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भारत सरकार
रेल मंत्राालय

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

डीजल लोकोमोटिव के कॉम्पैक्ट (ट्राई प्लेट) टाइप
आईआरएबी.1 और 28 एलएवी.1डुयल ब्रेक पैनल की विशिष्टि

Specification For Compact (Tri-plate) type IRAB-1 Pure Air Brake and 28 LAV-1 Dual Brake Panel for Diesel Locomotives

विशिष्टि संख्या एम.पी.0.01.00.19 (संशो.–02)
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LIST OF AMENDMENTS

S. No	Amendment Date	Rev.	Revised Para	Details of Revision
2	March' 2021	02	4.1	Clause 4.1 of RDSO ISO Apex document no. QO-D-8.1-5, Ver. 2.1- Application for registration of vendor, covers the requirement of vendor registration process. Accordingly, para has been deleted.
			4.2.4	Clause 4.3.1 of RDSO ISO Apex document no. QO-D-8.1-5, Ver. 2.1- Application for registration of vendor, covers the requirement of ISO certification. Accordingly, para has been deleted.
			4.5	RDSO ISO Apex document no. QO-D-8.1-13, Ver. 1.3- Quality Audit of Approved Vendor, covers the requirement of quality audit. Accordingly, para has been deleted.
			5.1.2	RDSO ISO document no.-QM-RF-8.1.3 (Ver-1.0) - Guidelines for preparing QAP during registration, is referred in the para. Accordingly, para has been revised
			5.1.3	Clause 4.13 of RDSO ISO Apex document no QO-D-8.1-6, Ver.3.2 - Vendor application processing, covers the requirement for review/upgradation of QAP. Accordingly, para has been deleted.
			5.2.17	Para has been revised to address restrictive/narrow eligibility criteria.
			7.1	As stage inspection not required, Para has been revised for better clarity.
			7.6	Para has been revised to define type test.
			7.8	Field trial quantity and field trial period are defined as per RDSO document no- MP-M-8.1-1 (latest version) and Field trial performance feedback format & acceptance criteria are added.
			7.9.1	Para has been revised to define routine test.
			8.1	"5 copies" word deleted in the sentence
			8.1.1	Para has been revised to address restrictive/narrow eligibility criteria.
			10.	Addition of new Para (Preference to Make In India) in compliance of directives issued by GOI for promotion of Make in India policy.
			11.	Addition of new Para (Vendor Changes in Approved Status) in compliance to Vigilance cell note no. 13/Vig/Policy dated 08.09.2016.

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Specification for Compact (Tri-plate) Type IRAB-1 Pure Air Brake and 28 LAV-1 Dual Brake Panel for Diesel Locomotives

1. Introduction

Panel mounted brake system consists of mounting of the pneumatic valves of locomotive brake system on a modular aluminium plate. Joining three plates together makes the modular aluminium plate. The grooves have been provided on the mating face of the plates for passage of compressed air. Valves are mounted on front face of the panel and are connected to the internal grooves through holes on front plate. At the bottom of the aluminium plates, connection has been taken to connect the panel with the pneumatic brake circuit of locomotive.

2. Definitions, Abbreviations and clarifications

2.1 Tenderer -means firm/company from whom the offer for the supply of air brake equipment is invited.

2.2 Contractor- means the present firm/company on whom the order for the supply of the air brake equipment is placed/will be placed.

2.3 Purchaser- means the Indian Railways on behalf of the President of the Republic of India who are purchasing the air brake equipment.

2.4 Inspecting Authority- means the organisation or its representative nominated by the purchaser to inspect the panel mounted brake system on his behalf.

2.5 The Research Designs and Standards Organization, Manak Nagar, Lucknow-226011 is hereafter referred to as RDSO.

2.6 Indian Railways is hereafter referred to as IR.

2.7 In case tenderer needs any clarification in respect of any clause of this specification or regarding the drawings the tenderer shall obtain it from Motive Power Directorate, RDSO Lucknow.

3. Scope

This specification covers the general design, lay out, inspection, testing, installation and commissioning of compact tri-plate type panel mounted IRAB-1 twin pipe pure air brake and 28LAV- 1 twin pipe dual brake system for all classes of diesel locomotives.

4. General Conditions

4.1 Service Conditions

4.1.1 The equipment shall be capable of operating efficiently inspite of dust, dirt, mist, torrential rains, sand storm and presence of oil vapours to which the locomotive is normally exposed in service.

4.1.2 The equipment shall be capable of working satisfactorily under site conditions indicated below:

.1 Altitude- Means sea level to an altitude of 1000m.

.2 Ambient temperature- 0ºC to 55ºC. The air temperature in-side the equipment compartment may reach up to 70ºC.

.3 Relative Humidity-Up to 100%.

4.1.3 Vibration, shock and bump test

The panel with mounting arrangement shall be able to withstand the vibrations and shocks normally encountered during service. The conditions are indicated below:

.1 Maximum vertical acceleration 1.0g.

.2 Maximum longitudinal acceleration 3.0g.

.3 Maximum transverse acceleration 0.5g.
('g' being acceleration due to gravity)

4.1.3.1. Details of Vibration, shock and bump tests

The assembly is secured in a suitable position to a machine producing vibrations of sinusoidal form with adjustable amplitude and frequency and is then subjected to the tests given below. The assembly under test shall be able to withstand successfully the electrical tests and, in particular, the dielectric tests applicable to the equipment concerned.

4.1.3.2. Determination of resonant frequencies

In order to determine the possible existence of critical producing resonance, the frequency shall be varied progressively over the range 1 Hz-100 Hz within a time of not less than four minutes and the amplitude of oscillations (A) expressed in millimetres should be varied as a function of frequency (f) according to the relation
$A = 25/f$ for values of f from 1 Hz to 10 Hz
$A = 250/f^2$ for values of f exceeding 10 Hz & upto 100 Hz.

If resonance is produced, the corresponding frequency shall be maintained for ten minutes in each case with the apparatus alive. A check shall be made that no ill effects result on the operation of the apparatus (abnormal tripping of a relay, sparking at contacts, temperature rise at contacts, etc.).

4.1.3.3. Tests with sustained vibrations:

The assembly is next subjected to a test with sustained vibration for a period of two hours-
- either at the critical frequency, if any such well defined frequency has been detected in the course of the test of sub-clause 4.1.3.2
- Otherwise, at a frequency of 10 Hz;

In both cases, the amplitude of the vibrating table is to be adjusted to the value corresponding to the frequency concerned.
The test is considered to be satisfactory if there is no resulting damage or abnormality in operation.
If considered by Engineer or Inspecting Officer, the assembly may be subjected to sustained vibration for a longer period (25 h to 50 h), as an investigation test.

4.1.3.4. Tests for simulating the effect of shunting shocks:

In the direction corresponding to the longitudinal movement of the vehicle on which it is to be mounted, the assembly is subjected for 2 min. to 50 Hz vibrations of such a nature that the maximum acceleration is equal to 30 m/s^2 (amplitude a= 0.3 mm) the equivalent in operation.

4.2 Guarantee

The equipment mounted on panel shall be guaranteed for satisfactory functioning for a period of 2 years after commissioning. However, the supplier shall guarantee for satisfactory functioning of the panel for a period of atleast 10 years. Any equipment which fails during the guarantee period shall be replaced or modified free of cost by the supplier. In case it becomes necessary to modify the design, all the units will have to be modified by the supplier free of cost.

4.3 After Sales

4.3.1. At least one set of wall charts showing pictorial view of components along with part nos. will be given with every 5 sets.

4.3.2. The contractor will impart training of working, operation and maintenance of the system free of charge to selected concerned personnel of Indian Railway, if purchaser/ RDSO desire so.

5. Technical Requirement

5.1 General Technical Requirement

These are applicable to panel mounted brake system of IRAB-1 and 28 LAV-1 brake systems for diesel locomotives.

5.1.1 Approval of drawing

At the time of prototype development the firm will get the approval of stage designs & drawings like groove layout arrangements, port passage groove dimensions etc. from Motive Power Directorate of RDSO. After the approval of stage designs & drawings the final drawing indicating arrangement of brake valves, mounting arrangement, dimension of panel, port sequence etc. will be given by firm to Motive Power Directorate of RDSO for approval. After prototype development, testing and fitment on locomotive, the drawing will be approved by RDSO. The firm will modify the drawings in consultation with RDSO, if required, based on field performance.

5.1.2 Quality Assurance Plan (QAP)

The firm shall have an "internal quality assurance system" with proper documentation to sustain quality of products being manufactured. Firm will also prepare quality assurance plan as per RDSO ISO document no-QM-RF-8.1.3 (latest version) - Guidelines for preparing QAP during registration.

5.2 Technical Requirement of Panel Mounted IRAB-1 Brake System

5.2.1 The brake system shall generally be in accordance with latest revision of RDSO brake schematic diagram no. SK.DP-3100 and shall be suitable for twin pipe graduated release type air braked stock. The brake equipment of WABCO design shall generally conform to WABCO drawings and specifications. Equipment not of WABCO design shall be approved by RDSO/ PU/ Zonal railways as the case may be.

5.2.2 The brake equipment to be mounted on the panel shall be as per list given in **Annexure- I**.

5.2.3 The panel shall be mounted in the short-hood of the locomotive. The envelope size of panel shall not be more than as mentioned below:

i. Length of Panel across the center line of locomotive = 550 mm

ii. Width of Panel along the center line of locomotive = 425 mm

iii. Height of Panel perpendicular to the center line of locomotive = 1655 mm

iv. Weight of Panel with equipment shall not be more than = 275 Kg

5.2.4 All the brake equipment provided on the panel will be without pipe brackets and the main panel block shall serve the purpose of pipe bracket for all the brake equipment so that individual valves can be removed from the panel easily for maintenance. A block can be used on panel for mounting of the valves provided that the envelope size of panel shall not exceed the size mentioned in para 5.2.3.

5.2.5 The air connections to the individual valves on the panel shall be made through the main block by milling operation. Inlet and outlet connections shall be provided at the bottom of the panel with a special design of manifold without flange connections to match the port sequence shown in **Annexure-II**.

5.2.6 It shall be suitable for working at a pressure of 10.0 kg/cm^2 with adequate safety factor.

5.2.7 Internal passages shall be as straight as possible to reduce pipe losses and flow area shall not be less than the port area of the corresponding valve. Adequate land space shall be provided between the adjacent grooves to prevent leakage between them and to provide leak proof bonding of plates.

5.2.8 The panel shall be made from corrosion resistant material and should not be affected by oil carry-over from the compressor.

5.2.9 Tri-plate technology shall be used in the main IRAB-1 panel.

5.2.10 There should not be any equipment mounted on the back wall of the panel, so that it can be placed flush with the front wall of the short hood on the locomotive.

5.2.11 Ports between valves and panel plate shall have gaskets to make joints leak proof. The fasteners and gaskets used for fitting brake valves /items on panel plate should be interchangeable between different manufactures. The details of fasteners, gasket etc has to be given to RDSO for approval. However, as a guideline, details of fasteners and gasket to be used on panel are given in ***Annexure-III***. Provision of locating dowels shall be made to avoid improper fixing of the valves and mis-match between ports.

5.2.12 The equipment mounted on the panel shall have sufficient space between two adjacent valves for their removal for day to day maintenance and trouble shooting.

5.2.13 The panel shall have the provision for test plugs for checking the performance/setting and proper functioning of valves, as and when required.

5.2.14 Cu tubes connecting brake panel with auxiliary small reservoirs mounted on panel shall be supported properly to withstand vibrations.

5.2.15 Suitable lifting hooks shall be provided for removal of the panel with the help of overhead crane as well as for sliding the panel in and out of the locomotive from side.

5.2.16 The name plate of the individual valves shall be provided to indicate the location of individual equipment on panel.

5.2.17 Rubber components used in all the brake equipment including those mounted on the panel shall either conform to IRS R-48-88 (latest) or to WABCO/equivalent specifications and shall be obtained from RDSO approved sources.

5.2.18 Since the valves mounted on panel would be removed periodically for maintenance, the

threads on the panel plates for fixing the valves may wear out or get damaged. The vendor is required to use helicoil thread inserts in holes meant for mounting the brake valves/ equipments.

5.2.19 The vendor shall ensure that it is possible to clean grooves in the panel plate either by blowing through or any other method in case of blockage of passage inside the plate. The arrangement and the procedure for cleaning shall be indicated in the offer.

5.2.20 For interconnecting loco piping to the panel, flexible metallic braided rubber hoses with suitable end connections shall be used.

5.2.21 Suitable arrangement for drainage of the condensate from the reservoirs mounted on the panel as well as from the panel plate assembly shall be provided.

5.2.22 For providing electrical connections to magnet Valves, pressure switches, etc., terminal box indicating the wire numbers shall be provided. The wire numbers, however, shall not be common with those used in locomotive. The firm shall submit wiring diagram alongwith the offer. Shielded type wires must be used.

5.2.23 Panel shall have 09 ports. 09th port of panel shall be provided with dummy plug, which may be opened if the panel is required to be used with dual brake system.

5.2.24 Mounting dimension of the panel is required to verified from DLW for any new class of locomotive.

5.2.25 Base of main panel will be included in scope of supply. The size of the base and location of mounting holes, fasteners etc will be decided by the vendor in consultation with DLW. Interchangeability should be there in mounting dimension, holes and fasteners between the bases supplied by various manufacturers. The drawing of mounting base shall, however, be approved by RDSO.

5.3 Technical Requirement of Panel Mounted Brake System of 28 LAV-1

5.3.1 It should consist of IRAB-1 main panel (as per para 5.2) and a rack to mount additional equipment required to haul vacuum braked trailing stock. The rack will consist of pipe mounted bigger valves as well as a small panel to mount smaller valves. The list of pipe mounted brake valves/ items and valves/items to be fitted on small panel is given in ***Annexure – IV***. Bi-plate/ tri-plate technology shall be used for small panel.

5.3.2 The rack shall be mounted in the short-hood of the locomotive. The envelope size of the rack (excluding main panel) shall not be more than as mentioned below:

i. Length of rack across the center line of locomotive = 660 mm

ii. Width of rack along the center line of locomotive = 370 mm

iii. Height of rack perpendicular to the center line of locomotive = 1950 mm

iv. Weight of Panel with equipment shall not be more than = 275 Kg

5.3.3 All the pipe mounted brake valves/items and valves/ items on small panel shall be arranged and connected as per latest revision of RDSO brake schematic drawing no. SKDP-2918.

5.3.4 The small panel is required to be placed in a convenient location on the rack where these valves can be easily attended for the maintenance.

5.3.5 Standard pipe and pipe fittings as recommended for loco brake system shall be used for the rack.

5.3.6 Vacuum rack shall be provided with lifting lugs.

5.3.7 Interchangeability between small panel manufactured by various firms should be there with respect to mounting dimensions, mounting arrangement, valve/items mounting dimensions, gaskets and fasteners. For this, drawings will be approved by RDSO.

5.3.8 Base of rack will be included in scope of supply. The size of the base and location of mounting holes, fasteners etc will be decided by the firm in consultation with DLW.

Interchangeability should be maintained in mounting dimension, holes and fasteners between various manufacturers. The drawing of mounting base shall, however, be approved by RDSO.

6. Installation

6.1 Installation and commissioning of the panel mounted equipment on the first prototype shall be the responsibility of the supplier. Other equipment shall, however, be installed by purchaser. Assistance with regard to labour and other facilities which are available in the workshop would, however, be provided by the purchaser to the supplier. Additional equipment/fittings, not covered in the specification, if required, for installation of panel mounted equipment, shall be supplied by the supplier.

6.2 The supplier shall submit tentative installation drawings along with the offer based on the availability of space in the locomotive. These drawings would, however, be finalised after fitment of the first prototype.

7. Inspection and Testing

7.1 A prototype sample of the panel and rack shall be offered for type test and the approval before commencing bulk manufacture. Any change in the equipment found necessary during prototype inspection, shall be carried out by the supplier free of cost to ensure satisfactory performance of the system.

7.2 The inspection of the prototype equipment shall be carried out by Motive Power Dte of RDSO or their nominee as per approved drawings and QAP. The supplier shall provide, without extra charges material, tools and any other assistance, which may be considered necessary for any test, examination and dimensional checking.

7.3 Supplier shall submit the test specification for testing of sub-assemblies as well as complete assembly of the panel and rack. The test scheme should clearly indicate the type as well as routine tests to be carried out. This shall be made part of the QAP as well.

7.4 At the time of inspection the supplier shall carry out all tests necessary to prove that the equipment fulfils the technical requirements covered in this specification as well as RDSO test program No MP.TP.029/87 and MPTP-019/81 for the complete system when mounted on locomotive.

7.5 Inspectors would be free to check the dimensions and material of any component after the units are assembled and even during the manufacturing stage to ensure that they have been manufactured in accordance with firm's standard drawings and specifications.

7.6 Tests shall be conducted to check the performance of panels at air pressure of 10 Kg/cm². Following shall comprise type tests:

S.N	Test	Details
1.	Dimensional check	As per para 5.2.3 & 5.3.2

2.	Performance Test	As per para 7.3, 7.4 & 7.7
3.	Vibration, shock and bump test	As per para 4.1.3
4.	Any other test specified in the approved QAP as well as desired by purchaser	As per QAP or as specified by the purchaser

7.7 Individual brake equipment would be tested by RDSO as per the standard test procedure of M/s. WABCO/RDSO including those being installed on panel.

7.8 After inspection of the panel it will be subjected for field trials to monitor its performance on locomotive. Quantity of the panel for field trial and field trial period shall be as per RDSO document no- MP-M-8.1-1 (latest version)

Field performance feedback format is as under:

S. No.	Shed/ Rly.	Loco No.	Date of fitment	Date of failure, if any	Reason of failure	Remarks

The acceptance criteria of field trial shall be the satisfactory field performance of equipment.

7.9 Regular Inspection

7.9.1 Regular inspection of the equipment shall be carried out by the purchaser or his nominee. The supplier shall provide, without extra charges, for material, equipment, tools and any other assistance, which the purchaser or his nominee may consider necessary for any test and examination. The supplier shall make available manufacturing drawings and material specifications of the components to the inspecting authority at the time of inspection. Following shall comprise regular inspection (routine tests):

S.N	Test	Details
1.	Dimensional check	As per para 5.2.3 & 5.3.2
2.	Performance Test	As per para 7.3
3.	Any other test specified in the approved QAP as well as desired by purchaser	As per QAP or as specified by the purchaser

7.9.2 Supplier will offer panel for inspection after complete checking by them. The test results of every panel will be submitted to the inspecting authority. Inspecting authority shall carry out all tests necessary to prove that the equipment fulfils the technical requirements, covered in this specification.

7.9.3 Sample Size

Sample size for various tests is given below:

Lot size	Tests as per QAP	
	Sample size	Number of rejection acceptable
Upto 25	3	0
25-50	5	0
50-75	8	0
75-100	10	0
More than 100	10% of the lot	0

Samples should be picked up at random from the lot. If rejection number is more than the acceptable limit, inspection will be stopped and entire lot will be tested again by the firm. After checking the firm will re offer the lot for re inspection. Again sample checking will be done by the inspecting authority. If second time also rejection is more than the acceptable limit, entire lot will be rejected.

8. Technical Documents/Drawings

8.1 Following documents shall be submitted along with the offer:

.1 List of equipment with WABCO or equivalent part catalogue numbers and drawing numbers.

.2 Technical literature covering design and principle of operation, to have a general idea of the panel mounted brake equipment offered.

.3 Detailed dimensional drawings indicating mounting arrangements, layout of valves, sub-assemblies etc.

.4 Clause wise comments on specification.

.5 Test programme and details of testing facilities at manufacturer's works.

.6 List of recommended spares for maintenance of panel mounted brake equipment for two years.

.7 List of special tools required for maintenance of panel mounted brake equipment.

.8 Latest Copy of bill of material of all brake items with Drawing. No. of individual components.

8.2 One copy per five set of the following documents shall be supplied by the supplier as part of contract:

Maintenance instructions covering description, operation of complete system and individual valves, disassembly and assembly, trouble shooting, maintenance schedule, test specification of individual items and complete panel mounted equipment, spare part catalogue and recommended lubricants.

9. Deviations

The supplier shall submit list of deviations, if any, with reasons thereof.

10. Preference to Make In India

The Government of India policy on ‘Make in India’ shall apply.

11. Vendor Changes in Approved Status

All the provisions contained RDSO’s ISO procedures laid down in Document No. QO-D-8.1-11, dated 22.01.2021 (Titled “Vendor-changes in approved status”) and subsequent version/amendment thereof, shall be binding and applicable on the successful vendor/vendors in the contract floated by Railways to maintain of products supplied to Railways.

12. Date of Enforcement

The date of enforcement of the specification is with effect from 1st May'2021.

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Annexure-I

List Of Equipment To Be Placed On IRAB-1 Panel (Main Panel)

Sl. No.	Description	Ref. of Item No. SKDP-3100	Ref. of Item No. SKDP-2918
1	MU-2B Control Valve with gasket	49	49
2	C-2W Relay Valve with OCF & 6 mm choke in exhaust port/ FT-2 relay valve	50	50
3	Reservoir 2 liters	51	51
4	1" C.O.C for brake pipe W/O vent	52	52
5	C-3W Distributor Valve with gasket	53	53
6	Distributor Valve Isolating Cock(filter unit)	53	53
7	Control Reservoir 10 liters	53	53
8	N-1 Reducing Valve set at 1.8Kg/cm²	54	54
9	Air Flow Measuring Valve	55	55
10	R-6 relay valve or SDW-1 relay valve	56	56
11	Rotex Magnet Valve N/C, 72V DC, SR-3097 NW10 N / O	58	58
12	435 cu.In(7 liter) Reservoir	59	59
13	F-1 Selector Valve with gasket	60	60
14	24-A Double Check Valve	61	61
15	C-2W Relay Valve for BC	62	62
16	2 Way Magnet Valve N/C, 72V DC, SR-3163 NW4 for OCF	63	63
17	3/8” Air Filter (Both ends straight)	64	64
18	Reservoir 4 liters with 0.5 mm chock	65	65
19	0.5 mm diameter choke with felt filter	66	66
20	3/8” COC with side vent (Ball type)	67	67
21	Pressure Switch (for B.P) with mounting bracket (RT-116)	68	68
22	Release Run Magnet Valve SR-3282	71	71
*23	Automatic emergency brake feature (Optional)		
	(i) Emergency brake valve, EBV1,(SR3097) (ii) Emergency brake valve, EBV1A, (SR3097)	-	-

* The schematic diagram for Automatic emergency brake feature is given in *SK.DP-3856.*

Annexure-II

Port Sequence for Air Brake Panel

Port No	Description	Port Size
1	From MR. EQ. Pipe	3/4" NPT
2	To BC. EQ pipe	3/8" NPT
3	To Brake Pipe	1" NPT
4	From Port No 5 of A-9	3/8" NPT
5	From Port No 20 of SA-9	3/8" NPT
6	From MR-2	1" NPT
7	To Brake Cylinder	3/4" NPT
8	To air flow Indicating gauge	3/8" NPT
9	To Port no. 3 of VBER Panel (From port no. 53 of MU-2B)	3/8" NPT

Annexure-III

Fasteners And Sealing Rings /'O' Rings/Gaskets To Be Used On Panel Mounted Brake System For DLW

S. No	Description	Wabco Pc No For Rubber Components	Threads	Projection From Front Plate
1	1" COC W/O vent	526388	3/8" UNCx1-1/2"	1"
2	Pressure switch bracket	531868	5/16" UNCx1-3/8"	7/8"
3	Gauge bracket	531868	M 6 x 30 mm	20 mm
4	24-A double check valve	531868	M 6	20 mm
5	Filter cartridge	526388	3/8" UNC	2-3/8"
6	Air flow measuring valve	524719	M 12 x 200 mm	160 mm
7	D.V.isolating cock	531868	5/16" UNCx1-3/4"	1-1/4"
8	Reservoir 2 liter	531868	¾" UNCx1-1/2"	7/8"
9	SR-3097 Magnet Valve	From M/S Rotex	M 6	65 mm
10	SR-3163 Magnet Valve	From M/S Rotex	M 6	55 mm
11	N-1 reducing valve	558515	3/8" UNCx2-1/2"	1-13/16"
12	C-2W relay valve	580565	3/8" UNCx1-1/2"	1"
13	F-1 selector valve	558534	3/8" UNCx4-1/2"	3"
14	MU-2B valve	558987	3/8" UNCx1-3/4"	1-1/8"
15	C-3 Wabco pc No	117460	M 16 x 90 mm	45 mm
16	Release Run Magnet Valve	From M/S Rotex	Socket head cap screw M6x85 LG.	-
17	R-6 relay valve	From approved source	5/16" UNCx1 3/8"	7/8"
18	SR-3097 Magnet Valve (Optional)	From M/S Rotex	-	-

Annexure-IV

Table 1 – Pipe Mounted Valves/Items to Be Placed on the Vacuum Rack

S.No	Description	Ref Of SKDP-2918
1.	VA-1 B Control Valve	76
2.	GD-80-D Filter	77
3.	3 Lit Reservoir (180 Cu.Inch)	78
4.	2" Flap Type Check Valve	79
5.	VA-1 Release Valve	80
6.	GD-80E- Filter	81
7.	2" C.O.C	82
8.	A-1 Diff Pilot Valve	83
9.	7 Lit Reservoir (435 Cu.Inch)	84

Table 2 - Valves/Items To Be Placed On The Small Panel For Dual Brake
(Required To Be Placed On The Rack With Other Pipe Mounted Valves)

S.No	Description	Ref Of SKDP-2918
1.	HB-5 Relay Air Valve	90
2.	Pressure Switch for HB-5	91
3.	3/8 C.O.C	92
4.	1/32 x 1/64 Inlet exhaust	93
5.	24 -A Double Check Valve	95
6.	HS-4 Control air Valve	96
7.	Pressure Gauge (Vacuum brake pipe control. gauge)	97