





TD-106-1 Rev No. 5	Form No.  HYDERABAD	PRODUCT STANDARD PUMPS HYDERABAD		FP60291 Rev No. 02 Page 1 of 4																																																																									
<u>ADDL QUALITY REQUIREMENTS - MHI DESIGN BFPs &, BPs</u>																																																																													
<p>1.0 SCOPE:</p> <p>This standard specifies additional quality requirements apart from the Plant Purchasing specifications HY19593-R03 and HY19569-R03. These additional quality requirements are as per purchase specifications of the Collaborator M/s. MHI, Japan.</p> <p>2.0 CASTINGS COVERED UNDER THIS STANDARD:</p> <table border="1" data-bbox="375 646 1435 1797"> <thead> <tr> <th>PUMP TYPE</th> <th>CASTING</th> <th>MATL CODE</th> <th>DRG.NO.-VAR NO</th> <th>JIS / MHI SPECN</th> </tr> </thead> <tbody> <tr> <td rowspan="2">MDG455</td> <td>Inner casing U&L (RPCL)</td> <td>FP9219306093</td> <td>21804214960-00</td> <td rowspan="2">SCS6</td> </tr> <tr> <td>Inner casing U&L (Gadarwara)</td> <td>FP9219306140</td> <td>21804215005-00</td> </tr> <tr> <td>MDG405</td> <td>Inner casing U&L</td> <td>FP9219306034</td> <td>21804214959-00</td> <td>SCS6</td> </tr> <tr> <td>MDG366</td> <td>Inner casing U&L</td> <td>FP9219321017</td> <td>21804215002-00</td> <td>SCS6</td> </tr> <tr> <td>MDG346</td> <td>Inner casing U&L</td> <td>FP9219306107</td> <td>21804214970-00</td> <td>SCS6</td> </tr> <tr> <td rowspan="4">MLC450</td> <td>Casing-TD</td> <td>FP9219306115</td> <td>01891124504-00</td> <td rowspan="4">SCS6</td> </tr> <tr> <td>Casing cover-TD</td> <td>FP9219306506</td> <td>01891124507-00</td> </tr> <tr> <td>Casing-MD</td> <td>FP9219306131</td> <td>01891124505-00</td> </tr> <tr> <td>Casing cover-MD</td> <td>FP9219306530</td> <td>01891124524-00</td> </tr> <tr> <td rowspan="4">MLC400</td> <td>Casing-TD</td> <td>FP9219306026</td> <td>01891124488-00</td> <td rowspan="4">SCS6</td> </tr> <tr> <td>Casing cover-TD</td> <td>FP9219307006</td> <td>01891124491-00</td> </tr> <tr> <td>Casing-MD</td> <td>FP9219306123</td> <td>01891124489-00</td> </tr> <tr> <td>Casing cover-MD</td> <td>FP9219306514</td> <td>01891124514-00</td> </tr> <tr> <td rowspan="2">144RND</td> <td rowspan="2">1st stage casing Stage bowl & Discharge bowl</td> <td>FP9216906073</td> <td>01812824576-00</td> <td rowspan="2">SCPH2</td> </tr> <tr> <td>FP9216907177</td> <td>01812924569-00</td> </tr> <tr> <td>MDG406</td> <td>Inner casing U&L</td> <td>FP9219306182</td> <td>21804215078-00</td> <td>SCS6</td> </tr> <tr> <td>MDG436</td> <td>Inner casing U&L</td> <td>FP9219306174</td> <td>21804215059-00</td> <td>SCS6</td> </tr> </tbody> </table>					PUMP TYPE	CASTING	MATL CODE	DRG.NO.-VAR NO	JIS / MHI SPECN	MDG455	Inner casing U&L (RPCL)	FP9219306093	21804214960-00	SCS6	Inner casing U&L (Gadarwara)	FP9219306140	21804215005-00	MDG405	Inner casing U&L	FP9219306034	21804214959-00	SCS6	MDG366	Inner casing U&L	FP9219321017	21804215002-00	SCS6	MDG346	Inner casing U&L	FP9219306107	21804214970-00	SCS6	MLC450	Casing-TD	FP9219306115	01891124504-00	SCS6	Casing cover-TD	FP9219306506	01891124507-00	Casing-MD	FP9219306131	01891124505-00	Casing cover-MD	FP9219306530	01891124524-00	MLC400	Casing-TD	FP9219306026	01891124488-00	SCS6	Casing cover-TD	FP9219307006	01891124491-00	Casing-MD	FP9219306123	01891124489-00	Casing cover-MD	FP9219306514	01891124514-00	144RND	1 st stage casing Stage bowl & Discharge bowl	FP9216906073	01812824576-00	SCPH2	FP9216907177	01812924569-00	MDG406	Inner casing U&L	FP9219306182	21804215078-00	SCS6	MDG436	Inner casing U&L	FP9219306174	21804215059-00	SCS6
PUMP TYPE	CASTING	MATL CODE	DRG.NO.-VAR NO	JIS / MHI SPECN																																																																									
MDG455	Inner casing U&L (RPCL)	FP9219306093	21804214960-00	SCS6																																																																									
	Inner casing U&L (Gadarwara)	FP9219306140	21804215005-00																																																																										
MDG405	Inner casing U&L	FP9219306034	21804214959-00	SCS6																																																																									
MDG366	Inner casing U&L	FP9219321017	21804215002-00	SCS6																																																																									
MDG346	Inner casing U&L	FP9219306107	21804214970-00	SCS6																																																																									
MLC450	Casing-TD	FP9219306115	01891124504-00	SCS6																																																																									
	Casing cover-TD	FP9219306506	01891124507-00																																																																										
	Casing-MD	FP9219306131	01891124505-00																																																																										
	Casing cover-MD	FP9219306530	01891124524-00																																																																										
MLC400	Casing-TD	FP9219306026	01891124488-00	SCS6																																																																									
	Casing cover-TD	FP9219307006	01891124491-00																																																																										
	Casing-MD	FP9219306123	01891124489-00																																																																										
	Casing cover-MD	FP9219306514	01891124514-00																																																																										
144RND	1 st stage casing Stage bowl & Discharge bowl	FP9216906073	01812824576-00	SCPH2																																																																									
		FP9216907177	01812924569-00																																																																										
MDG406	Inner casing U&L	FP9219306182	21804215078-00	SCS6																																																																									
MDG436	Inner casing U&L	FP9219306174	21804215059-00	SCS6																																																																									
Ref. Doc	Revisions : Refer to record of revisions :		Prepared : M.S.RAM	Approved : K.H.R.K	Date : 22.04.16																																																																								

COPYRIGHT AND CONFIDENTIAL

The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.

ID-106-1 Rev. No.5 Form No.	 HYDERABAD	PRODUCT STANDARD PUMPS HYDERABAD	FP60291 Rev No. 02 Page 2 of 4
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.	<p>3.0 ADDL.REQUIREMENTS FOR CASTINGS WITH JIS SPECN <u>SCS6</u>:</p> <p>3.1 HEAT TREATMENT:</p> <p>Against Clause 6.0 of Specification HY19593-R03, Castings shall be heat treated as mentioned below.</p> <p>Quenching: 950 deg.C MINIMUM + Air cooling Tempering: 570 - 620 deg.C + Air cooling or slow cooling</p> <p>3.2 MECHANICAL PROPERTIES:</p> <p>Over and above specification requirement of Clause 10.0 of HY19593-R03, castings shall confirm to the following tensile test requirement.</p> <p>Tensile test for reduction of area > 35%</p> <p>4.0 ADDL.REQUIREMENTS FOR CASTINGS WITH JIS SPECN <u>SCPH2</u>:</p> <p>4.1 MECHANICAL PROPERTIES:</p> <p>Over and above specification requirement of Clause 11.0 of HY19569-R05, castings shall confirm to the following tensile test requirement.</p> <p>Yield strength > 245 N/sq.mm Tensile strength > 480 N/sq.mm Reduction of area > 35%</p> <p>6.0 LIQUID PENETRANT TEST FOR ALL CASTINGS:</p> <p>Penetrant Test shall be conducted as per BHEL standard AA0850131.</p> <p>Acceptance standards: Both the following acceptance standards shall be met.</p> <p>6.1 As per MHI standard GPC-0280-R05:</p> <p>No crack indications Size of indication shall be under 2 mm. Linear indication is the length not less than three the width. Maximum 2 pieces of linear indications on the unit area (in a rectangle of 2500 sq.mm, maximum length of a side of the rectangle shall be 150mm)</p> <p>6.2 As per AA0850132:</p> <p>3 no. of 3 mm dia circular indications per unit rectangular area of 100 sq.cm. The maximum length of side of rectangle shall be 25cm.</p>		
Ref. Doc			

ID-106-1 Rev.No.5 Form No.	 HYDERABAD	PRODUCT STANDARD PUMPS HYDERABAD	FP60291 Rev No. 02 Page 3 of 4
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.	<p>7.0 DIMENSIONAL CHECK FOR CASTINGS:</p> <p>All the castings shall be dimensionally checked as per the following applicable Formats, in addition to the regular dimensional check as per casting drawing.</p> <p>7.1 FOR INNER CASINGS OF BFPs:</p> <p>Applicable Format Nos.: Refer Annexure-1</p> <p>7.2 FOR CASING & CASING COVERS OF BOOSTER PUMPS:</p> <p>Applicable Format Nos.: Refer Annexure-3</p> <p>7.3 FOR 1ST STAGE CASING, STAGE&DISCHARGE BOWLS OF CEP:</p> <p>Applicable Format Nos.: Refer Annexure-4</p> <p>8.0 ALLOWANCES ON INNER CASING CASTINGS, BFP:</p> <p>Allowances on casting shall be as per Annexure-2.</p>		
Ref. Doc			

TD-106-3 Rev No. 5	Form No.	 HYDERABAD	PRODUCT STANDARD PUMPS HYDERABAD		FP60291 Rev No. 02 Page 4 of 4
RECORD OF REVISIONS					
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	Rev. No.	Date	Revision Details	Revised By	Approved By
	01	10.11.17	Clause 8.0, Allowance on inner casing castings added. BFP,BP.CEP formats attached as Annexures.	ASK	MSR
	02	19.10.21	MDG406 & MDG436 added in Clause no. 2.	KVSM	MSR
	Ref. Doc.				

**MEASUREMENT OF WALL THICKNESS OF
SHORT CROSSOVER OF INNER CASING**

Scope:

The wall thickness of short crossover of inner casing shall be measured for the moulding and the raw material in order to prevent wall thickness of finished part from falling.

Measurement Record:

You shall measure and record the data in accordance with the attached record sheet, after writing the customer name, project name, measured stage name etc. as specified.

Submittal Schedule:

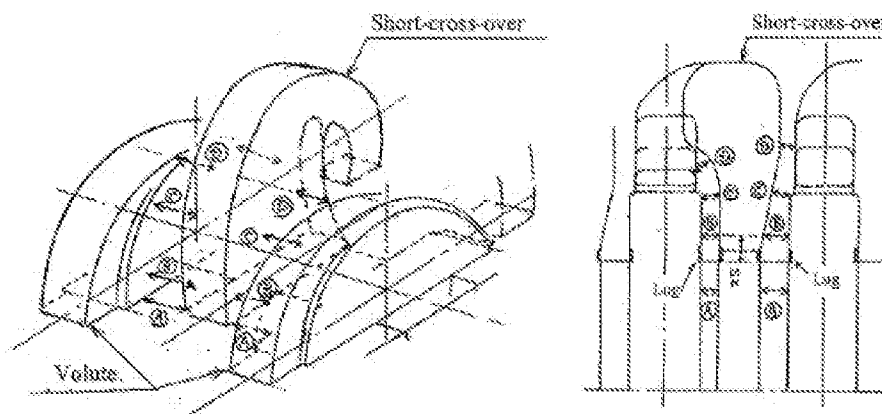
You shall submit the measurement records to the purchaser immediately after the measurement.

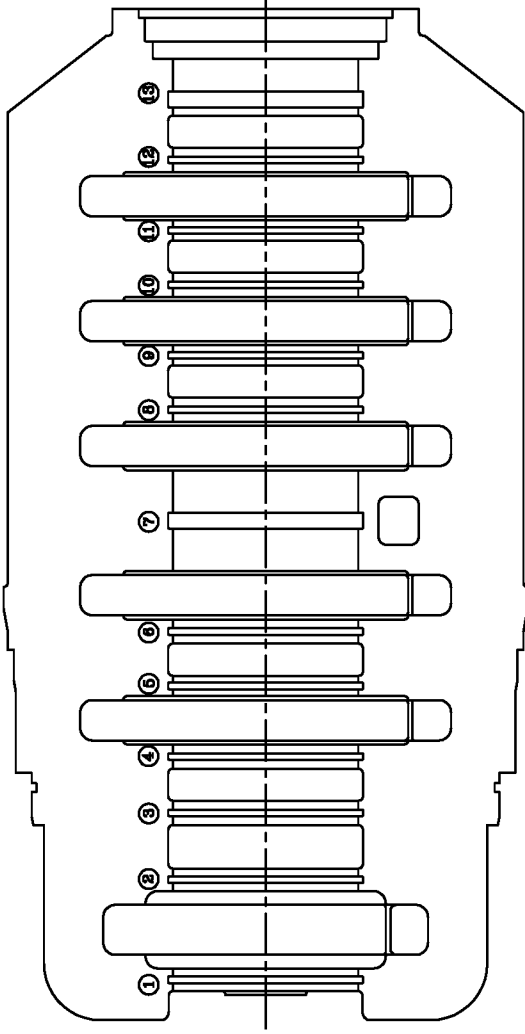
If the wall thickness is out of limit, the purchaser may require that the core shall be corrected and the contractor shall correct the core. Therefore please submit the record as soon as possible.

The contractor shall obtain purchaser's agreement prior to the casting. The purchase will confirm whether the core complied with the drawing or not.

Measurement Procedure:

The wall thickness shall be measured as follows. Although the each measurement position of A, B, C & D is rough position, the minimum rough thickness shall be found at the position of A, B, C & D and it shall be recorded in the attached sheet. For the moulding work, the space for the wall thickness shall be measured and recorded.





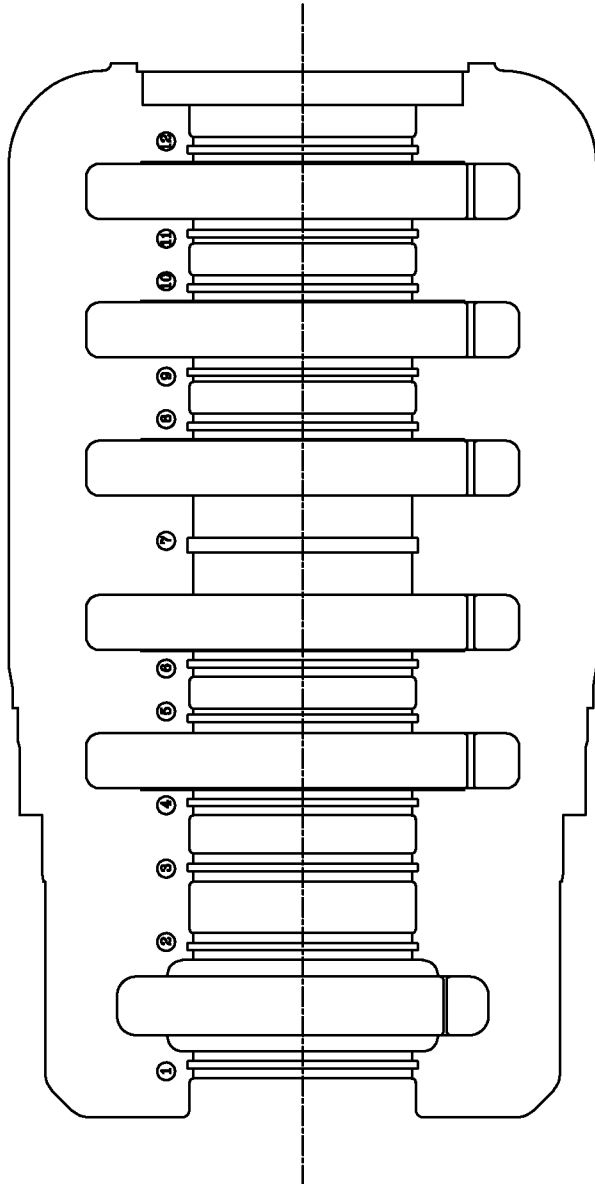
ORDER NUMBER:
CUSTOMER:
PROJECT NAME:
DRAWING NUMBER:
SERIAL No.(Upper):
SERIAL No.(Lower):

MEASUREMENT RECORD OF WALL THICKNESS OF INNER CASING MDG346

MINIMUM ALLOWABLE WALL THICKNESS(FROM DRAWING): _____ mm

STAGE NUMBER	1st		2nd		3rd		6th		5th		4th	
	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫
FOR MOLDING	UPPER HALF	A										
		B										
		C										
		D										
FOR ROUGH MATERIAL	UPPER HALF	A										
		B										
		C										
		D										

NOTE: DESIGNED WALL THICKNESS FOR POSITION C & D IS MINIMUM ALLOWABLE WALL THICKNESS INDICATED IN THE DRAWING.



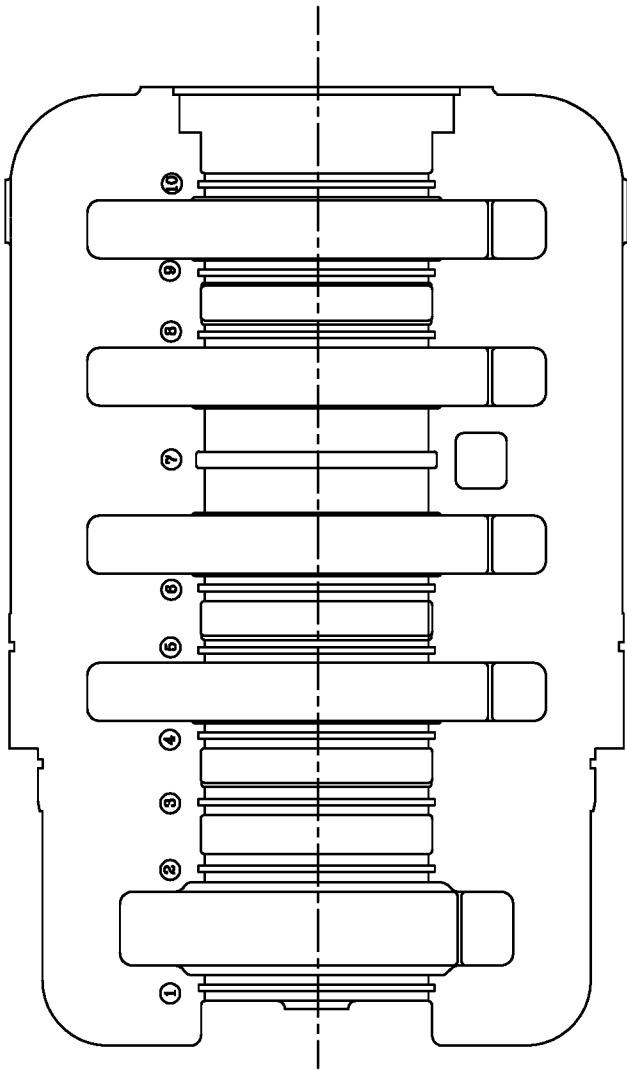
ORDER NUMBER:
CUSTOMER:
PROJECT NAME:
DRAWING NUMBER:
SERIAL No. (Upper):
SERIAL No. (Lower):

MEASUREMENT RECORD OF WALL THICKNESS OF INNER CASINGS MDG366, MDG406 & MDG436

MINIMUM ALLOWABLE WALL THICKNESS(FROM DRAWING): _____ **mm**

STAGE NUMBER	1st		2nd	3rd	6th	5th	4th
	①	②					
DESIGNED VALUE AT A	A						
	B						
	C						
	D						
MEASURED LOCATION	A						
	B						
	C						
	D						
FOR MOLDING	A						
	B						
	C						
	D						
FOR ROUGH MATERIAL	A						
	B						
	C						
	D						

NOTE: DESIGNED WALL THICKNESS FOR POSITION C & D IS MINIMUM ALLOWABLE WALL THICKNESS INDICATED IN THE DRAWING.



ORDER NUMBER:
CUSTOMER:
PROJECT NAME:
DRAWING NUMBER:
SERIAL No.(Upper):
SERIAL No.(Lower):

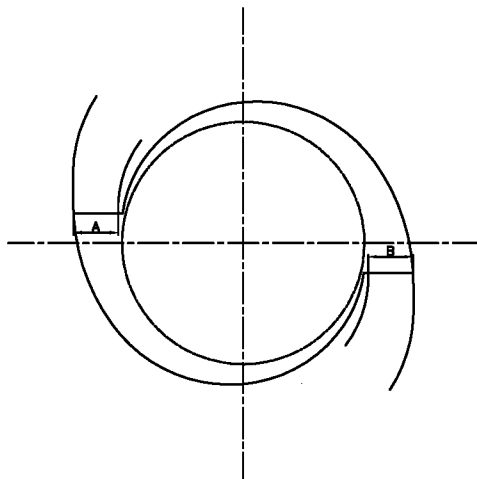
MEASUREMENT RECORD OF WALL THICKNESS OF INNER CASINGS MDG405 & MDG455

MINIMUM ALLOWABLE WALL THICKNESS(FROM DRAWING): _____ mm

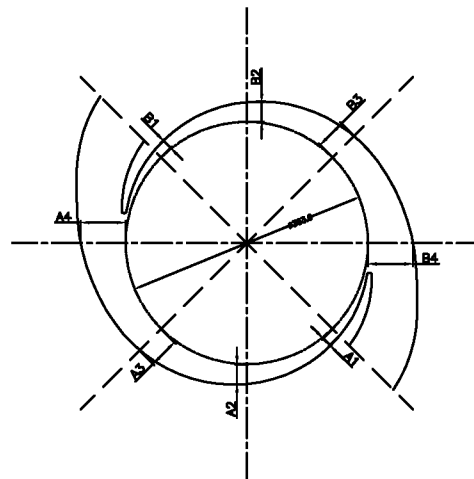
STAGE NUMBER	1st		2nd		3rd		5th		4th	
	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩
FOR MOLDING	UPPER HALF	A								
		B								
		C								
		D								
FOR ROUGH MATERIAL	UPPER HALF	A								
		B								
		C								
		D								

NOTE: DESIGNED WALL THICKNESS FOR POSITION C & D IS MINIMUM ALLOWABLE WALL THICKNESS INDICATED IN THE DRAWING.

DIMENSIONAL INSPECTION REPORT



CASING THROAT AREA



VOLUTE FORM

CASING THROAT AREA

		A	B	ACCEPTANCE
1ST STAGE	DESIGN VALUE			
	MEASURED VALUE			
2ND STAGE	DESIGN VALUE			
	MEASURED VALUE			
3RD STAGE	DESIGN VALUE			
	MEASURED VALUE			
4TH STAGE	DESIGN VALUE			
	MEASURED VALUE			
5TH STAGE	DESIGN VALUE			
	MEASURED VALUE			
6TH STAGE	DESIGN VALUE			
	MEASURED VALUE			

VOLUTE FORM

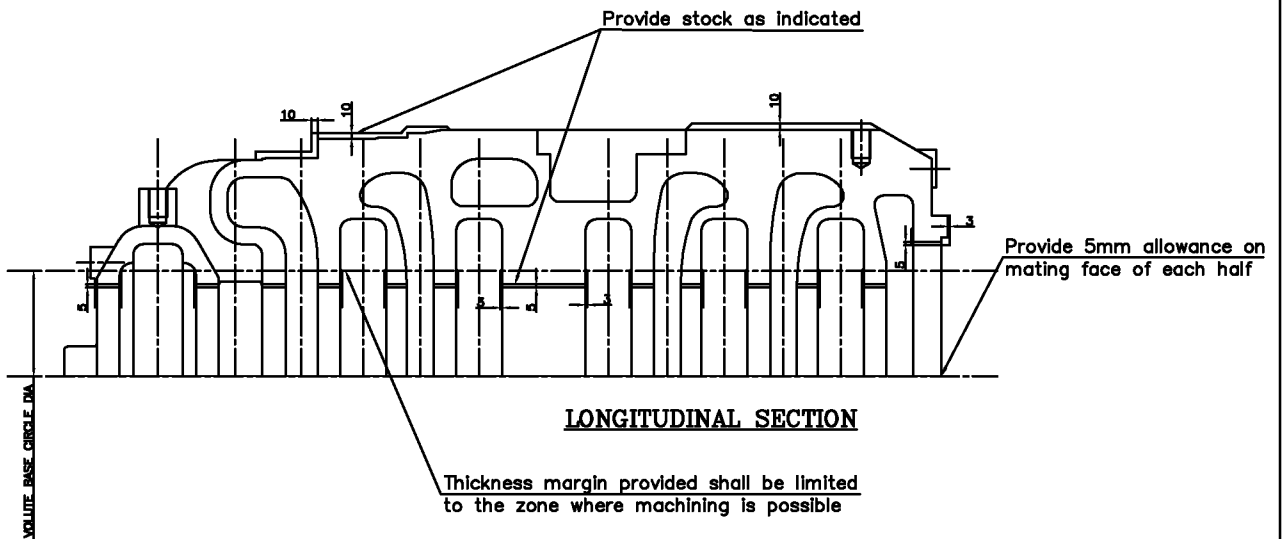
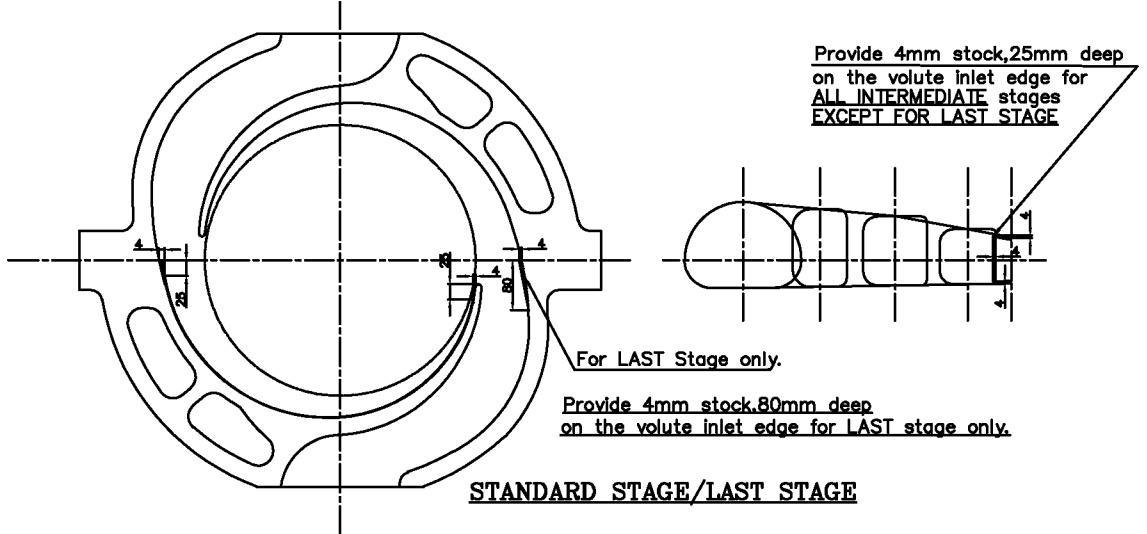
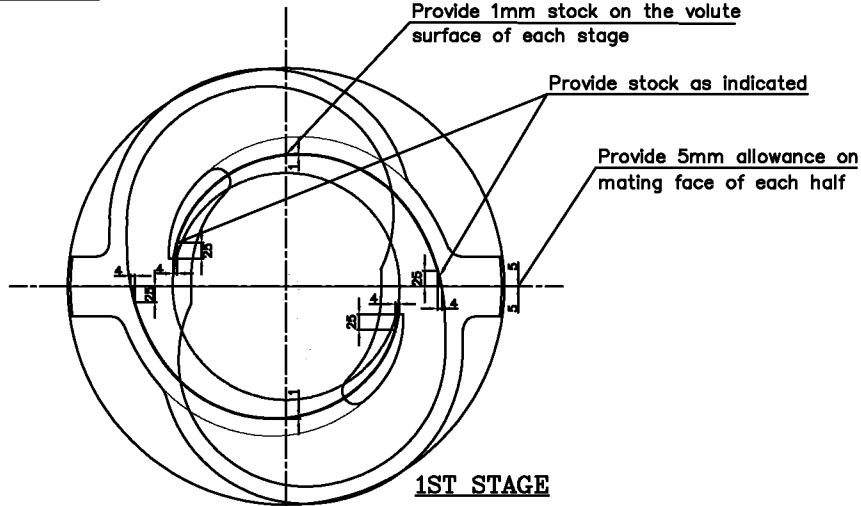
	DESIGN	POS	MEASURED	POS	MEASURED	B.C∅	ACCEPTANCE
1ST STAGE		A1		B1			
		A2		A2			
		A3		A3			
		A4		A4			
2ND STAGE		A1		B1			
		A2		A2			
		A3		A3			
		A4		A4			
3RD STAGE		A1		B1			
		A2		A2			
		A3		A3			
		A4		A4			
4TH STAGE		A1		B1			
		A2		A2			
		A3		A3			
		A4		A4			
5TH STAGE		A1		B1			
		A2		A2			
		A3		A3			
		A4		A4			
6TH STAGE		A1		B1			
		A2		A2			
		A3		A3			
		A4		A4			



PRODUCT STANDARD
PUMPS
HYDERABAD

ALLOWANCES ON INNER CASING CASTING

Annexure-2



COPY RIGHT AND CONFIDENTIAL
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.

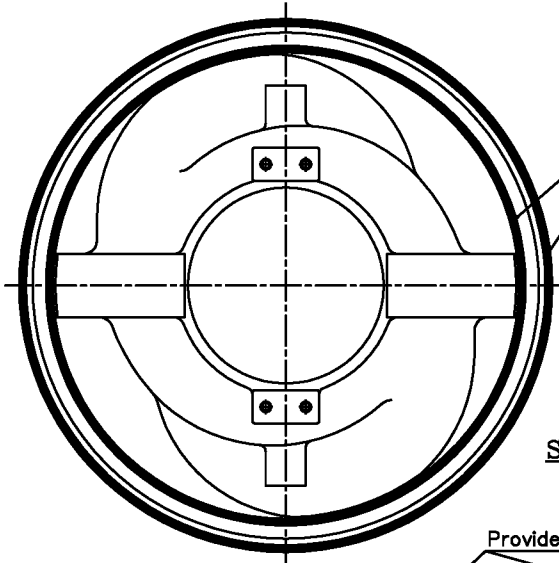


PRODUCT STANDARD

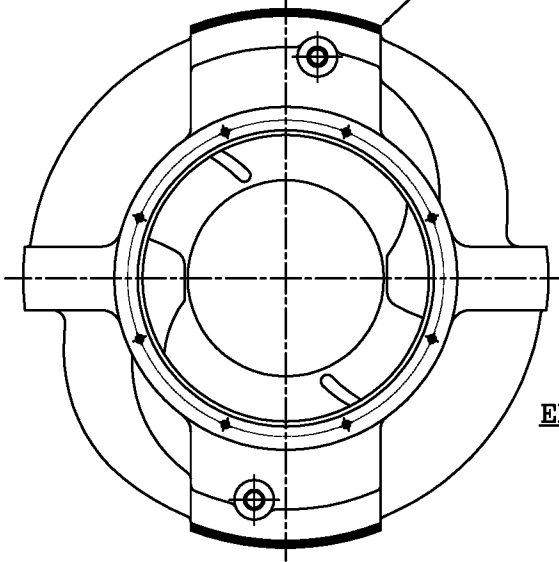
PUMPS HYDERABAD

COPY RIGHT AND CONFIDENTIAL

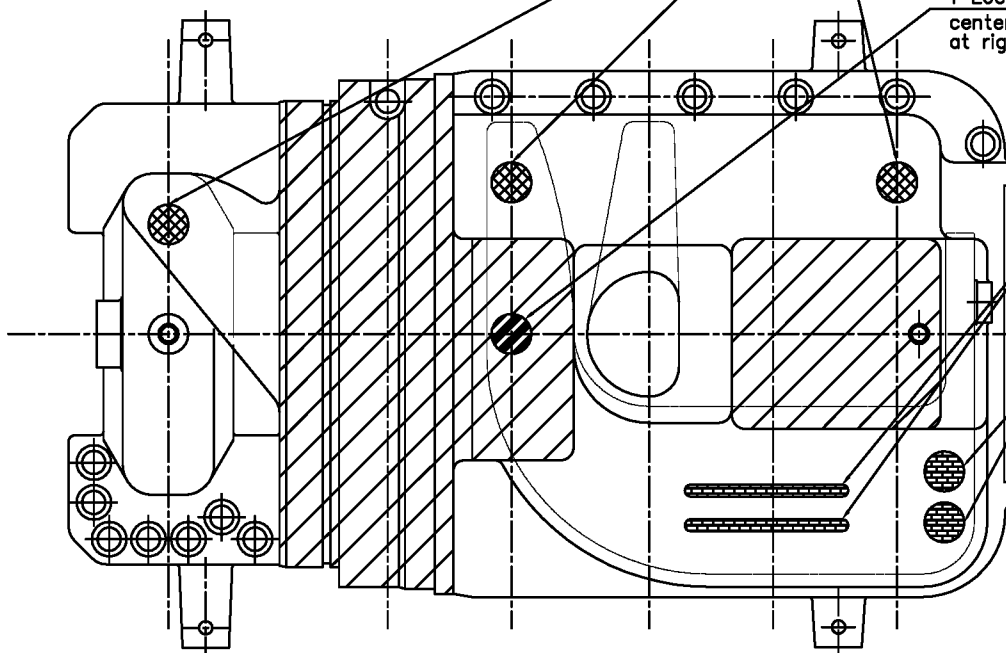
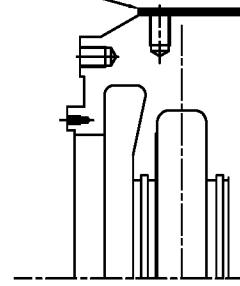
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITD, It must not be used directly or indirectly in any way detrimental to the interest of the company.



SUCTION SIDE VIEW



END SIDE VIEW



OUTLINE OF INNER CASING

3 Locations: $\phi 60 \pm 10$ mm, holes at 45° angle to split face. Hole side face should be at right angle to wall face.

1 Location: $\phi 60 \pm 10$ mm, holes on centerline. Hole side face should be at right angle to wall face.

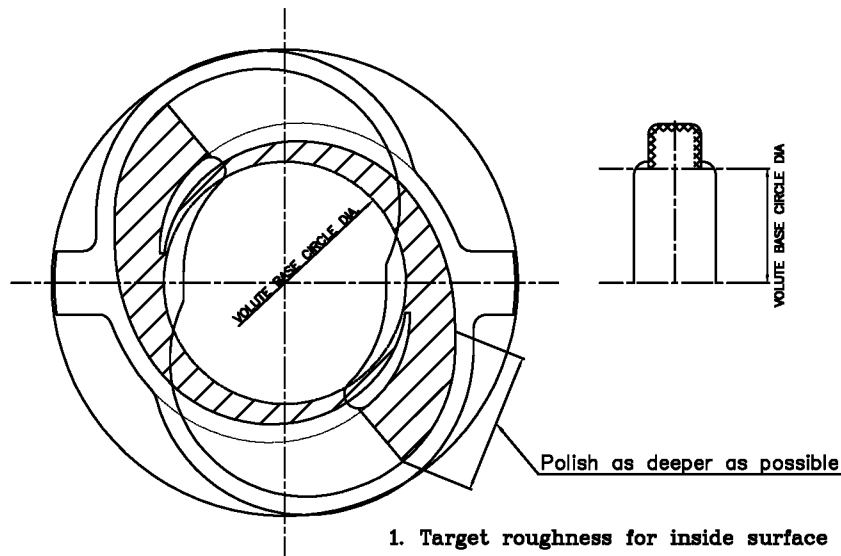
2 Locations: convenient for cleaning long classover

2 Locations: $\phi 60 \pm 10$ mm
Make hole at a position from where, passage can be cleaned properly.



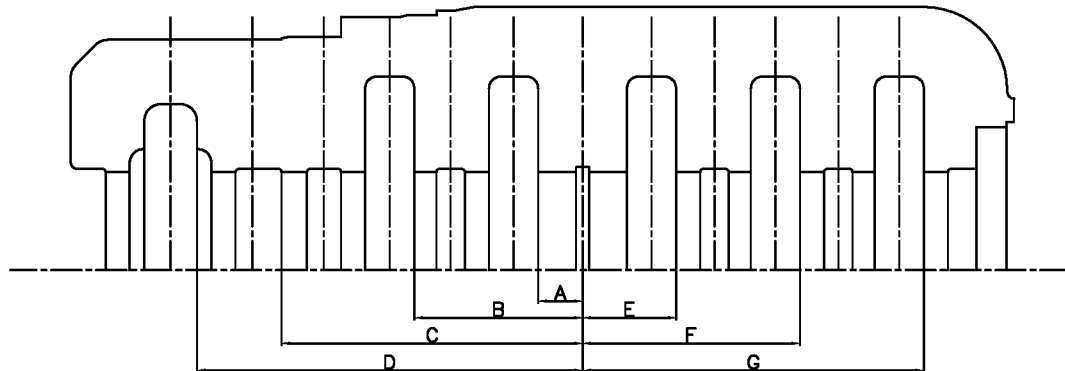
PRODUCT STANDARD
PUMPS
HYDERABAD

SURFACE ROUGHNESS OF INNER CASING



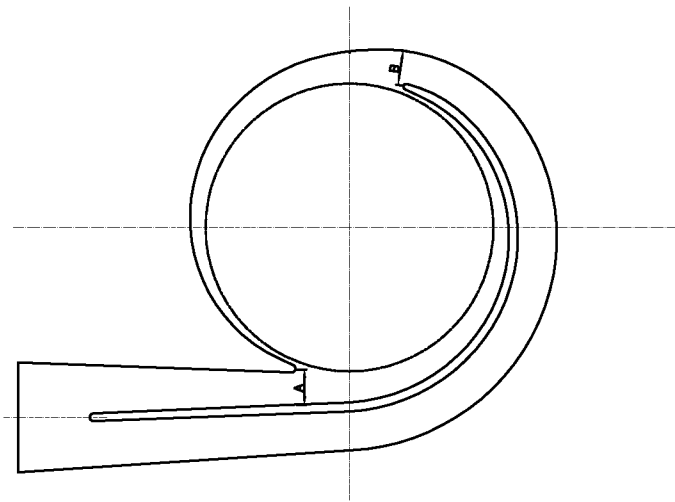
1. Target roughness for inside surface of volute of each stage: $\sqrt{32}$
2. Inside surface shall include the shaded area and area marked by XXX in the above sketch
3. Polish the inside surface of Volute blade-tongue as deep as possible
4. Polish surfaces for the long-crossover and last stage are also same as indicated above.

ALLOWABLE TOLERANCE IN INNER CASING STAGE PITCH



Axial dimensions (from centerline of center stage bush to face to each stage) as shown above shall be measured, ensured within allowed tolerances indicated below.

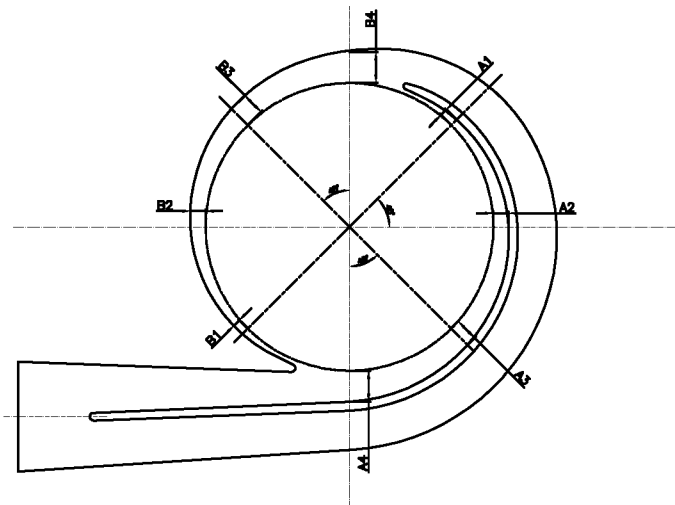
Standard Dimension	Allowed Tolerance
250mm and under	$\pm 0.5\text{mm}$
500mm and under	$\pm 1.0\text{mm}$
750mm and under	$\pm 1.5\text{mm}$
1000mm and under	$\pm 2.0\text{mm}$



CASING THROAT AREA

CASING THROAT AREA

	A	B	ACCEPTANCE
DESIGN VALUE			
MEASURED VALUE			



VOLUTE FORM

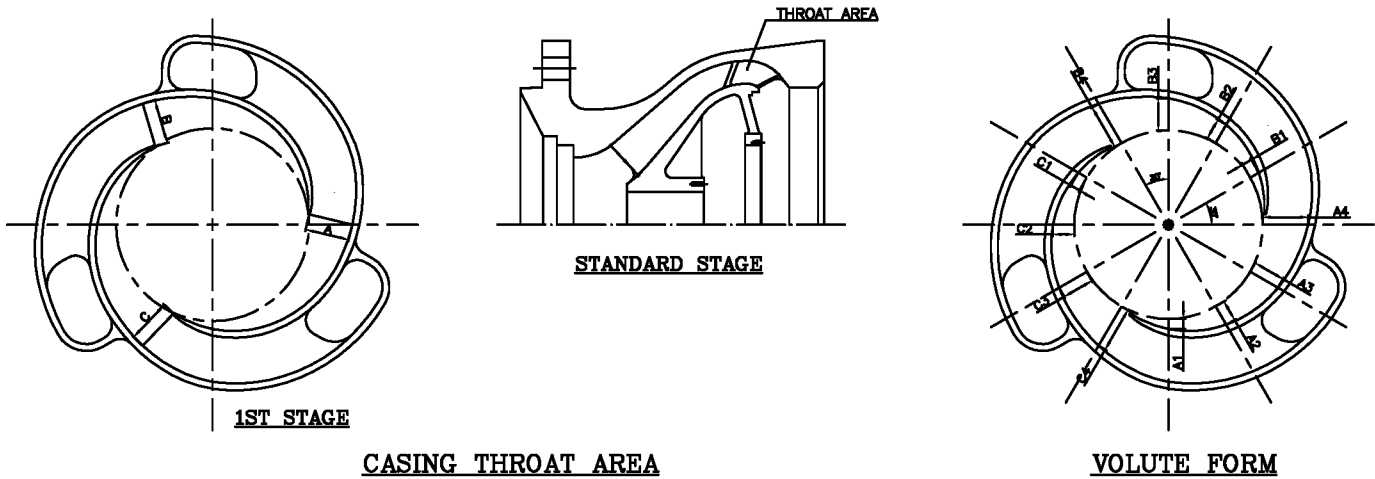
VOLUTE FORM

DESIGN	POS	MEASURED	POS	MEASURED	B.C∅	ACCEPTANCE
	A1		B1			
	A2		B2			
	A3		B3			
	A4		B4			

DIMENSIONAL INSPECTION REPORT

Annexure 4–FP60291

CEP,1st & Standard stage casings



CASING THROAT AREA

VOLUTE FORM

CASING THROAT AREA: 1ST STAGE

	A	B	C	ACCEPTANCE
DESIGN VALUE				
MEASURED VALUE				

CASING THROAT AREA: STANDARD STAGE

	DESIGN VALUE	THROAT AREA							ACCEPTANCE
		1	2	3	4	5	6	7	
1ST									
2ND									
3RD									
4TH									
5TH									
6TH									
7TH									

VOLUTE FORM

DESIGN	POS	MEASURED	POS	MEASURED	POS	MEASURED	B.CØ	ACCEPTANCE
	A1		B1		C1			
	A2		B2		C2			
	A3		B3		C3			
	A4		B4		C4			