

Spec No. E-10/3/09 (BLOWER)
(3 Phase Drive loco)

Government of India
Ministry of Railway
(Railway Board)

**SPECIFICATION AND TEST SCHEDULE FOR
MOTOR DRIVEN BLOWERS**

For

25 KV AC/50 HZ THREE PHASE DRIVE ELECTRIC LOCOMOTIVE

Part - 1 (Blowers)

AUGUST - 1997

ISSUED BY

Research Designs and Standards Organisation
Manak Nagar, Lucknow 226011

SPECIFICATION AND TEST SCHEDULE FOR MOTOR DRIVEN BLOWERS

0.0 FOREWORD

0.1 The centrifugal and axial flow fans covered by this specification are capable of working against pressure.

0.2 In preparing this specification assistance has been taken from the following specifications :

IS: 3588	Axial flow fans
IS: 4894	Specification for Centrifugal fans
BS: 848	Method of testing of fans for general purposes.

0.3 This specification contains clauses which call for agreement between the purchaser and the supplier and which requires the manufacturer to supply certain technical information at the time of submitting tenders.

0.4 This specification is in two parts - Part I dealing with blower and Part II dealing with driving motors. Performance requirements and tests on the combined unit are dealt in Part I, Part I of the specification shall be read in conjunction with Part II.

1.0 SCOPE

1.1 This standard covers the performance requirements and tests of centrifugal and axial flow fans having impellers directly coupled to ac electric motors fitted in 25 KV, AC/50 HZ 3 phase drive electric locomotives.

1.2 Each locomotive is equipped with 3 auxiliary converters each rated at 100 KVA. These converters directly gets supply from a common auxiliary winding of 1000 V (corresponds to 25 KV catenary voltage) from the main transformer. The three phase output voltage of the auxiliary converter 1&2 feeds variable voltage and variable frequency to the traction motor blowers, oil cooler blowers and its scavenge blowers. For traction motor blowers, oil cooler blowers and their scavenge blowers, the speed is controlled in 3 steps (17 HZ, 33 HZ, and 50 HZ) by the control electronics which gets signal from the temperature sensors in traction motor winding and in oil cooler circuit.

Machine room blower and scavenge blower for machine room blower are connected across single phase, 415 V, 50 HZ supply separately.

1.3 The following blowers are used in an 3 phase drive electric locomotive:-

- Traction motor cooling blower	2 Nos.	Mixed flow centrifugal
Transformer & convertor Oil Cooler blowers	2 Nos.	- Do -
Machine Room Blower	2 Nos.	- Do -
- Traction motor/oil cooler scavenge blower.	2 Nos.	- Do -
- combined scavenge blower	2 Nos.	Centrifugal type
- Machine room scavenge blower	2 Nos.	- Do -

2.0 Terminology, symbols and units.

2.1 For the purpose of this specification, the definitions given in IS: 4894 and IS:3588 shall apply.

3.0 Capacity and rating.

3.1 Individual ratings of the blowers shall be furnished along with the tender.

3.2 Rated output : The rated output of the blower shall correspond to the rated speed of the motor. The output of the blowers at rated voltage is indicated in Annexure-I.

3.3 Starting performance: The blowers shall accelerate from stop to the full speed within 6 seconds over the entire range of supply voltage i.e. $415 \pm 10\%$.

3.4 The following tolerance shall be applicable:

Characteristics	Tolerance
Volume flow	- 5%
Power Input	+ 10%
Static or total efficiency	- 5%
Speed	$\pm 10\%$

4.0 Service Conditions

4.1 Ambient Temperature: The general ambient temperature of air at the inlet to the blower and the motor will be 5 deg to 55 deg c maximum with humidity varying upto 100 % (saturation).

4.2 Maximum altitude - 1000 meters above mean sea

level.

4.3 The equipment and mounting arrangement shall be of robust design for traction duty and shall withstand satisfactorily the vibration and shocks normally encountered in service as indicated below:

- a) Maximum vertical acceleration. 1.0 g
- b) Maximum longitudinal acceleration due to shock. 3.0 g
- c) Maximum transverse acceleration. 1.0 g

4.3.1 The vibrations are of sine wave form and the frequency 'f' of vibration is between 1 Hz and 50 Hz. The amplitude 'a' expressed in millimetres is given as a function of f, by the equations :

$$a = 25/f \quad \text{for values of } f \text{ from 1 Hz to 10 Hz}$$

$$a = 250/f^2 \quad \text{for values of } f \text{ exceeding 10 Hz upto 50 Hz.}$$

4.3.2 In the direction corresponding to the longitudinal movement of the vehicle, the equipment is subjected for 2 min to 50 Hz vibration of such a nature that the maximum acceleration is equal to 3 g (amplitude 'a' = 0.3 mm)

4.3.3 Climatic and Environmental Conditions.

Maximum atmospheric Temperature	Under Sun 70 °c In Shed 55°c
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Humidity - 100% saturation during rainy season

Reference side condition:

i) Ambient temp.	Max. 55 °c Min. 0°c
ii) Humidity	60%
Altitude	160 m above mean sea level.

Atmospher during hot weather	Extremely dusty and desert terrain in certain areas.
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Coastal area	Equipment will be designed to work in coastal area in humid and salt laden atmp here.
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SECTION AND GENERAL CONSTRUCTION

5.1 Drive and coupling: The fan impeller shall be directly mounted on the motor shaft. In case of cast aluminium impellers a steel boss of hexagonal shape should be cast integrally with the impeller. The drive may be by a key of adequate strength with the impeller locked in position by a securing bolt and washer at the shaft end. The bolt shall be further locked against unscrewing in service by locking plates. Alternatively a tapered shaft without a key but with locking arrangement by bolt and locking plate may be used. The impeller mounting arrangement shall be subject to prior approval by the RDSO/CLW.

5.2 Direction of rotation: An arrow indicating the direction of rotation shall be permanently marked on the blower casing.

5.3 Balancing : The rotor and the blower impeller shall be dynamically balanced individually, in quality grade G 6.3 of ISO - 1940.

5.4 Vibration : The vibration level when blower is coupled with motor shall not exceed 25 microns (peak to peak) on motor bearing and 40 micron (peak to peak) on the blower casing.

5.5 Mounting arrangement : The mounting arrangement shall be subject to prior approval of RDSO/CLW.

5.6 Lifting arrangements: Suitable lifting arrangement for the blower fan and the motor separately and for the complete unit shall be provided.

6.0 Special construction features :

6.1 Special manufacturing processes: As the blowers operate for long periods at high speeds, the end rings, the impeller blade etc. should be designed with a higher margin of safety as compared to normal industrial designs. Non cast impellers shall be fabricated out of high tensile steel of weldable quality conforming to either Domex 400E or ST-55-HTW of IS:961 or ST 52 of IS 1079 or SAILMA 350 of "SAIL" or any other steel having superior or similar quality which has been adequately tested to ensure mechanical strength and dimensional uniformity. The cold pressed blades shall be stress relieved. The blades shall be welded. The welded joints should be free from undue stress either by stress relieving or by improved welding techniques. The quality of welding shall be also tested by the purchaser from time to time. Necessary test certificates should be produced as and when required.

6.2 Casing : Casing should be of heavy duty industrial design. It should not deform during lifting. It should be of single side intake. Mixed flow form with axial intake direction and axial discharge direction. It should be of welded construction of mild steel. Intake side and discharge side flange are bolted together corresponding to dimensional drawing. Intake side dismantling cover for impeller, Guide plate for streamlined air flow, mounting plate for flange mounted motors should be provided. All out side welds of the housing should be welded continuously. For scavenge blowers, casing shall be designed as per existing arrangement of centrifugal fans provided on 25 KV ac electric locos type WAP/WAG.

6.3 Pocket for mounting air flow relay : A pocket for mounting an air flow relay for minimum air flow protection to be fitted by the Railways shall be provided on the casing on the out let side of centrifugal blowers and on the inlet side of the axial flow blowers. The dimensions and mounting arrangement will be furnished by the Railways.

6.4 The mounting arrangement of the blower on the casing shall be properly secured so as to avoid loosening during the vibrations encountered in service.

7. Finish

The fan motor, the blades and the casing shall be suitably treated to remove rust and should be coated with an anti rust primer and finished with two coats of battle ship grey synthetic paint. All hardwares shall be cadmium plated.

8. Inter-changeability:

8.1 The motors blowers, impellers and casings shall be interchangeable such that the performance of the blower is kept within the limits of the standard.

9. Marking Plate:

9.1 Each blower shall have a suitable name plate having the following information engraved on it:

- a- Manufacturer's name, type and serial number
- b- Air delivery
- c- Total head at 20 dg.c.
- d- Rated speed
- e- Make of the motor
- f- Power consumption in 'KW'
- g- Impeller diameter
- h- Weight of the unit
- i- Manufacturing data and year

10. **Maintenance Instructions:**

10.1 The manufacturer shall supply detailed maintenance instructions as desired by the purchaser.

11. **Drawings:**

11.1 The drawings (to be asked by the purchaser) giving the overall dimensions of the blower shall be supplied with the tender.

12. **Data :**

12.1 The particulars of the blower set shall be furnished in the data sheet at Annexure 2.

13. **Tests :**

13.1 **General:** Tests are classified as type and routine tests. Type tests shall be carried out on one machine for every batch of 50 machines supplied to Railways.

13.2 The following are the different tests on the complete blower unit:-

a) **TYPE TESTS**

- i) Air delivery test
- ii) Starting time test
- iii) Starting duty test
- iv) Endurance test
- v) Vibration level test
- vi) Weighment
- vii) Checking of bearing by shock pulse meter
- viii) Checking of dimensions workmanship, clearance of impeller fixing and locking arrangement.

b) **ROUTINE TESTS:**

- i) Checking of obligatory dimensions and clearance of impeller fixing and locking arrangement.
- ii) Starting time test
- iii) Vibration level test
- iv) Condition of bearing by shock pulse meter

13.3 Unless otherwise specified in the contract the test and the method of measurement adopted shall comply with

Indian Standards specifications for centrifugal and axial flow fans.

13.4 Air delivery test

13.4.1 Type test : Test shall be carried out with the supply to the driving motor maintained at 415V(+ - 10%) at 50 Hz. However, it is desirable to conduct the tests at 17 and 33 Hz also with supply from the auxiliary converter. Adequate number of observations shall be made on both sides of the operating point to plot the characteristic curve. Measure the following quantities.

- i) Line voltage
- ii) Line current
- iii) Power input
- iv) Speed
- v) Total Pressure
- vi) Ambient temperature

The manometer pressure readings shall be taken atleast at 4 points to arrive at a mean value.

Calculate the blower output at standard conditions WT= 1.2 Kg/m³ Record method of test, details of equipments used and their calibration for observed and calculated results.

Plot curves of total head developed in mm water gauge, static head in mm WG, speed, efficiency air horse power power input to the motor in KW against output in cubic metre per minute.

13.5 Starting time test

13.5.1 Type test - with a test installation similar to that adopted for the air delivery test, start the blower successively at 415V and 373V.

Measure oscillographically or by any other accurate methods starting time of the motor blower unit to come upto full speed from zero speed. Record final load current and voltage reading.

13.5.2 Routine Test:

Conduct test on 10% of the blowers at 373V. The starting time obtained shall not exceed 6 seconds.

13.6 Starting duty test:

13.6.1 Type test: The blower unit shall be subjected to repeated start and stop cycling for 1000 times at a supply voltage of 415V. The "ON" and "OFF" period shall be 1 minute

in each case. If the unit takes more than 1 minute to stop freely the next start shall commence immediately after the unit has stopped.

At the end of the test the efficacy of impeller locking device shall be checked the impeller shall then be dismantled and various parts like key, key way and the fit of the impeller on the shaft shall be examined for abnormal wear.

13.7 Endurance Test

13.7.1. Type test - This test shall be conducted for a period of 48 hours with rated output and head and with a 415 V supply at the motor terminals.

After the test, the blower and the motor shall be dismantled and examined for wear and tear of the parts condition of rings and bearings etc.

13.8 Measurement of vibration intensity.

13.8.1 Type Test: For the measurement of vibration intensity on electronic vibration measurement equipment having a frequency range of 5 to 2000 CPS, shall be employed. The machine under test shall be mounted in accordance with IS:4729. Vibration measurement shall be made at the bearing housing of the machine which shall operate at no load at rated voltage and at rated speed.

Limits of vibration intensity:

The peak to peak value shall not exceed 10 microns on motor body, foot and bearing of all motors and 40 microns at blower casing of MVMT & VRH and 15 Microns for machine room blowers and scavage blowers.

13.8.2. Routine Test : Same as itemno. 13.8.1 above.

13.9. Condition of bearing by shock pulse meter

13.9.1 Condition of bearing shall be checked at rated voltage. The deflection shall be within green zone of the instrument.

13.9.2 Routine Test

Condition of bearing shall be checked at balanced 415V on each machine. The deflection shall be within the green zone of the instrument.

ANNEXURE - I

BLOWER RATING AT 415 V & RATING OF DRIVING MOTOR

Sl. No.	Nomenclature of equipment	TM Blower	Oil cooler Blower	Machine room Blower	Scavenge Blower for TM + oil cooler	Scavenge Blower for machine room Blower
1.	Make	ABB flakt	BHER/Gmbh	&co ABB Flakt	Flossep/ABB Transportation	Flossep/ABB Transportation
2.	Type/Size	HCBX-605-115		415-60	MB 55/R270 Dia-300	BB 11/R270 Dia-240
3.	Reference Drawing No.	V2598181	04.882.90.001	V2597597	1A116-00007	1A116-00004
		V2598174	RI. J. VON 5	BEHT3055	V2598180	
		V2597596	BEHT3054		V2598510	
					V2598503	
4.	Quantity per Loco	2	2	2	2	2
5.	Blower Head at 20 deg. C	Ro-Ro 3450 Co-Co 2950	1781 (Total head)	1390 (Total head)	475 (Static Pressure)	550 (Static Pressure)
	Total Head in mmHg at 20 deg. C		Total head	Total head		
			Total Pressure	Total Pressure		
6.	Air Delivery at 20 Deg. C	3.6	8.8	1.0	0.67	0.1

Sl. No.	Nomenclature of equipment	TM Blower	Oil cooler Blower	Machine room Blower	Scavange Blower for TM + oil cooler	Scavange Blower for machine room Blower
7.	HP/kw	34/25	34/25	3.5/2.6	40/3 30/2.2	1.0/0.75
8.	Synchronous Speed (rpm)	3000	3000	3000	1500 3000	3000
9.	Motor frame Size	200 TEFC	200 TEFC	132 TEFC	100 TEFC	90 TEFC
10.	Type of Bearing	3 DE 3 NDE	6312 ZR 6312 ZR	6208 ZR 6208 ZR	6206 ZR 6206 ZR	6205 ZR 6205 ZR

Note: For detailed drawings CLW may be contacted.

ANNEXURE - 2

Data Sheet for Blower

- A.1 Type, model and make.
- A.2 Air delivered in cubic meter per minute and total head in mm W6 corrected to 20 C and 760 mm barometric pressure.
- (a) at rated voltage.
 - (b) at lowest voltage.
- A.3 Design data-
- (a) Impeller diameter.
 - (b) Type of impeller blades.
 - (c) Number of blades.
 - (d) Method of fixing of the blades.
 - (e) Clearance between inlet cone and impeller (maximum and minimum).
 - (f) maximum shaft speed of the impeller.
 - (g) motor shaft and impeller bore diameter (maximum and minimum).
 - (h) Method of fixing of impeller on motor shaft and locking arrangement
 - (i) GD2 value of the impeller (indicate the maximum variation in manufacture).

NOTE :- GD2 value of the impeller will be made use of for calculating the starting performance of the blower with regard to the specified electric motor. As such the value to be furnished should take into account the inertia, the friction and the resistive torque of the impeller while it is being started.

A.4 The manufacture shall furnish the speed-torque characteristic of the blower. This is required for matching the motor and the impeller.

A.5 Torque necessary for the blower when working against constant rated head and delivering the rated output.

A.6 The supplier shall enclose the following characteristic curves at 20 C and 55 C.

- (a) total and static head vs. air delivery,
- (b) total and static efficiency vs. air delivery,
- (c) air horse power vs. air delivery,
- (d) power absorbed vs. air delivery
- (e) speed vs. Air Quantity in m³/sec.

A.7 Vibration level in microns.

A.8 Furnish the welding strength calculation for the joint between impeller and base plate and core.

A.9 Calculation for locking strength calculation for impeller locking arrangement and key strength.

A.10 Necessary dimensioned drawings of the blowers and its all components showing the constructional and material specification as per IS, BS etc. and assembly details should be submitted.

Ventilation details of Traction Motors

	CO - CO (WAG9)
Air flow per blower(m3/s)	4.05
Static Pressure (Pa)	2920
Dynamic pressure (Pa)	30
Total Pressure (Pa)	2950
RPM	2920
P. mechanical (kw)	25

Pressure drop details

	CO -CO
No. of blowers per loco	2
V1-Air flow per loco (m3/s)	4.05
Total air flow (m3/s)	8.10

Pressure drops (Pa)

△ P1- Strata-panel filter	721
△ P2- Air duct filter blower	59
△ P3- Air duct filter blower	432
△ P4- bellow	54
△ P5- Traction motor	1600
△ P6- Air outlet	28
Reserve	26

△ P Static (Pa)	2920
△ P Dynamic (Pa)	30

	2950
P. mechanical (Kw)	21.7
Blower type	HCBX 605-115

Pressure drop details of Machine room blower

Number of blowers per loco	2
RPM	2950
V1- Air flow per blower (m ³ /s)	1
Total air flow (m ³ /s)	2
Pressure drops	
ΔP_1 - Strata panel filter	570
ΔP_2 - Air duct filter blower	31
ΔP_3 - Air duct filter blower	374

ΔP Static (Pa)	1380
ΔP Dynamic (Pa)	10

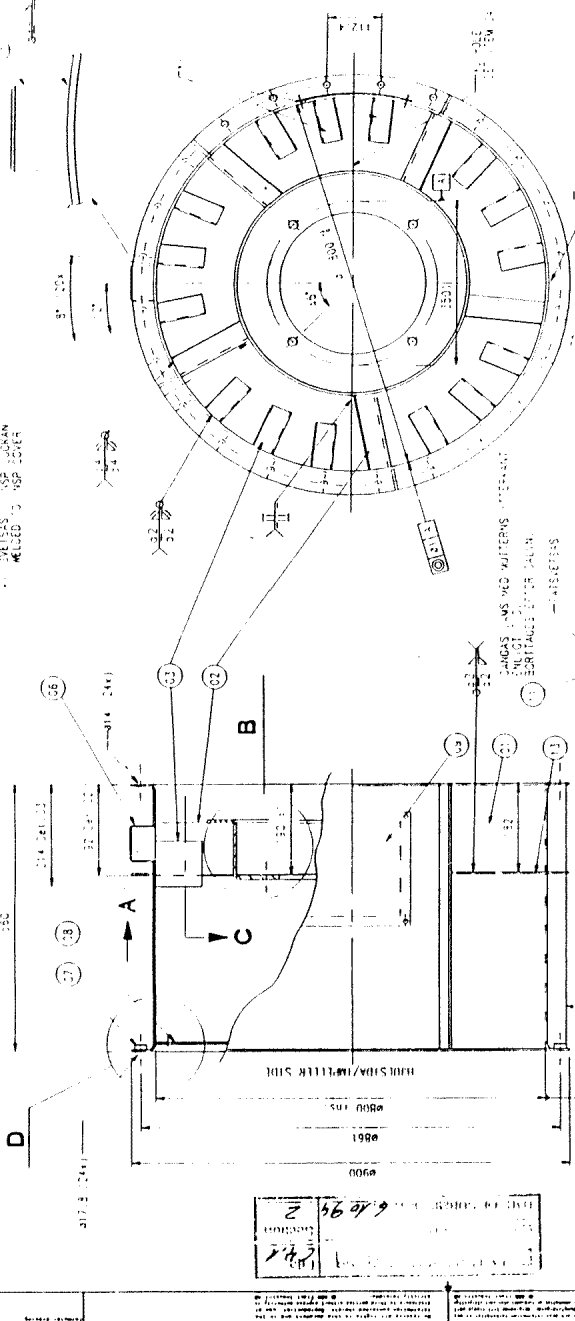
ΔP Total (Pa)	1390
P. mechanical (kw)	2.55
Blower type	415-60

Annexure 3 continued

Pressure drops of Transformer convertor oil cooling unit

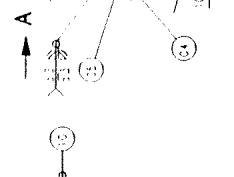
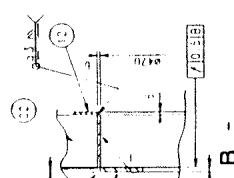
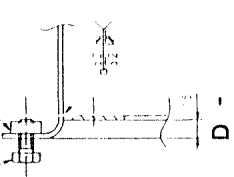
	WAG-5 & WAG-9
V1-air flow (Kg/s)	8.8
Mass flow density (Kg/m ³)	1.076
RPM	2920
Pressure drops (Pa)	
Δ P1- Filter panel	730
Δ P2- Air duct filter-Oil cooling unit	121
Δ P3- Oil cooling unit	800
Δ P4- Air out let	90
Reserve	40
Δ P Total (Pa)	1781
Blower type	HLS70-695x250
P.mechanical (Kw)	23.5

WELLS AND JOINTS
WELDED TO SP COUPLER



DATE FOR CHECKING: 6.10.92
 DRAWN BY: J.P.
 CHECKED BY: J.P.

NO.	REVISIONS	DATE	BY	REASON
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15	AS PER Dwg No. 173598174-15	1991	J.P.	ISSUE



SWEDENING
 SWEDENING TO BE DONE BY THE CUSTOMER OR BY THE SUPPLIER AT THE CUSTOMER'S RISK AND EXPENSE.
MELDING
 MELDING TO BE DONE BY THE CUSTOMER OR BY THE SUPPLIER AT THE CUSTOMER'S RISK AND EXPENSE.

TOLERANCES
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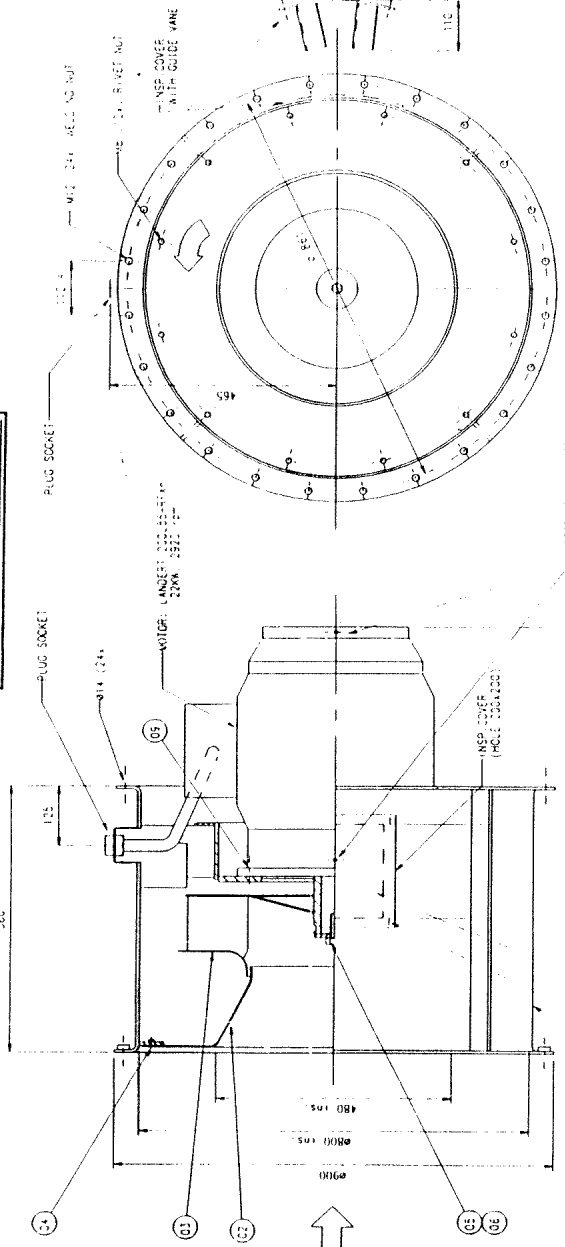
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1 09	3158-1428	SCRW M3x0,70
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FOR APPROVAL
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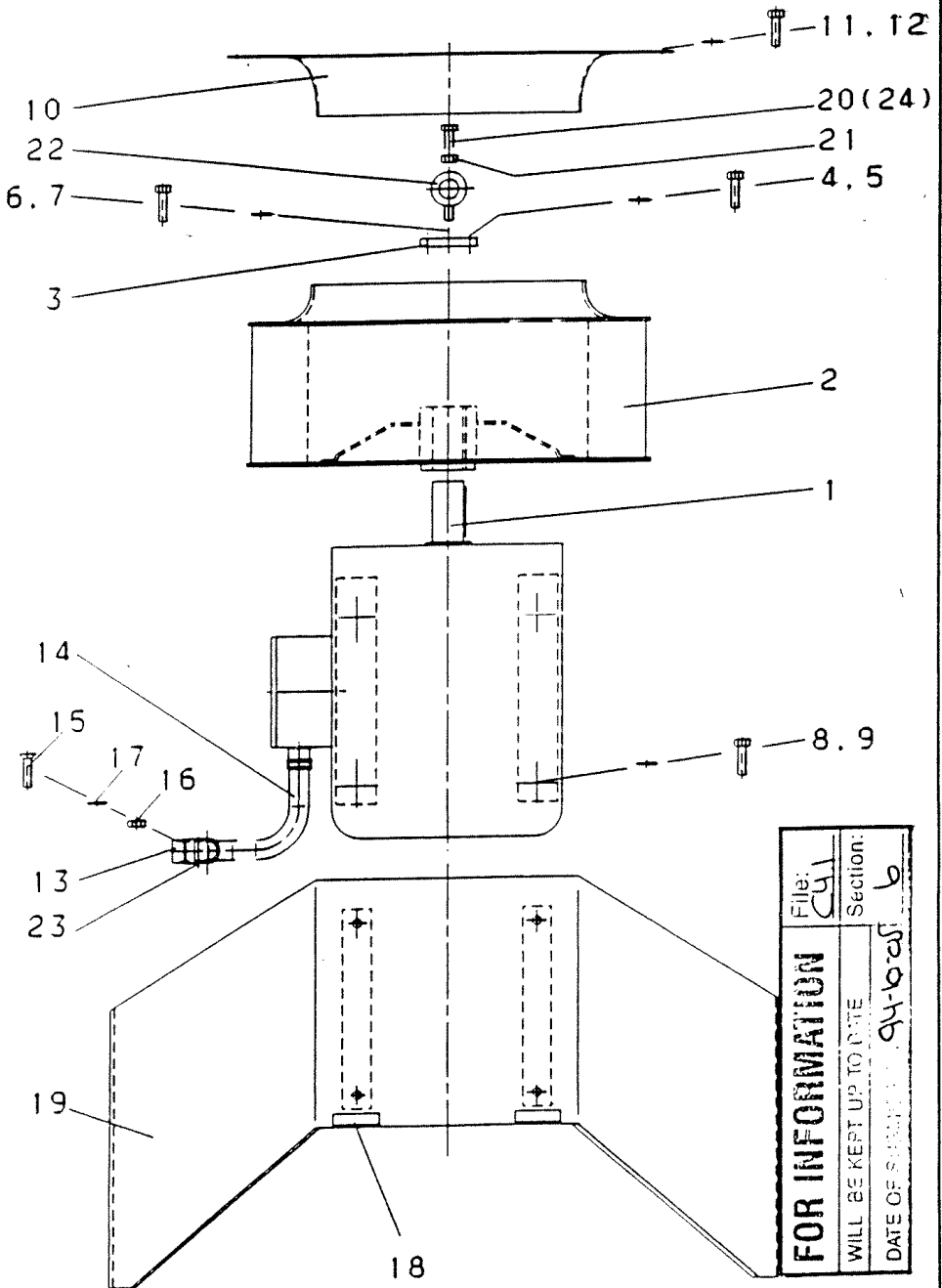


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12		1	PC	100A200	31.10.06
13		1	PC	100A200	31.10.06
14		1	PC	100A200	31.10.06
15		1	PC	100A200	31.10.06
16		1	PC	100A200	31.10.06
17		1	PC	100A200	31.10.06
18		1	PC	100A200	31.10.06
19		1	PC	100A200	31.10.06
20		1	PC	100A200	31.10.06

SURFACE TREATMENT: HOT DIP GALVANIZED
 WEIGHT: 400 AG. INCL. MOTOR.

C13	WEIGHT ADJUSTED	31/10/06 21
B12	LIST COMPLETE	31/10/06 21
A11	COMPLETE	31/10/06 21

W597596



Alle Maße für den Fall der Anfertigung oder
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	DATE OF SUBMIT:	94-02-05

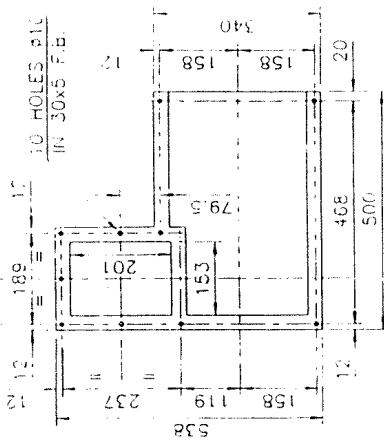
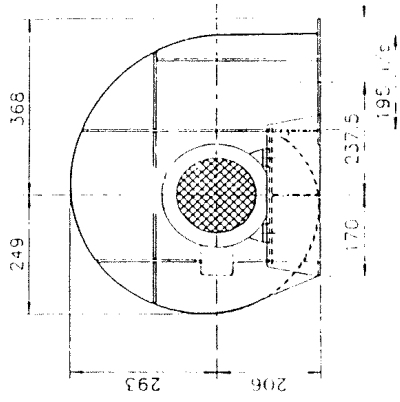
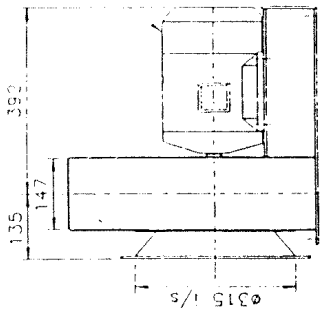
TOTAL MASS(kg)
75.0

ALL DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED
SURFACE FINISHES IN MILLIS IN IN.

DO NOT SCALE DRAWINGS, IF IN DOUBT ASK!
REMOVE ALL BURRS & SHARP EDGES

FOR INFORMATION
FILE NO. 3
SECTION 1
DATE OF ISSUE: 16.11.94

2.2KW, 4 POLE
MOTOR, FRAME 100L



REF FLOSSEP DRG No /059725

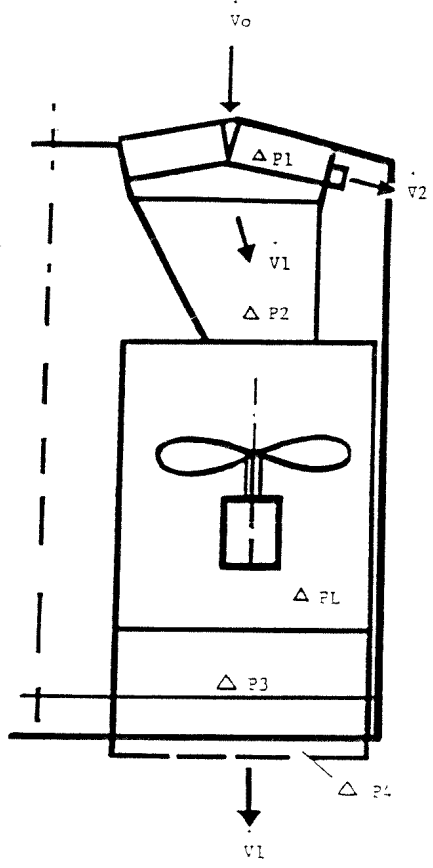
INLET FLANGE

ITEM	QTY	UNIT	DESCRIPTION	ITEM DESIGN	ITEM NO
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7					7
8					8
9					9
10					10
11					11
12					12
13					13
14					14
15					15

ABB Transportation Pty. Limited ACN 017 689 804	Customer: DRG No
Drawing Title GA - FAN TYPE MB55, ARRGT 2, R270,DIA 300	Customer: DRG No IA116-0007
Scale: 1:1	Sheet: 1 of 1

ITEMS OTHERWISE SPECIFIED: MATERIALS TO BE TO SPEC EXCEPT: PART B	DATE: 94-09-12	DESIGNER: C.B.S.	PROJ. ENG: [Signature]	APP. ENG: [Signature]	WRO. ENG: [Signature]	CHK. ENG: [Signature]
TYPE OF TEST/REPORT	YES	NO				

Closure to third parties without express authority of
 strictly forbidden. ©ABB Vertriebsysteme AG
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 auch auszugsweise, ist ohne schriftliche Genehmigung der ABB
 Vertriebsysteme AG.

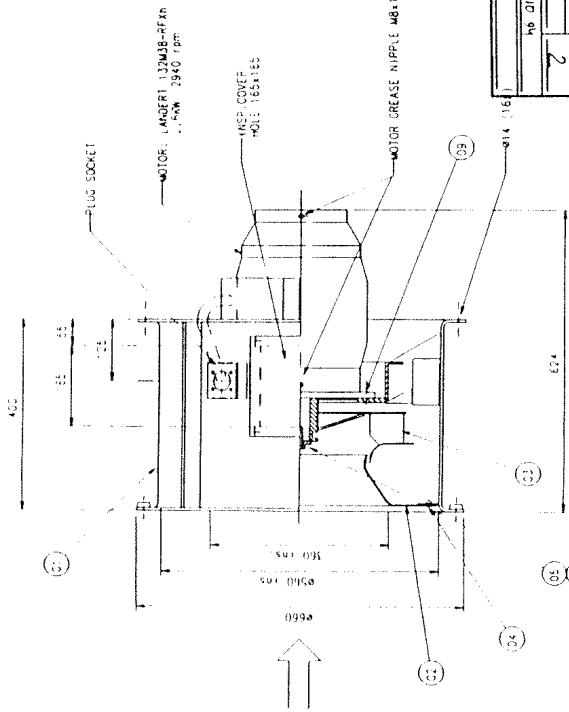
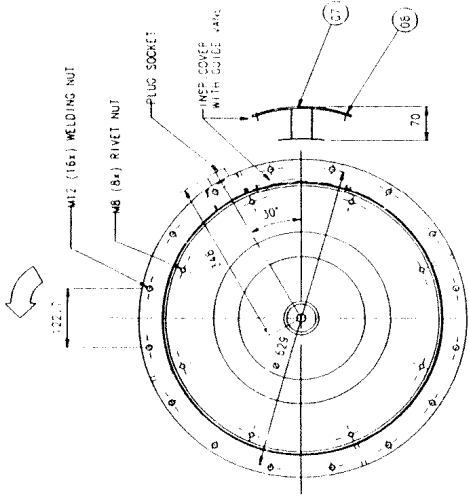


$$\dot{V}_0 = \dot{V}_1 + \dot{V}_2$$

$$\Delta PL = \sum_{i=1}^4 \Delta Pi$$

ABB	Revision	A 94-10-18 H ₁	Language	En	BEHT 3054
			Page	2	

1	10	1021-1438	SCREW M6X10
1	2	1022-433	SCREW M6X10
1	3	1022-433	SCREW M6X10
1	4	1022-9553-1039	PLUG SOCKET
1	5	1028-1488	SCREW M10X10
1	6	1028-1488	SCREW M10X10
1	7	1028-1488	SCREW M10X10
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1	98	1028-1488	SCREW M10X10
1	99	1028-1488	SCREW M10X10
1	100	1028-1488	SCREW M10X10



FOR APPROVAL

DATE OF SUBMISSION: 5-10-06
ISSUED BY: H. Haak
RECEIVING DATE: 10 10 04
APPROVED BY: [Signature]

File: C6.1
Section: 2

ABB FAN SYSTEMS 415 - 60	
DRIVER:	ABB FAN SYSTEMS 415 - 60
TYPE:	ABB VERKEHRSSYSTEM AG
COUNTRY:	ABB VERKEHRSSYSTEM AG
ADDRESS:	ABB VERKEHRSSYSTEM AG
TELEPHONE:	ABB VERKEHRSSYSTEM AG
TELEFAX:	ABB VERKEHRSSYSTEM AG
INTERNET:	ABB VERKEHRSSYSTEM AG
EMAIL:	ABB VERKEHRSSYSTEM AG
DATE OF ORDER:	ABB VERKEHRSSYSTEM AG
DATE OF DELIVERY:	ABB VERKEHRSSYSTEM AG
DATE OF RECEIPT:	ABB VERKEHRSSYSTEM AG
DATE OF PAYMENT:	ABB VERKEHRSSYSTEM AG
DATE OF CANCELLATION:	ABB VERKEHRSSYSTEM AG
DATE OF RETURN:	ABB VERKEHRSSYSTEM AG
DATE OF DISPOSAL:	ABB VERKEHRSSYSTEM AG
DATE OF REPAIR:	ABB VERKEHRSSYSTEM AG
DATE OF REPLACEMENT:	ABB VERKEHRSSYSTEM AG
DATE OF OVERHAUL:	ABB VERKEHRSSYSTEM AG
DATE OF MAINTENANCE:	ABB VERKEHRSSYSTEM AG
DATE OF INSPECTION:	ABB VERKEHRSSYSTEM AG
DATE OF CALIBRATION:	ABB VERKEHRSSYSTEM AG
DATE OF TESTING:	ABB VERKEHRSSYSTEM AG
DATE OF CERTIFICATION:	ABB VERKEHRSSYSTEM AG
DATE OF APPROVAL:	ABB VERKEHRSSYSTEM AG

SURFACE TREATMENT: HOT DIP GALVANIZED

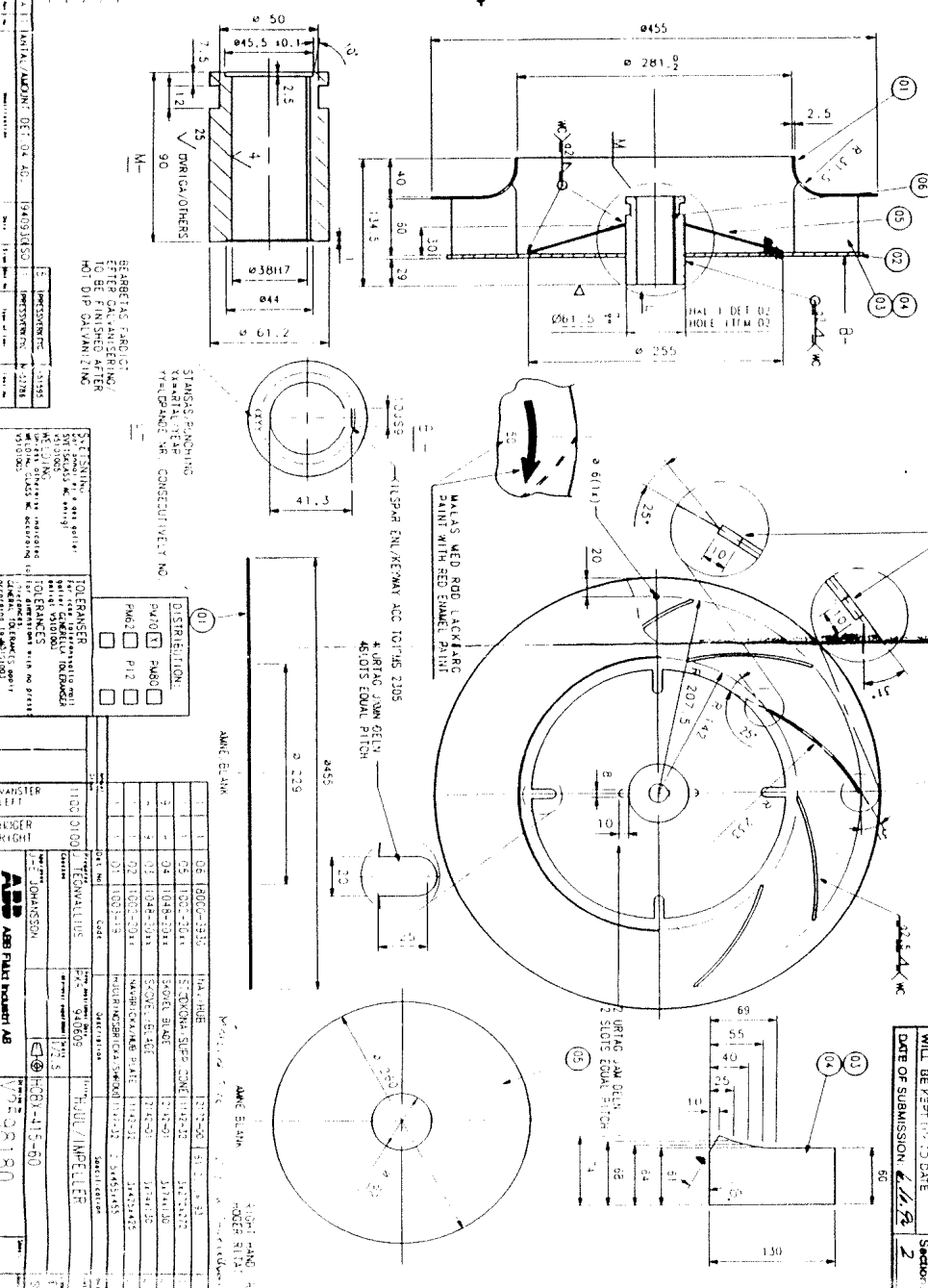
WEIGHT - 140 KG (INCL. MOTOR)

Mod. 1120 M-2 f

1	ABB FAN SYSTEMS 415 - 60	1
2	ABB VERKEHRSSYSTEM AG	1
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18	ABB VERKEHRSSYSTEM AG	1
19	ABB VERKEHRSSYSTEM AG	1
20	ABB VERKEHRSSYSTEM AG	1

V2569171

SETS RIGHT SIDE/ROTOR 1000
 INCLUDED ROUND BOLT ENDS TOLA
 UTORAL BESPRI VAWC V3583971



FOR INFORMATION		<input type="checkbox"/>
WILL BE KEPT IN D DATE		<input type="checkbox"/>
DATE OF SUBMISSION: 6/1/82		<input type="checkbox"/>
		Section 2

1	INITIAL/AUTUM. DEL. DA. AQ.	1	PREPARED	1	DATE
2	INITIAL/AUTUM. DEL. DA. AQ.	2	PREPARED	2	DATE

BEHAVING... TO BE FINISHED AFTER... HOI DIP CANTAN ZING

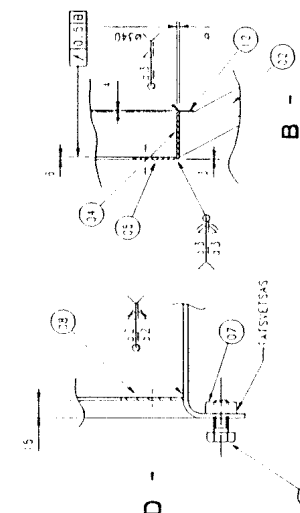
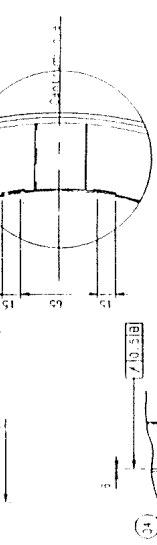
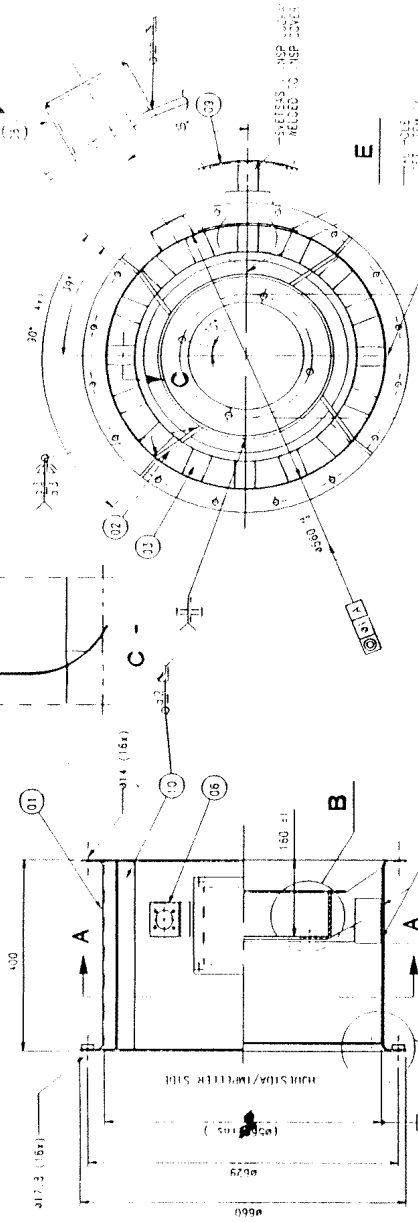
STAINLESS PUNCHING...
 VERTICAL/CLIP
 YEAR/DIAPANE VR CONSECUTIVELY NO.

DISTRIBUTION:
 PABO
 PABO
 PABO
 PABO
 PABO

TOLERANCES:
 FOR HUB: 0.1000
 FOR ROTOR: 0.1000
 FOR OTHERS: 0.1000
 UNLESS OTHERWISE SPECIFIED

MANUFACTURER	ABB	DATE	11/00/0100
MANUFACTURER	ABB	DATE	11/00/0100
MANUFACTURER	ABB	DATE	11/00/0100
MANUFACTURER	ABB	DATE	11/00/0100
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MANUFACTURER	ABB	DATE	11/00/0100

V2569171



07
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-SAEISS: NMP
 REFUSED TO NMP 2024

A - A

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FOR...
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0100
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 0100

DISTRIBUTION
 P100 P180
 P120 P12
 P182

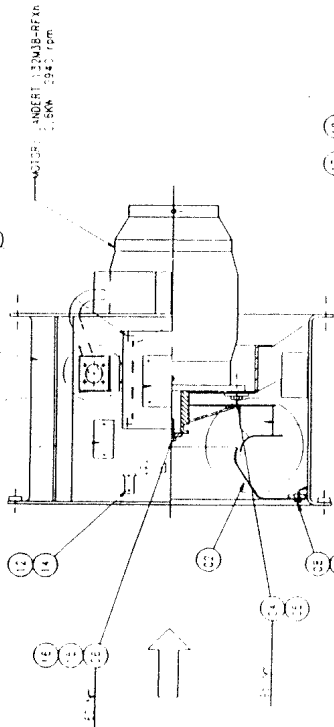
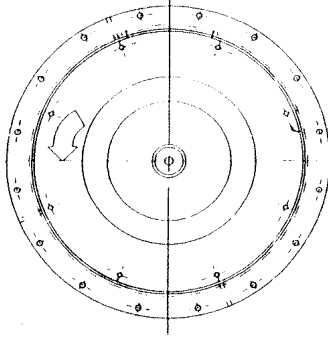
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 WELDING
 TOLERANCES

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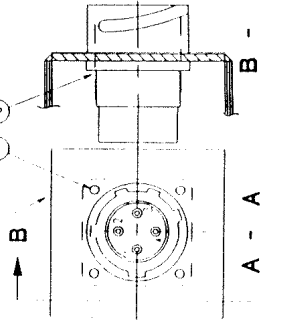
V2398503

STANDARD
 A200
 p12
 p12

FOR INFORMATION
 WILL OF FEEL TO DATE Section
 DATE OF SUBMISSION 17/11/11



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4	17	145-152	ISO 6937-M3.5 E 1202	ISO 6937-M3.5 E 1202
1	16	112-113	ISO 6937-M3.5 E 1202	ISO 6937-M3.5 E 1202
1	15	N365776-1	ISO 6937-M3.5 E 1202	ISO 6937-M3.5 E 1202
2	14	33354-004	ISO 6937-M3.5 E 1202	ISO 6937-M3.5 E 1202
1	13	16144-1-001	ISO 6937-M3.5 E 1202	ISO 6937-M3.5 E 1202
1	12	1613-116-012	ISO 6937-M3.5 E 1202	ISO 6937-M3.5 E 1202
1	10	14515-2	ISO 6937-M3.5 E 1202	ISO 6937-M3.5 E 1202
1	10	14515-2	ISO 6937-M3.5 E 1202	ISO 6937-M3.5 E 1202
1	9	14515-2	ISO 6937-M3.5 E 1202	ISO 6937-M3.5 E 1202
1	8	14515-2	ISO 6937-M3.5 E 1202	ISO 6937-M3.5 E 1202
1	7	14515-2	ISO 6937-M3.5 E 1202	ISO 6937-M3.5 E 1202
1	6	14515-2	ISO 6937-M3.5 E 1202	ISO 6937-M3.5 E 1202
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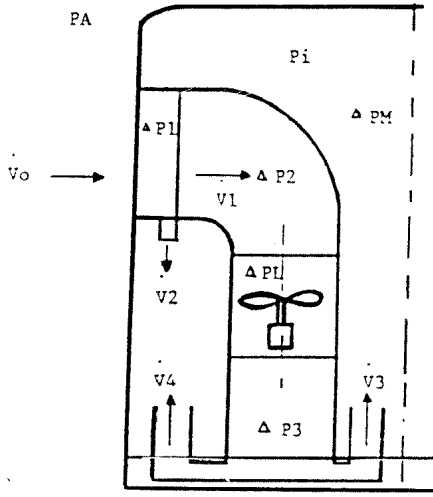


SURFACE TREATMENT: HOT DIP GALVANIZED
 WEIGHT: 140 KG (INCL. MOTOR)

01000 10000 01000 10000 01000 10000		DATE: 17/11/11 DRAWN BY: 940817 CHECKED BY: 11/11 DESIGNED BY: 11/11	NAME: SMT/ASSEMBL. DRWG. PROJECT: HCBY-115-60 PART NO: W353510
DATE: 17/11/11	DRAWN BY: 940817	CHECKED BY: 11/11	DESIGNED BY: 11/11
SCALE: 1:1	CAD FILE: 940817	PROJ. NAME: HCBY-115-60	PART NO: W353510

DATE: 17/11/11	DRAWN BY: 940817	CHECKED BY: 11/11	DESIGNED BY: 11/11
----------------	------------------	-------------------	--------------------

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$$\dot{V}_0 = \dot{V}_1 + \dot{V}_2$$

$$\dot{V}_1 = \sum_{j=3}^n \dot{V}_j$$

n = Number of cubicles / electronics to be cooled

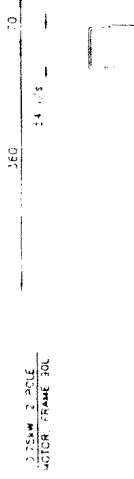
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$$\Delta P_L = \sum_{i=1}^3 \Delta P_i + \Delta P_M + \text{Max}(\Delta P_j)$$

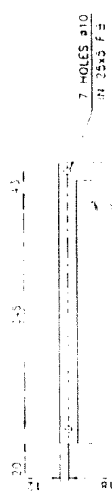
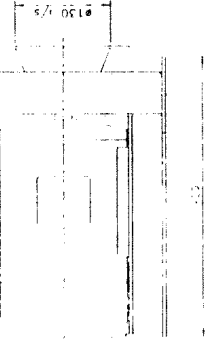
TOTAL MASS(kg)
35.0

ALL DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED.
SURFACE FINISHES IN UNLESS OTHERWISE SPECIFIED.

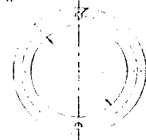
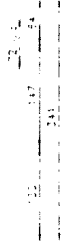
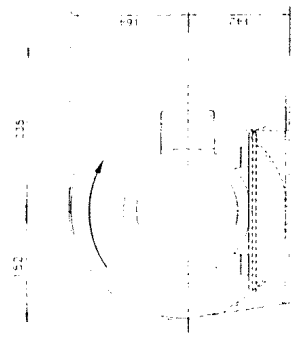
DO NOT SCALE DRAWINGS. IF IN DOUBT ASK!
REMOVE ALL BURRS & SHARP EDGES



7.25mm ϕ HOLE
MOTOR FRAME BOL



7 HOLES ϕ 10
IN 35x3 F F



FILE INFORMATION

FILE	DESIGN
DATE	
DESIGNER	
CHECKED	

REF FLOSSEP ORG No /CS9528 (REV A)

7 HOLES ϕ 10 IN 100 ϕ HOLES
IN 100 ϕ DIA TYPE

ITEM	DESCRIPTION	ITEM DESIGN	SOURCE	1455	QTY	PR ITEM	1455	ITEM	DESCRIPTION	Customer Dwg No
1				3rd ANGLE PROJECTION			285		ABB Transportation Pty. Limited A.C.N. 210 859 804	ABB Dwg No IA116-0000-
2			3rd ANGLE PROJECTION	116.NT.0000B		19-09-12	01		G.A - FAN TYPE BB11, ARRGT 2, R270.DIA.242	Scale 1/5 Sheet 1/5
3			116.NT.0000B	Prog Eng						
4			N.C. Machine Program to	Prog Eng						
5				Prod Eng						

CONFORM DIMENSIONS

UNLESS OTHERWISE SPECIFIED DIMENSIONS OF LENGTH & ANGLE TO BE TO SPE CS9528

TEST CERTIFICATE
TEST RESULT
MATERIAL CERTIFICATE
CONTRACT NO.
PART B
IA111-02001 875
HOT ASSEMBLY
CONTRACT USED ON

116.NT.0000B
N.C. Machine Program to

116.NT.0000B
N.C. Machine Program to

ABB Transportation Pty. Limited
A.C.N. 210 859 804

24

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फैक्स 91-0522-458500
पूरी दस्तावेज लिखनऊ
Telegram: 'RAILMANAK' Lucknow
टेलीफोन/टेली 451200 (PBX)
450115 (DID)



सत्यमेव जयते
Blower

भारत सरकार - रेल मंत्रालय
अनुसंधान अभिकल्प और मानक संगठन
लखनऊ - 226011

Government of India-Ministry of Railways
Research Designs & Standards Organisation
LUCKNOW - 226011

No:EL/3.2.176.1

Dated: 5/5/98



M/s Accel, M/s Acco,
M/s BBL, M/s ABB,
M/s Samal Harrañd

(as per enclosed list)

Dear Sir,

Sub: Amendment on the Specification no.E-10/3/09
(Blower) Part-I. for 3-phase drive loco i.e.
WAG-9.

Ref: RDSO letter of even no. dated 22/8/97.

.....

RDSO has issued the above mentioned Specification on "Specification & Test Schedules for Motor Driven Blowers" vide their letter referred to above. Subsequently, change in the balancing quality grade was needed to reduce vibration in blower encountered in service.

2.0 Similarly, the change was also required in the annexure 1 due to change in head parameter under Sr.No.5 and in rating and speed parameters mentioned under Sr.No.7 & 8 respectively for scavage blower for TM & oil cooler blower & machine room blower.

3.0 The above amendment is being enclosed in the form of annexure of this letter for your necessary reference and record.

Yours fiathfully,

Rajin Kumar

(R.K.Kulshrestha)

For Director General/ Elect

164963

1. M/s Asea Brown Boveri Ltd,
32 Industrial Area,
NIT Faridabad -121001
2. M/s Bharat Bijlee Ltd,
Electric Mansion, 6th Floor,
Appasaheb Marathe Marg,
Prabhadevi, Mumbai -400 025
3. M/s Air Conditioning Corporation Ltd,
17 Taratalla Road, Calcutta -700 088
4. M/s Air Control & Chemical Engg. Co. Ltd,
ACCEL House, 2nd Floor,
204 Juhu Gaothan No. 2
Juhu Vile Parle Road No.13
Mumbai-400 049
5. M/s Samal Harand of India Pvt. Ltd,
33 A, Chowringhee road, 4th Floor,
Room No.45, Calcutta - 700 001
6. M/s HMTD Engg Pvt. Ltd,
Plot No: A-21, Road No. 9
Wagle Industrial Estate
Thane - 400 604

Annexure to letter no.EL/3.2.176.1 dated . .98

1. Clause no.5.3 on page 5 of the Specification is being amended and recorded as follows:

"5.3 **Balancing:** The rotor and the blower impeller shall be dynamically balanced individually and as well as combined in quality grade **G2.5** of ISO 1940 - 1973 or IS 11723 of 1985."

2.0 Sr.No.5, 7 & 8 of the Annexure 1 of the Specification" are being changed.

16/96

BLOWER RATING AT 415 V & RATING OF DRIVING MOTOR

SN	Nomenclature of equipment/ parameter	TM Blower	Oil cooler Blower	Machine Room Blower	Scavange Blower for TM & Oil cooler	Scavange Blower for M.R. Blower
5.	Blower total head in pascals (pa) at 20 °C	Bo-Bo 3450 (Pa) Co-Co 2950 (Pa)	1781 1781	-	-	-
	Blower static pressure in pascals (Pa) at 20 °C	-	-	1390	475	550
7	HP/KW	-	-	4/3.0	4/3.0	-
8	Synchronous Speed (rpm)	-	-	-	3000	-

Note : Other parameters will remain same as mentioned vide Annexure - I of the RDSO Specification No.E-10/3/09 (blower) Part.I