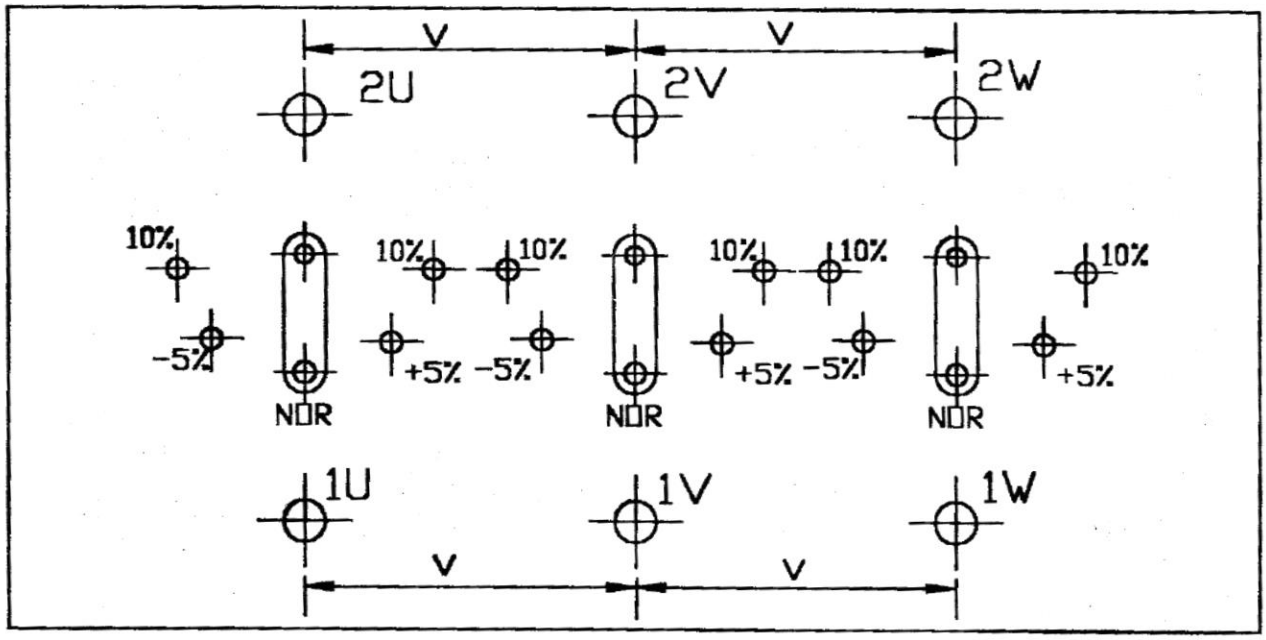
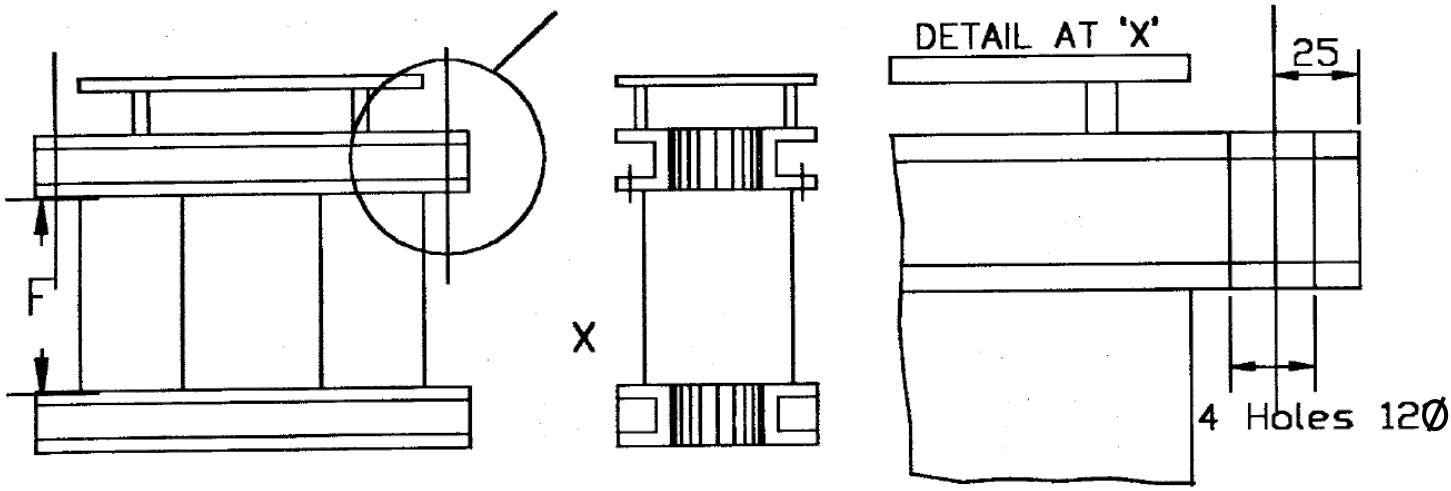


Fig. 1

FIG – 2



Note: 'F' is taken approximately as 75% of B

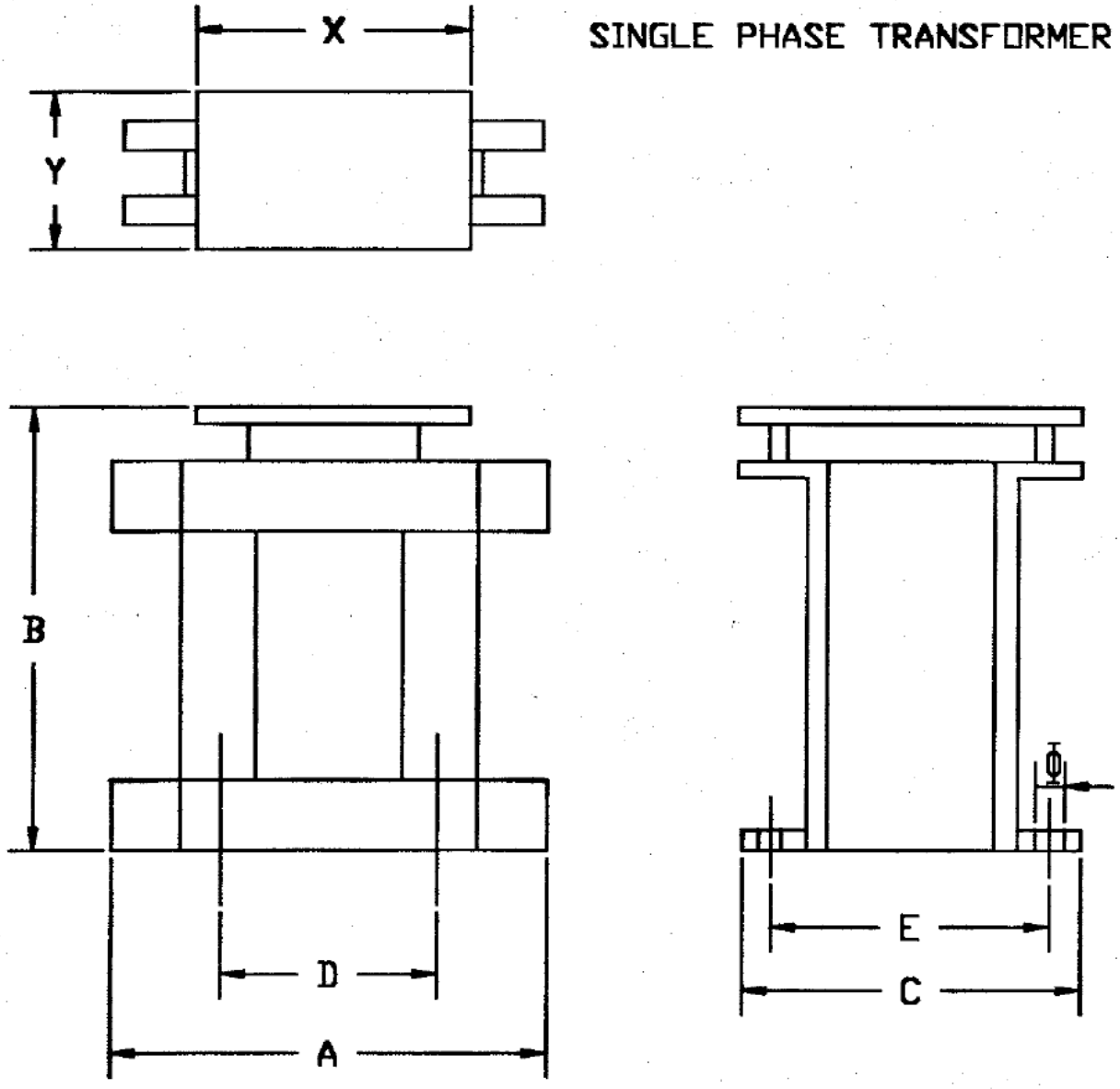


FIG – 3

NOTE: The tolerences for variosus dimensions shall be as per IS:2102 'coarse'

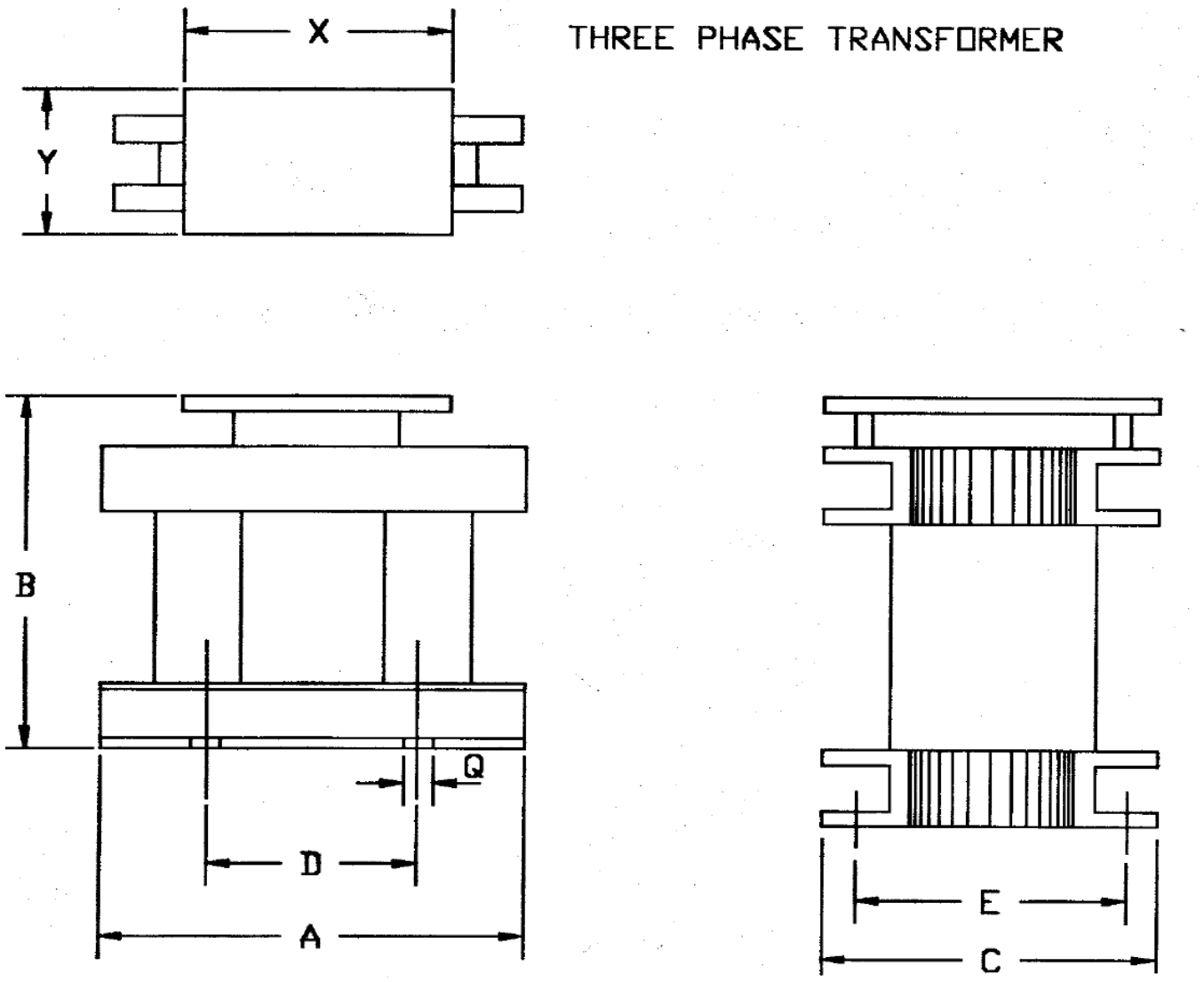


FIG - 4

NOTE: The tolerances for various dimensions shall be as per IS: 2102 'coarse'

PRE-QUALIFICATION CRITERIA FOR SMALL RATING TRANSFORMER

Sl.No.	CRITERIA	DOCUMENT REQUIRED
1.	The bidder should be a manufacturer / supplier of small rating transformers (up to 15KVA) for two years or more.	Self-certification for OEM/OEM authorization for dealers.
2.	The bidder shall fully comply with all the clauses mentioned in the latest revision of specification ED7461195 (Current revision number is REV No..03).	Conformance for complying.
3.	The Bidder shall submit the documents indicated during bidding stage. OR The bidder should have supplied the item to BHEL against an earlier purchase order.	a) At least one end user performance certificate. b) Reference list of customers for dry type transformers. c) Relevant purchase order copies along with invoice and delivery challans. OR If supplier had already supplied transformer to BHEL, then supplier shall provide relevant purchase order details.
4.	On –site service support shall be provided at purchaser's works within 6 working days, if it is observed that the item requires rework /rectification.	Conformance for complying.

Technical specification

TRANSFORMER DRY 5KVA 3PHASE: SA0655870016

TRANSFORMER DRY 5KVA 3PHASE,
50HZ LV: 415V HV: 415V
VECTOR GROUP:YnD11 HV TAP:+/-5%, +/-10%
IMPEDANCE: 4%
INSULATION CLASS:B
INSULATION LEVEL:4KV 50HZ FOR 1 MINUTE
NICKEL PLATED BRASS STUD TERMINALS,
TRANSPARENT POLY CARBONATE SHEET
8MM THICK OVER TERMINAL BOARD,
EARTHED SCREEN BETWEEN
HV & LV WINDINGS TO BE PROVIDED
IS 2026, IS 11171

REVISION HISTORY SHEET

REV NO	DATE	NATURE OF CHANGE	REASONS	PREPARED BY	APPROVED BY
00	23/07/96	SUPERSEDES CN74500S	-	BS,NS	N.J
01	02/10/99	Cl.4.3 &Cl.12.3 Note added	F.B From GHC. Group	BKD,CCR	NS
02	14/07/03	C1.1.2,4.1,4.3 &12.3 Revised	F.B.(GHC) CE\GHC\2003 STDS\KVBR Dt.10/07/03	HRN	NS
03	17/11/21	Cl.16. Acceptance criteria included. Cl.15.Tests refined	FB FROM QS	Anusri S	R Rukmani

APPROVED:
R Rukmani

PREPARED: Anusri S
ISSUED: ENGG. SERV.
DATE: 17/11/21

SPECIFICATION FOR POWER AND CONTROL TRANSFORMER

1. SCOPE

1.1. This Standard details the specifications for single and polyphase drytype, power and control transformers.

1.2. This Standard shall be read in conjunction with IS:11171 and IS:2026

2. DEFINITIONS

For the purpose of this Standard following definitions shall apply.

2.1 Power transformer: Single phase transformer rated above 1KVA and 3 phase transformer rated above 5KVA shall be designated as power transformer.

2.2 Control transformer : Single phase transformer below 1KVA and 3 phase transformer below 5 KVA shall be designated as control transformer

3. SERVICE CONDITIONS

3.1 Max ambient temp	: 50°C
3.2 Cooling	: Air natural
3.3 Humidity	: 100 percent
3.4 Ventilation	: Restricted as it is mounted inside a cubicle (IP 21)

4. RATING

4.1 KVA Rating:
The rated KVA assigned taking into account the service condition as specified in 3.0

APPROVED:
R Rukmani

PREPARED: Anusri S ISSUED: ENGG. SERV, DATE: 17/11/21

The following shall be the preferred rated KVA
3 Phase Transformers:
0.25,1,1.5,2,2.5,3,4,5,6,7.5,10,12.5,15,20,25,30,35,40,45,
50,55,60,65,75,80,100,135,160,200,250,300,350 & 400 KVA

Single Phase Transformers:
50, 100, 150, 200, 300, 500, 750 VA
1,1.25,1.5,2,3,4,4.5,5,6,7.5,10,12.5,15,20 & 25 KVA

4.2 Rated Voltages :
The rated voltages assigned to the windings of the transformers may be operated at its rated KVA at any voltage within +/-10% of rated voltage.

4.3 No Load Current

SlNo.	Rating	Value
1.	up to 1KV	Less than 20% of Rated current
2.	above 1KVA to less than 5KVA	less than 15% of rated current
3.	above 5KVA to less than 10KVA	less than 10% of rated current
4.	Rating higher than above subject to approval of iron and copper losses by EDN.	

4.4 Rated Frequency
The frequency for the purpose of this standard shall be 50 Hz unless otherwise specified, with a tolerance of +/-3%.

5. TEMPERATURE RISE

The Transformer shall conform to the requirements of Temperature Rise specified in IS:2026 part II.

6. INSULATION LEVELS

The Transformer shall conform to the requirements of insulation Levels Specified in IS:2026 part III.

7. TAPPING

Unless otherwise specified all transformers shall be provided with off load tapings on +/-5% and+/-10% on primary.

8. CONNECTION

For the purpose of this standard the winding connections shall be in accordance with IS:2026 part - IV.

9. IMPEDANCE

Unless otherwise specified transformers shall have the following impedances.

Up to and including 250VA	-	6%
Above 250VA up to and including 150KVA	-	4%
Above 150KVA up to 400 KVA	-	5%

The tolerance for the impedance values shall be +/-10%

10. TERMINAL MARKINGS

For the purpose of this standard the various terminal markings shall be as stated below

10.1 The windings of the transformers shall be denoted by HV & LV. HV refers to high voltage winding and LV refers to low voltage winding.

10.2 Line terminals shall be marked as

For 3 phase transformers
1U, 1V, 1W for HV windings and
2U, 2V, 2W for LV windings

For Single phase Transformers
P1, P2 for HV winding and
S1, S2 for LV winding

The markings shall be started from left hand-side as viewed for HV side.

Neutral Terminal shall be marked as 1N for HV side and 2N for LV side.

10.3 The tapings shall be marked with natural ascending sequence as shown in the figure-1. The tapings shall be through tap selector for all transformers rated above 250VA.

10.4 The rated voltage of the transformer shall be marked by the side of respective terminals.

10.5 Earthing terminals shall be marked with earthing mark ( )

11. TERMINALS

All terminals except Bar type shall be of nickel plated Brass. Bar terminal shall be of pure copper of appropriate grade. Nut & Bolt shall be secured with vibration proof washers. The

appropriate size of the terminals shall be as given in Table-III.

TABLE – III

Type of terminal	Current rating							
	5A	10A	20A	50A	100A	200A	300A	500A
Screw/Stud	M6	M6	M8	M10	M12	-	-	-
Bar	-	-	-	-	-	20X6 1 hole M8	25X6 1 hole M8	40X6 1 hole M12

Note: All the terminals including hardware shall be free from rusting. After tightening the bolt, minimum 3 threads of bolt shall project outside the nut. Adequate clearances between phases shall be ensured and indicated in the drawing. Proper fixing arrangement with insulators shall be provided to ensure same clearances for the entire quantity of a purchase order.

12. FITTINGS

All transformers shall be provided with following fittings

12.1 Rating plate:

Transformers shall be provided with rating plates of weatherproof material. Rating plate shall be fixed along the breadth of the transformer & a provision shall be made to fix it along the length of the adjacent side.

For transformer rated 250VA & below rating plate shall be fixed along the breadth

The rating plate shall be marked legibly with following markings

A. Transformers rated above 250VA
   1) KVA rating
   2) Voltage Ratio
   3) HV/LV Current
   4) Tapings
   5) No. of Phases
   6) Vector grouping
   7) System Frequency
   8) Insulation Level
   9) Insulation Class

10) % Impedance
11) Reference Standard : IS:2026
12) Ambient temperature
13) Weight
14) Sl. No. & Year of manufacture
15) Manufacturer Name

B. Transformers rated below 250VA
1) KVA rating
2) Voltage ratio
3) Phase
4) Connection
5) Insulation class
6) Frequency

12.2 Diagram Plate:

Transformers shall be provided with diagram plate and shall be fixed along the breadth along with rating plate. It shall be legibly marked with a connection diagram.

12.3 Terminal board:

All the terminations of the transformers shall be brought out and fixed on the terminal board which is fixed on the top. The dimensions shall be as specified in corresponding Annexure for 1ph or 3ph transformer.

The material of the terminal board shall be of PRBC sheets (or any other better insulator) insulated and varnished. It shall be designated to take up the required torque. The terminals shall be rigidly fixed on the board with suitable fasteners, with adequate clearance as per table-IV.

Note: 8mm thick perspex cover shall be provided over the terminal board

TABLE -IV CLEARANCE DISTANCES

Rated Voltage	To earth in air (mm)	Between phases in air (mm)
415V	15.8	19.0
600V	19.0	19.0
3300V	50.8	50.8
6600V	63.5	88.9
11KV	76.2	127.0

12.4 Lifting lugs:

Lifting lugs shall be provided for transformers weighing more than 50Kgs. Two lifting lugs shall be provided at two ends diagonally opposite to each other for transformers weighing more than 50 Kgs but below 100 Kgs. For transformers weighing more than 100 Kgs four lifting lugs shall be provided at each end.

12.5 Earthing terminals:

Two earthing terminals shall be provided on all the transformers. The size of the earthing terminals may be less than the rated conductor size.

12.6 Top Supports

4 holes each of 12mm dia shall be drilled on the lower portion of the top frame of transformer, to facilitate rigid fixing to the enclosure. However, this shall be provided for transformers rated 10KVA and above. The details are shown in Fig.2.

Note: 'F' is taken approximately as 75% of 'B'

13. ADDITIONAL INFORMATION

The following are the materials recommended to be used for constructions of transformers

A. Core: CRGO grade 41/51 or any equivalent grade.
B. Winding: Pure copper of appropriate grade and with suitable insulation.
C. Insulation, Varnish etc: Shall be to appropriate class of insulation.

14. DIMENSIONAL DETAILS

All transformers should conform to dimensions specified in corresponding Annexure for 1ph or 3ph transformer. The values mentioned for overall dimensions are maximum values. The values for mounting holes are exact values. The dimensions shall be within tolerance mentioned therein.

15. TESTS

15.1 Following are the tests for power transformers

A. Type tests :
1. Temperature rise test
2. Lightning impulse test

B. Routine tests:
1. Measurement of winding resistance
2. Voltage ratio test
3. Check on vector grouping
4. Measurement of losses : Load & No load loss
5. Induced over voltage test
6. Measurement of short circuit Impedance (% Impedance)
7. High voltage test

15.2 Following are the test for control transformers

A. Type test :
1. Temperature rise test

B. Routine test:
1. Measurement of winding resistance
2. Voltage ratio and polarity check
3. Vector grouping test
4. Measurement of loss: Load & No load loss
5. Induced over voltage test
6. Insulation resistance test.

15.3 The manufacturer shall submit the test certificates for tests on transformers.

16. ACCEPTANCE CRITERIA

16.1 Conducting Routine tests and Submission of reports

16.2 Inspection/Acceptance by BHEL-EDN Quality Services

16.3 Conducting Type tests and Submission of reports (On one transformer)

16.4 Test certificates for major bought out items

17. SUPPLY CONDITIONS

Following information are to be supplied by the supplier

17.1 Iron and copper losses at specified temperature

17.2 Flux density in the core

17.3 Current density of the coil : HV & LV

17.4 Winding resistance

17.5 Supplier shall submit 6 copies of test guarantee certificates along with the materials

17.6 Transformers shall be suitably packed in wooden carters such that no damage is caused during transportation and handling.

Annexure-1

SINGLE PHASE TRANSFORMER

TYPE	KVA	A	B	C	KXE	O	X	Y
ST-1	0.05	100	130	85	80X60	5X10	95	85
ST-02	0.10	120	130	90	80X60	5X10	95	90
ST-03	0.15	120	150	90	95X60	5X10	115	90
ST-04	0.20	120	175	100	95X75	6X12	115	100
ST-05	0.25	120	175	100	95X90	6X12	115	100
ST-06	0.30	120	175	125	95X100	6X12	120	125
ST-07	0.50	150	190	150	125X100	8X15	150	145
ST-08	0.75	200	250	150	150X120	8X15	185	150
ST-09	1.00	200	250	160	160X130	8X15	185	160
ST-10	1.25	200	250	160	160X130	8X15	185	160
ST-11	1.50	280	300	175	160X130	10	200	160
ST-12	2.00	280	300	175	180X130	10	220	160
ST-13	3.00	300	350	200	200X150	10	220	180
ST-14	4.00	320	360	200	240X150	10	220	180
ST-15	4.50	320	400	200	240X170	10	250	200
ST-16	4.50	350	450	200	240X170	10	250	200
ST-17	5.00	350	450	200	240X170	10	250	200
ST-18	6.00	350	475	200	260X170	10	300	200
ST-19	7.50	350	500	240	290X200	10	300	250
ST-20	10.00	400	500	240	290X200	10	300	250
ST-21	12.50	400	600	250	330X200	10	300	250
ST-22	15.00	450	600	250	250X200	10	300	250
ST-23	25.00	500	600	250	400X200	10	300	250

Annexure-2

THREE PHASE TRANSFORMER

TYPE	KVA	A	B	C	KXE	O	X	Y
TT-01	0.25	250	220	150	150X100	10	230	120
TT-02	0.05	280	250	190	200X150	10	250	150
TT-03	1.00	300	280	200	200X150	10	280	160
TT-04	1.50	300	320	200	200X150	10	300	180
TT-05	2.00	320	300	200	200X150	10	300	180
TT-06	2.50	340	350	200	200X150	10	300	180
TT-07	3.00	380	350	200	200X150	10	350	180
TT-08	4.00	400	425	250	250X200	10	350	180
TT-09	5.00	450	425	250	250X200	10	350	200
TT-10	6.00	450	480	250	250X200	10	350	200
TT-11	7.70	450	480	250	250X200	10	350	200
TT-12	10.00	500	525	250	300X200	10	400	250
TT-13	12.50	620	550	250	350X200	10	450	250
TT-14	15.00	620	600	250	350X200	10	450	250
TT-15	20.00	650	600	300	400X250	10	450	250
TT-16	25.00	650	600	300	400X250	10	450	250
TT-17	30.00	700	600	300	400X250	10	450	250
TT-18	35.00	700	600	300	400X250	10	450	250
TT-19	40.00	700	650	300	400X250	10	450	250
TT-20	45.00	700	650	300	400X250	10	450	250
TT-21	50.00	750	650	300	450X250	10	500	300
TT-22	55.00	750	700	300	450X250	10	500	300
TT-23	60.00	750	700	300	450X250	10	500	300
TT-24	65.00	750	800	300	450X250	10	500	300
TT-25	75.00	800	850	300	500X300	10	600	300
TT-26	80.00	800	850	350	500X300	10	600	300
TT-27	100.00	850	900	350	550X300	10	600	300
TT-28	135.00	850	900	400	550X300	10	600	300
TT-29	160.00	1000	1000	400	600X400	10	600	400
TT-30	200.00	1100	1250	450	650X500	12	700	550
TT-31	250.00	1150	1400	600	650X550	12	700	550
TT-32	300.00	1200	1600	600	700X600	12	750	600
TT-33	350.00	1300	1700	650	800X600	12	800	650
TT-34	400.00	1400	1750	750	800X630	12	850	650

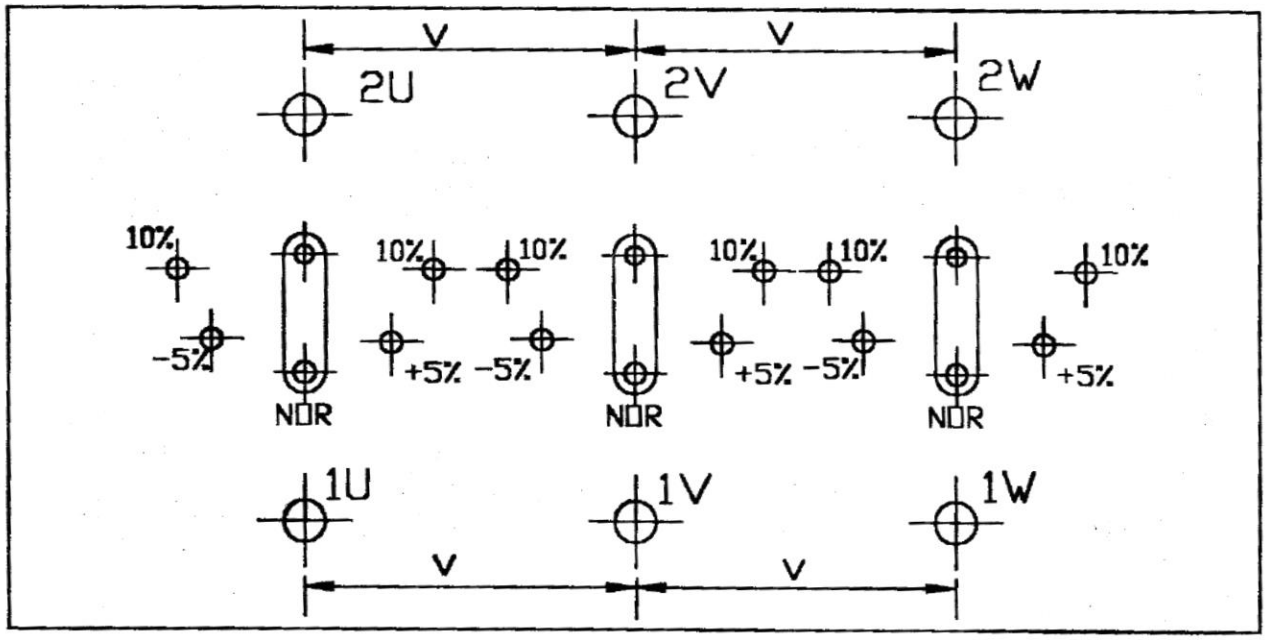
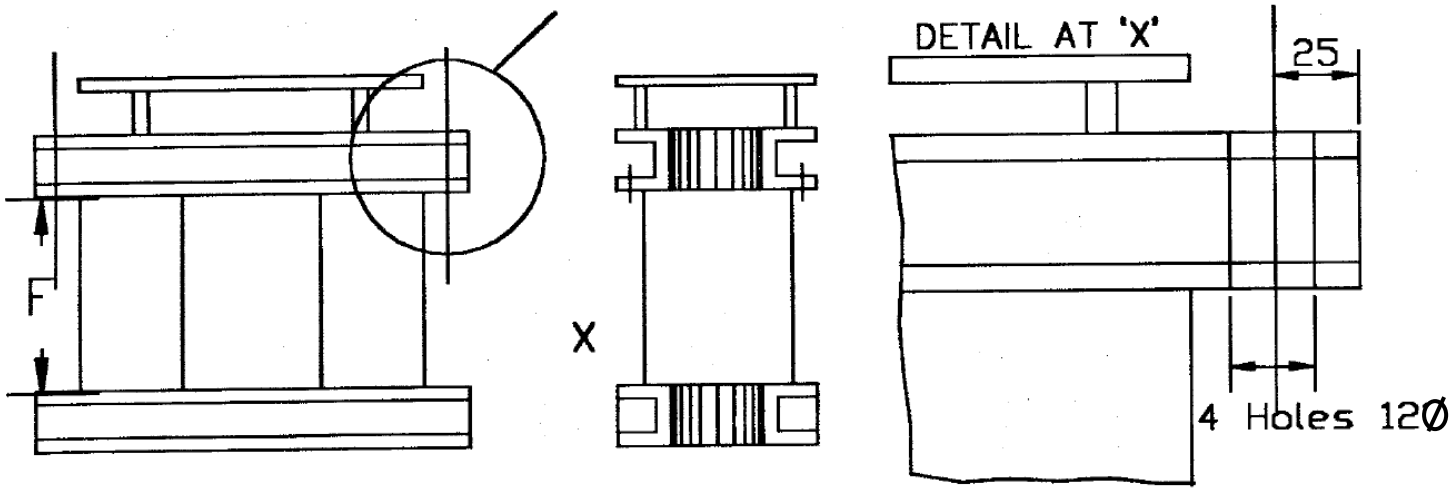


Fig. 1

FIG – 2



Note: 'F' is taken approximately as 75% of B

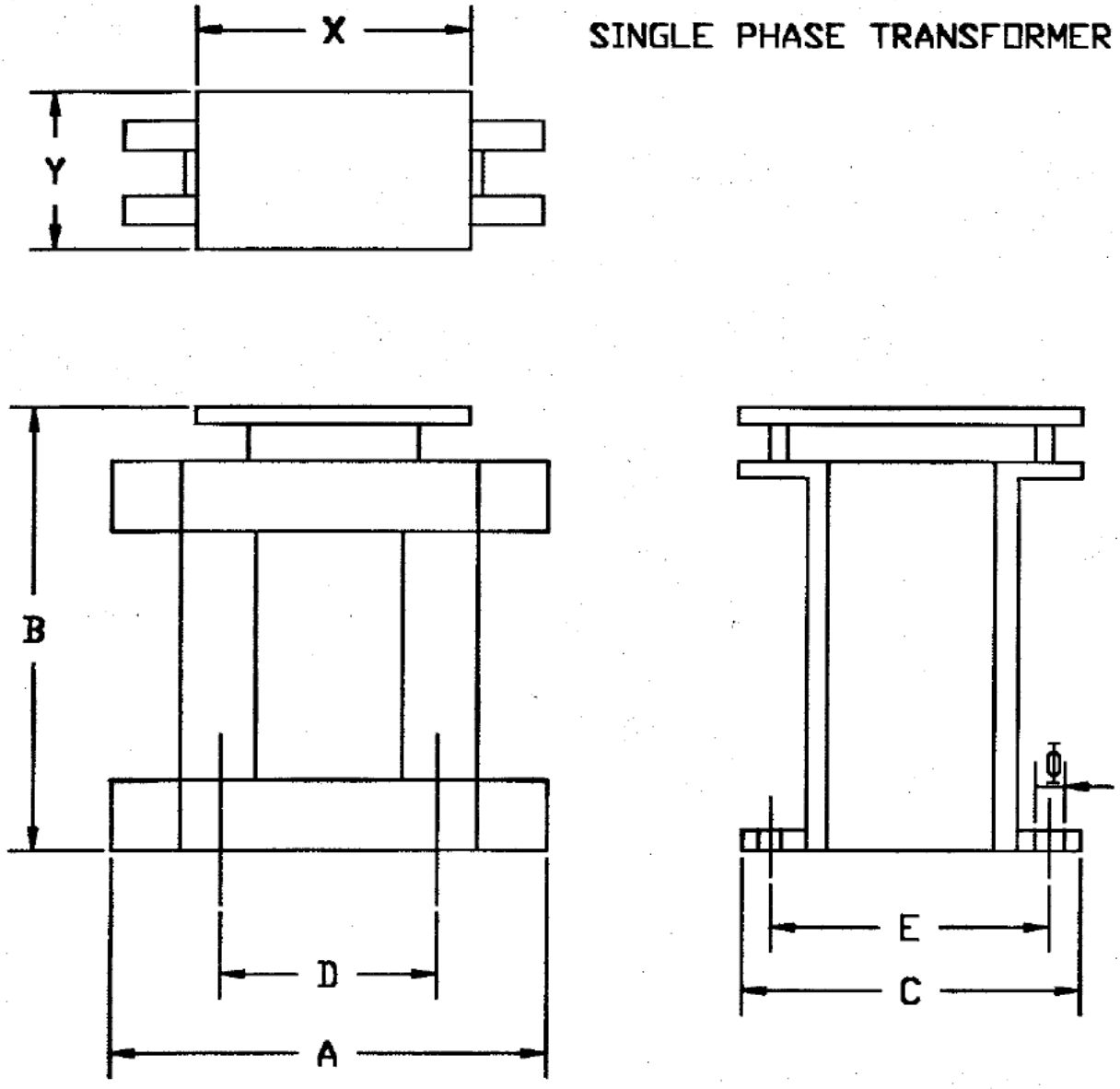


FIG – 3

NOTE: The tolerences for variosus dimensions shall be as per IS:2102 'coarse'

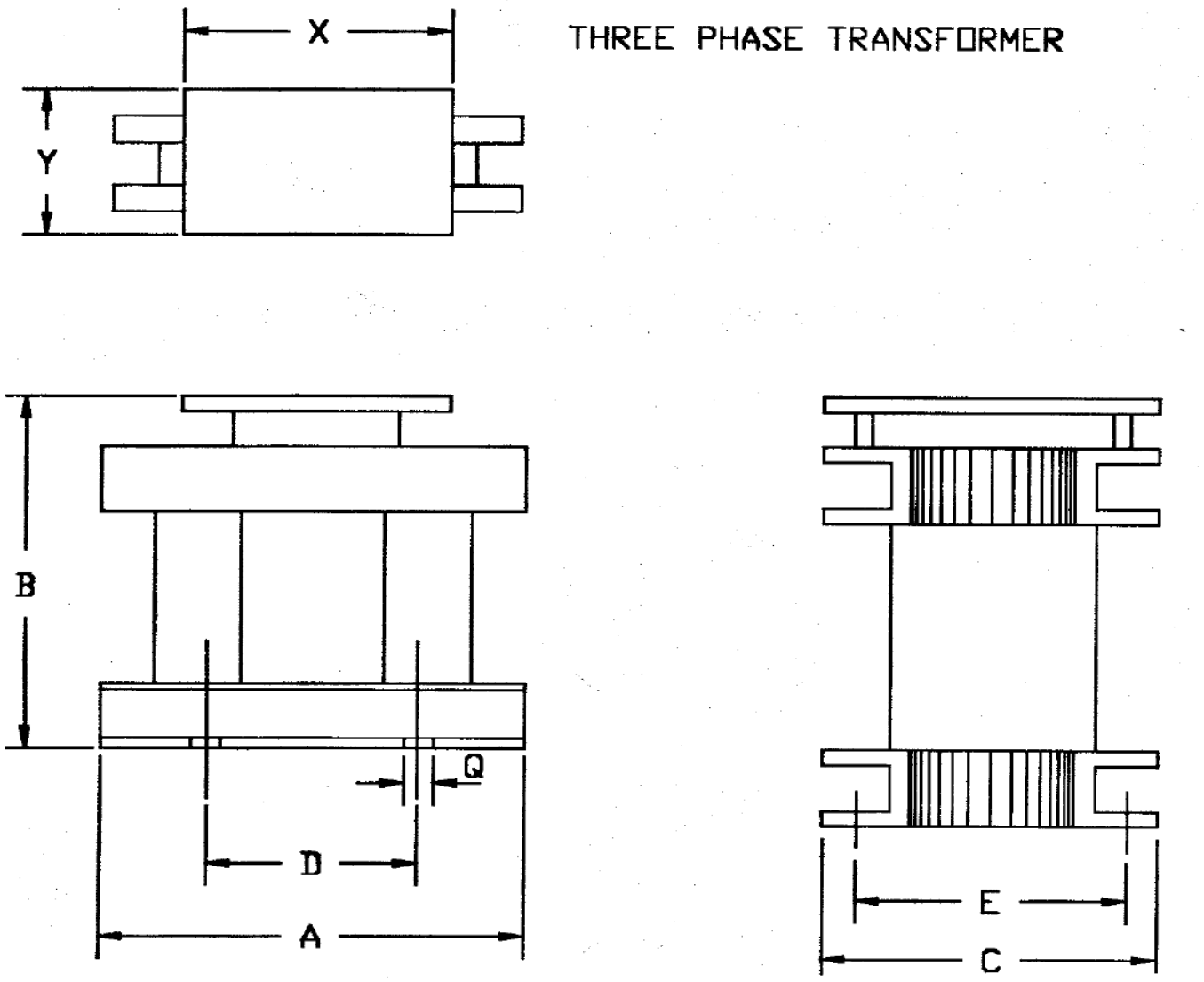


FIG - 4

NOTE: The tolerances for various dimensions shall be as per IS: 2102 'coarse'

PRE-QUALIFICATION CRITERIA FOR SMALL RATING TRANSFORMER

Sl.No.	CRITERIA	DOCUMENT REQUIRED
1.	The bidder should be a manufacturer / supplier of small rating transformers (up to 15KVA) for two years or more.	Self-certification for OEM/OEM authorization for dealers.
2.	The bidder shall fully comply with all the clauses mentioned in the latest revision of specification ED7461195 (Current revision number is REV No..03).	Conformance for complying.
3.	The Bidder shall submit the documents indicated during bidding stage. OR The bidder should have supplied the item to BHEL against an earlier purchase order.	a) At least one end user performance certificate. b) Reference list of customers for dry type transformers. c) Relevant purchase order copies along with invoice and delivery challans. OR If supplier had already supplied transformer to BHEL, then supplier shall provide relevant purchase order details.
4.	On –site service support shall be provided at purchaser's works within 6 working days, if it is observed that the item requires rework /rectification.	Conformance for complying.

Technical specification

TRFMR 5KVA 3PH YNYNO 220/415V: SA0655940278

TRANSFORMER PWR DRY
RATING : 5KVA
3 PHASE, 50 HZ,YNYN0
HV : 415 V
LV : 22O V
TAP ON HV : +/-5%
+/-10%
IMPEDENCE : 4%
INS. CLASS : B
INS. LEVEL : 4 KV
50HZ FOR 1 MIN.
NICKEL PLATED BRASS
STUD TERMINALS
PERSPEX SHEET OF 8MM
THICKNESS OVER
TERMINAL BOARD.
SCREEN BETWEEN HV & LV TO BE PROVIDED.
NO LOAD CURRENT LESS
THAN 15% OF RATED
CURRENT.

REF.STANDARD: IS 2026
IS 11171 AND
ED7461195

REVISION HISTORY SHEET

REV NO	DATE	NATURE OF CHANGE	REASONS	PREPARED BY	APPROVED BY
00	23/07/96	SUPERSEDES CN74500S	-	BS,NS	N.J
01	02/10/99	Cl.4.3 &Cl.12.3 Note added	F.B From GHC. Group	BKD,CCR	NS
02	14/07/03	C1.1.2,4.1,4.3 &12.3 Revised	F.B.(GHC) CE\GHC\2003 STDS\KVBR Dt.10/07/03	HRN	NS
03	17/11/21	Cl.16. Acceptance criteria included. Cl.15.Tests refined	FB FROM QS	Anusri S	R Rukmani

APPROVED:
R Rukmani

PREPARED: Anusri S
ISSUED: ENGG. SERV.
DATE: 17/11/21

SPECIFICATION FOR POWER AND CONTROL TRANSFORMER

1. SCOPE

1.1. This Standard details the specifications for single and polyphase drytype, power and control transformers.

1.2. This Standard shall be read in conjunction with IS:11171 and IS:2026

2. DEFINITIONS

For the purpose of this Standard following definitions shall apply.

2.1 Power transformer: Single phase transformer rated above 1KVA and 3 phase transformer rated above 5KVA shall be designated as power transformer.

2.2 Control transformer : Single phase transformer below 1KVA and 3 phase transformer below 5 KVA shall be designated as control transformer

3. SERVICE CONDITIONS

3.1 Max ambient temp	: 50°C
3.2 Cooling	: Air natural
3.3 Humidity	: 100 percent
3.4 Ventilation	: Restricted as it is mounted inside a cubicle (IP 21)

4. RATING

4.1 KVA Rating:
The rated KVA assigned taking into account the service condition as specified in 3.0

APPROVED:
R Rukmani

PREPARED: Anusri S ISSUED: ENGG. SERV, DATE: 17/11/21

The following shall be the preferred rated KVA
3 Phase Transformers:
0.25,1,1.5,2,2.5,3,4,5,6,7.5,10,12.5,15,20,25,30,35,40,45,
50,55,60,65,75,80,100,135,160,200,250,300,350 & 400 KVA

Single Phase Transformers:
50, 100, 150, 200, 300, 500, 750 VA
1,1.25,1.5,2,3,4,4.5,5,6,7.5,10,12.5,15,20 & 25 KVA

4.2 Rated Voltages :
The rated voltages assigned to the windings of the transformers may be operated at its rated KVA at any voltage within +/-10% of rated voltage.

4.3 No Load Current

SlNo.	Rating	Value
1.	up to 1KV	Less than 20% of Rated current
2.	above 1KVA to less than 5KVA	less than 15% of rated current
3.	above 5KVA to less than 10KVA	less than 10% of rated current
4.	Rating higher than above subject to approval of iron and copper losses by EDN.	

4.4 Rated Frequency
The frequency for the purpose of this standard shall be 50 Hz unless otherwise specified, with a tolerance of +/-3%.

5. TEMPERATURE RISE

The Transformer shall conform to the requirements of Temperature Rise specified in IS:2026 part II.

6. INSULATION LEVELS

The Transformer shall conform to the requirements of insulation Levels Specified in IS:2026 part III.

7. TAPPING

Unless otherwise specified all transformers shall be provided with off load tapings on +/-5% and+/-10% on primary.

8. CONNECTION

For the purpose of this standard the winding connections shall be in accordance with IS:2026 part - IV.

9. IMPEDANCE

Unless otherwise specified transformers shall have the following impedances.

Up to and including 250VA	-	6%
Above 250VA up to and including 150KVA	-	4%
Above 150KVA up to 400 KVA	-	5%

The tolerance for the impedance values shall be +/-10%

10. TERMINAL MARKINGS

For the purpose of this standard the various terminal markings shall be as stated below

10.1 The windings of the transformers shall be denoted by HV & LV. HV refers to high voltage winding and LV refers to low voltage winding.

10.2 Line terminals shall be marked as

For 3 phase transformers
1U, 1V, 1W for HV windings and
2U, 2V, 2W for LV windings

For Single phase Transformers
P1, P2 for HV winding and
S1, S2 for LV winding

The markings shall be started from left hand-side as viewed for HV side.

Neutral Terminal shall be marked as 1N for HV side and 2N for LV side.

10.3 The tapings shall be marked with natural ascending sequence as shown in the figure-1. The tapings shall be through tap selector for all transformers rated above 250VA.

10.4 The rated voltage of the transformer shall be marked by the side of respective terminals.

10.5 Earthing terminals shall be marked with earthing mark ( )

11. TERMINALS

All terminals except Bar type shall be of nickel plated Brass. Bar terminal shall be of pure copper of appropriate grade. Nut & Bolt shall be secured with vibration proof washers. The

appropriate size of the terminals shall be as given in Table-III.

TABLE – III

Type of terminal	Current rating							
	5A	10A	20A	50A	100A	200A	300A	500A
Screw/Stud	M6	M6	M8	M10	M12	-	-	-
Bar	-	-	-	-	-	20X6 1 hole M8	25X6 1 hole M8	40X6 1 hole M12

Note: All the terminals including hardware shall be free from rusting. After tightening the bolt, minimum 3 threads of bolt shall project outside the nut. Adequate clearances between phases shall be ensured and indicated in the drawing. Proper fixing arrangement with insulators shall be provided to ensure same clearances for the entire quantity of a purchase order.

12. FITTINGS

All transformers shall be provided with following fittings

12.1 Rating plate:

Transformers shall be provided with rating plates of weatherproof material. Rating plate shall be fixed along the breadth of the transformer & a provision shall be made to fix it along the length of the adjacent side.

For transformer rated 250VA & below rating plate shall be fixed along the breadth

The rating plate shall be marked legibly with following markings

A. Transformers rated above 250VA
   1) KVA rating
   2) Voltage Ratio
   3) HV/LV Current
   4) Tapings
   5) No. of Phases
   6) Vector grouping
   7) System Frequency
   8) Insulation Level
   9) Insulation Class

10) % Impedance
11) Reference Standard : IS:2026
12) Ambient temperature
13) Weight
14) Sl. No. & Year of manufacture
15) Manufacturer Name

B. Transformers rated below 250VA
1) KVA rating
2) Voltage ratio
3) Phase
4) Connection
5) Insulation class
6) Frequency

12.2 Diagram Plate:

Transformers shall be provided with diagram plate and shall be fixed along the breadth along with rating plate. It shall be legibly marked with a connection diagram.

12.3 Terminal board:

All the terminations of the transformers shall be brought out and fixed on the terminal board which is fixed on the top. The dimensions shall be as specified in corresponding Annexure for 1ph or 3ph transformer.

The material of the terminal board shall be of PRBC sheets (or any other better insulator) insulated and varnished. It shall be designated to take up the required torque. The terminals shall be rigidly fixed on the board with suitable fasteners, with adequate clearance as per table-IV.

Note: 8mm thick perspex cover shall be provided over the terminal board

TABLE -IV CLEARANCE DISTANCES

Rated Voltage	To earth in air (mm)	Between phases in air (mm)
415V	15.8	19.0
600V	19.0	19.0
3300V	50.8	50.8
6600V	63.5	88.9
11KV	76.2	127.0

12.4 Lifting lugs:

Lifting lugs shall be provided for transformers weighing more than 50Kgs. Two lifting lugs shall be provided at two ends diagonally opposite to each other for transformers weighing more than 50 Kgs but below 100 Kgs. For transformers weighing more than 100 Kgs four lifting lugs shall be provided at each end.

12.5 Earthing terminals:

Two earthing terminals shall be provided on all the transformers. The size of the earthing terminals may be less than the rated conductor size.

12.6 Top Supports

4 holes each of 12mm dia shall be drilled on the lower portion of the top frame of transformer, to facilitate rigid fixing to the enclosure. However, this shall be provided for transformers rated 10KVA and above. The details are shown in Fig.2.

Note: 'F' is taken approximately as 75% of 'B'

13. ADDITIONAL INFORMATION

The following are the materials recommended to be used for constructions of transformers

A. Core: CRGO grade 41/51 or any equivalent grade.
B. Winding: Pure copper of appropriate grade and with suitable insulation.
C. Insulation, Varnish etc: Shall be to appropriate class of insulation.

14. DIMENSIONAL DETAILS

All transformers should conform to dimensions specified in corresponding Annexure for 1ph or 3ph transformer. The values mentioned for overall dimensions are maximum values. The values for mounting holes are exact values. The dimensions shall be within tolerance mentioned therein.

15. TESTS

15.1 Following are the tests for power transformers

A. Type tests :
1. Temperature rise test
2. Lightning impulse test

B. Routine tests:
1. Measurement of winding resistance
2. Voltage ratio test
3. Check on vector grouping
4. Measurement of losses : Load & No load loss
5. Induced over voltage test
6. Measurement of short circuit Impedance (% Impedance)
7. High voltage test

15.2 Following are the test for control transformers

A. Type test :
1. Temperature rise test

B. Routine test:
1. Measurement of winding resistance
2. Voltage ratio and polarity check
3. Vector grouping test
4. Measurement of loss: Load & No load loss
5. Induced over voltage test
6. Insulation resistance test.

15.3 The manufacturer shall submit the test certificates for tests on transformers.

16. ACCEPTANCE CRITERIA

16.1 Conducting Routine tests and Submission of reports

16.2 Inspection/Acceptance by BHEL-EDN Quality Services

16.3 Conducting Type tests and Submission of reports (On one transformer)

16.4 Test certificates for major bought out items

17. SUPPLY CONDITIONS

Following information are to be supplied by the supplier

17.1 Iron and copper losses at specified temperature

17.2 Flux density in the core

17.3 Current density of the coil : HV & LV

17.4 Winding resistance

17.5 Supplier shall submit 6 copies of test guarantee certificates along with the materials

17.6 Transformers shall be suitably packed in wooden carters such that no damage is caused during transportation and handling.

Annexure-1

SINGLE PHASE TRANSFORMER

TYPE	KVA	A	B	C	KXE	O	X	Y
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ST-02	0.10	120	130	90	80X60	5X10	95	90
ST-03	0.15	120	150	90	95X60	5X10	115	90
ST-04	0.20	120	175	100	95X75	6X12	115	100
ST-05	0.25	120	175	100	95X90	6X12	115	100
ST-06	0.30	120	175	125	95X100	6X12	120	125
ST-07	0.50	150	190	150	125X100	8X15	150	145
ST-08	0.75	200	250	150	150X120	8X15	185	150
ST-09	1.00	200	250	160	160X130	8X15	185	160
ST-10	1.25	200	250	160	160X130	8X15	185	160
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ST-12	2.00	280	300	175	180X130	10	220	160
ST-13	3.00	300	350	200	200X150	10	220	180
ST-14	4.00	320	360	200	240X150	10	220	180
ST-15	4.50	320	400	200	240X170	10	250	200
ST-16	4.50	350	450	200	240X170	10	250	200
ST-17	5.00	350	450	200	240X170	10	250	200
ST-18	6.00	350	475	200	260X170	10	300	200
ST-19	7.50	350	500	240	290X200	10	300	250
ST-20	10.00	400	500	240	290X200	10	300	250
ST-21	12.50	400	600	250	330X200	10	300	250
ST-22	15.00	450	600	250	250X200	10	300	250
ST-23	25.00	500	600	250	400X200	10	300	250

Annexure-2

THREE PHASE TRANSFORMER

TYPE	KVA	A	B	C	KXE	O	X	Y
TT-01	0.25	250	220	150	150X100	10	230	120
TT-02	0.05	280	250	190	200X150	10	250	150
TT-03	1.00	300	280	200	200X150	10	280	160
TT-04	1.50	300	320	200	200X150	10	300	180
TT-05	2.00	320	300	200	200X150	10	300	180
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TT-11	7.70	450	480	250	250X200	10	350	200
TT-12	10.00	500	525	250	300X200	10	400	250
TT-13	12.50	620	550	250	350X200	10	450	250
TT-14	15.00	620	600	250	350X200	10	450	250
TT-15	20.00	650	600	300	400X250	10	450	250
TT-16	25.00	650	600	300	400X250	10	450	250
TT-17	30.00	700	600	300	400X250	10	450	250
TT-18	35.00	700	600	300	400X250	10	450	250
TT-19	40.00	700	650	300	400X250	10	450	250
TT-20	45.00	700	650	300	400X250	10	450	250
TT-21	50.00	750	650	300	450X250	10	500	300
TT-22	55.00	750	700	300	450X250	10	500	300
TT-23	60.00	750	700	300	450X250	10	500	300
TT-24	65.00	750	800	300	450X250	10	500	300
TT-25	75.00	800	850	300	500X300	10	600	300
TT-26	80.00	800	850	350	500X300	10	600	300
TT-27	100.00	850	900	350	550X300	10	600	300
TT-28	135.00	850	900	400	550X300	10	600	300
TT-29	160.00	1000	1000	400	600X400	10	600	400
TT-30	200.00	1100	1250	450	650X500	12	700	550
TT-31	250.00	1150	1400	600	650X550	12	700	550
TT-32	300.00	1200	1600	600	700X600	12	750	600
TT-33	350.00	1300	1700	650	800X600	12	800	650
TT-34	400.00	1400	1750	750	800X630	12	850	650

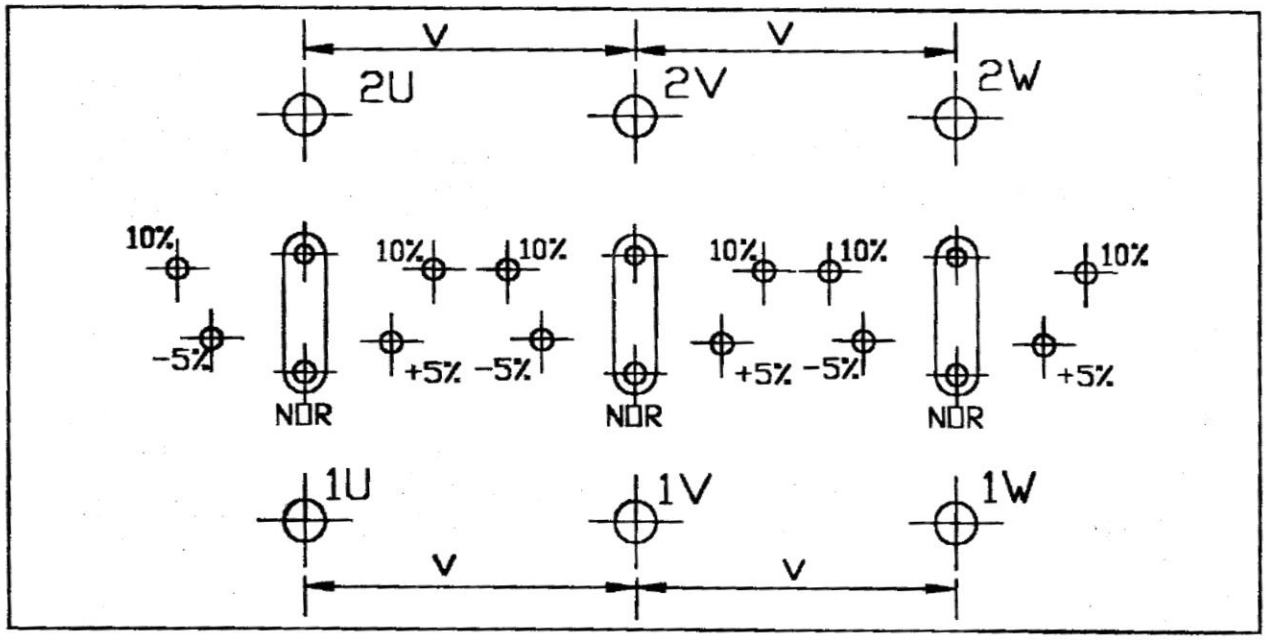
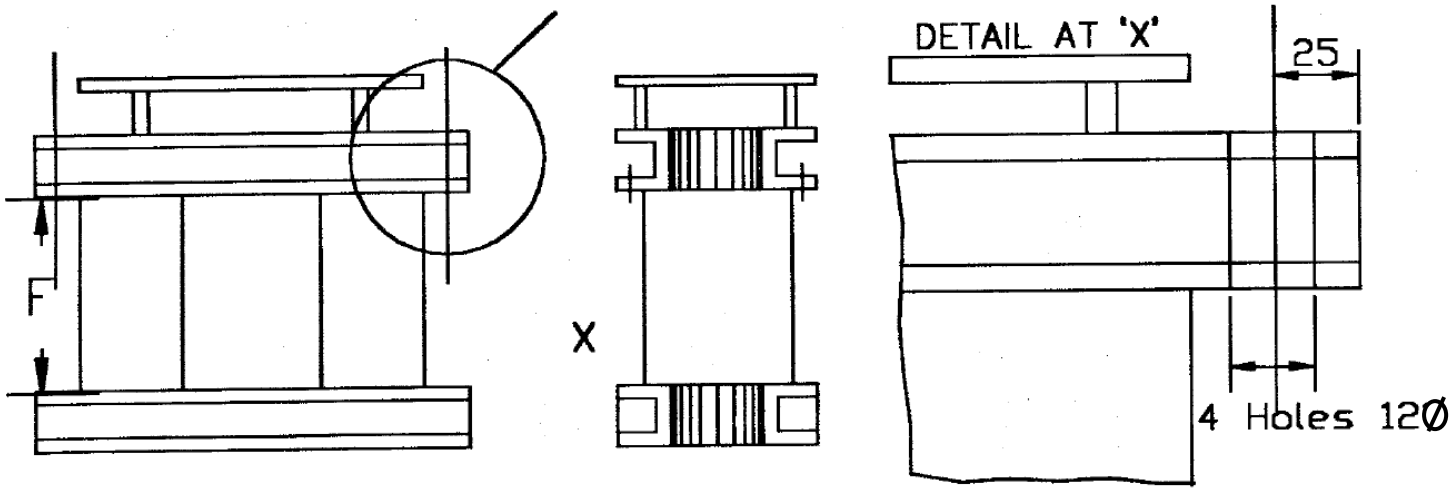


Fig. 1

FIG – 2



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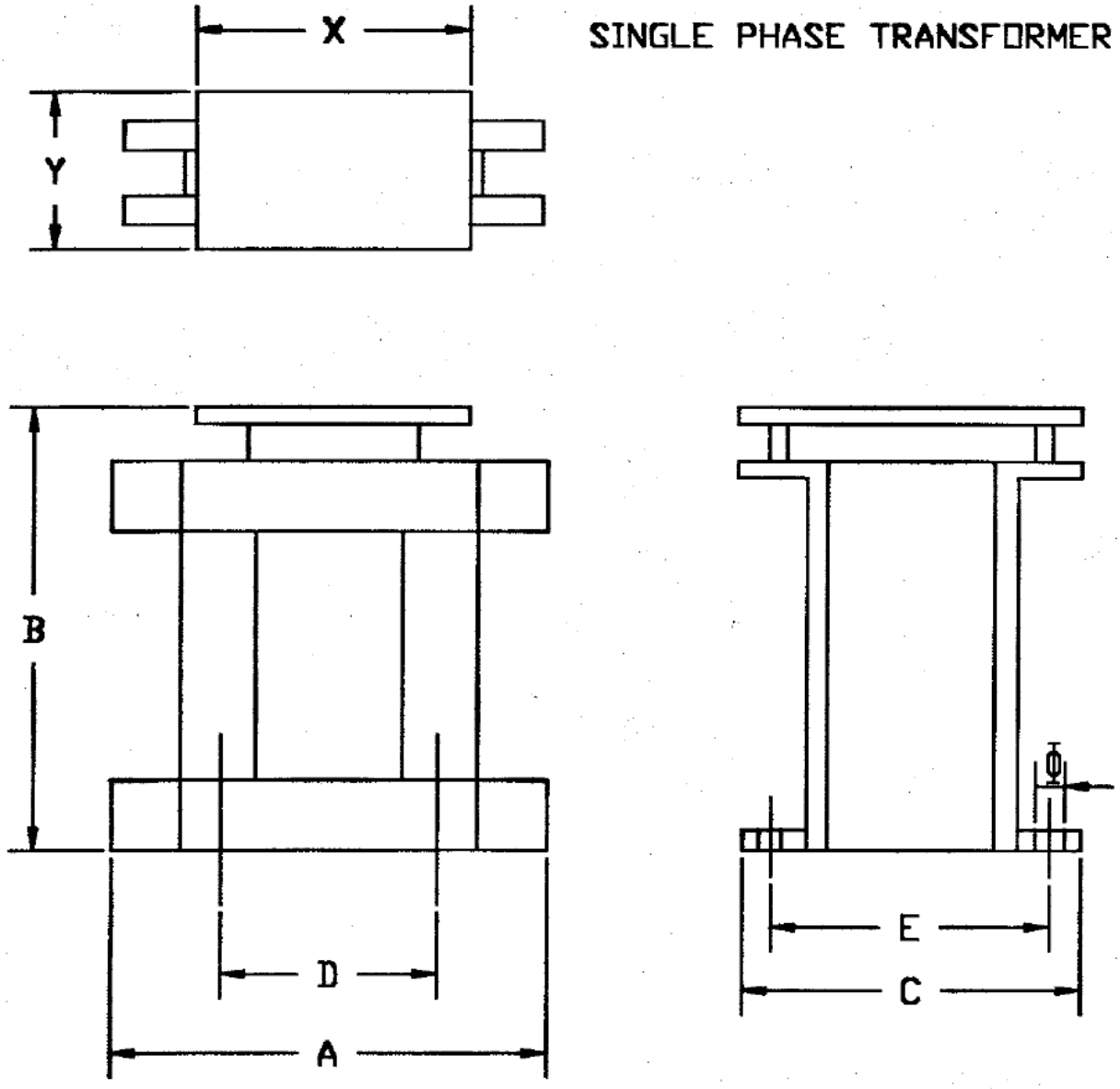

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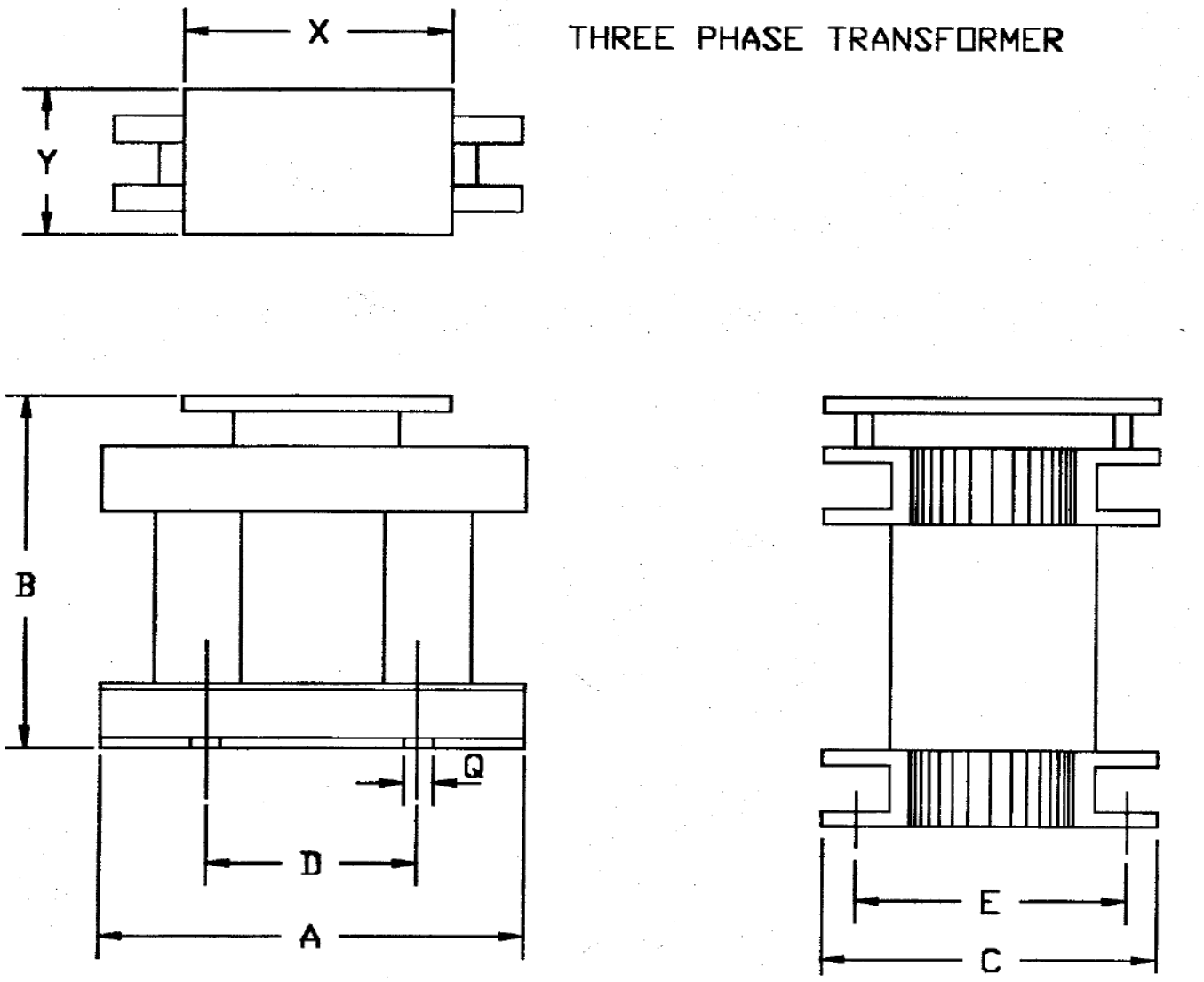

FIG - 4

NOTE: The tolerances for various dimensions shall be as per IS: 2102 'coarse'