

## RAIL COACH FACTORY, KAPURTHALA

## SPECIFICATION FOR DOUBLE/SINGLE INLET CENTRIFUGAL BLOWER FAN ASSEMBLY FOR LHB COACHES

S.NO.	Date of Revision/amendment	Revision/ Amendment	Page no.	Reasons for Revision
1	--	Rev.-'Nil'	6	First issue 15.06.2009
2	02.12.2021	Rev.-'A'	9	<ol style="list-style-type: none"> <li>1. Cl. 2.0: Train Speed (max) 200Kmph specified.</li> <li>2. Cl.3.0: Governing Specification of Elastomeric Cables and Low Voltage switchgear control updated.</li> <li>3. Cl. 5.13, 5.14, 5.15 &amp; 5.16 added.</li> <li>4. Cl.7.4: Power Factor test &amp; Flash test added.</li> <li>5. Cl. 7.5, 7.6, 7.7, 7.8, 7.9 &amp; 7.10 added.</li> <li>6. Cl. 8.2 added.</li> <li>7. Outlet opening dimension of blower fan <math>213 \pm 2\text{mm}</math> &amp; <math>68 \pm 2\text{mm}</math> specified in drawing no. LW75205, Alt-'b'.</li> <li>8. Height and Depth of Blower Fan (180mm &amp; 171.5mm) specified in drawing no. LW75205, Alt-'b'.</li> </ol>

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**SPECIFICATION FOR DOUBLE/SINGLE INLET CENTRIFUGAL BLOWER FAN ASSEMBLY FOR LHB COACHES****1.0 SCOPE :**

- 1.1 This Specification covers the Technical requirement for Design, Manufacture, Testing and Supply of Centrifugal Blower Fans for LHB coaches suitable for working on 3Ø, 415V, 50 Hz Supply. The Centrifugal blower fan shall be mounted on the coach end wall with the help of suitable mounting brackets and shall connect the inlet/outlet ducts from lavatories/Pantry area/SBC meant for exhausting the foul/hot air.

**2.0 SERVICE CONDITIONS :**


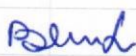
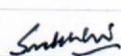
- Ambient Temperature : - 5° C to 55° C
- Train Speed (max.) : 200 Kmph
- Average Ambient Temperature : 35° C
- Relative Humidity : Upto 98% during rainy season.
- Altitude : Max. 1700 mt. above sea level.
- Atmosphere : Extremely dusty and dust weather and desert terrain in certain areas. The dust contents in air may reach as high values as 1.6 mg/Cu-m Very dusty atmosphere with fog, cast iron dust of brake block shoe, flying ballast etc.
- Coastal Area : The system shall be designed to work in humidity, salt laden and corrosive atmosphere.

The maximum value of the condition shall be as under:

- Maximum Ph value : 8.5
- Sulphate : 7 mg/ltrs
- Max. Concentration of chlorine : 6 mg/ltrs
- Maximum conductivity : 130 micro semen/cm
- Annual rain fall : Ranging between 1750 to 6250mm with thunder storm

**WORKING CONDITIONS:**

- Vibration and Shocks: The equipment, system and their mounting arrangement shall be designed to satisfactorily withstand the vibration and shock encountered in service as specified below
- a) Maximum vertical acceleration : 3.0g

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- b) Maximum lateral acceleration : 3.0g  
 c) Maximum longitudinal acceleration : 3.0g  
 - Frequency and amplitude:

Sinusoidal form of vibration, the frequency 'f' lies between 1Hz and 50Hz and their amplitude 'a' express in mm is given as function of 'f' by the equation.


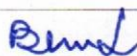
$a = 25/f$  for values of 'f' between 1 Hz to 10Hz

$a = 250/f^2$  for values of 'f' between 10 Hz to 50Hz

### 3.0 GOVERNING SPECIFICATIONS :

Following Standards/specifications (Latest Revision) will be referred unless stated otherwise:

IS:2312	Specification for Propeller Type AC Ventilating fans.
IS:1271	Thermal evaluation and classification of electrical insulation.
IS:648	Non-oriented electrical steel sheets and strips for magnetic circuits.
ELRS/SPEC/ELC/0019, (latest revision)	Thin walled flexible elastomeric cables with copper conductors for working voltages upto 750V and above 750V upto 1.8/3.0KV.
IS:11353-1985	Guide for uniform system of marking and identification of conductors and apparatus terminals.
IS:513-1994	Cold rolled low carbon steel sheets and strips (Fourth Revision) (Amendment-1).
IS/IEC:60947 : (Part-1) : 2007	Low voltage Switchgear and Control gear: Part-1 (General rules)
IS/IEC: 60947 : (Part-3) : 2012	Low voltage Switchgear and Control gear: Part-3 (Switches, Disconnectors, switch disconnectors and fuse combination unit).
IS:1364-1992	Hexagonal Head Bolt, Screws and Nuts of Part-I, II, III and IV Product grades A & B.
IS:8623-1993 (Pt-1)	Low voltage Switchgear and Control gear assemblies: Requirements for type tested and partially type tested assemblies.
IS:10118-1982	Code of Practice for selection, installation and maintenance of Switchgear and controlgear.
IS:4905-68	Method of random sampling.
RDSO/Spec./E-16/1	Reliability assurance specification for electronic components for use in rolling stock.

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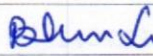
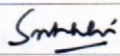


**4.0 SCOPE OF SUPPLY :**

- TYPE-I** Double Inlet Centrifugal Fan complete with mounting brackets suitable for 415V, 3- Phase, 50 Hz supply , Generally conforming to drawing no. **LW75205, Alt.'b'** (for guidance only).
- TYPE-II** Single Inlet Centrifugal Fan suitable for 415V, 3-Phase, 50 Hz. Generally conforming to drawing no. **as per Annexure-A** (for guidance only) of EDTS-331, Rev. 'A'

**5.0 GENERAL REQUIREMENTS:**

- 5.1 The Double/Single Inlet Centrifugal Blower shall be supplied complete with mounting brackets suitable for 415V AC, 3-Phase, 50Hz conforming to drawing no. **LW75205, alt.'b' /Annexure-A** (for guidance only) respectively. The Centrifugal fan shall be generally conforming to **IS:2312** (latest) with additional data as under:
- 5.2 The equipment shall be suitable for indoor mounting in LHB AC coaches which are expected to work in service conditions given in Clause 2.0.
- 5.3 The complete unit shall consist of Scroll housing with high inertia mass external rotor motor i.e rotor rotating externally around the stator equipped with stainless steel shaft of suitable dia.
- 5.4 The scroll housing shall be of galvanised Steel sheet unit with rectangular flange as indicated in the drawing.
- 5.5 The 3-phase drive motor shall have compact construction with constant speed, high starting torque and efficiency.
- 5.6 Fan unit shall be supplied complete with connecting cable alongwith male to female type cage clamp terminals to cat no. 721-603000-042 and 721-103026-000 of M/s Wago or equivalent approved make for termination of coach wiring.
- 5.7 **Scroll housing :** The material shall be of Galvanized Steel sheet/CRCA sheet (with powder coating).
- 5.8 **Impeller :-**The unit shall be of galvanised sheet steel forward curved impellers press fitted onto the rotor, dynamically balanced in two planes.
- 5.8.1 **Single Inlet Fan :-** The external rotor motor shall be integrated in impeller and mounted onto the side wall of the scroll housing.
- 5.8.2 **Double Inlet Fan :-** Motor shall be mounted by means of bracket on one side of scroll housing . An external rotor motor with standing shaft can also be used.
- 5.9 **Direction of rotation:-**
- 5.9.1 **Single Inlet :-** Clockwise as seen from the Suction side.
- 5.9.2 **Double Inlet:-** Anticlockwise as seen from Inlet Opposite the Cable exit.

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**5.10 Protection :-**

It shall conform to **IP-44** as per IEC: 60529.

**5.11 Insulation class:- Class-H**

5.12 The complete fan unit i.e. Rotor motor and Impeller shall be such to required minimum space. Both motor and impeller shall be in direct stream for efficient cooling of motor to have minimum thermal and mechanical stress.

5.13 All components provided shall be adequately rated to render satisfactory service without any undue heating or arcing and shall meet the requirements of 'IS' specified. All protective devices shall be positive in action.

5.14 All fasteners including washers etc. used shall be of **Stainless steel** & generally conforming to IS: 1364-1992.


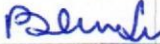

5.15 All steel items excluding hardware shall be given requisite surface treatment for Anti-Rust & Anti-Corrosion before finishing with powder coating of thickness not less than 100-125 micron to Siemens grey shade no. 6102/08038 of M/s Nerolac Paints or 877 of Berger Paints.

5.16 All the components / equipment / materials including paint shall be fire retardant. Blower manufacturer shall certify this requirement.

**6.0 TECHNICAL DETAILS :**

S.no.	Test	Type-I	Type-II
a	Sweep (mm)	133mm	180mm
b	Supply voltage (V)	415 ± 10%	415 ± 10%
c	Phase	3ø	3ø
d	Frequency	50 Hz	50 Hz
e	Minimum Air volume CMH	<b>625 *</b>	<b>1045</b>
f	Speed (RPM)	<b>1500 #</b>	1300
g	Power input (max) watts	<b>200W</b>	185W
h	Nominal Current (A) amps	<b>0.4A</b>	<b>0.6A</b>
i	Noise level (dB)	60	68
j	Degree of Protection	IP-44	IP-44

\*The exhaust fan shall be mounted on the endwall of the coach and exhaust air shall be drawn through duct arrangement from each lavatory as per drawing no. **LW64236 (latest)**. In view of above, the exhaust fan shall be designed to give minimum exhaust air volume of **450±5% CMH** at the back pressure of **15mm** of water gauge collectively from both lavatories at actual site conditions. Special test apparatus / equipments to check

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compliance of above shall be arranged by the firm.

# The speed of exhaust fan shall be kept as **1500 RPM**, however to obtain the desired result may vary subject to the condition that noise level shall not exceed 60 dB in any case.

Tolerance on the ratings shall be in accordance to Clause 16 of IS:2312 (latest edition).

\*# Prior approval in this regard shall be taken from CEDE/RCF.

## 7.0 TEST :

### 7.1 Type Test:-

All the type tests mentioned in table given in clause 7.4 shall be carried out on a prototype unit.

### 7.2 Routine Test:-

Routine test mentioned in table given in clause 7.4 shall be carried out on each unit by manufacturer at his works to ensure compliance with the specification and the drawings.

### 7.3 Acceptance Test:-


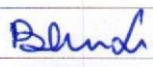
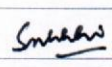
Acceptance test mentioned in table given in clause 7.4 are to be carried out by an inspection authority nominated by the purchaser at the works of the manufacturer, on the samples picked up by the Inspecting authority.

### 7.4 Following tests shall be conducted:

	Test	Type	Acceptance	Routine	Para of IS:2312
i.	Starting	Yes	Yes	Yes	Clause 10.0
ii.	Air Delivery	Yes	Yes	No	Clause 14.2
iii.	Temperature Rise	Yes	Yes	No	Clause 14.3
iv.	Power Factor	Yes	No	No	Clause 14.6
v.	High Voltage	Yes	No	No	Clause 14.8
vi.	Insulation Resistance	Yes	Yes	Yes	Clause 14.9
vii.	Electrical Input	Yes	Yes	Yes	Clause 14.11
viii.	Fan Speed	Yes	Yes	Yes	Clause 14.12
ix.	Flash Test	No	No	Yes	Clause 14.13

7.5 The accuracy of measuring instruments used for both type and routine tests shall be of Class-I.

7.6 All the tests shall be carried out at firm's premises at the manufacturer's cost. The

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Inspecting agency will witness the tests. A copy of the internal tests conducted by the firm shall be supplied to Inspecting / purchasing authority. Inspecting agency shall also verify all the invoices of the Material / Items used in the manufacture premises during the inspection to ensure use of genuine material by the firm as per the relevant specifications.

- 7.7 The Inspecting agency shall conduct necessary checks as regards to use of material in construction of the equipment to confirm that the sub-components, sub-assemblies and the raw material used in the manufacturing of the unit has been taken from approved sources and conform to the relevant standards. For any item sub-components / sub-assembly etc. for which approved sources are not available the Inspecting agency shall check as regards to conformance to materials used in the approved Prototype Sample.
- 7.8 Compliance to clause 'Governing standards/specifications' will be checked & confirmed by the Inspecting agency .
- 7.9 Conformance to the provisions in 'General Requirements' shall be checked and confirmed by the Inspecting agency.

#### 7.10 Sampling and Rejection:-

The sampling and rejection of the blower assembly shall be carried out as per IS:4905-68 unless otherwise specified.

#### 8.0 MARKINGS :



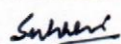
- 8.1 Each fan shall be marked indelibly or punched with information as per clause 13 of IS:2312 (latest edition) or conforming to International Standards such as CE/VDE/Underwriters Laboratory USA/Canadian standards etc.
- 8.2 Manufacturer's name plate indicating name and addresss, Sr. No. of the Blower, Specification No., P.O. No., Month & Year of manufacture and Weight shall be fixed on the Blower suitably.

#### 9.0 IRIS CONDITIONS:

This annexure is issued to the specification to incorporate IRIS conditions.

##### A. First Article / Prototype Inspection :-

- 1 First Article Inspection (FAI) will be done in case of first time manufacture and approved by CEDE/RCF before bulk supplies.
- 2 External Provider shall be carryout FAI at their premises as per ISO/TS 22163:2017 requirements and submits the report alongwith the documents to RCF, kapurthala prior to FAI by the purchaser. The following documents shall be submitted:-
  - i) FAI report
  - ii) QAP (Quality Assurance Plan)

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iii) Details of special processes and their compliance.

3 Special processes are as under:-

i) Fabrication

ii) Powder coating / Painting

iii) Welding

4 On completion of First Article Inspection in-house by the firm and submission of documents to RCF, the representative of the purchaser shall be nominated to carry out FAI along with the validation of the above special processes at firm's premises.

5 Validation of outsourced special processes shall also be carried out as per requirements of the ISO/TS 22163:2017.

6 Audit Inspection shall be done during regular production in the firm for certify quality Centrifugal Blowers.

7 Firm has to fulfill all the requirements as mentioned in the IRIS standard ISO/TS 22163:2017.

#### **B: RAMS (Reliability, Availability, Maintainability and safety) :-**

##### **1 Reliability Targets :-**

The achieved level of reliability shall ensure MDBF of 2,00,000 Kms or more after initial reliability growth period on one year. The following fleet average levels of MDBF shall be achieved after the mentioned period of time:

- MDBF > 80,000 Kms after 06 months.
- MDBF > 2,00,000 Kms after 12 months.

For this purpose, any equipment shall be counted as available for calculations only after a stabilization period of 6 months after putting the train into revenue service.

##### **2 Availability Requirements :-**


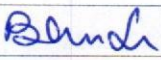
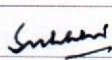
The availability of the coach calculated on quarterly basis and considering unscheduled repairs for the equipment should not be less than 96%.

##### **3 Maintainability :-**

The maintenance program prepared by EPPPS shall have the following objectives:-

- a) Enhancement of Rolling stock availability.
- b) Minimisation of maintenance costs.
- c) Minimisation of coach downtime / MTTR (Mean Time To Retore Serviceability)

EPPPS shall submit the basic maintenance schedules for the equipment. The minimum




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interval between overhauls at workshop be as per the maintenance manual / schedule for LHB coaches issued by CAMTECH.

#### 10.0 ENCLOSURES :

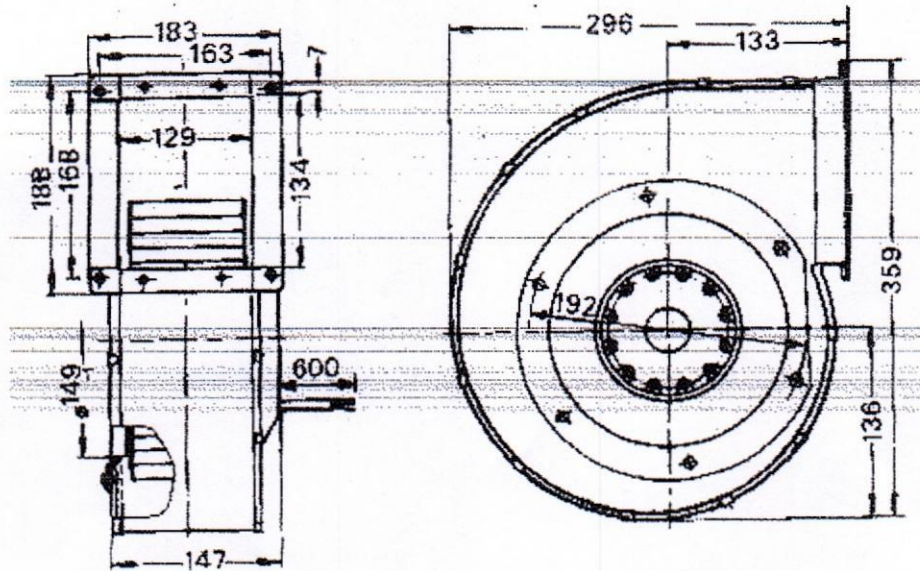
- a) Annexeure-A
- b) LW75205, alt.'b'
- c) LW64236, alt.'b'

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## ANNEXURE-A

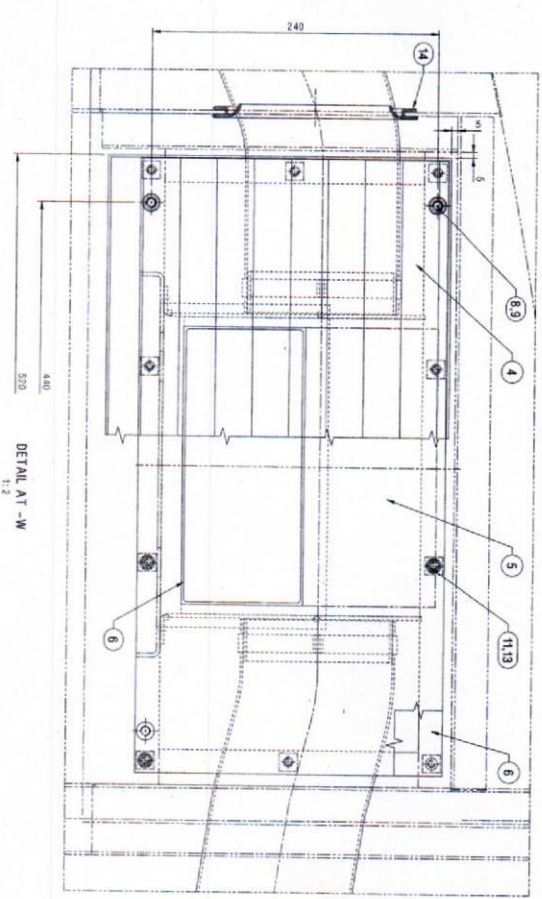
## SINGLE INLET CENTRIFUGAL BLOWER



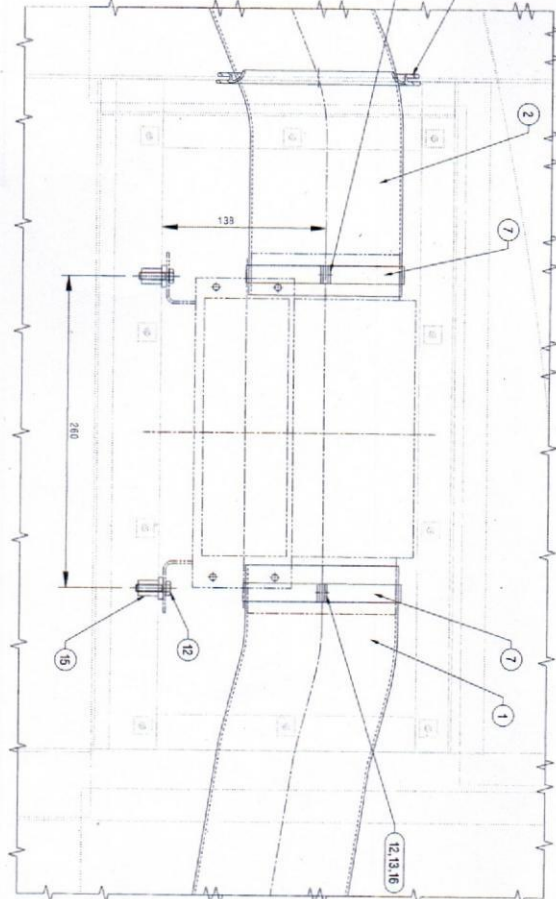
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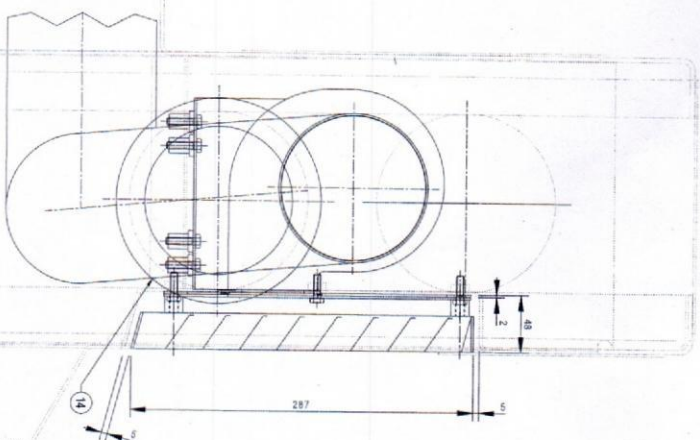




DETAIL AT - W  
1:2



DETAIL AT - W (DISPLAYED WITHOUT ITEM 4.5.6)  
1:2





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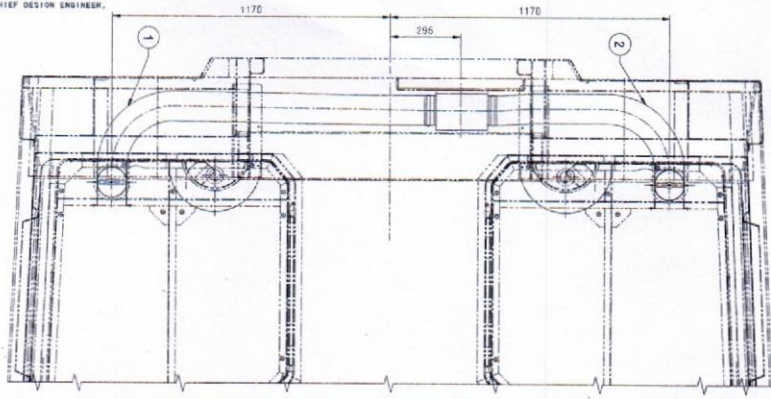
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DATE OF FIRST ISSUE 03/12/2011

FIELD NO.	1201	DESIGNATION & DIMENSIONS	EXHAUST AIR ARRANGEMENT FOR LAVATORIES	SCALE	1:50
FILE NO.	111	INTERIOR EQUIPMENTS & ACCESSORIES	EXHAUST AIR ARRANGEMENT FOR LAVATORIES	DATE	03/12/2011
REV.	1	DATE	03/12/2011	BY	DRG. NO. LW64236
REV.	2	DATE		BY	
REV.	3	DATE		BY	
REV.	4	DATE		BY	
REV.	5	DATE		BY	
REV.	6	DATE		BY	
REV.	7	DATE		BY	
REV.	8	DATE		BY	
REV.	9	DATE		BY	
REV.	10	DATE		BY	
REV.	11	DATE		BY	
REV.	12	DATE		BY	
REV.	13	DATE		BY	
REV.	14	DATE		BY	
REV.	15	DATE		BY	
REV.	16	DATE		BY	
REV.	17	DATE		BY	
REV.	18	DATE		BY	
REV.	19	DATE		BY	

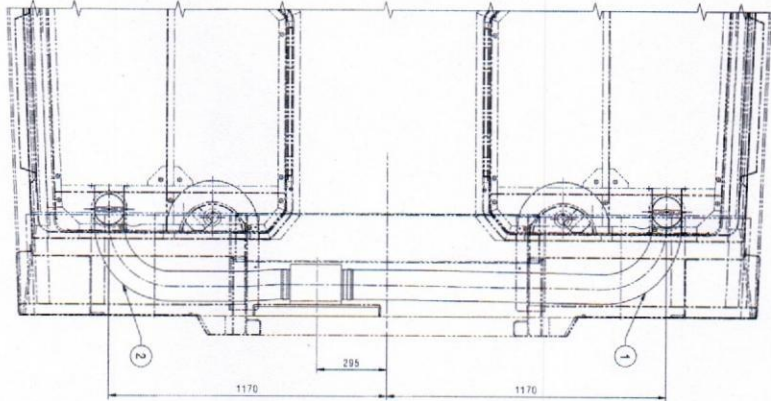
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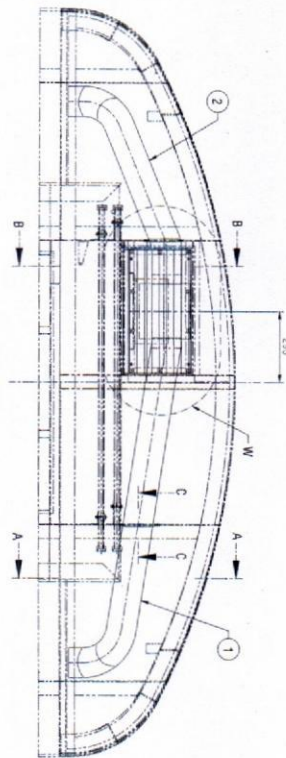
DETAIL AT -Y



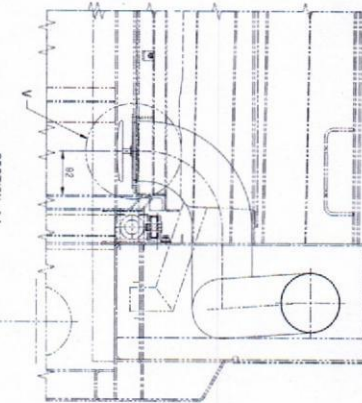
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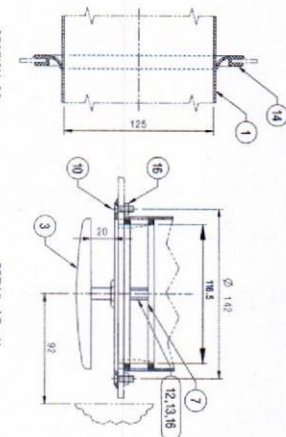
VIEW FROM -Z



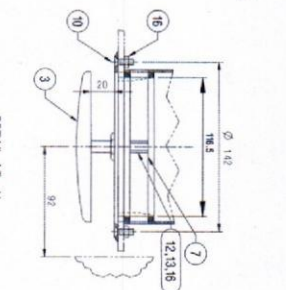
SECTION-AA  
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SECTION-CC  
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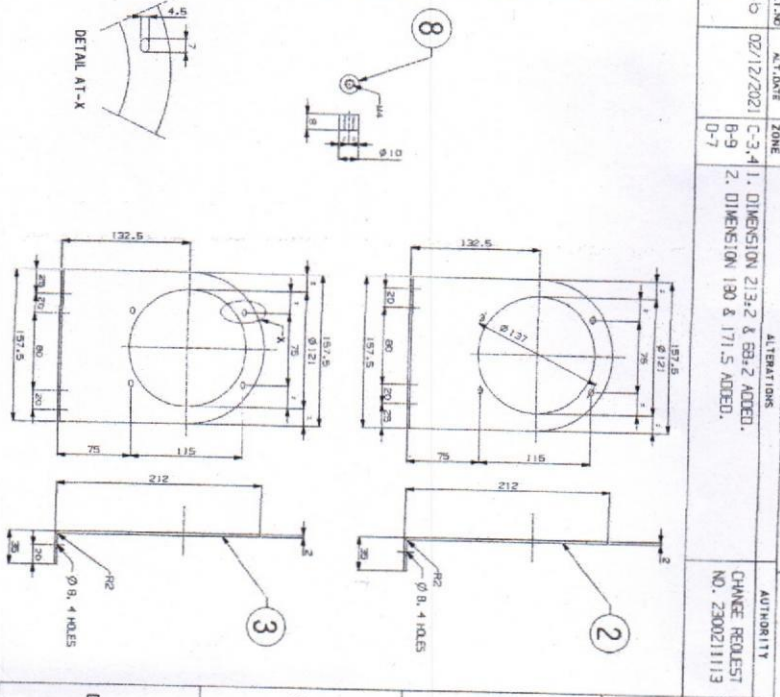
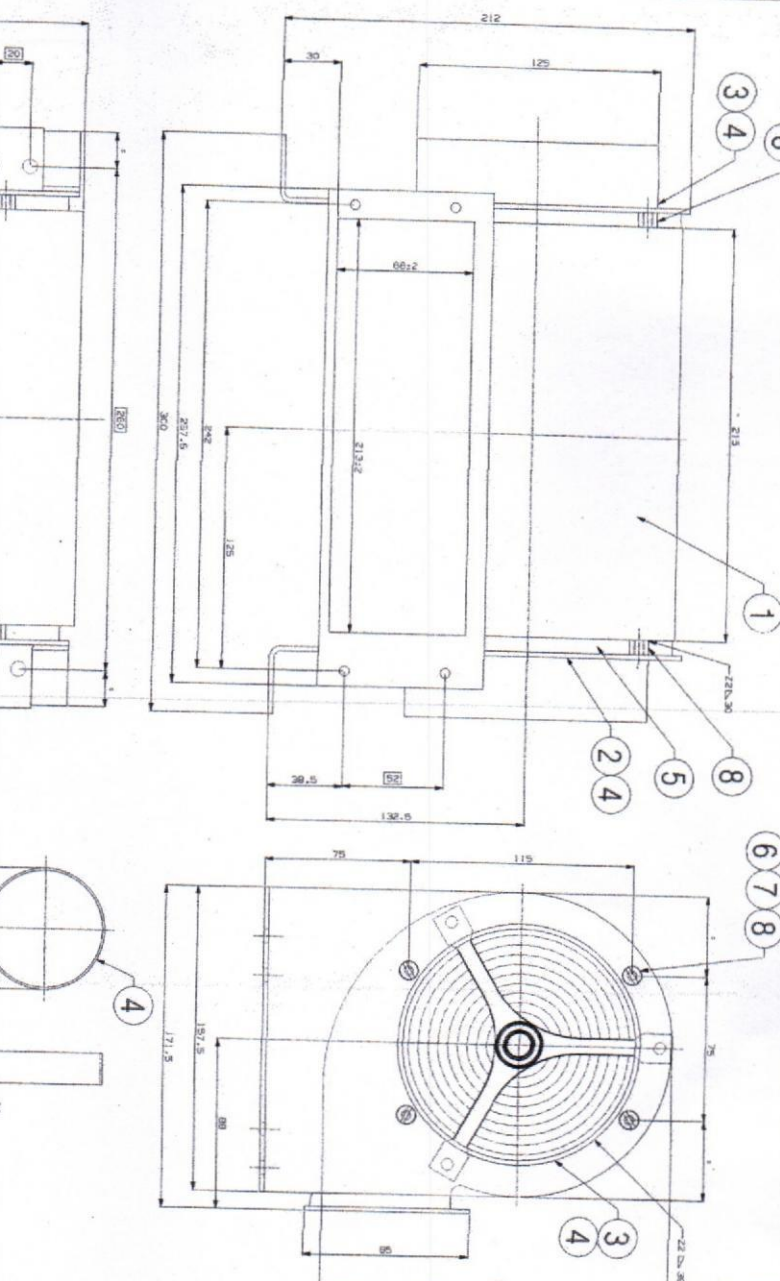
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15 FEB 2013  
DRG. NO. LW64236



ALT. NO.	ALT. DATE	ZONE	ALTERATIONS	AUTHORITY
02/12/2021		C-3-4	1. DIMENSION 213.2 & 69.2 ADDED.	CHANGE REQUEST
B-9		2. DIMENSION 130 & 171.5 ADDED.		NO. 2300211113
D-7				



1. ALL DIMENSIONS IN MM.
2. FRAMED MOUNTING DIMENSIONS ARE TO BE STRICTLY ADHERED TO BY JIG POSITIONING.
3. ITEM 1 SHALL BE DOUBLE INLET CENTRIFUGAL BLOWER 415W 500V 420W 450 CUM/H.R. TO CAT. NO. D20 133-AB06-16.
4. STAND FOR YEAR INSTALLATION TO BE ORDERED FROM THE SAME MANUFACTURER. STAND FOR RUNNING SERIAL NO. SHALL BE.
5. WELDING SHALL BE DONE AS PER DIN 6700, 10 WITH STAINLESS STEEL WELDING ELECTRODE TO DIN 17007, 1.4370.

DETAIL DRGS STARTING WITH "LI" ARE INTERNAL REFERENCE LISTS ONLY AND ARE NOT FOR ISSUE

ANY MANUAL ALTERATION SHALL AUTOMATICALLY RENDER THIS DRAWING INVALID.

ITEM	DESCRIPTION & DIMENSIONS	GROUP	DETAIL DRG	WELD	WELD LENGTH	WELD WEIGHT	WELD AREA	WELD LENGTH / DIA	WELD WEIGHT / THICK	WELD HEIGHT
1	DOUBLE INLET CENTRIFUGAL BLOWER	01	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
2	MOUNTING BRACKET	01	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
3	OUTER RING	02	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
4	FLANGE	02	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
5	RUBBER PACKING	02	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
6	HEX. HD. SCREW M8X10	08	P-1.4, A2-70	NIL	NIL	NIL	NIL	NIL	NIL	NIL
7	PLAIN WASHER Ø 5	08	P-1.4, A2-70	NIL	NIL	NIL	NIL	NIL	NIL	NIL
8	SCREENING BOSS Ø 10 (M4)	08	P-1.4, A2-70	NIL	NIL	NIL	NIL	NIL	NIL	NIL

DOUBLE INLET CENTRIFUGAL BLOWER ASSEMBLY

INDIAN RAILWAYS STANDARD

DRG. NO. LW75205

SCALE: 1:1

DATE OF FIRST ISSUE: 22/08/2005

FOR UNTOLERANCED DIMENSIONS REFER MDG0008




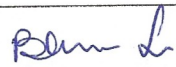

## Corrigendum -1

## Corrigendum – 1 to specification no EDTS 331 Rev A

This corrigendum is being issued to specification no EDTS 331, Rev. 'A' for 'Double/Single Inlet Centrifugal Blower fan assembly for LHB coaches to incorporate the following:

**Clause no. 5.6 shall be read as:**

- 5.6 Fan unit shall be supplied complete with connecting cable along with 4-pole, male-female type cage clamp terminals with preceding ground terminal to cat no. **721-604/000-042 and 721-104/026-000** of M/s WAGO or equivalent approved make for termination of coach wiring.



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**Corrigendum -2 to Specification no. EDTS 331 Rev A, corr -1**

This corrigendum is being issued to specification no. EDTS 331, rev. 'A', corr-1 for 'Double/Single Inlet Centrifugal Blower fan assembly for LHB coaches/ Vande Bharat Trainset to incorporate the following:

Following clauses to be read as:

Clause No.	To be read as
1.1	<p>This specification covers the Technical requirement for design, Manufacture, testing and Supply of centrifugal Blower Fans for:</p> <ol style="list-style-type: none"> <li>1. LHB coaches suitable for working on 3Phase, 415V, 50 Hz supply to be fixed on the coach end wall.</li> <li>2. Vande Bharat Trainsets suitable for working on 110 V AC supply to be fixed on sidewall/ ceiling.</li> </ol> <p>The exhaust fans shall be mounted with the help of suitable mounting brackets and shall connect inlet/outlet ducts from lavatories/pantry area/SBC meant for exhausting the foul/hot air.</p>
4.0	<p><b>SCOPE OF SUPPLY:</b></p> <p><b>TYPE-I</b> Double Inlet Centrifugal Fan complete with mounting brackets suitable for 415V, 3-Phase, 50 Hz supply, generally conforming to drawing no. LW75205, Alt. 'b' (for guidance only).</p> <p><b>TYPE-II</b> Single Inlet Centrifugal fan suitable for 415V, 3-phase, 50 Hz, generally conforming to drawing no. as per Annexure-A (for guidance only) of EDTS-331.</p> <p><b>TYPE-III</b> Supply Installation, Testing and commissioning of Single Inlet Centrifugal fan suitable for 3 Phase 415V AC, for Pantry along with ducting arrangement in Vande Bharat Trainsets generally conforming to Annexure-B of EDTS-331 (for reference only) ##</p> <p><b>TYPE-IV</b> Single Inlet Centrifugal fan suitable for 110V AC, for Lavatories in Vande Bharat Trainsets generally conforming to Annexure-C of EDTS-331 (for reference only) ##</p> <p>## OGAs shall be got approved from CEDE/RCF before prototype manufacturing.</p>
5.1	<p>The Double/Single Inlet Centrifugal Blower shall be supplied complete with mounting brackets suitable for 415 V AC, 3 Phase, 50 Hz conforming to drawing no. LW75205, Alt. 'b'/Annexure-A for LHB coaches.</p> <p>The single Inlet Centrifugal fans suitable for 3 Phase, 415V AC for Pantry and 110V AC for Lavatories in Vande Bharat Trainsets shall be supplied conforming to Annexure-B and Annexure-C (for reference only) respectively. The Centrifugal fan shall be generally conforming to IS:2312 (latest) with additional data as under:</p>
5.2	The equipment shall be suitable for indoor mounting in LHB AC coaches and Vande Bharat Trainsets which are expected to work in service conditions given in clause 2.0.
5.5	The 3-Phase/Single phase drive motor shall have compact construction with constant speed, high starting torque and efficiency.

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5.9

Direction of rotation:

5.9.1 Single Inlet for LHB coaches: - Clockwise as seen from the Suction side.

5.9.2 Double Inlet for LHB coaches:- Anticlockwise as seen from Inlet opposite the Cable exit.

5.9.3 Single Inlet for Pantry in Vande Bharat Trainset: - Anticlockwise as seen from the Suction side.

5.9.4 Single Inlet for Lavatories in Vande Bharat Trainset: - 1 no. clockwise and 1 no. Anticlockwise.

6.0

TECHNICAL DETAILS:

SN	Description	Type-I	Type-II	Type-III	Type-IV
a	Sweep (mm)	133mm	180mm	160mm	133mm
b	Supply Voltage (V)	415 ± 10%	415 ± 10%	415 ± 10%	110 V AC
c	Phase	3Ø	3Ø	3Ø	1Ø
d	Frequency	50 Hz	50 Hz	50 Hz	50 Hz
e	Minimum air volume (CMH)	625 *	1045	600 @	265 \$
f	Speed (RPM)	1500 #	1300	2200 (max)	2700 (max)
g	Power input (max) watts	200 W	185 W	190 W	65W
h	Nominal Current (A)	0.4A	0.6A	0.33A	0.59A
i	Noise level (dBA)	60	68	**	**
j	Degree of protection	IP-44	IP-44	IP-44	IP-44

\*The exhaust fan shall be mounted on the endwall of the coach and exhaust air shall be drawn through duct arrangement from each lavatory as per drawing no. LW64236 (latest). In view of above, the exhaust fan shall be designed to give minimum exhaust air volume of 450± 5% CMH at the back pressure of 115mm of water gauge collectively from both lavatories at actual site conditions. Special test apparatus/equipment to check compliance of above shall be arranged by the firm.



# The speed of exhaust fan shall be kept as 1500 RPM. However to obtain the desired result may vary subject to the condition that noise level shall not exceed 60 dB in any case.

@ For Type-III: The Design, Manufacture, Supply and Installation of Aluminium flexible duct arrangement on exhaust side of exhaust fan in Pantry in Vande Bharat coaches (i.e. for Type-III only) shall be in scope of exhaust fan supplier. The exhaust fan along with ducting arrangement shall be installed by the firm to ensure minimum CMH value as specified above after installation in the coach on the outlet cut out of size 60mm X 120mm on Sidewall (the suction grills shall be provided in Pantry and adjacent corridor area and the inlet ducts shall be in the scope of RCF Furnishing). Firm may physically assess the site conditions before manufacture, however any modification required at site shall be carried out by the firm without any financial implication. Sealant of make M/s Henkel, M/s 3M and M/s Sika shall be used to prevent leakage/ingress of water.

\$ For Type-IV: The exhaust fan shall ensure minimum CMH value as specified above after installation in the coach on the outlet of Sidewall. Firm may physically assess the site conditions before manufacture, however any modification required at site shall be carried

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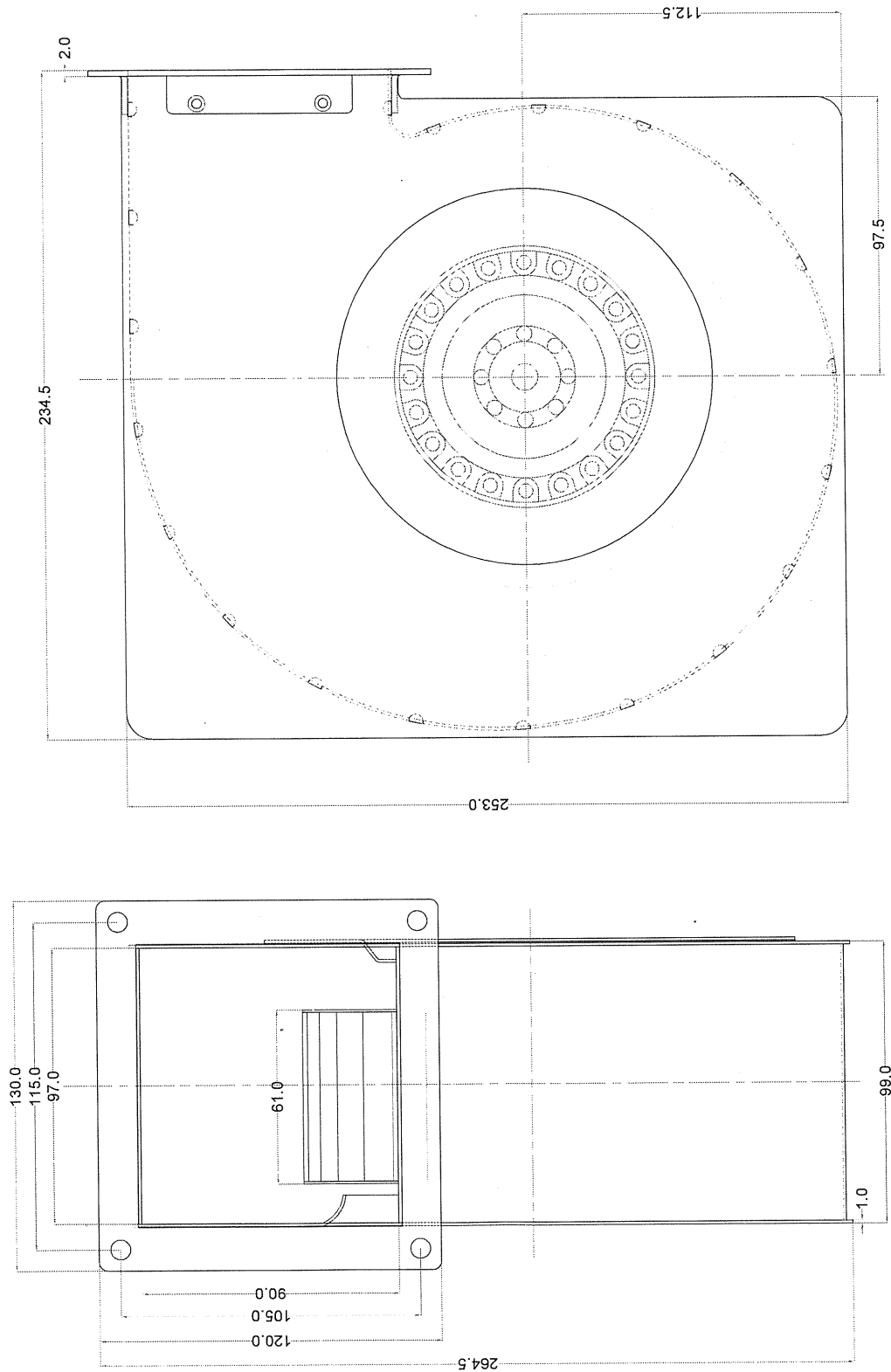
	<p>out by the firm without any financial implication. Sealant of make M/s Henkel, M/s 3M and M/s Sika shall be used to prevent leakage/ingress of water.</p> <p>**Limit of noise level of the equipment shall be as per clause 1.5 of RDSO specification RDSO/PE/SPEC/EMU/1096-2019.</p> <p>Tolerance on the ratings shall be in accordance to clause 16 of IS:2312 (latest edition).</p> <p>*#@\$ Prior approval in this regard shall be taken from CEDE/RCF.</p>
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EDTS-331 Rev. A  
Annexure-B

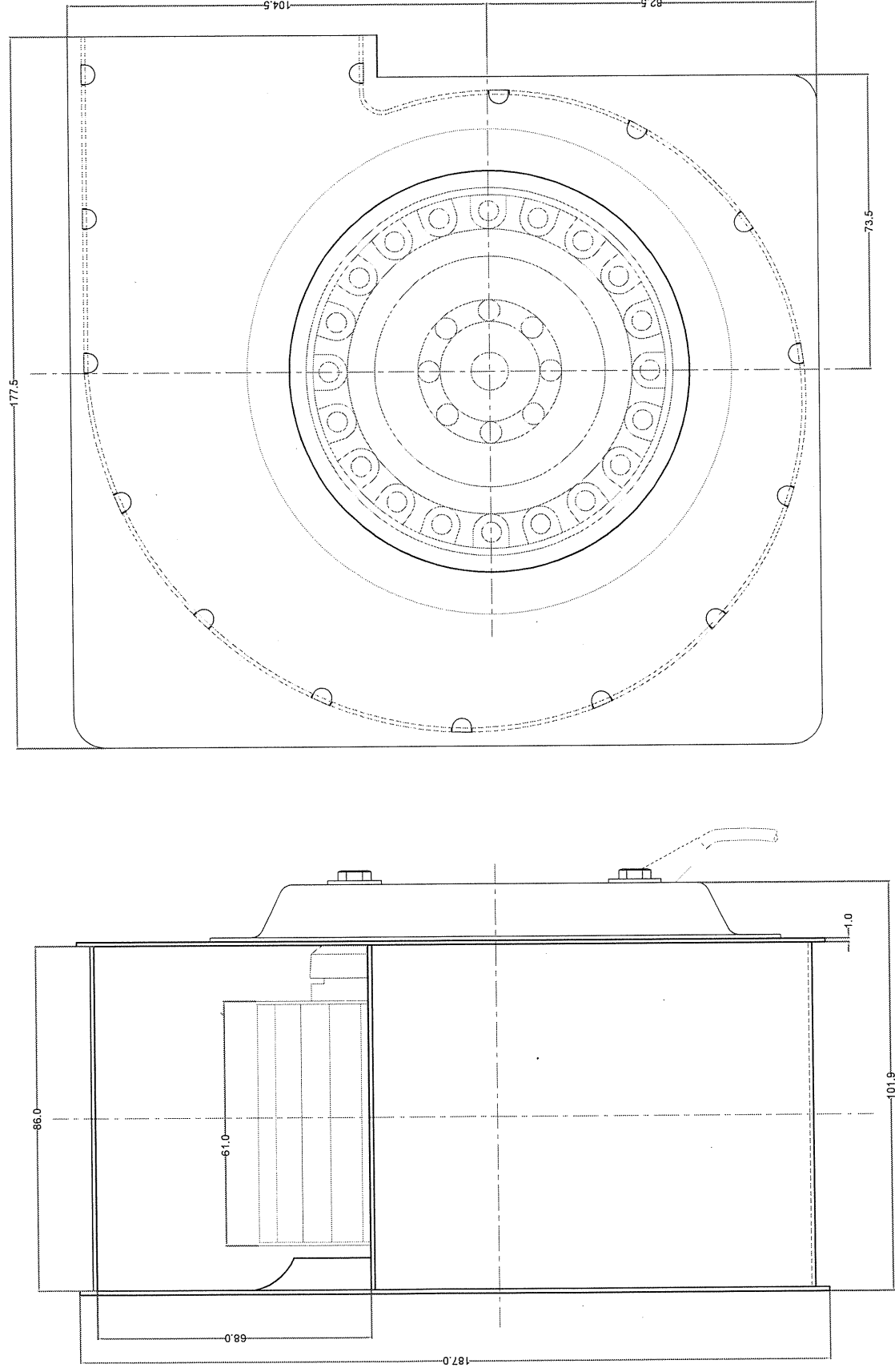
For reference only







For reference only



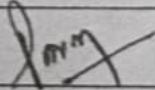
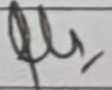
Exhaust Fan without Flange

Corrigendum No. 3 to Specification no. EDTS-331, Rev-A, Corr-2

This Corrigendum is being issued to specification no. EDTS-331, Rev-A, Corr-2 for "Double/Single inlet centrifugal blower fan assembly for LHB coach/Vande Bharat Trainset" to modify the scope of supply as follows:

Clause No. 6, Foot Note "@ For Type-III" of Corrigendum-2 modified as under:

@ For Type-III: The Design, Manufacture, Supply and Installation of Aluminium flexible duct arrangement on exhaust side and inlet side of exhaust fan in Pantry in Vande Bharat coaches (i.e. for Type III only) shall be in scope of exhaust fan supplier. The exhaust fan along with ducting arrangement shall be installed by the firm to ensure minimum CMH value as specified above after installation in the coach. On the outlet, cut out of size 60mm X 120mm is provided in the Sidewall and the grill from outside of the coach shall be provided by the firm. Suitable inlet canopy with diffuser duly integrated with the ceiling of pantry area for air suction shall be fabricated in stainless steel material and shall be in the scope of firm. The mounting arrangement of fan shall be so designed to prevent vibrations and noise in saloon side. Stainless steel mounting brackets along with hardware shall be in the scope of firm to suit at site. Firm may physically assess the site conditions before manufacture, however any modification required at site shall be carried out by the firm without any financial implication. Sealant of make M/s Henkel, M/s 3M and M/s Sika shall be used to prevent leakage/ingress of water.

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