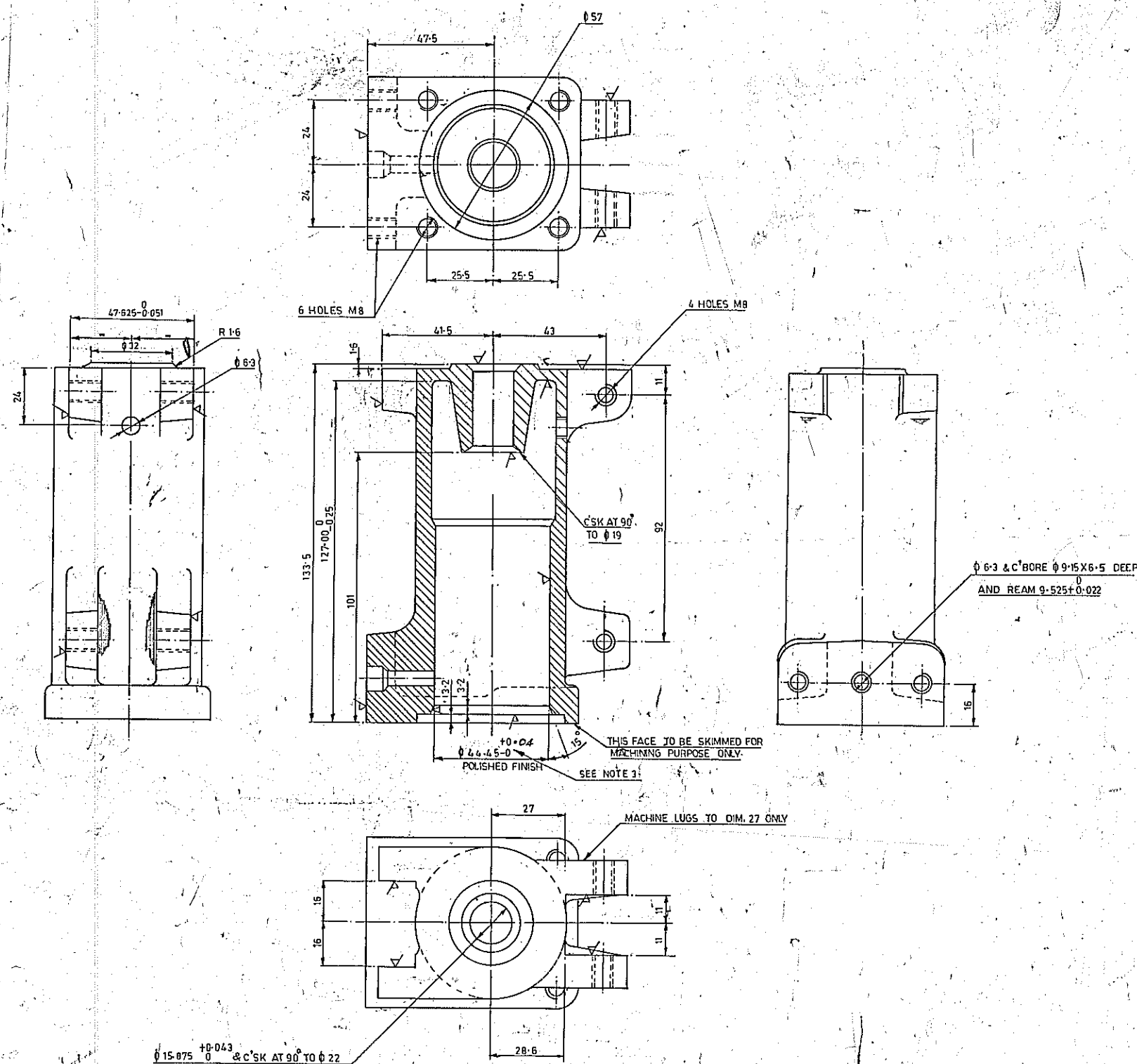


Y No.

[illegible]

1616119/2023/HEP-SWM20915



TOOL LIST		
ITEM	TOOL	DESCRIPTION
001	1486291	SOFT JAWS (W/ CHUCK)
001	1486292	MICRO BORING C'SK FACING BAR
001	1486293	SPADE C'SK & FACING BAR
001	1486294	MICRO BORE BORING BAR
001	1486295	ADAPTOR FOR STD FACE PLATE
001	1485362	MILLING FIXTURE
001	1485363	DRIILL JIG
001	1486296	ROLL POLISHING TOOL
001	1486013	RING GAUGE
001	1486341	ADAPTOR FOR PRESSURE TESTING
001	1555335	PLUG GAUGE +100 FOR BORE 0.484 0
001	15558556	GAUGE FOR CHECKING CYLINDER CONCENTRIC

FINISH :- ANODISE

NOTE: CYLINDER MUST WITHSTAND A LIQUID PRESSURE TEST OF 10-55 KG/SQ CM.

2. SURFACE FINISH TO BE 0.7 MICRONS MAX. FOR THE POLISHED SURFACE. FINISH TO BE CHECKED 0.03 INCH WAVE LENGTH CUT OFF.
3. DRILL AND BORE ± 0.0005 BEFORE POLISHING.
4. MIN 4% ELONGATION IS ACCEPTABLE.

BP907858640										001										CYLINDER										1585 11 3 0004										[001]																																																											
VAR. CO										REMARKS										VAR. No.										ITEM No.										DESCRIPTION										DRAWING No.										MATL. CODE.										UNIT WT.																													
28										CARD TYPE-3										28										CARD TYPE-1										28										CARD TYPE-2										28																																							
ADDITIONAL INFORMATION																				TYPE OF PRODUCT 25 KV AC EMU OR NAME OF CUSTOMER/PROJECT INDIAN RAILWAYS																																																																															
STATUS OF DRAWING																				Bharat Heavy Electricals Ltd. Bhopal																																																																															
DISTRIBUTION OF PRINT OFFICE COPY SWM TCC (SWM) FVM																				DRN MATHAW C.K. CHD V.P.A. APPD																				NAME MATHAW C.K. CHD V.P.A. APPD																				SIGN [Signature] [Signature] [Signature] [Signature]																				DATE 3-12-81 18/3/82 15/5/82																			
REV. DATE NONE										ALTERED CHECKED										DEPT. CODE 710										GRADE OF SWM TOL DIM. CMM										SCALE NTS.										WEIGHT (Kg)										REF. TO ASSY. DRG. 2585 11 3 0001																																							
TITLE																				CYLINDER																				DRAWING NO. 1585 11 3 0003																				SHEET NO.																				NO. OF SHEETS																			

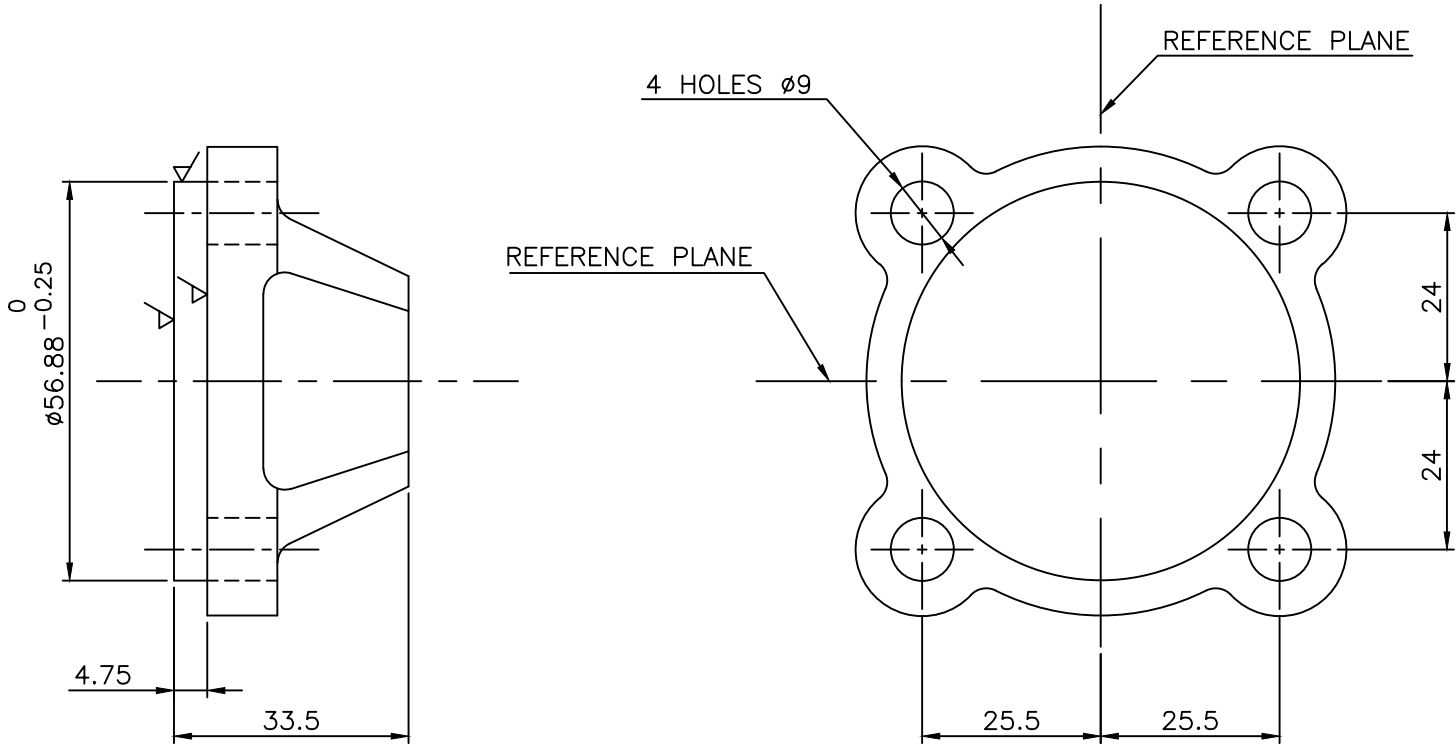
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm.)

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.

3 585 11 3 0003
DRAWING NO.


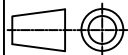
TOOL LIST		
ITEM	TOOL	DESCRIPTION
001	1485364	DRILL JIG



FINISH:– ANODISE

- NOTE:–
- 1. IT.001 SHOULD BE HYDRAULICALLY PRESSURE TESTED TO 11.25 KG/CMSQ. AFTER MACHINING IN CONJUNCTION WITH ITS CYLINDER 15851130003.
 - 2. MIN 4% ELONGATION IS ACCEPTABLE.

	STYLE CODE NO. BP 9078571098		001	CYLINDER CAP		2 585 11 3 0003	001						
VAR. 00	REMARKS	VAR NO.	ITEM NO.	DESCRIPTION	STD.	DRAWING NO.	IT. NO.	MATL. CODE.	A/C	UNIT	UNIT WT.	QTY.	QTY.
							VAR	MATL. SPCN.					

F	R											ADDITIONAL INFORMATION										उत्पाद का प्रकार या ग्राहक/परियोजना का नाम										25 KV AC EMU										
												STATUS OF DRAWING M										TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT										INDIAN RAILWAYS										
SIGN. & DATE		REV	DATE							REV	DATE	NOTE 2 ADDED. STYLE NO. ADDED.						DISTRIBUTION OF PRINTS										बी.एच.ई.एल.  BHARAT HEAVY ELECTRICALS LTD. BHOPAL										बनाया DRN.	नाम /NAME	हस्ता/SIGN.	दि./DATE	पेरि की संख्या NO. OF VAR.
										04	26.07.96							OFFICE COPY - 1 SWM - 4 TCX (SWM) - 1											MATHEW C.K	-Sd-	25.11.81											
INVENTORY No.		REV	DATE	ALTERED	CKM	-SD-	REV	DATE	ALTERED	VJOHN	-SD-	REV	DATE	ALTERED	RCB	-SD-	विभाग	उत्प.टोल.नाप की त्रुटि		अनुपात SCALE	भार कि.ग्रा. WEIGHT (K.G.)	उत्प. ड्राईंग का संदर्भ										मद संख्या ITEM NO.	मद संख्या NO. OF ITEM									
	03	17.11.95	CHECKED	SCV	-SD-	02	15.12.89	CHECKED		-SD-	01	30.06.85	CHECKED	SCV	-SD-	DEPT. CEE	UNTOL. DIMS. GR.	REF. TO ASSY.																								
			APPROVED	SCV	-SD-			APPROVED		-SD-			APPROVED	SCV	-SD-	कोड	REF CG 06503	2 585 11 3 0001																								
			NOTE ADDED.							FINISH ADDED							TOOL NO. 1485364 WAS 1555079.						0407		004																	
																			CYLINDER CAP						ड्राईंग क्र./DRGAWING NO.										पुन./ REV.							
																									3 585 11 3 0003											04						
																									शीट क्र /SHT.NO 01 शीटों की सं./NO.OF.SHT. 01																	

STYLE LIST				
STYLE CODE NO.	ITEM INCLUDED	DESCRIPTION OR REMARKS	RECORDED	
			SIGN	DATE
BP9308576711	001	CYLINDER	LMO	26.9.81

- 1.1. SUPPLIER SHOULD REFER THE MACHINING DRG. 1 580 11 3 0009 IT.001 BEFORE PROCEEDING WITH THE MANUFACTURE OF CASTINGS.
- 1.2. SUPPLIER SHOULD CAST THE NAME OF HIS FIRM AND CASTING DRG. NO. IN PLACE MARKED THUS. *
- 1.3. SUPPLIER SHOULD FURNISH TEST CERTIFICATES ALONG WITH THE SUPPLY OF CASTING REGARDING MECHANICAL PROPERTIES AND CHEMICAL COMPOSITION AS PER BP 19998
- 1.4. CASTING SHOULD BE SOUND, CLEAN AND FREE FROM POROSITY, BLOW HOLES, HARD SPOTS, COLD SHOTS AND DISTORTION.
- 1.5. ONE PERCENT OF EACH BATCH OF SUPPLY (MINIMUM TWO CASTINGS) SHOULD BE MACHINED AS PER MACHINING DRG. 1 580 11 3 0009 IT.001 FOR CHECKING ITS MACHINABILITY.
- 1.6. ALL OTHER REQUIREMENTS AS PER BP 19998

2.1 DIMENSIONS.
DIMENSIONS GIVEN INCLUDE MACHINING ALLOWANCES REQUIRED BY US
ALL CASTING RADII TO BE 1.0 UNLESS OTHERWISE SHOWN.

A-TOLERANCE OF ± 0.25 IS ALLOWED ON ALL DIMENSIONS UNLESS OTHERWISE SHOWN.

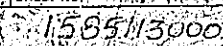
FACES MARKED THUS ⊕ SHOULD BE FLAT AND PARALLEL TO EACH OTHER.

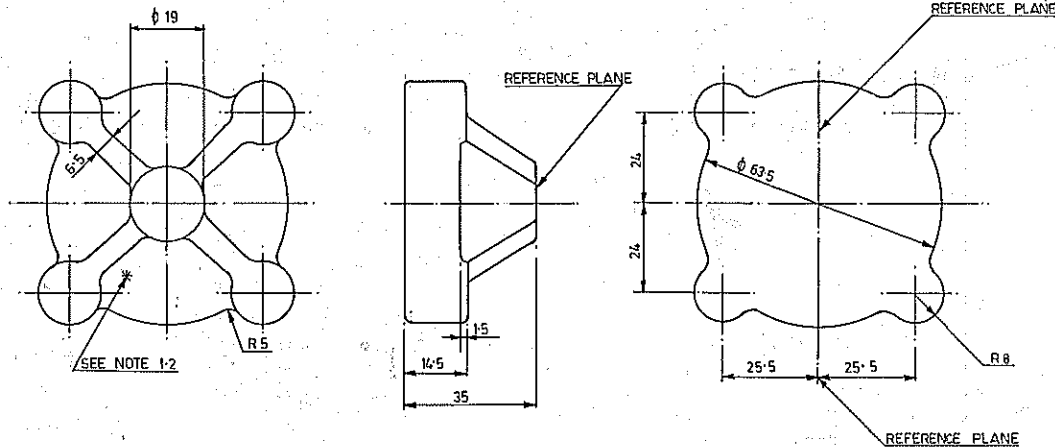
TENSILE STRENGTH TO BE: 275 N/MM²

MINIMUM 4% ELONGATION IS ACCEPTABLE

[illegible]

INVENTORY NO.	SIGN & DATE	REF. ORG. NO.
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1. GENERAL REQUIREMENTS:-

- 1-1. SUPPLIER SHOULD REFER THE MACHINING DRG. 3 585 113 0003 IT-001 BEFORE PROCEEDING WITH THE MANUFACTURE OF CASTING
- 1-2. SUPPLIER SHOULD CAST THE NAME OF HIS FIRM AND CASTING DRG-NO IN THE PLACE MARKED THUS *
- 1-3. THE SUPPLIER SHOULD FURNISH TEST CERTIFICATES ALONG WITH THE SUPPLY OF CASTINGS REGARDING MECHANICAL PROPERTIES AND CHEMICAL COMPOSITION AS PER BP 19998
- 1-4. THE CASTING SHOULD BE SOUND CLEAN, AND FREE FROM POROSITY, BLOW HOLES, HARD SPOTS, COLD SHOTS AND DISTORTION
- 1-5. ONE PERCENT OF EACH BATCH OF SUPPLY (MIN. TWO CASTINGS) SHOULD BE MACHINED AS PER THE M/C DRG. 3 585 113 0003 IT-001 FOR CHECKING ITS MACHINABILITY
- 1-6. ALL OTHER REQUIREMENTS AS PER BP 19998.

2. TECHNICAL REQUIREMENTS:

2.1. DIMENSIONS:-

- 2-11 DIMENSIONS GIVEN INCLUDE MACHINING ALLOWANCES REQUIRED BY US.
2-12 ALL CASTING RADII TO BE 1-6 UNLESS OTHERWISE SHOWN.

2.2 TOLERANCES:

- 2-21 A TOLERANCE OF ± 1.5 IS ALLOWED ON ALL DIMENSIONS UNLESS OTHERWISE SHOWN.

2.3. HARNESS:-

- 2.3.1 THE HARDNESS OF THE CASTING SHOULD NOT BE MORE THAN 110 HB.

STYLE LIST				
STYLE	ITEM INCLUDED	DESCRIPTION OR REMARKS	RECORDED	
			SIG	DATE
850153	001	CYLINDER CAP	MS	4-11-61

TOOL LIST		
ITEM	TOOL	DESCRIPTION
001	1486938	DIE

CYLINDER CAP., AL. ALLOY DIE CASTING								1285066							
BP 19998															
VAR. MATL. CODE								UNIT WT.							
VAR. MATL. SPECN.								QTY.							
CARD TYPE-1								CARD TYPE-2							
ADDITIONAL INFORMATION															
STATUS OF DRAWING M															
DISTRIBUTION OF PRINTS OFFICE COPY SWM TCX(FYM) FOUNDRY PROD															
TYPE OF PRODUCT 25 KV AC EMU OR NAME OF CUSTOMER/PROJECT INDIAN RAILWAYS															
BHARAT HEAVY ELECTRICALS LIMITED BHOVAL															
REF. NAME CHD. MATHIEW CK. APPD V.P.A.															
DATE 25-11-81 SIGNATURE 15/12/82															
NO. OF VAL.															
DEPT. CODE GRADE OF UN. TOL. DIM/C/M/F															
SCALE 1:1															
WEIGHT (Kg.) 045															
REF. TO ASSY. DRG. 3 585 11 3 0003															
ITEM NO. 001															
NO. OF ITEMS															
TITLE CASTING OF CYLINDER CAP. OR															
CARD CODE DRAWING NO. 2 585 11 3 0003															
SHEET NO. NO. OF SHEETS															



PLANT PURCHASING SPECIFICATION BHOPAL

BP 19998

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SUPERSEDES
BP 19998 Rev.03

ALUMINUM ALLOY SAND & CHILL CASTING Gr. 2280 T6

1. GENERAL:

This specification governs the quality of Aluminum alloy sand and chill casting of grade 2280 T6.

2. APPLICATION:

For complex, thin walled, pressure tight and vibrated resisting castings with very good resistance to corrosion and good weld ability.

3. CONDITION OF DELIVERY:

Fully heat treated (T6) condition.

4. COMPLIANCE WITH NATIONAL STANDARDS:

The casting shall comply with the requirements of.

IS:617 – 1994
(reaffirmed 2014)
Alloy : 2280 T6

Specification for Aluminum and Aluminum alloy ingots and
Casting for general engineering purpose.

5. DIMENSIONS AND TOLERANCES:

The dimensions of the castings shall be in according with the drawings supplied with the order. All surfaces marked for machining shall have sufficient machining allowance but it shall not be too excessive resulting in more machining. For un-machined surfaces, unless otherwise stated in the order/drawing, the tolerances on linear dimensions and wall thickness shall be as per CS AA 023 04 02.

6. MANUFACTURE:

The casting shall be sand or chill cast as specified on the order/drawing.

7. FINISH:

The casting shall be properly fettled and dressed and shall be thoroughly cleaned. The casting shall be supplied either in un-machined, rough-machined or finish machined condition as stated in the order/drawing.

Revision :
Reviewed & IS Reffirmed 2014

Issued by :

STANDARDS AND MATERIALS GROUP
TECHNICAL SERVICES DEPARTMENT

Rev No : 04

Date : 12.02.2020

Date of first issue : June 1970



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BP 19998

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8. FREEDOM FROM DEFECTS :

The castings shall be sound and free from harmful defects such as blow holes, inclusions, shrinkage, gas cavities, hot spots, cold shuts, cracks, gross porosities, dross etc. which may adversely affect the machining and utility of castings.

9. CHEMICAL COMPOSITION :

The chemical composition of the material when analyzed in accordance with IS:504 (Methods of chemical analysis of Aluminum and Its alloys) or any other suitable instrumental/chemical method, shall be as follows :

Element	Percent	
	Min.	Max.
Copper	4.00	5.0
Silicon	-	0.25
Magnesium	-	0.10
Iron	-	0.25
*Manganese	-	0.10
*Nickel	-	0.10
*Zinc	-	0.10
*Lead	-	0.05
*Tin	-	0.05
*Titanium	0.20	0.30
Aluminum	Reminder	

*These elements need not be determined when the material supplied conforms with the mechanical properties specified in the specification. However, the supplier shall ensure that the composition of the material lies within the limits specified above.

10: TEST SAMPLES :

- 10.1. One test specimen shall be selected from each heat for chemical analysis. Care shall be taken to discard the first drillings till a clean oxide-free surface is reached.
- 10.2. One representative tensile test specimen shall be prepared from each cast/heat treatment batch as per clause 6 of I.S. 617 and shall be supplied along with the consignment, bearing the cast no/heat treatment batch no. etc.

11. MECHANICAL PROPERTIES :

11.1 Tensile :

The test specimen when tested in accordance with IS:1608 shall show the following tensile properties.



PLANT PURCHASING SPECIFICATION BHOPAL

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Tensile strength, N/mm²

Sand Casting : 275 Min.

Chill Casting : 310 Min.

% Elongation on 5.65 \sqrt{so} gauge length

Sand casting : 4 Min

Chill casting : 9 Min

11.2 Hardness Brinell :

The castings when tested as per IS:1500 shall show a Brinell Hardness of 85 - 115 HB.

12. ADDITIONAL TESTS :

If specified in the order/drawing, the following additional tests shall be conducted on the castings.

1. Pressure test.
2. Radiographic test.

The requirements of these tests shall be prescribed in the order/drawing or as mutually agreed upon.

13. REPAIR OF CASTINGS :

Castings shall not be repaired unless permission in writing has been obtained previously from BHEL.

14. TEST CERTIFICATE :

Unless otherwise specified, three copies of test certificates shall be supplied.

In addition, the supplier shall ensure to enclose one copy of the test certificate along with their dispatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information:

BHEL Order No:

BP 19998 (Rev.04) - Aluminum Alloy Sand and Chill Castings (Gr. 2280 T6)

Supplier's Reference & Name:

Method of manufacture

Melt No.



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PLANT PURCHASING SPECIFICATION BHOPAL

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RESULTS OF TESTS.

Results of chemical, analysis mechanical test dimensional tolerances and other tests called for in this specification/order/drawing/pattern.

15. PACKING AND MARKING :

Castings shall be suitably packed to prevent corrosion and damage during transit. Machined surfaces shall be properly protected with anticorrosive compounds.

Each package or casting shall be legibly marked with the following information.

BHEL Order No

EP 19998 : Aluminum Alloy Sand and Chill Castings (Gr. 2280 T6)

Heat No.

Identification mark/No.

Weight.

Supplier's reference and Name.