Letter of Intent- CNC INTERNAL GRINDING MACHINE

EOI-2022-23/02 Date 20.05.2022

PURPOSE: Traction division of BHEL-Bhopal requires CNC Internal Grinding machine for the internal taper grinding of motor shafts in general and 6FRA motor shafts in particular. The finish machine drawing for the shaft is attached for greater understanding and for providing latest, economical and productive solution, prevalent in the market.

The general machining parameters as per our past experience and requirements are tabulated below. The dimensions are indicative in nature, vendor is free to provide better solutions to address the machining issues. Productivity and quality shall be the sole guiding light for selection of the machine.

Most Important: The proposed internal grinding machine shall be used to grind critical dimensions affecting the overall vibration parameters of the traction motor.

In available internal grinding machine at our place we are facing difficulty in attaining the desired accuracies and runout. We had tried two of the methods detailed below.

1. Conventional internal grinding by using steady support.
2. Extension of the available chuck (jugaad) to reduce the overhang.

Method 01 was not successful. Not only the steady was having placement issues with the guides, but also regular maintenance issues. Reliability and confidence was very much missing in continuous production process, to add to our problems the run-outs were erratic.

With method 02 we are having slightly better results, but then again we are not satisfied. The problems are of run-outs, finish and production time taken.

In the light of above and with reference to the following technical details we express our intent to buy a CNC Internal grinding machine, to solve our specific problem. It shall enable us to seek the solutions available in current market scenario.

S.No	Technical Head	Remarks
01	Machine shall have facility to perform following operations: - Internal Taper grinding on internal bore at Shaft ends, ability to do internal grinding of the bore up to angle of 1°8'45"(1:50 Taper) (ABB 6FRA shaft diagram attached).	Vendor to Confirm
02	Work Piece Material: Carbon Steel, Alloy Steel, Stainless Steel, etc. (Hardness and other characteristic are as under) Work piece material: ABB 6FRA Shaft is Chrome Molybdenum steel conform **to DIN EN 10083-1, grade 30CrNiMo8 (material No.1.6580)**, Hardness value range is **270 to 320HBS**. Bearing Components of ABB 6FRA motor, Material is Spheroidal **Graphite Cast Iron (SGCI), Gr.400/18 of IS:1865 (Latest version), Hardness value is 130 to 180 HBS.**	Vendor to Note
03	This machine is to be used for wet grinding bores, internal faces of traction machines Shafts made of Forged steel.	Vendor to Note
04	It should be a horizontal axis machine.	Vendor to Confirm
05	The table is to be capable of small angular adjustment for taper grinding and to carry a motorised swivelling heavy duty work head. for taper grinding having angular grinding graduations on swivelling base for taper setting. Angular graduations to be on operator's side. The head stock will have a face plate for holding chucks for holding the work piece.	Vendor to Confirm

(Convenor)

Dy. Mg. (ELW)

SUNIL MISRA
DGM (CFNX)

Anurag Shrivastava
(Mgr, ATX)

BHUPENDRA MISHRA
MGR (ELW)

(SUMIT)

06	The horizontal axis machine is expected to have lathe type bed for the grinding spindle with driving motor and should be able to travel across the bed for bore grinding. The grinding spindle overhang is to be 350mm to reach deep bores. Provision should be available for usage of different size of spindle	Vendor to Confirm
07	Grinding spindles should also be able to carry wheel of dimensions (in mm):ø105(OD)Xø50.8(ID)X40(Width),ROS 76X10.	Vendor to Confirm
08	I.D to be ground: 90mm to 300mm	Vendor to Confirm
09	Max.length of grinding : 300mm.	Vendor to Confirm
10	Maximum Weight of Work Piece:325Kg.	Vendor to Confirm
11	WORKHEAD: It should be designed to hold shafts or components as per below OD diameter (dimension mentioned is finish dimensions hence machining/grinding allowance may be consider): 1) Rotor Shaft / Drg No 04454564051: 170.5 +/- 0.1 mm 2) Inner labyrinth (DE)/ Drg No 44454364052: 254 - 0.210 mm 3) Outer labyrinth (DE)/ Drg No 44454364051: 310 - 0.210 mm 4) Inner labyrinth (NDE)/ Drg No 44454464051: 179.5 – 0.160 mm	Vendor to Note
12	Work Head Spindle Speed(RPM):40 to 250	Vendor to Confirm
13	Swivel range: 0° to 15° minimum	Vendor to Confirm
14	Face plate dia: Up to 400mm	Vendor to Confirm
15	The capability of shaft/component holding inside work head maximum diameter 325 mm	Vendor to Confirm
16	Cross Slide: Machine must be equipped with Cross slide on which grinding wheel attachment will be mounted.	Vendor to Confirm
17	Max Taper to be ground: 1:50	Vendor to Confirm
18	Table travel speeds infinitely variable range : 0.01- 8000mm/min. or better	Vendor to Confirm
19	Surface finish: Up to 0.4 Ra µ m / N5 as per IS:3073	Vendor to Confirm
20	Traverse of table: 1250 mm minimum & as per attached job requirements	Vendor to Confirm
21	Tolerance on diameters: + /- 0.0025mm	Vendor to Confirm

Table -2 Pre-Qualifying Conditions (PQC)

S No.	Pre-Qualifying Conditions	Remarks
01	The vendor must be an Original Equipment Manufacturer (OEM) for offered equipment.	Vendor to comply
02	However ,such Indian machine tool vendors(OEMs) who do not meet specified qualifying conditions can quote if they have running collaborations/joint ventures/joint working arrangements for manufacture of CNC internal grinding machine of same or higher sizes with foreign machine tool manufacturers who meets specified qualifying conditions, such Indian machine tool vendors (OEMs) shall have to submit from their Foreign partner a back to back guarantee for satisfactory performance of the offered machine and the JV documents /Collaboration Certificate or letter.in compliance to all specified tender requirements.	Vendor to confirm and furnish details
03	The OEM or Indian machine tool vendors (OEMs must have supplied at least one CNC internal grinding machine for internal taper grinding of same or higher size in past 5 years (from the date of opening of EOI) & such machine is presently working satisfactorily for more than one year after commissioning (on date of opening of EOI).	Vendor to comply

(Convener) Dy. Mgr(EM) (SUNIL MIND) DGM(PHX) Anurag Shrivastava (Mgr. ATIX) Abhupendra Mishra MGR (EMX) Sr (convener) SUMIT Dy Mgr (TDM)

	1) Successful commissioning certificates for the machines to be furnished by the party. 2) Performance certificate from the customers regarding satisfactory performance of machine supplied to them. 3) Copy of purchase order to be submitted along with offer 4) The item, type, make and model number should be clearly mentioned in the PO copy. 5) BHEL reserve the right on their own discretion to cross examine/verification of above documents submitted by the vendors, physical assessment also at the place where machine is installed. The vendor shall make necessary arrangement for gate passes and coordinate all the technical queries, process queries PO's and refurbishment etc.	
04	Make In India content to be specified by the supplier in terms of %.	Vendor to specify

NOTE:

1) Component Drawing is for purpose of clarity/ understanding of machining requirement only. Drawings are intellectual property of BHEL and are confidential in nature, it cannot be reproduced or redistributed for any other purpose to potential bidders.
2) Potential Vendors are advised and encouraged to visit BHEL's shop floor for any clarification, discussion & to have more idea about our machining requirement.
3) Vendor to submit complete technical specification such as machine configuration (spindle, traverse, feeds & drive system), constructional details, accuracy, any special attachment, tooling and any other relevant/ necessary data pertaining to machine.
4) Vendor to submit details of operation & control system, CNC system (Make: Siemens / Fanuc only) & features.
5) Vendor to submit tentative layout drawing and Approximate gross weight of complete machine during budgetary stage itself. The information shall be used for budgeting and civil estimate for easy approval from the authority.
6) After placement of order, Vendor shall submit the GA Drawings along with necessary reports for getting BHEL'S approval. Vendor shall also submit details civil foundation drawing, mentioning the details of concrete and reinforcement for construction. BHEL shall construct complete foundation. Vendor should arrange equipment required for the testing of foundation, if required by the vendor. The vendor shall also indicate detailed specifications of grouting compound and Grouting procedure, etc.
7) Offers of only those vendors who qualifies PQC as mentioned in **Table-2** will be evaluated.

(R.K.Gupta)
Convenor

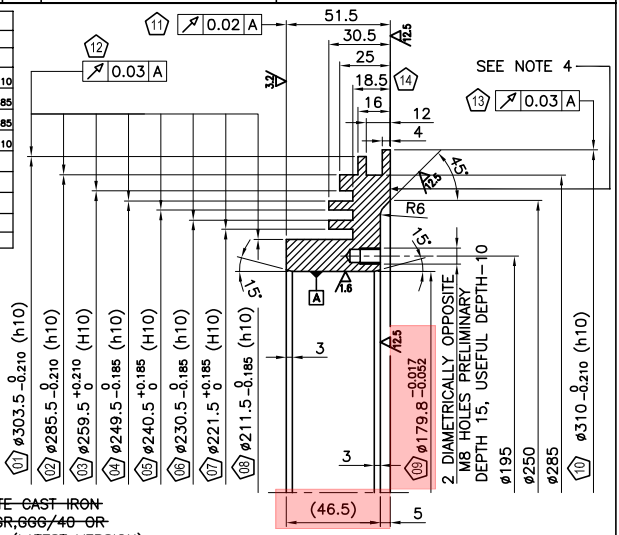
DTC Members:

(Manoranjan Thakur)	(Bhupendra Mishra)	(Anurag)	(Jayant Hirwane)
Mgr/TXM	Mgr/EMX-CNC	Mgr/EMX-ATX	Dy.Mgr/ELX
(Sunil Minz)	(C.L.Malav)	(Sumit Kumar)	(Lokendra Meena)
DGM/FNX	Mgr/FCX	Dy.Mgr/TXM	Engr/CMX

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

REV.	DATE	ALTERED SDB	REV.	DATE	ALTERED SDB	ADDITIONAL INFORMATION	4TWD.096.029, ALT.06
		CHED AS			CHED ABHIJIT		
14	22.12.20	APPD AS	13	14.12.20	APPD ABHIJIT	STATUS OF DRAWING	
ZONE	IN TOOL LIST, DESCRIPTION OF TOOL NO. 1577886 MODIFIED. (TCM-357)		ZONE	CTQ ADDED ON DIM. 18.5		DISTRIBUTION OF PRINTS	TME-1, TXM-4 TNX-1

TOOL LIST	
TOOL NO.	DESCRIPTION
1577916	DRILL JIG FOR 2 HOLES
1605119	CALIPER GAUGE ø211.5 $^{0}_{-0.210}$
1605120	CALIPER GAUGE ø230.5 $^{0}_{-0.185}$
1605121	CALIPER GAUGE ø249.5 $^{0}_{-0.185}$
1605122	CALIPER GAUGE ø285.5 $^{0}_{-0.210}$
1605123	PIN GAUGE ø221.5 $^{+0.185}_{0}$
1605124	PIN GAUGE ø240.5 $^{+0.185}_{0}$
1605125	PIN GAUGE ø259.5 $^{+0.210}_{0}$
1577886	GROOVE & DEPTH GAUGE 5x12
1605154	SPIGOT PLATE FOR TURNING



NOTES:-

1. REMOVE ALL SHARP EDGES.
2. ~~MATERIAL:-SPHEROIDAL GRAPHITE CAST IRON (SGCI) TO DIN-1693 PART-1 GR.GGG/40 OR GR-400/18 OF IS:1865-1991 (LATEST VERSION).~~
3. ALL 14 NOS. "⬠" MARKED DIMENSION ARE CRITICAL TO QUALITY (CTQ) & SL. NO. OF CTQ DIMENSION ARE INSCRIBED IN ⬠ e.g. ⑭.
4. SUPPLIER'S INITIAL/TRADE MARK, MANUFACTURERS SERIAL NO. BHEL PO NO. BATCH NO. & DATE OF MFG. IN MM-YY FORMAT TO BE ETCHED AT THE SHOWN LOCATION.
5. MACHINING ALLOWANCE ON EACH TOOL POINT TO BE 5-7 MM IN CASE CASTING IS SUPPLIED OR 3-5 MM IN CASE ROUGH MACHINED CASTING IS SUPPLIED.
6. FOR QUALITY REQUIREMENT OF COMPONENT SPECIFICATION TM12545 TO BE REFERRED.
7. ~~DIMENSIONS TO BE CHECKED ON SAMPLE BASIS QUANTUM OF INSPECTION SHALL BE AS GIVEN BELOW (AT LEAST ONE NUMBER).~~

SL.NO.	CHECKING PARAMETER		BHEL Q.C.
001	CTQ DIMS.	~~DIMENSIONAL TOLERANCE~~	20%
		~~GEOMETRICAL TOLERANCE~~	20%
002	REMAINING DIMS.		5%

8. ALL MACHINED/ R.MACHINED SURFACES TO BE PROTECTED WITH TRP.

REF. DRG. NO.

	RAW WEIGHT 20.3 KG.	001	OUTER LABYRINTH DE		TM11491		KG	9.0
59 64	65 75	25 27	29 58	59	34 45	55	56	58 65
VAR00	REMARKS	ITEM NO.	DESCRIPTION	STD	MATL. CODE	A / C	UNIT	UNIT WT.
					46 54 MATL. SPCN.			68 71 QTY.
28 → CARD TYPE-3		28 → CARD TYPE-1			28 → CARD TYPE-2			

SIGN. & DATE

BHARAT HEAVY ELECTRICALS LTD. BHOPAL

	NAME	SIGN	DATE	NO. OF VAR.
DRN.	BHAGAT	-sd-	03.09.10	
CHD.	D.K.	-sd-	03.09.10	
APPD.	A.S.	-sd-	03.09.10	

INVENTORY NO.

DEPT.	UNTOL. DIMS. GR.		SCALE	WEIGHT (K.G.)	REF. TO ASSY. DRG.	ITEM NO.	NO. OF ITEM
TME	'M'		N.T.S.	9.0	0 445 10 64 051		001
CODE 405	TM20079						

TITLE

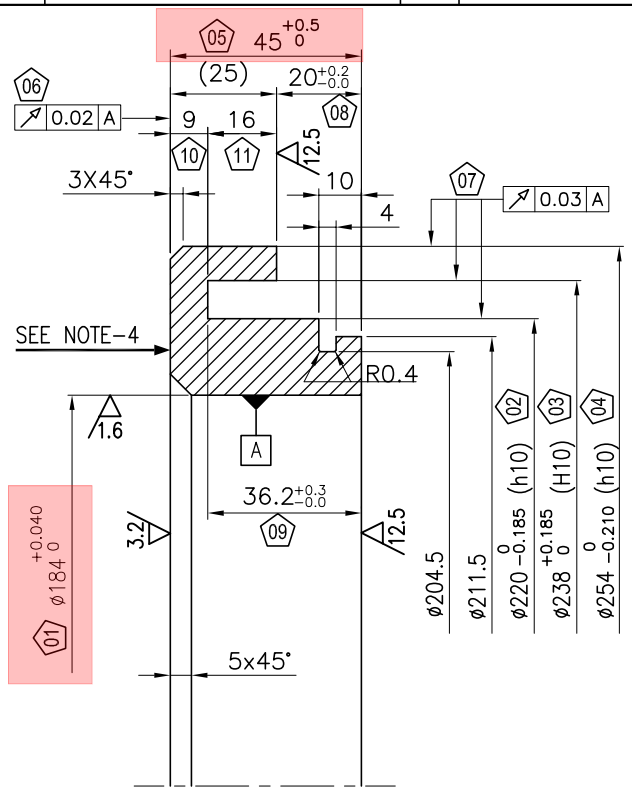
OUTER LABYRINTH (DE) (CNC MACHINED) 6FRA 6068

DRAWING NO.	REV.
4 445 43 64 051	14
SHT. NO. 01	NO. OF SHT. 01

SIZE A4

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

REV.	DATE		REV.	DATE		ADDITIONAL INFORMATION	4TWD.096.043, ALT.06
18	14.12.20	ALT. SDB CHK. ABHIJIT APPD. ABHIJIT	17	04.08.20	ALTERED SDB CHECKED AS APPROVED AS	STATUS OF DRAWING	
ZONE	CTQ ADDED ON DIMS. 16 & 9.		ZONE	TOOL NO. 1605126 DELETED & DESCRIPTION OF TOOL NO. 1577943 UPDATED (TCM–356).		DISTRIBUTION OF PRINTS	TME–1, TXM–4 TNX–1



TOOL LIST

IT. NO.	TOOL NO.	DESCRIPTION
~~001~~	~~1605126~~	~~GROOVE & DEPTH GAUGE 9x16~~
001	1605127	CALIPER GAUGE 220 0 -0.185
001	1605128	PIN GAUGE 238 +0.185 0
001	1577942	PIN GAUGE 183.60/183.65
001	1577943	GROOVE GAUGE 9+0.185/0x16
001	1577944	GRINDING FIX.
001	1577945	PIN GAUGE 184 +0.040 0
001	1605014	SNAP GAUGE 254 0 -0.210 (h10)
001	1605074	STEP GAUGE 36.2+0.3/0
001	1605075	STEP GAUGE 20+0.2/0
001	1605149	**SPIGOT PLATE FOR TURNING**

NOTES:–

1. REMOVE ALL SHARP EDGES.
2. ~~MATERIAL:–SPHEROIDAL GRAPHITE CAST IRON (SGCI) TO DIN–1693 PART–1 GR,GGG/40 OR GR–400/18 OF IS:1865–1991 (LATEST VERSION).~~
3. ALL 11 NOS. '"⬠" MARKED DIMENSION ARE CRITICAL TO QUALITY (CTQ) & SL. NO. OF CTQ DIMENSION ARE INSCRIBED IN ⬠ e.g. (11).
4. SUPPLIER'S INITIAL/TRADE MARK, MANUFACTURERS SERIAL NO. BHEL PO NO. BATCH NO. & DATE OF MFG. IN MM–YY FORMAT TO BE ETCHED AT THE SHOWN LOCATION.
5. MACHINING ALLOWANCE ON EACH TOOL POINT TO BE 5–7 MM IN CASE CASTING IS SUPPLIED OR 3–5 MM IN CASE ROUGH MACHINED CASTING IS SUPPLIED.
6. FOR QUALITY REQUIREMENT OF COMPONENT SPECIFICATION TM12545 TO BE REFERRED.
7. ~~DIMENSIONS TO BE CHECKED ON SAMPLE BASIS. QUANTUM OF INSPECTION SHALL BE AS GIVEN BELOW (AT LEAST ONE NUMBER).~~

SL.NO.	CHECKING PARAMETER		BHEL Q.C.
001	CTQ DIMS.	~~DIMENSIONAL TOLERANCE~~	~~20%~~
		~~GEOMETRICAL TOLERANCE~~	~~20%~~
002	~~REMAINING DIMS.~~		~~5%~~

8. ALL MACHINED/ R.MACHINED SURFACES TO BE PROTECTED WITH TRP.

REF. DRG. NO.

	RAW WEIGHT 12.0 KG.	001	INNER LABYRINTH DE		TM–11491		KG	5.3	
59 64 VAR00	65 75 REMARKS	25 27 ITEM NO.	29 58 DESCRIPTION	59 STD	34 45 MATL. CODE 46 54 MATL. SPCN.	55 A-I-C	56 UNIT	58 65 UNIT WT. 68 71 QTY.	
28 → CARD TYPE–3			28 → CARD TYPE–1		28 → CARD TYPE–2				

SIGN. & DATE

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

	NAME	SIGN	DATE	NO. OF VAR.
DRN.	ASWINI	–sd–	07.09.10	
CHD.	D.K.	–sd–	07.09.10	
APPD.	A.S.	–sd–	07.09.10	

INVENTORY NO.

DEPT. TME CODE 405	UNTOL. DIMS. GR. 'M' TM20079	SCALE N.T.S.	WEIGHT (K.G.) 5.3	REF. TO ASSY. DRG. 1 445 45 64 053	ITEM NO. 003	NO. OF ITEM 001

TITLE **INNER LABYRINTH (DE) (STOPPER) (CNC MACHINED) 6FRA 6068**

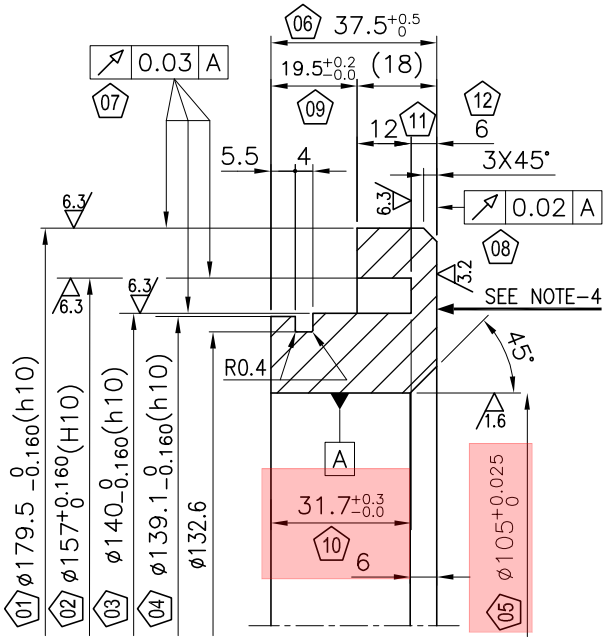
DRAWING NO. 4 445 43 64 052 REV. 18

SHT. NO. 01 NO. OF SHT. 01

SIZE A4

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

REV.	DATE			REV.	DATE			ADDITIONAL INFORMATION	4TWD.096.042(ALT.–06)
18	14.12.20	ALTERED	SDB	17	04.08.20	ALTERED	SDB		
		CHECKED	ABHIJIT			CHECKED	AS		
		APPROVED	ABHIJIT			APPROVED	AS		
ZONE	CTQ ADDED ON DIMS. 12 & 6.			ZONE	TOOL NO. 1605131 DELETED & 1578327 ADDED (TCM–356).			STATUS OF DRAWING	
								DISTRIBUTION OF PRINTS	TME–1, TXM–3 TNX–1



TOOL LIST

TOOL NO.	DESCRIPTION
1577956	SNAP GAUGE ø179.5 0 -0.160 (h10)
~~1605002~~	~~PIN GAUGE ø157.5+0.160 0 (H10)~~
~~1605003~~	~~SNAP GAUGE ø139.5 0 -0.160 (h10)~~
~~1605004~~	~~SNAP GAUGE ø139.1 0 -0.160 (h10)~~
1577960	PIN GAUGE ø105+0.025 0
~~1578505~~	~~GROOVE CHECKING GAUGE 9x12.2~~
~~1605005~~	~~GROOVE CHECKING GAUGE 4x5.5~~
1577962	STEP GAUGE 19.5
1577963	GRINDING FIXTUTRE
1605078	STEP GAUGE 31.7+0.3/0
1605079	STEP GAUGE 19.5+0.2/0
1605088	SNAP GAUGE ø139.1 0 -0.160 (h10)
1605005	GROOVE GAUGE
1605133	PIN GAUGE FOR 157+0.160/0
1605142	CALIPER GAUGE FOR 140–0.160/0
1578327	GROOVE GAUGE 8.5+0.160/0x12 DEEP
1605152	SPIGOT PLATE FOR TURNING

NOTES:–

1. REMOVE ALL SHARP EDGES.
2. ~~MATERIAL: SPHEROIDAL GRAPHITE CAST IRON (SGCI) TO DIN–1693 PART–1 GR.GGG/40 OR GR–400/18 OF IS:1865–1991(LATEST VERSION).~~
3. ALL 12 NOS. "⬠" MARKED DIMENSION ARE CRITICAL TO QUALITY (CTQ) & SL. NO. OF CTQ DIMENSION ARE INSCRIBED IN ⬠ e.g. ⬠12.
4. SUPPLIER'S INITIAL/TRADE MARK, MANUFACTURERS SERIAL NO. BHEL PO NO. BATCH NO. & DATE OF MFG. IN MM–YY FORMAT TO BE ETCHED AT THE SHOWN LOCATION.
5. MACHINING ALLOWANCE ON EACH TOOL POINT TO BE 5–7 MM IN CASE CASTING IS SUPPLIED OR 3–5 MM IN CASE ROUGH MACHINED CASTING IS SUPPLIED.
6. FOR QUALITY REQUIREMENT OF COMPONENT SPECIFICATION TM12545 TO BE REFERRED.
7. ~~DIMENSIONS TO BE CHECKED ON SAMPLE BASIS. QUANTUM OF INSPECTION SHALL BE AS GIVEN BELOW (AT LEAST ONE NUMBER).~~

SL.NO.	CHECKING PARAMETER		BHEL Q.C.
001	CTQ DIMS.	DIMENSIONAL TOLERANCE	20%
		GEOMETRICAL TOLERANCE	20%
002	REMAINING DIMS.		5%

8. ALL MACHINED/ R.MACHINED SURFACES TO BE PROTECTED WITH TRP.

	RAW WEIGHT 7.0 KG.	001	INNER LABYRINTH NDE (NDE)		TM–11491		KG	3.0
59 64	65 75	25 27	29 58	59	34 45	55	56	58 65
VAR00	REMARKS	ITEM NO.	DESCRIPTION	STD	MATL. CODE	A I C	UNIT	UNIT WT.
					46 54 MATL. SPCN.			68 71 QTY.

REF. DRG. NO.

SIGN. & DATE

INVENTORY NO.

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

	NAME	SIGN	DATE	NO. OF VAR.
DRN.	S.D.BHAGAT	–sd–	02.09.10	
CHD.	D.K.	–sd–	02.09.10	
APPD.	A.S.	–sd–	02.09.10	

DEPT.	UNTOL. DIMS. GR.		SCALE	WEIGHT (K.G.)	REF. TO ASSY. DRG.	ITEM NO.	NO. OF ITEM
TME	'M'				14454564053	002	001
CODE 405	TM20079		N.T.S.	3.0			

TITLE: INNER LABYRINTH (NDE) (STOPPER) (CNC MACHINED) 6FRA6068

DRAWING NO. 4 445 44 64 051 REV. 18

SHT. NO. 01 NO. OF SHT. 01

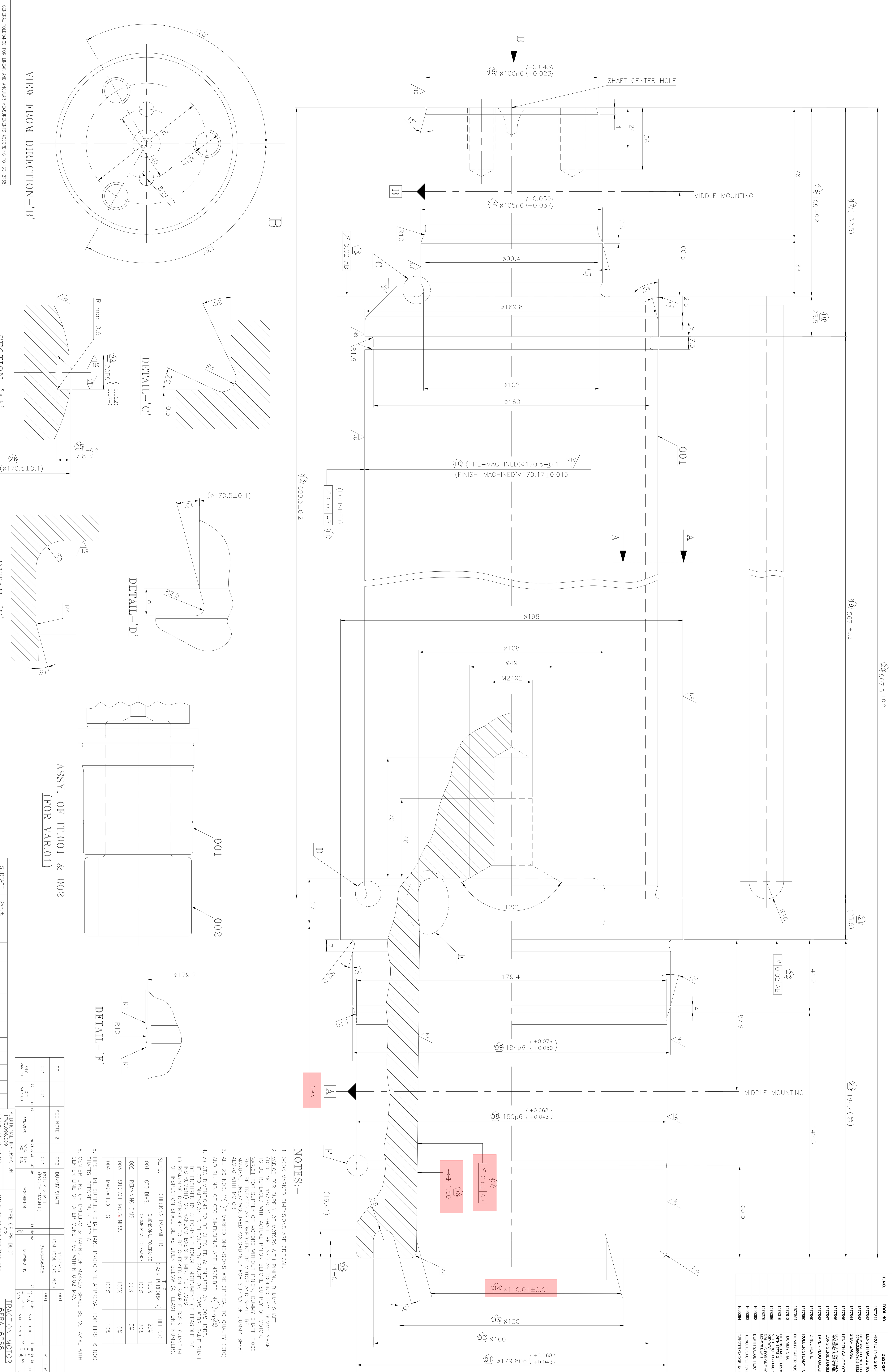
SIZE A4

INVENTORY NO.	SIGN. & DATE	REF. DRG. NO.

DRG. NO. 0 445 45 64 051

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)



NOTES:-

1. ~~✱✱ MARKED DIMENSIONS ARE CRITICAL.~~
2. VAR.00 FOR SUPPLY OF MOTORS WITH PINION, DUMMY SHAFT (TOOL NO.-1577813) SHALL BE USED AS TOOLING ITEM. DUMMY SHAFT TO BE REPLACED WITH ACTUAL PINION BEFORE SUPPLY OF MOTOR.
   VAR.01 FOR SUPPLY OF MOTORS WITHOUT PINION, DUMMY SHAFT IT.002 SHALL BE TREATED AS COMPONENT OF MOTOR AND SHALL BE MANUFACTURED/PROCURED ACCORDINGLY FOR SUPPLY OF DUMMY SHAFT ALONG WITH MOTOR.
3. ALL 26 NOS. "⬠" MARKED DIMENSIONS ARE CRITICAL TO QUALITY (CTQ) AND SL. NO. OF CTQ DIMENSIONS ARE INSCRIBED IN ⬠ e.g. 26.
4. a) CTQ DIMENSIONS TO BE CHECKED & ENSURED ON 100% JOBS. IF CTQ DIMENSION IS CHECKED BY GAUGE ON 100% JOBS, SAME SHALL BE ENSURED BY CHECKING THROUGH INSTRUMENT (IF FEASIBLE BY INSTRUMENT) ON RANDOM BASIS IN MIN. 10% JOBS.
   b) REMAINING DIMENSIONS TO BE CHECKED ON SAMPLE BASIS. QUANTUM OF INSPECTION SHALL BE AS GIVEN BELOW (AT LEAST ONE NUMBER).

SL.NO.	CHECKING PARAMETER		T.P. (TASK PERFORMER)	BHEL Q.C.
001	CTQ DIMS.	DIMENSIONAL TOLERANCE	100%	20%
		GEOMETRICAL TOLERANCE	100%	20%
002	REMAINING DIMS.		20%	5%
003	SURFACE ROUGHNESS		100%	10%
004	MAGNAFLUX TEST		100%	10%

5. FIRST TIME SUPPLIER SHALL TAKE PROTOTYPE APPROVAL FOR FIRST 6 NOS. SHAFTS, BEFORE BULK SUPPLY.
6. CENTER LINE OF DRILLING & TAPING OF M24x25 SHALL BE CO-AXIAL WITH CENTER LINE OF TAPER CONE 1:50 WITHIN 0.02 MAX.

TOOL LIST

IT. NO.	TOOL NO.	DESCRIPTION
	~~1577841~~	~~PROTO TYPE SHAFT~~
	1577842	LENGTH GAUGE 109±0.2
	~~1577843~~	~~COMBINED LENGTH GAUGE 567±0.2, 699.5±0.2, 183.5±0.2~~
	1577844	SNAP GAUGE
	~~1577845~~	~~LENGTH GAUGE 907±0.2~~
	1577846	BUSHES IN TWO HALVES FOR HOLDING & CENTERING
	1577847	LONG SERIES DRILL FOR M24
	1577848	TAPER PLUG GAUGE
	1577849	DRILL PLATE
	1577850	ROLLER STEADY FOR SHAFT
	~~1577851~~	~~DUMMY TAPER BUSH~~
	1577813	DUMMY SHAFT
	1578016	LIFTING TACKLE M27X2 TO BE USED WITH 1577813
	1578086	VEE BLOCK FOR M/CING KEY WAY
	1578276	DRILL JIG FOR ONE HOLE M24X70 DEPTH
	1605082	DEPTH GAUGE 11±0.1
	1605083	LENGTH GAUGE 567±0.2, 109±0.2
	1605084	LENGTH GAUGE 184.4-0.2/0, 23.6

GENERAL TOLERANCE FOR LINEAR AND ANGULAR MEASUREMENTS ACCORDING TO ISO-2768

RATED MEASUREMENT IN mm.	> 0.5 ...3.0	> 3 ...6	> 6 ...30	> 30 ...120	>120 ...400	>400 ...1000	>1000 ...2000	>2000 ...4000	>4000 ...8000	>8000 ...12000	>12000 ...16000	> 16000 ...20000
DEVIATION OF MEDIUM GRADE	± 0.1	± 0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±4	±5	±6

SURFACE ROUGHNESS VALUE TO IS:3073												
GRADE NUMBER	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
Ra µ m	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50
SYMBOL	∇∇∇∇		∇∇∇			∇∇			∇			~

REV.	DATE	ZONE	DESCRIPTION	ALT.	CHK.	APPD.
11	23.02.18		IN TOOL LIST, DESCRIPTION OF TOOL NOS. 1605083 & 1605084 MODIFIED.	VK	AS	AS
10	03.02.18		IN TOOL LIST, TOOL NOS. 1605082, 1605083 & 1605084 ADDED AND TOOL NOS. 1577843 & 1577845 DELETED. (TCM-352)	VK	AS	AS
09	23.01.18	A/11,13 B/12	DIMN. 23.6, 184.4(+0.0/-0.2), 41.9 & 87.9 WERE 24.5,183.5±0.2, 41 & 87.	VK	ABHIJIT	ABHIJIT
08	14.7.17		IN BOM ROUGH MACHD. SHAFT WEIGHT ADDED & IN TITLE BLOCK FINISH WEIGHT ADDED.	SDB	ABHIJIT	ABHIJIT
07	20.3.17		CRITICAL TO QUALITY DIMENSIONS ARE "⬠" MARKED AND NUMBERED. NOTES-3 TO 6 ADDED. NOTE-1 DELETED.	SDB	ABHIJIT	ABHIJIT
06	11.11.13	K-10	IN BOM IT.002 & VAR.01 WERE NOT ON. VIEW FOR VAR.01 WAS NOT ON. NOTE-2 MODIFIED TO CALL VAR.00 & VAR.01.			
05	16.09.13		IN TOOL LIST TOOL NO. 1577813 WAS NOT ON. & 1577851 WAS NOT ON. NOTE-2 ADDED.			
04	23.11.11		NOTE-1 WAS NOT ON.	C.K.S.B.	D.K.	A.S.
03	31.10.11		IN TOOL LIST TOOL NO. 1577848 WAS NOT ON. 1577841 WAS ON. (TCM-337)	C.K.S.B.	D.K.	A.S.
02	22.07.11		TOOL LIST WAS NOT ON. MATL. SPEC TM11497 WAS 4TMS.096.071 (TCM 334)	A.JHARIA	D.K.	A.S.
01	16.01.11		DRG. UPDATE & DIGITIZED.	S.BHAGAT	A.S.	A.S.

IT. NO.	DESCRIPTION	DRAWING NO.	MATL. CODE	MATL. SPCN.	QTY VAR 00	QTY VAR 01	REMARKS	UNIT WT.
001	ROTOR SHAFT (ROUGH MACHD.)	3445456 4051	001		001	001		164.05 KG.
002	DUMMY SHAFT	1577813 (TGM TOOL DRG. NO.)	001			001	SEE NOTE-2	

ADDITIONAL INFORMATION 1TWD.096.009

STATUS OF DRAWING

DISTRIBUTION OF PRINTS TME-1, TXM-3, TNX-1

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: TRACTION MOTOR 6FRA-6068

BHARAT HEAVY ELECTRICALS LTD. BHOPAL

	NAME	SIGN	DATE
DRN.	BHAGAT	-sd-	01/09/10
CHD.	DK	-sd-	01/09/10
APPD.	AS	-sd-	01/09/10

NO. OF VAR. 02

DEPT.	CODE	UNTOL. DIMS. GR.	SCALE	WEIGHT (KG.)	REF. TO ASSY. DRG.	ITEM NO.	NO. OF ITEM
TME	405		N.T.S.	137.0	1 445 45 64 052	001	001

TITLE: ROTOR SHAFT (FINISH MACHD)

DRAWING NO. 0 445 45 64 051 — REV. 11 — SHT. NO. 01 — NO. OF SHT. 01

SIZE A0

Procedure for participation in the EOI

1) Vendor to mention their say against each point of EOI and duly signed seal paper must be submit.
2) Vendor to submit full/complete technical details along with catalogue / brochure of offered machine.
3) Vendor to submit all supporting documents required against PQC clause in EOI

Interested OEM vendor which are fulfilling our EOI requirements can submit their offer in following ways:

1) By E mail: submit above all documents for participation in the EOI before due date of EOI in the following E mail id :

   A) guptaravindra@bhel.in
   B) ajaydhuwe@bhel.in
   C) manojchaudhary@bhel.in

Or

2) By Post/Courier: submit EOI related all documents in the following address either by Indian post or by courier (prefer Indian post):

Deputy Manager, TXM-Tooling

Block-9 Annexe, Ground Floor

Heavy Electrical Plant, Piplani Bhopal (M.P.)

Pin code – 462023

Telephone – (0755) 2503093