



ELECTRO-PNEUMATIC BRAKE UNIT

ELECTRO-PNEUMATIC BRAKE UNIT (Kbr VIIIc) – ESCORTS

INTRODUCTION

1. General

The electro-pneumatic brake unit Kbr VIIIc acting in conjunction with the modular brake controller Esbc IIIM is a system in which two brake systems, working independently, are combined. These are the electrically controlled and the automatic air brakes.

The EP brake unit type Kbr VIIIc comprises all the controller sub-assy's of the electrically controlled and the automatic air brake, which are mounted on a common valve bracket. In order to facilitate installation, the unit is of the smallest possible dimensions.

All the required pipe connections and electrical connections are also combined in the valve bracket. This makes it possible to remove any piece of sub-assy. separately, without having to break or remove any pipe connections.

2. Design

The EP brake unit comprises the sub-assemblies listed below:

- a) Application magnet valve (item a) EV 208 3Vt.
- b) Holding magnet valve (item b) EV 207 3Vt.
- c) Safety valve type AKL (item c)
- d) Triple valve Fe 114 So (item d) direct release.
- e) Pressure limiting valve (item e) Hdb 3/3.6.
- f) Stabilizing valve (item f)
- g) Check Valve (item g)
- h) Valve bracket (item h).

3. Operation

The Modular brake controller Esbc IIIM controls the apparatus of both the electrically controlled and the automatic air brakes.

Through the contacts actuated in the brake controller, in accordance with the position of the main handle, the circuit excited the magnet valves, items 'a' and 'b', is opened or closed. During application with the automatic air brake, auto valve unit in the modular brake controller regulates the pressure in the brake pipe.

The connections provided in the Valve bracket as well as the connection between the different sub-assy's of the EP brake unit may be seen from the annexed diagram.

Application Magnet Valve

The application magnet valve, item 'a', is excited and hence open in the application and emergency application positions, compressed air flows from the main reservoir pipe via the application magnet valve, item 'a', the pressure limiting valve, item 'e' and the check valve item 'g', into the brake cylinders. The brake cylinder pressure is determined by the duration of the excitation of the magnet valve, item 'b'.

Holding Magnet Valve

The holding magnet valve, item 'b', is excited and hence closed in the holding, application, self-lapping and emergency application positions. The brake cylinders are then isolated from the atmosphere.

Safety Valve

During a purely pneumatic application initiated through the triple valve, item 'e', the safety valve, item 'c' limits the brake cylinder pressure to a maximum of 4 kg/cm² (57 psi).

Triple Valve

The triple valve for direct release, item 'd', serves for application and release on operation of the automatic air brake, in accordance with pressure changes in the brake pipe. In addition, the release of the electrically controlled air brake is effected via the triple valve in release position.

Pressure Limiting Valve

During electrically controlled application the pressure limiting valve, item 'e', limits the brake cylinder pressure to a maximum of 3.6 kg/cm² (51 psi).

Stabilizing Valve

The stabilizing valve, item 'f', in the release position connects the auxiliary reservoir with a bulb, whereby the pressure in the auxiliary reservoir is reduced by about 0.2 kg/cm² (3 psi) lower than that in the brake pipe. This pressure reduction is necessary in order to avoid the possibility that pressure fluctuations in the brake pipe might cause the triple valve, item 'd', to move from release position into lap position. The stabilizing valve is controlled by the brake cylinder pipe. On brake application, the bulb previously mentioned is exhausted through the stabilizing valve.

Check Valve

During purely pneumatic application, the check valve, item 'g', prevents the escape of air from the brake cylinders through the open holding magnet valve.

EP BRAKE

Application

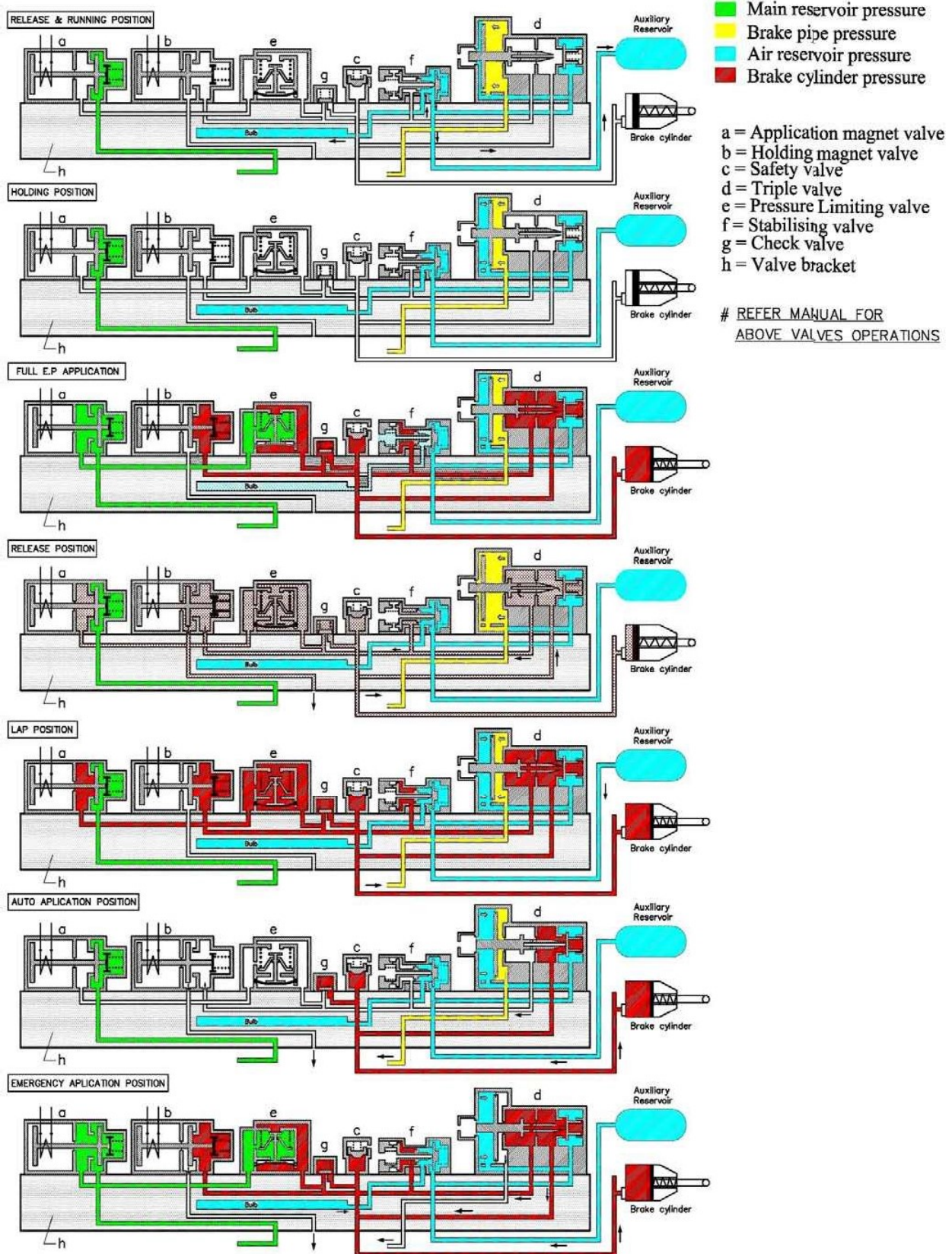
During application, the holding magnet valve, item 'b', is excited and cuts off communication between the brake cylinders and the atmosphere. The application magnet valve, item 'a', is also excited and allows air from the main reservoir pipe to flow through the pressure limiting valve, item 'e' and the check valve, item 'g', into the brake cylinders, where the pressure is limited to 3.6 kg/cm² by the limiting valve. The pressure in the brake cylinder acts on the piston of the stabilizing valve, item 'f', pressing it towards the left against the force of a spring, by which means the bulb which was connected to the auxiliary reservoir during release is exhausted.

Holding position

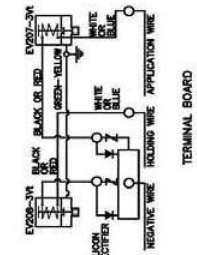
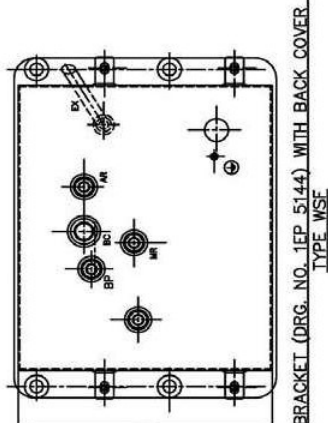
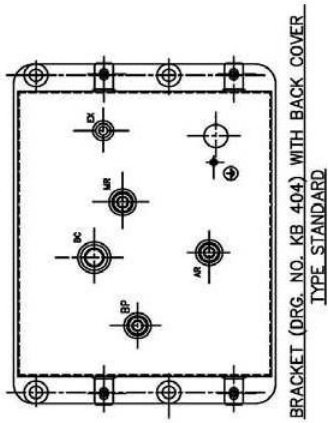
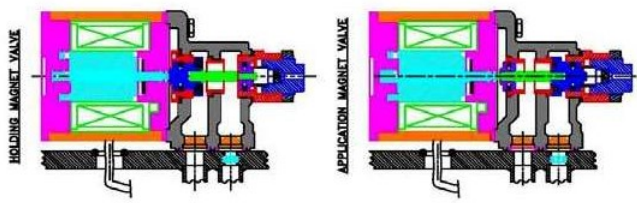
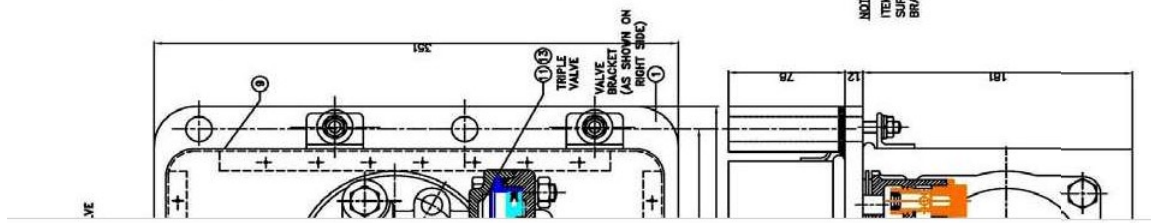
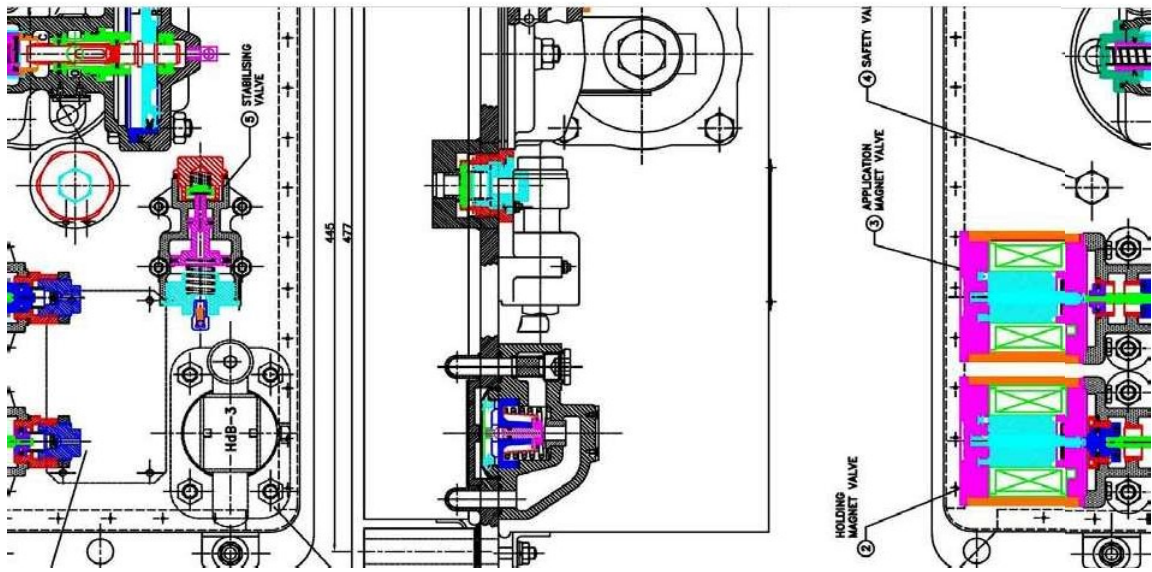
In the holding position only the holding magnet valve item 'b' is excited. Both magnet valves are closed, so that compressed air is neither supplied nor released from, the brake cylinders.

Release

During release neither magnet valve is excited. The air in the brake cylinders flows through the triple valve in the release position and the open holding magnet valve, item 'b', to atmosphere. The stabilizing valve, item 'f', connects the auxiliary reservoir to a bulb in the valve bracket.



SCHEMATIC DIAGRAMS OF E.P. UNIT AT DIFFERENT POSITIONS



NOTE:--
ITEM NO.4 I.e. SAFETY VALVE NOT TO BE SUPPLIED FOR EP-UNITS MENT FOR SYNTHETIC BRAKE BLOCKS, OPENING TO BE PLUGED.

ELCTRO PNEUMATIC BRAKE UNIT-0A68051/--
F.P UNIT 16" (1/293155)- /A
E.P UNIT 12" (1/29422)- /C

ELECTRO PNEUMATIC BRAKE UNIT

MAGNET VALVE (EV 207-3Vt)

The Magnet valve EV 207-3Vt drawing no. 3 A 82337 is used as both application and release valve for the electrically controlled brake. The valve is mounted on the valve bracket of the EP brake unit. When the electrically controlled brake is operated by means of the driver's brake valve, depending on the brake handle position selected, the magnet valve acts as a braking valve by allowing compressed air from the filling pipe to pass via a maximum pressure limiter into the pipe leading to the brake cylinders, or as release valve by connecting the brake cylinders to atmosphere.

The magnet, type G-21, used in this valve is designed for a 100% load period and voltage fluctuations of $\pm 30\%$.

The valve is supplied for DC. The rated voltage is marked on the indication plate, together with the power input, valve type and serial number and manufacturing year etc.

Design and Operation

The magnet valve consists of two main parts, the magnet and, flanged to it, the valve body containing the air passages. In the body, which contains pressed-in valve seating bushes, a valve head with a rubber-facing insert moves in upper and lower guides and is fitted with K type air seals. The guides are so designed as to relieve the valve head from air-pressure so that the armature of the magnet need only work against the spring. The tension of the spring can be regulated by means of the set screw with a Hex: socket head. The principal parts of the magnetic element are the armature with pull rod, the coil, casing core flange, armature stop, terminal board and protective cover.

When the circuit is broken and there is no current in the magnet, the armature is held up by the spring. The air passage is closed. When the magnet is excited, the magnet core lifts the spring loaded valve head from its seat.

Installation

The valve should be installed upright, with the magnet at the top. It is built for attachment to the valve bracket of the brake unit.

Maintenance

No routine maintenance is required. Should any fault occur in the magnetic component, the whole valve magnet can be exchanged without taking down the air pressure component.

During general inspections or in the event of failure it is expedient to take down the magnet valves for disassembly. The individual parts of the air pressure component should be carefully cleaned. Defective sealing members should be replaced.

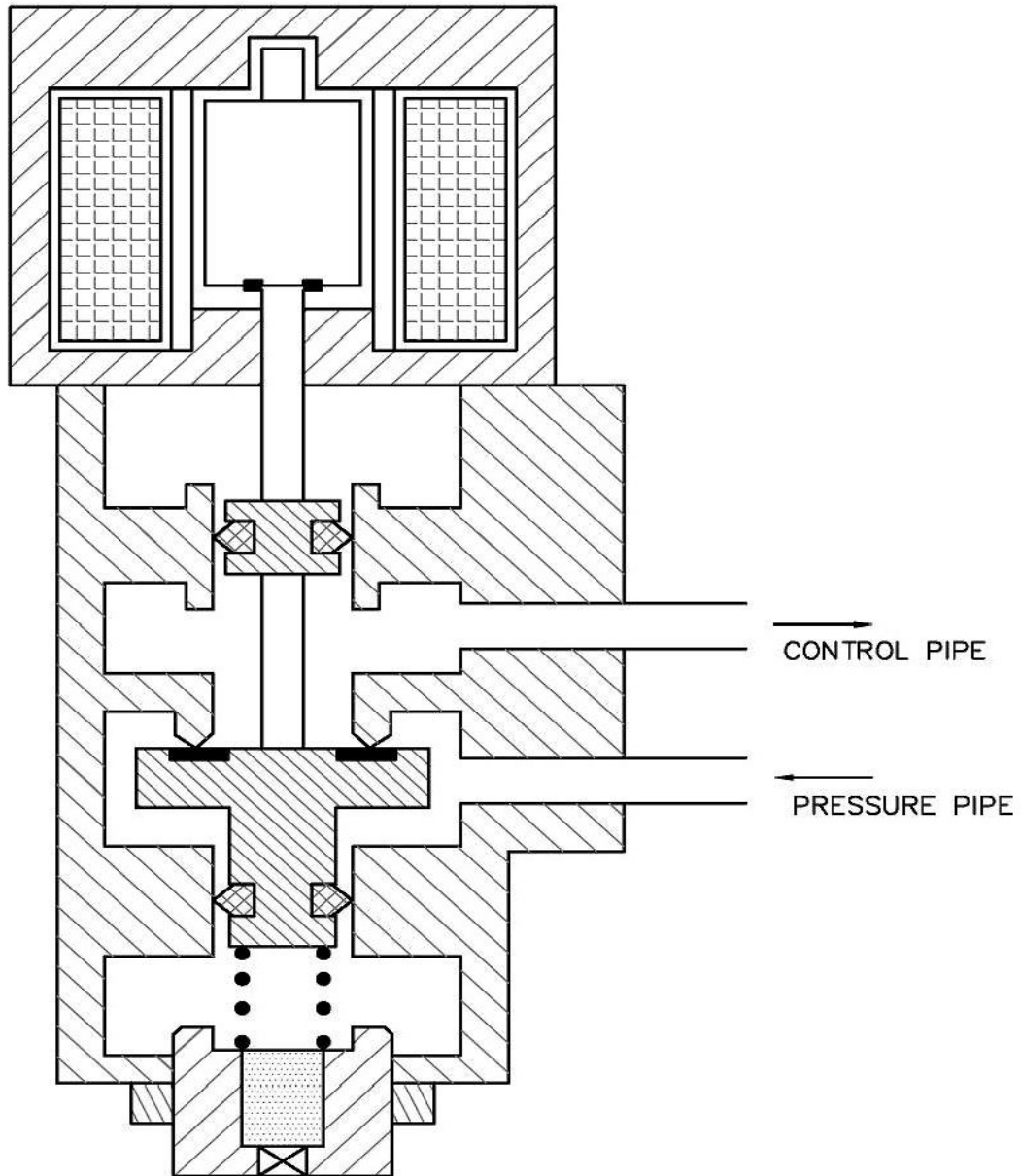
If the valve magnet has been functioning perfectly upto that time, it should not be disassembled but only cleaned externally. The protective cover must be removed in order to check and clean the cable connections. The easy motion of the armature must be verified. One or two drops of acid-free oil may introduce between the draw rod and the sintered bearing through which it passes.

If a field coil has to be exchanged, the screws in the casing of the magnet must be opened to make it possible to remove the flange from the casing and thus gain access to the field coil, when a coil is exchanged, all parts of the valve magnet should be carefully cleaned, and defective parts replaced.

Before re-assembly, the armature and working surfaces in the magnet should be wiped over with a rag dipped in acid-free oil. Any accumulation of lubricant should be avoided.

The K-type air seals in the air pressure component must be also lightly greased on re-assembly, as well as their sealing and guide surfaces and the spring. No lubricant should touch

the valve seat and the rubber-facing insert. When inserting the K air seals care must be taken not to bend back and damage the sealing edges.

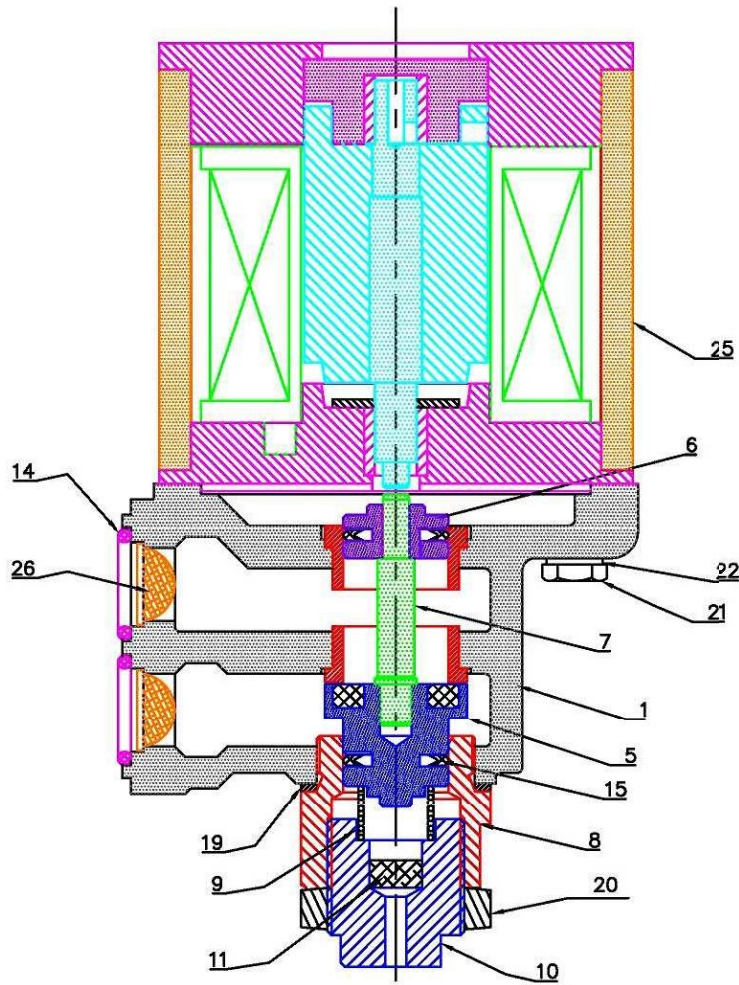


Solenoid deenergised : passage closed

Solenoid energised : passage opened

Drawn solenoid deenergised

MAGNET VALVE (EV 207- 3Vt)



11	FILTER	4A37470	1	B					
10	ADJUSTING SCREW	4A83777	1		26	FILTER	4A43212	2	B
9	COMP. SPRING	4A60934A	1	C	25	VALVE MAGNET G21 S/A	2EP5025	1	C
8	VALVE GUIDE	4A83783	1	C	22	SPRING WASHER B6	DIN 127	2	
7	VALVE ROD	4A99588	1		21	HEX. HEAD SCREW (M6X22)	DIN 933	2	
6	PISTON	4A83780	1		20	HEX. NUT (M26x1.5)	DIN 80705	1	
5	VALVE HEAD S/A	4EP 5561	1		19	SEALING RING A30x36	DIN 7603	1	A
5-7	PISTON S/A	4A 99589-1/53593	1	C	15	K-RING	N890/20.1	2	B
1	HOUSING S/A	4A83782-1/41030	1		14	O RING (16x2.5 B)	DIN 3770	2	B
ITEM NO.	DESCRIPTION	DRG.NO.	NO. OFF	CAT.	ITEM NO.	DESCRIPTION	DRG.NO.	NO. OFF	CAT.

MAGNET VALVE EV 207-3Vt (110 V) (Drg. no. 3A 82337)

HOLDING MAGNET VALVE (EV 208)

1. General

The magnet valve EV 208K-3Vt drawing no. 3A 82330 is used as holding and release valve for the electrically controlled air brake. The valve is mounted on the valve bracket of the EP brake unit and serves to disconnect the brake cylinders from the atmosphere during electrically controlled application and to allow the air in the brake cylinders to escape to atmosphere during electrically controlled release.

The magnet valve is supplied for DC. The rated voltage is marked on the indication plate, as well as the power input, valve type and serial number.

The magnet type G-21 used in this valve is designed for a 100% load period and voltage fluctuations of $\pm 30\%$.

2. Design

The magnet valve consists of two main parts, the magnet and, flanged to it, the valve body containing the air passages. The body contains a valve which is guided above and below and fitted with K type air seals. The upper and lower valve guides are so designed that the valve disc is relieved of air pressure so that the armature of the valve magnet need only work against the spring. The tension of the spring can be adjusted by means of a set screw with a Hex. socket head. The principal parts of the valve magnet are the armature with pull rod, the magnet coil, casing, core flange, armature stop, terminal board and protective cover. The valve should be installed upright, with the magnet at the top.

3. Operation

When the magnet is not under current the force of the spring presses the armature upwards, lifting the valve off its seat. The air passage is then open. When the magnet is excited the armature presses the valve onto its seat, against the force of the spring. The air passage is then closed.

- i. Holding magnet valve (EV-208): (DRG. NO. 3A 82339.)
- ii. Application magnet valve (EV-207) (DRG. NO. 3A 82337)

CONSTRUCTION, OVERHAULING & MAINTENANCE

Construction wise, both valve, i.e. holding and application, are almost identical with most of the components common. They have a common coil (items 24 & 25), which is mounted on to the respective housings (item 1) by hex screws (item 18 & 21). The housing contains a piston sub-assy. (item 4- 6 and 5-7) which moves inside it and closes or opens the passage when the magnet coil is energized. The other parts of the valves are adjusting screw (item 9 & 10) by which tension of the spring (item 8 & 9) can be regulated. The piston sub-assy. also contains two K rings (item 14 & 15) for sealing different chambers. A filter (item 10 & 11) is provided in the adjusting screw to protect the valves from dust.

No routine maintenance is required. However, should any fault occur in the magnetic components, the whole valve magnet can be replaced without taking down the pneumatic sub-assy.

During POH, the valves should be completely dismantled and the various parts should be cleaned as already mentioned. Rubber parts, such as K-rings, O-rings, etc. should be replaced after 2 years of service. Piston sub-assy. should be checked for wear and tear and must be replaced if the sealing marks on the rubber exceeds 0.2 mm in depth, otherwise the pistons are to be replaced after 3 years of service as a matter of principle. Magnet coil should be checked for their movement of spindle at $110V \pm 30\%$ DC. In case of sluggish movement or jamming, replace the coil. Other parts as and when found worn out or damaged must be replaced.

During assembly, care must be taken that all parts are clean. Rubber parts and other moving parts are to be greased lightly. After assembling the pneumatic portion, check for the piston movement which should not be less than 1.3 mm. After complete assembly, the valves are to be tested individually on a test bench for their function.

TESTING

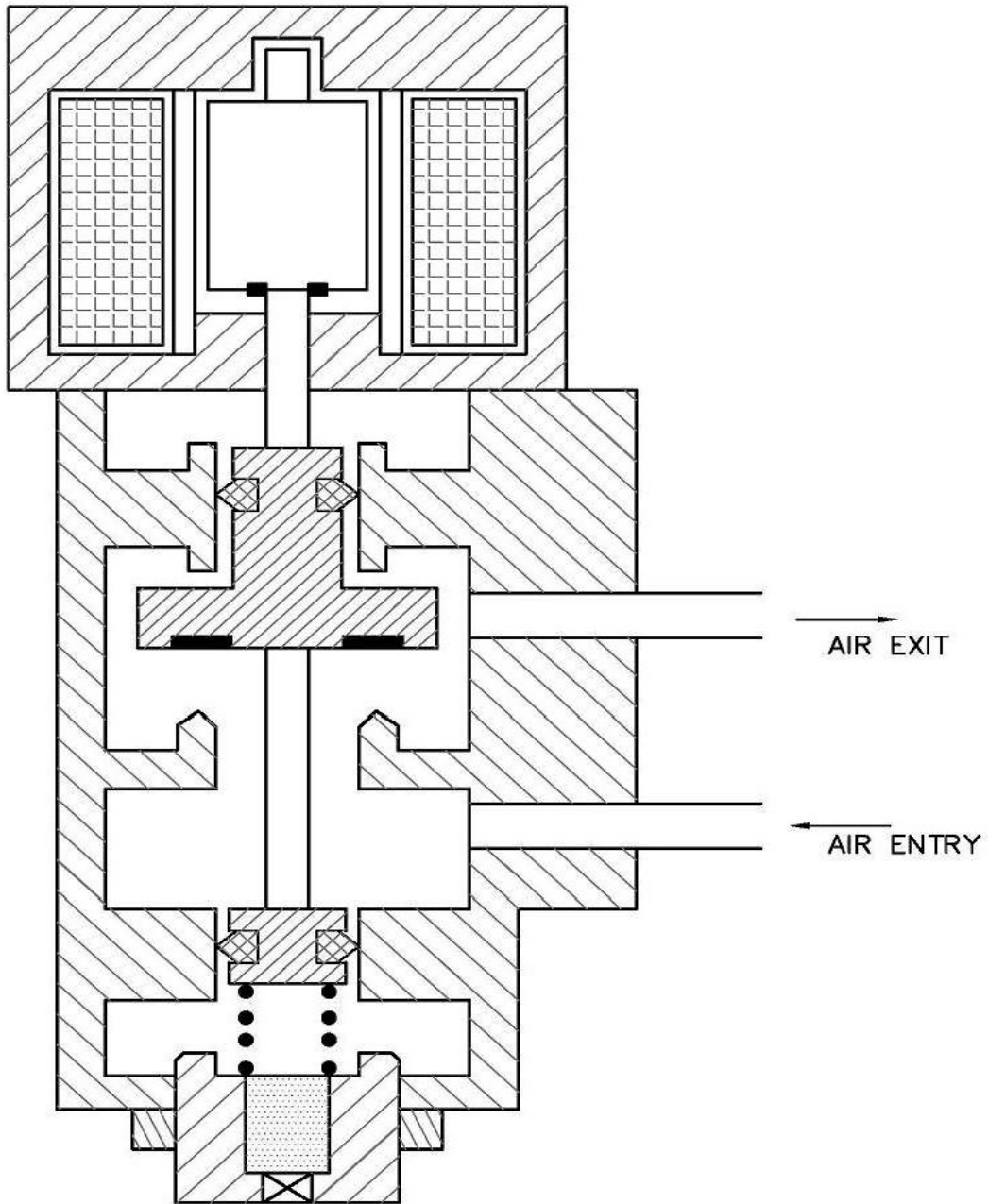
Holding magnet valve EV-208 and application magnet valve EV-207 are tested according to Pruf 1055 and Pruf 1042 respectively on a common test bench to drg. no. KB 1101. The testing generally includes measuring of valve lift, sealing and function, sensitivity and steps (application and release). It is very important to check these valves on a separate test bench before they are fitted on the EP unit bracket.

ADJUSTMENT

Generally in electrical application and release, application and release timings are controlled by mean of chokes provided in the EP bracket under these valves. Unless any major changes are required in the brake and release timings of a coach some minor adjustments in timings can be done by tightening or loosening the adjusting screw (item 9 & 10). In case of increasing or decreasing release timings, it can be done by the regulating screw of holding magnet valve and similarly for application timings by regulating screw of application magnet valve. Tightening the screw in holding magnet valve will decrease the release timings and vice versa. Similarly tightening of the screw in the application magnet valve will increase the application timings and vice versa.

OPERATIONAL CHECKS

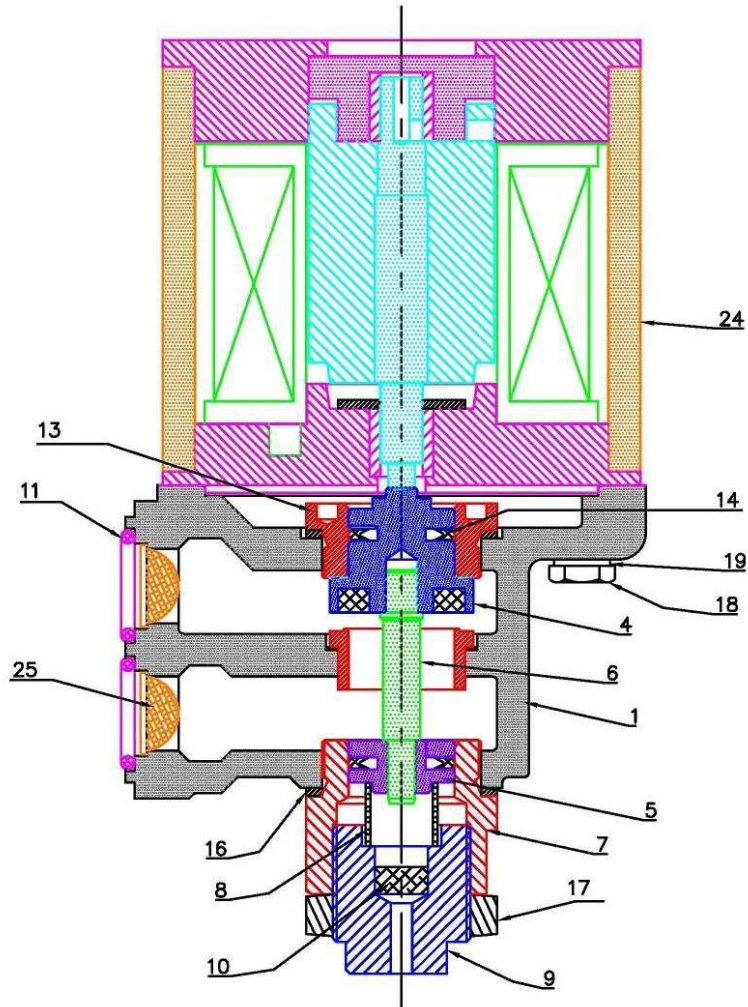
During routine operational checks, the valves should be checked for their proper functioning. From the exhaust port of the EP bracket, no air should leak either during release or application position. Also check the valves for quick and smooth movement of the piston. Any minor adjustments of the timings (application & release) can also be done by these valves as explained earlier. Also check for any defective wiring, if found, it should be replaced. As a matter of principle the valve should be cleaned after every two months.



Solenoid deenergised : passage opened
 Solenoid energised : passage closed

Drawn solenoid deenergised

MAGNET VALVE (EV 208-3Vt)



10	FILTER	4A37470	1	B	25	FILTER	4A43212	2	B
9	ADJUSTING SCREW	4A83777	1		24	VALVE MAGNET G21 S/A	2EP5025	1	C
8	COMP. SPRING	4A60934A	1	C	19	SPRING WASHER B6	DIN 127	2	
7	VALVE GUIDE	4A83783	1	C	18	HEX. HEAD SCREW (M6X22)	DIN 933	2	
6	VALVE ROD	4A99588	1		17	HEX. NUT (M26x1.5)	DIN 80705	1	
5	PISTON	4A83780	1		16	SEALING RING A30x36	DIN 7603	2	A
4	VALVE HEAD S/A	4EP 5561	1		14	K-RING	N890/20.1	2	B
4-6	PISTON S/A	4A 99589-I/53593	1	C	13	VALVE GUIDE	4A 83776	1	
1	HOUSING S/A	4A83774-I/41034	1		11	O RING (16x2.5 B)	DIN 3770	2	B
ITEM NO.	DESCRIPTION	DRG.NO.	NO. OFF	CAT.	ITEM NO.	DESCRIPTION	DRG.NO.	NO. OFF	CAT.

MAGNET VALVE EV 208-3Vt (110 V) (Drg. no. 3A 82339)

SAFETY VALVE, TYPE AKL (DRG. NO. 4A 11422)

The safety valve AKL protects the brake cylinders from over pressure. When the pressure reaches its permissible maximum limit, the safety valve discharges air into the open. The blow-off capacity is 78 chf/min. at 145 psi (2600 ltrs./min. at 10 kg/cm²). The valve assembly comprises a valve cone, and the screw plug with adjusting screw in the upper part of the body, the spring and tightening screw in the lower part, and the connecting nipple.

Compressed air enters through the connecting nipple, passes through holes in the bottom of the lower part into the spring chamber and lifts the valve cone up as soon as the pressure overcomes the set tension of the spring. After the piston has been lifted air flows across the total bottom area of the valve cone and forces same against the screw plug in the upper part. The air escapes through the exhaust holes leading into the open and passes through the slack piston wall of the valve cone and through a small hole in the piston wall into the upper part of the valve cone. Due to the influence of the resulting pressure distribution, the valve cone closes again. The closing pressure can be adjusted by the adjusting screw.

INSTALLATION

The valve unit should be installed vertically between or immediately behind the brake cylinder line. The removal of the actual valve from the firmly inserted connecting nipple should not be impeded.

CONSTRUCTION, OVERHAULING & MAINTENANCE

The safety valve consists of a housing sub-assy. (item 6) comprising of upper part (made out of brass) and lower part (made out of steel) which are screwed and machined together. The valve cone (item 7) is lapped for sealing against the housing with grinding powder, brasso and a special tool. To the valve cone, through a link (item 13) is attached a tension spring (item 5), spring tightening screw (item 3) and nut (item 2). This complete assembly is placed inside the housing and the blow-off pressure is adjusted by the nut (item 2). On the top of valve cone is a locking cap (item 9) with a hex nut (item 8), a regulating screw (item 11) and hex nut (item 10). The closing pressure is adjusted by this regulating screw.

Generally, safety valve type AKL requires very little maintenance in day to day working. During POH the safety valve is to be completely dismantled and all the parts cleaned and washed with kerosene or petrol. The major components which need attention during overhauling are tension spring and valve cone. Tension spring of the safety valve must be replaced after every two years of service. In case it is found rusty or damaged, it must be replaced immediately. Every time, safety valve is opened the sealing ring (item 4) should be changed. Other parts, such as joining piece, spring tightening screw, links, locking cap, hex nut, and regulating screw should be replaced if found damaged. Every time a valve cone is replaced it is to be lapped with the housing with lapping powder and brasso. It is always recommended that in case of replacement of valve cone, the housing sub-assy. should also be replaced for proper lapping and matching to give perfect sealing.

In order to use safety valves in conjunction with the synthetic brake blocks, the tension spring to drg. no. 4A 37074 is to be replaced with tension spring to drg. no. 4A 37074/2 and adjusted to 2.2 kg/cm² blow off pressure.

ADJUSTMENTS

The safety valve is adjusted for two pressures:

- a) Working pressure (blow off pressure)
- b) Closing pressure (shut off pressure)

Working Pressure (blow off pressure)

Safety valves used in EP brake units for use in conjunction with cast iron brake blocks are set at 4.0±0.1 kg/cm² blow off pressure where those in conjunction with the synthetic brake blocks EP installed after additional pressure limiting valve and before brake cylinder and set at

2.2 kg/cm² pressure. The blow off pressure is adjusted by tightening or loosening of the nut for spring tightening screw (item 2). For increasing the blow off pressure the nut is tightened. After the set adjusted pressure is reached the nut is locked by a split pin.

Closing pressure (shut off pressure)

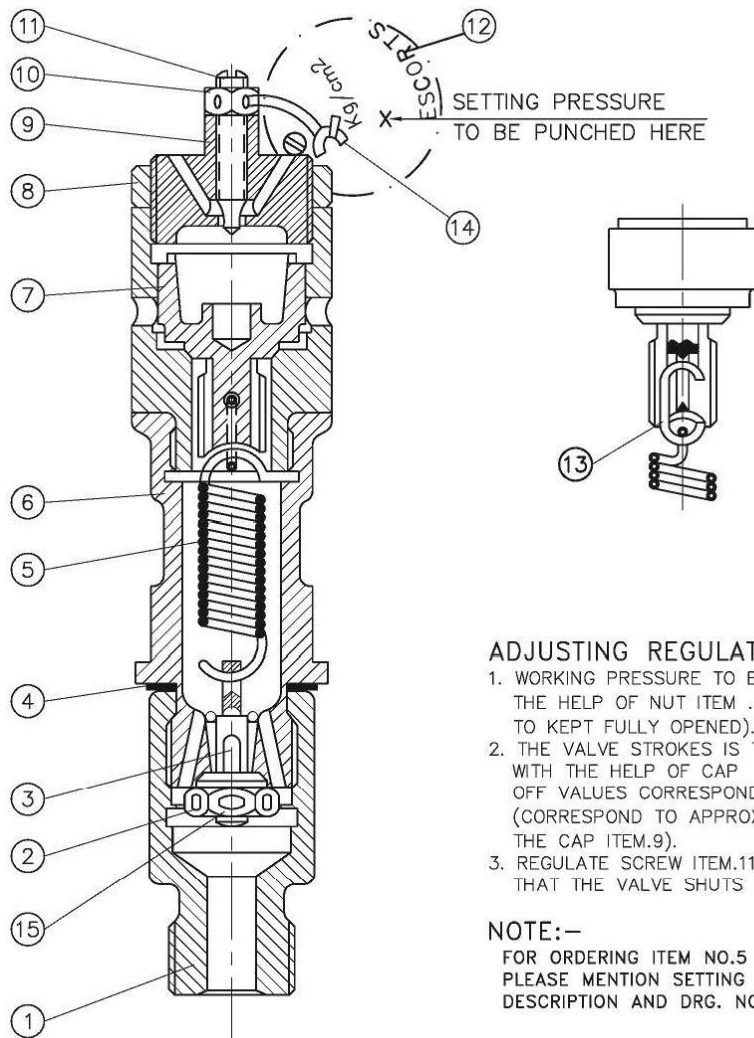
When safety valve blows at 4.0 kg/cm² it automatically closes at 3.7 ± 0.1 kg/cm² i.e. after a drop of 0.3 kg/cm² maximum. This closing pressure is adjusted by the movement of regulating screw (item 11). Initially, locking cap (item 9) is screwed in fully to touch the valve cone and is then rotated back by one revolution and locked by hex nut (item 8). Fine regulations in the pressure drop are then controlled by this regulating screw (item 11). After getting the set pressure drop, this screw is locked by hex. nut (item 10). It is recommended that the setting of the safety valve should always be done on the test bench.

TESTING

The safety valves (type AKL) are tested on a test bench to drg. pruf 1274 and are also tested in accordance with pruf 1274 for adjustment, leakage, sensitivity, blow off capacity and proper functioning. Safety valves thus tested and adjusted will give satisfactory service and will not change their set values in running operations.

OPERATION CHECKS

During operational checks safety valves are to be tested for their blow off pressure once every month. This is so because during normal running operations such conditions may not arise. It should be opened in case the blow off pressure and shut off pressures vary. In case of continuous blowing off of the shut off pressure, check for the free movement of the valve cone. Clean all the parts and apply a little grease in all the moving parts. If a safety valve starts leaking at low pressures, lap the valve cone with the housing as explained earlier.



ADJUSTING REGULATIONS:-

1. WORKING PRESSURE TO BE ADJUSTED WITH THE HELP OF NUT ITEM .2 (SCREW ITEM 11 THEN TO KEPT FULLY OPENED).
2. THE VALVE STROKES IS TO BE SO ADJUSTED WITH THE HELP OF CAP ITEM 9. THAT BLOW OFF VALUES CORRESPOND TO DRG. NO. 4A18242g (CORRESPOND TO APPROXIMATELY 1 TURN OF THE CAP ITEM.9).
3. REGULATE SCREW ITEM.11 IN SUCH A WAY THAT THE VALVE SHUTS OFF AFTER A FULL

NOTE:-

FOR ORDERING ITEM NO.5 – TENSION SPRING PLEASE MENTION SETTING PRESSURE ALONG WITH DESCRIPTION AND DRG. NO.

8	HEX. NUT	1	4A26252			1	
7	VALVE CONE	1	4A26148	15	SPLIT PIN (3x20)	1	DIN94
6	HOUSING (ASSY.)	1	4A18202	14	BRASS WIRE (ø1x100)	1	DIN1757
5	TENSION SPRING	1	4A37074	13	LINK	1	4A20622
4	SEALING RING	1	4A29412	12	IDENTIFICATION MARK	1	4KB228
3	SPRING TIGHTENING SCREW	1	4A11602	11	REGULATING SCREW	1	4A11601
2	NUT FOR SPRING TIGHTENING SCREW	1	4A11603/1	10	HEX. NUT	1	4A18204
1	JOINING PIECE	1	4A26155	9	LOCKING CAP	1	4A11600
ITEM NO.	DESCRIPTION	NO. OFF	DRG.NO.	ITEM NO.	DESCRIPTION	NO. OFF	DRG.NO.

SAFETY VALVE (AKL-4Kg/cm2)
(Drg. no. 4A 11422a)

PRESSURE LIMITING VALVE

1. General

The function of the pressure limiting valve drawing no. 2A 81335 is to limit the air pressure in the brake cylinders to a specified value. For installation in pipe lines, the valve is supplied with a supporting bracket from which it can be removed for maintenance work without necessitating the breaking of pipe or pipe connections or removal of pipes. In the case of EP brake equipment the model without a bracket is used, the HdB valve being mounted on the valve bracket of the EP brake unit.

The spring in the pressure limiting valve is selected and adjusted to correspond to the maximum pressure desired.

2. Design

The pressure limiting valve consists of a body with 2 chambers, 'a' and 'b' in which a piston is fitted. Between the two chambers is a valve seat which is opened and closed by the piston. A spring 'c' holds the piston in its lower end position and keeps the passage between chambers 'a' and 'b' open. At the lower end of the piston are a diaphragm plate and diaphragm.

3. Operation

The piston is normally held down by the force of the spring (8) so that the passage between the chambers remains open.

The air entering the valve flows through chamber 'a' and the open valve seat into chamber 'b' and the pipe downstream of the valve. A certain pressure builds up in chamber 'a' and via the seat, as well as in chamber 'b', and this acts on the diaphragm. As soon as the pressure in chamber 'b' reaches the value for which the spring 8 is adjusted, the piston is pressed upwards against the force of the spring and the valve seat closed. Communication between chamber 'a' and 'b' is interrupted when the pressure in chamber 'b' drops against the spring 'c' reopens the passage, allowing air to pass once more.

The inlet valve is balanced so that the closing pressure remains independent of the incoming pressure; this also ensures high re-feeding sensitivity.

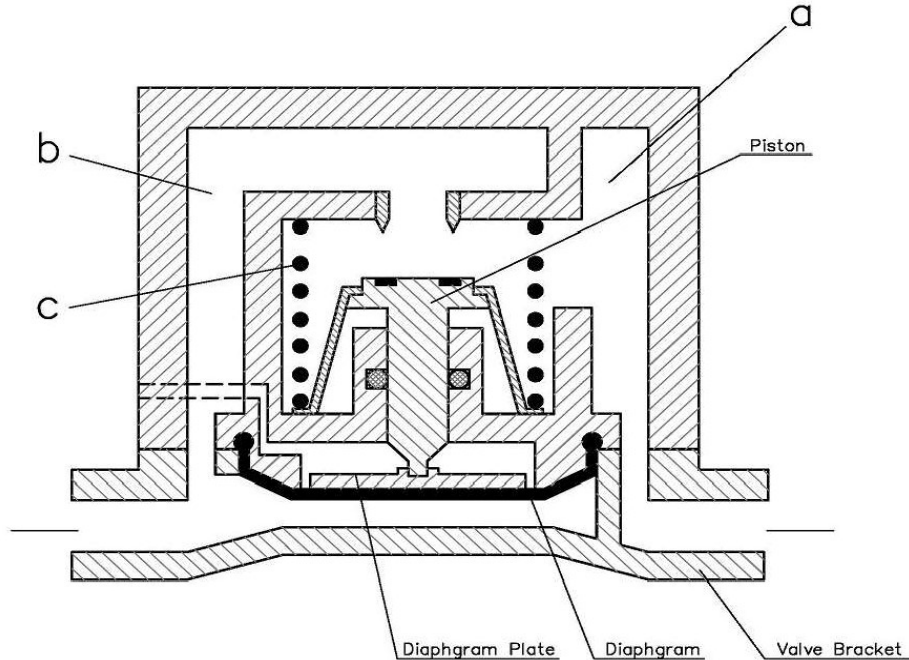
Construction, Overhauling & Maintenance

Taking into consideration the functional importance and operation of the pressure limiting valve in the working of EP unit, it is very important to overhaul the valve during every POH. Basically the valve consists of a grey cast iron housing (item 1) into which a valve head (item 2) moves against the force of a comp. spring (item 8). A rubber diaphragm (item 10) is pressed in the groove 2 of the housing and rests on a diaphragm plate (item 9). A supporting ring (item 14) is screwed in for adjusting the max. pressure. The valve head moves inside a locking screw (item 13) which is securely tightened by a special spanner 4A 47440.

To overhaul the pressure limiting valve it should be dismantled completely. The locking screw (item 13) must never be opened by ordinary screw driver or by chisel and hammer, but a special spanner to escort drg. 4A 47440 should be used. After complete dismantling of the valve, the cast iron housing should be washed with petrol. The rubber parts and valve head are to be washed with soap water solution. Examine the condition of these parts and replace in case of damage or wear and tear. In any case all the rubber parts including to valve head must be replaced after a period of two years.

The compression spring (item 8) which also controls the adjustment of BC pressure should be inspected for any rust or wear. This spring must be replaced after a period of 3 years or earlier if found rusty or damaged. Filter (item 6) should be washed in petrol and before re-assembling should be dried thoroughly. Before assembling the valve all the components should be cleaned. A light grease should be applied on the valve head and inside the locking screw (item 4) locking screw should be free and smooth. Flat sealing ring (item 12) should be

replaced every time the valve is opened for overhauling. Cable compound 'B' is to be applied in hot condition on the threading of the supporting ring (item 14). After cooling down the supporting ring, it is then to be screwed in by special spanner 4A 59318. The use of cable compound is only as an additional precaution against disturbance of maximum adjusted pressure. Sealing lip of rubber diaphragm (item 10) is to be seated properly on to its groove in the valve housing. The exhaust plug if found missing must be replaced. Mounting sealing rings (item 11) should always be replaced when the pressure limiting valve is opened for overhauling. The free movement of the diaphragm against the force of the spring should be checked with hand before mounting the valve on to the test bench for testing.



- a = INCOMING MR PRESSURE
- b = OUTPUT B.C PRESSURE
- C = COMP. SPRING

PRESSURE LIMITING VALVE

TESTING ADJUSTMENT

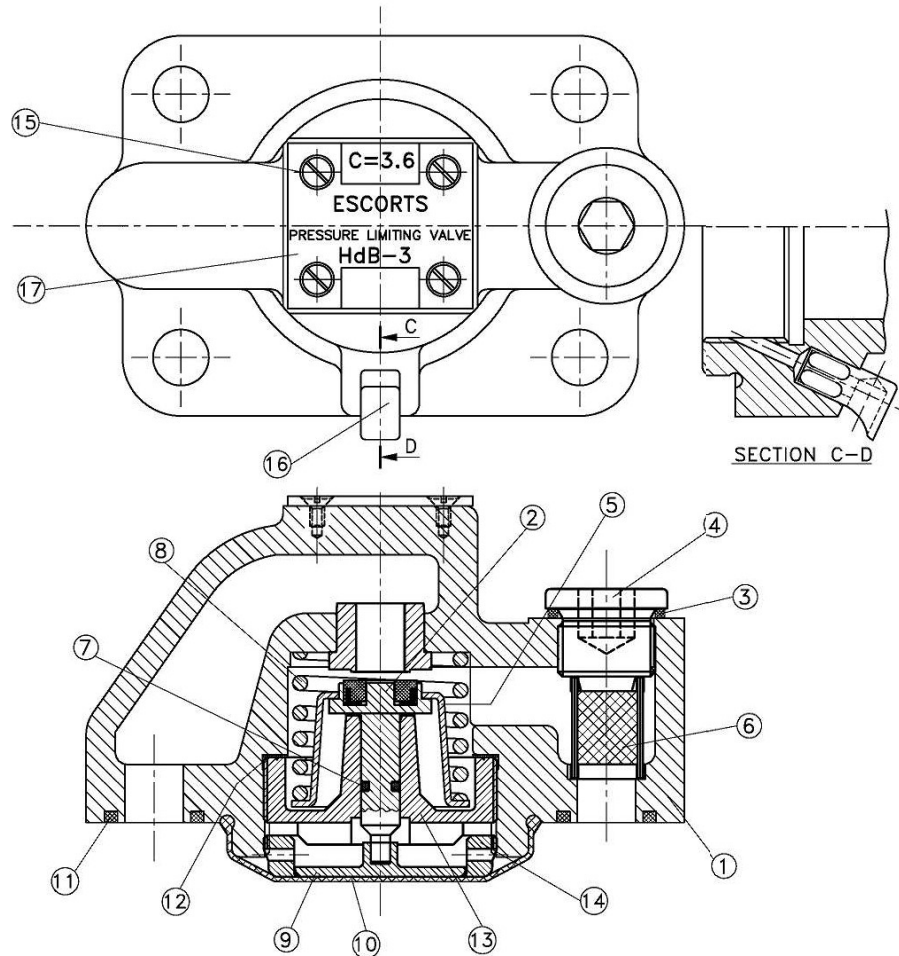
The pressure limiting valve is individually tested on a separate test bench to drg. no. 4A 82436 according to pruf 3089 for setting of max. brake cylinder pressure of 3.6 ± 0.1 kg/cm². Adjustment of pressure is done by the supporting ring (item 14). The clockwise rotation of the supporting ring decrease the pressure, whereas anti-clockwise rotation will increase the pressure. Once the pressure limiting valve is adjusted and tested as per pruf 3089, the pressure is not likely to vary from the desired adjusted pressure. Also the testing includes the leakage from the exhaust port and the leakage from the main reservoir to brake cylinder when the valve head is in closed position. The release timings of BC can also be recorded in the test bench to check for the open passage of PLVs valve head.

The maximum range of adjustment of BC pressure from 3.2 to 3.8 kg/cm² may be possible with maximum and minimum tightening of supporting ring.

OPERATION CHECKS

Normally the adjustment of pressure limiting valve does not get disturbed. As and when it is observed that the adjustment has been disturbed, against it as explained above for correct

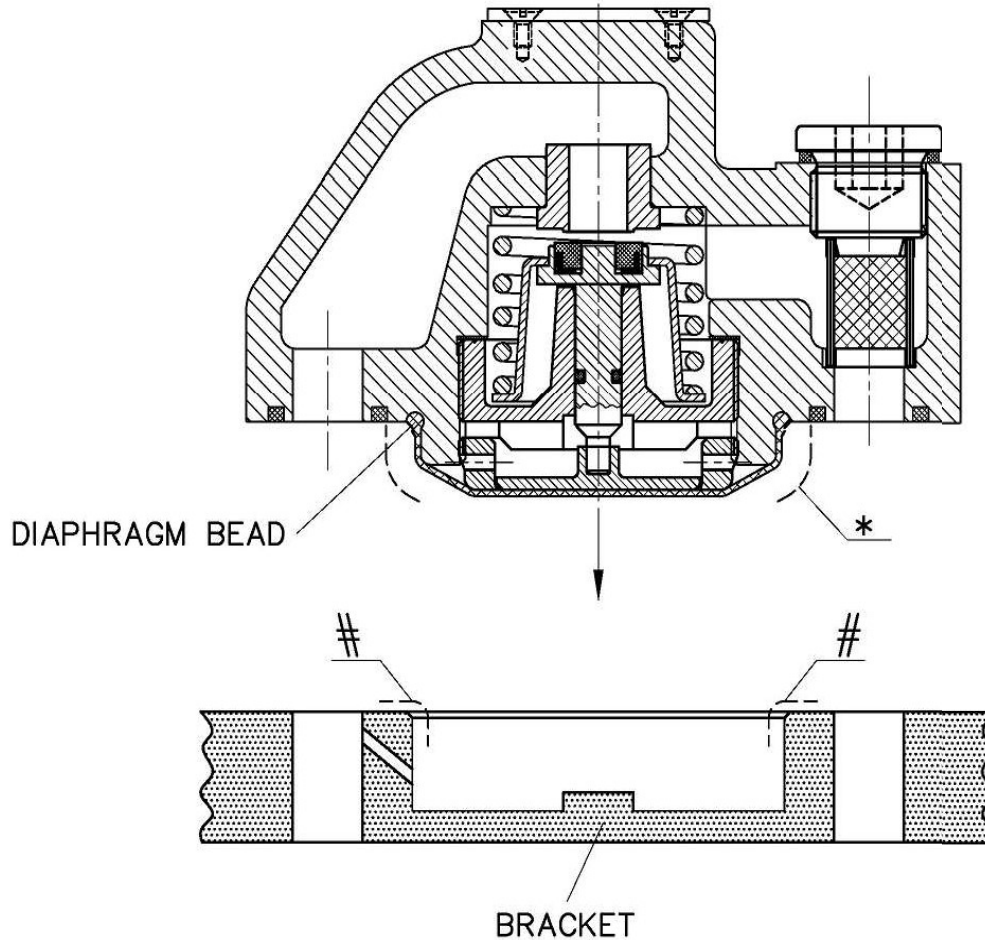
functioning. Any leakage from exhaust port or anywhere else will also cause disturbance in the pre-adjusted pressure. In the case of leakage from exhaust port, change the flat sealing ring (item 12) and O-ring (item 7). Press the diaphragm (item 10) on to its groove if it is not properly pressed in. Scratches, dent marks or wear and tear of the polished surface of the valve head could also be the cause of leakage from the exhaust port (which later on affects the adjusting pressure). This valve head must be replaced in case of such defects. Choking of the filter (item 6) may cause slow charging of the BC pressure, it is, therefore, advisable to clean the filter after regular intervals. Period to be decided by the user Railways based on field experience.



9	DIAPHRAGM PLATE	4A31332	1						
8	COMPRESSION SPRING	4A30485/3	1	C	17	NAME PLATE	KB193	1	
7	O-RING	4A40125/6	1	B	16	EXHAUST PLUG	4A34520	1	
6	FILTER	4A57215	1	B	15	COUNTER SUNK SCREW	M3X6 DIN63	4	
5	SPRING PLATE	4A31335	1		14	ADJUSTING RING	4A31337	1	
4	LOCKING SCREW	4A57216	1		13	LOCKING SCREW	4A42840	1	
3	SEALING RING (A20x24)	DIN7603	1	A	12	FLAT SEALING RING	4A31340/3	1	A
2	VALVE HEAD (SUB ASSY.)	4A74548-1/16130	1	C	11	SEALING RING	4A27763/32	2	B
1	HOUSING (SUB ASSY.)	3A81384-1/39410	1		10	DIAPHRAGM	4A40667	1	B
S.NO.	DESCRIPTION	DRG.NO.	NO. OFF	CAT.	S.NO.	DESCRIPTION	DRG.NO.	NO. OFF	CAT.

ALT.01-17.2.06

PRESSURE LIMITING VALVE
(Drg. no. 2A81335)



NOTE:-

- * DIAPHRAGM SHOULD BE SNUGLY INSTALLED AND AREA AS SHOWN IN DOTTED SHOULD BE APPLIED WITH THIN FILM OF GREASE FOR EASY INSERTION OF ASSY. CARE TO BE TAKEN WHILE TIGHTENING FOUR HEX. NUTS THAT NUTS ARE EQUALLY TIGHTEN DIAGONALLY IN STEPS
- # CHECK FOR NO DENTS/SHARP EDGES

Recommended method of diaphragm installation & fixing of sub assembly.

PRESSURE LIMITING VALVE ON EP UNIT BRACKET

TRIPLE VALVE (Type Fe114)

1. General

The function of the triple valve Fe 114 drawing no. 1A 68053 is to admit compressed air to the brake cylinders or to exhaust them in accordance with the pressure conditions prevailing in the brake pipe. When the pressure in the brake pipe is reduced the brake cylinders are charged; when the brake pipe pressure is increased, they are exhausted. It is possible by gradually reducing the pressure in the brake pipe to obtain a gradual increase of brake cylinder pressure. It is not possible, however, to obtain gradual decrease of brake cylinder pressure by gradually increasing the brake pipe pressure. Increasing the brake pipe pressure results in full release and hence exhausting of the brake cylinders, i.e. the triple valve only provides for direct release. The triple valve is provided with a valve bracket to which the necessary pipes can be connected.

When this triple valve is used with EP brake equipment it is mounted on the Valve bracket of the EP brake unit. In this system the triple valve is used for operation of the brake purely by air pressure.

2. Design

The Fe 114 triple valve is designed on modern lines. It contains no ground-in parts such as slide valve or piston rings, but only rubber-sealed valves and K-type air seals. A piston in the body of the triple valve divides it into 5 chambers.

Leakage between the piston and the body is prevented by K type air seals. One end of the piston rod is pierced by a longitudinal passage and forms a valve seat. The brake cylinders are exhausted through this valve seat. Another valve seat serves for charging the brake cylinders. Both valve seats are opened and closed by means of a spring loaded double seated valve.

3. Operation

1. Charging and release position.

The charging of the auxiliary reservoir takes place through the triple valve in release position. Compressed air flows from the brake pipe L to the right hand side of the piston L/R. The piston is urged to the left and opens the passage from L to R. The auxiliary reservoir is filled. The passage from R to C is closed and the brake cylinder C connected to atmosphere.

2. Application position

On application, the pressure in the brake pipe L is reduced. The pressure in the auxiliary reservoir, which is as high as the original brake pipe pressure, urges the piston L/R to the right. This first cuts communication from C to atmosphere, and also interrupts communication between L and R. Further motion of the piston towards the right lifts the double seated valve from its seat, against the force of the spring, and establishes communication between R and C. Thereupon air pressure flows from the auxiliary reservoir into the brake cylinders.

3. Lap position

As soon as the pressure in the auxiliary reservoir has fallen to the same value as the brake pipe pressure, the piston L/R is moved to the left and the triple valve goes into lap position. In this position the connection from R to C and from C to atmosphere is closed.

4. Release

During release the triple valve takes up the same position as in the charging position. As soon as the pressure in the brake pipe L is increased and exceeds the pressure in the auxiliary reservoir, the piston L/R is moved to the left again and communication established between C and the atmosphere. air escapes from the brake cylinders to atmosphere and the brakes released. The auxiliary reservoir is simultaneously recharged with air.

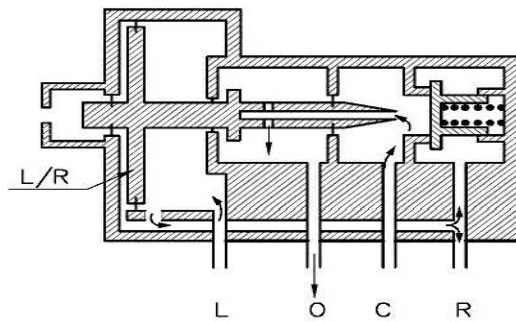


Fig. I
RELEASE POSITION

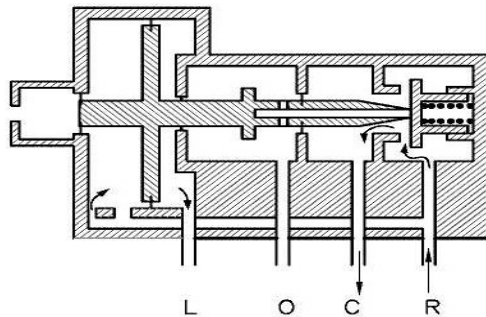


Fig. II
APPLICATION POSITION

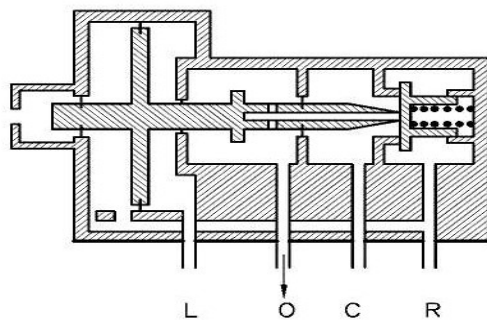


Fig. III
LAP POSITION

L = BRAKE PIPE
O = EXHAUST
C = BRAKE CYLINDER
R = AUXILIARY RESERVOIR

TRIPLE VALVE (Fe 114 So)

Construction, Overhauling & Maintenance

The triple valve consists of a housing sub-assembly (item 1) made out of grey cast iron. A cover (item 2) is fixed at the lower end of the housing by 4 nos. hex head bolts and nuts (items 22 & 23). A screw bush (item 9) is screwed in to the housing sub assly. The piston (item 4) actuates inside the cover and the screw bush which is duly supported by K rings (item 15). The top chamber valve plate (item 6) seals the R and C chambers. The valve plate is forced to rest on its seat by a compression spring (item 11). A filter (item 14) is provided at exist of the aux. reservoir to filter the air going into the brake cylinders.

The triple valve 12" and 16" differ from each other in the following respects :

<u>S. No.</u>	<u>Triple Valve</u>	<u>16" CI/ Syn BB</u>	<u>12" CI/ Syn BB</u>
1.	Bush with filling choke (item 30)	8 orifices	6 orifices
2.	Release choke (item 31)	Nil	1 no.
3.	O-ring (item 26)	Nil / 1 no.	1 no.
4.	Housing (item 1)	Bigger choke	Smaller choke
5.	Brake application choke (item 3)	Nil / 1 no	1 no.

Triple valves, in general, should be opened after every 3 months, for cleaning purposes. During the POH, the valve should be completely dismantled and the parts cleaned for visual inspection. Triple valve contains maximum number of K-rings / O-rings hence all the rubber parts must be replaced after 2 years of service. Whenever the piston assy. shows marks of wear & tear/scratches on the ground surface, it should be replaced. Similarly, if the valve plate (item 6) shows marks on the sealing surface which are more than 0.4 mm deep or wear and tear on the ground surface, it should be replaced. Before assembling the valve, all the parts must be cleaned. Rubber parts should be washed in soap water solution. All the moving and rubber parts should be lightly greased. The inner surface of the bush with filling choke should be polished with brasso for perfect sealing. The comp. spring (item 11) should be replaced after every 3 years of service. The filter should be washed and cleaned in petrol before assembling. The dust filter (item 7) should also be cleaned with petrol and checked for any damage before assembly. After the triple valve is assembled, it should be tested on a separate test bench.

TESTING

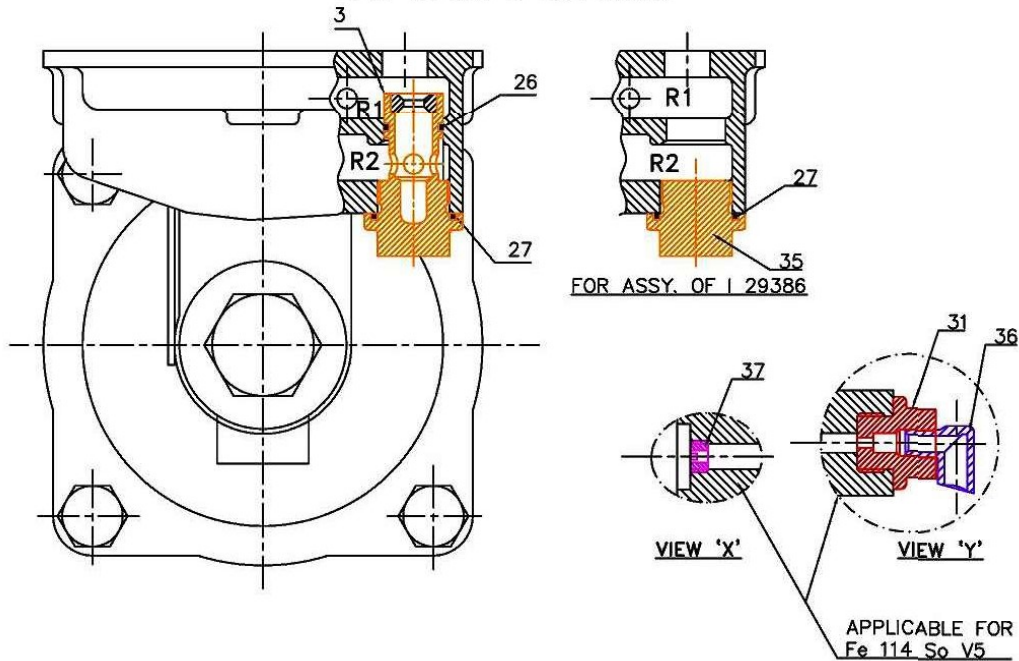
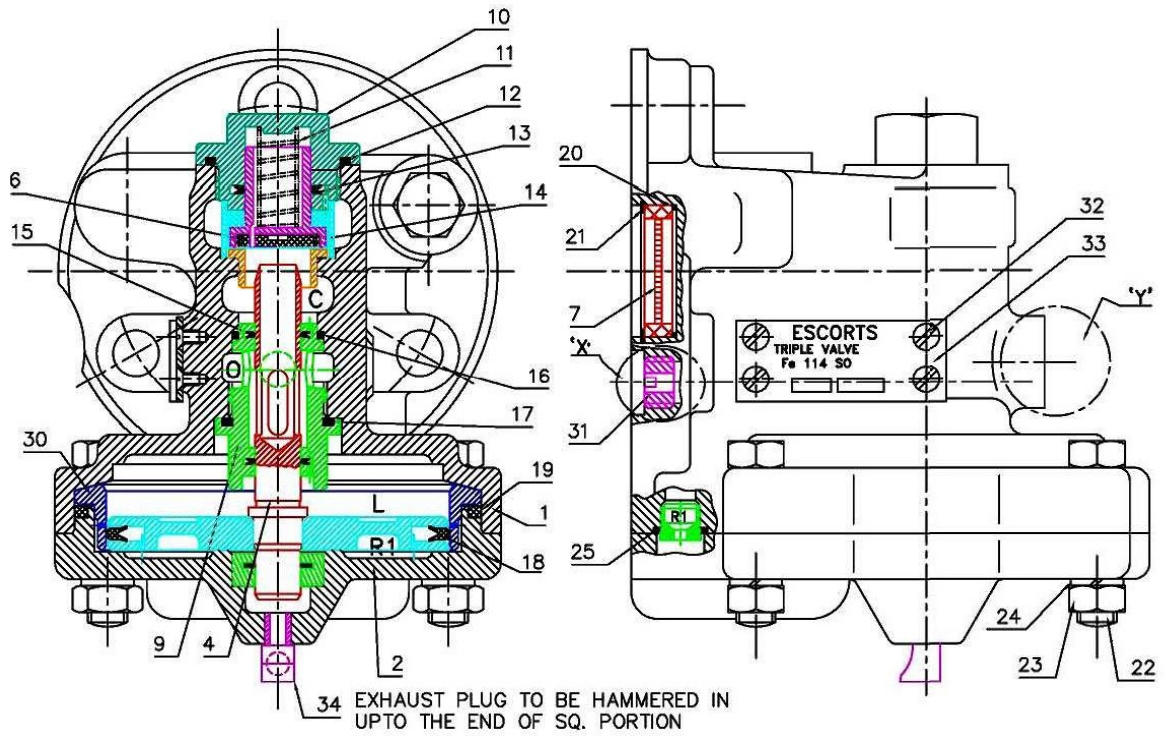
Triple valve is tested separately on a test bench to drg. KB 1102 in accordance to pruf 3107. This testing will include overall and internal leakage between the various chambers, auto application and release timings, application steps, initial filling of aux. reservoir sensitivity and insensitivity tests etc. Functionally, the triple valve plays a very important role in the operation of auto brakes, therefore, it is important to check each valve after the overhauling according to the pruf 3107 for the above mentioned tests.

ADJUSTMENTS

No adjustments are required to be made on the triple valve. However, the only precaution that needs to be observed is that triple valve for motor coaches (16'') and driving trailer/plain trailers (12') do not mix-up with each other. Respective name plates must be there to identify these valves.

OPERATIONAL CHECKS

For slow charging of aux. reservoir triple valve should be cleaned especially bush with filling choke and piston. Also check should be made for easy and free movement of piston. In case of any leakage from the exhaust port of the EP bracket, clean or replace the rubber parts of the triple valve. In case of any variation into auto application or release timings the valve should be overhauled and checked on the test bench for correct timings. **The mounting seal on the EP bracket for triple valve must be replaced after 3 years.** In case of any leakage from the mounting, replace this seal.



TRIPLE VALVE Fe 114 So
(Drg. no. 1A 68053/...)

PART LIST OF TRIPLE VALVE

37	LOCKING SCREW M10x1	-	-	-	-	1	DIN908		PRESENTLY USED IN METRO		
36	EXHAUST PLUG	-	-	-	-	1	4A34520				
35	LOCKING SCREW	1	-	-	-	-	4A94630		ONLY FOR 16" UNIT USED C.I BRAKE BLOCK		
34	EXHAUST PLUG	1	1	1	1	1	4A34520				
33	NAME PLATE	-	-	-	-	1	4A42210				
33	NAME PLATE	-	-	-	1	-					
33	NAME PLATE	-	-	1	-	-	KB191/B				
33	NAME PLATE	-	1	-	-	-					
33	NAME PLATE	1	-	-	-	-	KB191/A				
32	COUNTER SUNK SCREW (AM3x6)	4	4	4	4	4	DIN63				
31	RELEASE CHOKE	-	-	-	-	1	4A42214/10		PRESENTLY USED IN METRO		
31	RELEASE CHOKE	-	-	-	1	-	4A68035/4				
31	RELEASE CHOKE	-	-	1	-	-	4A68035/3				
31	RELEASE CHOKE	-	1	-	-	-	4A68035/2				
30	BUSH WITH FILLING CHOKE	-	-	-	-	1	4A55178/10		8 NOS. HOLES OF #0.9		
30	BUSH WITH FILLING CHOKE	-	-	-	1	-	4A55178/11		2 NOS. HOLES OF #0.7		
30	BUSH WITH FILLING CHOKE	-	-	1	-	-	4A55178/3		6 NOS. HOLES OF #1.1		
30	BUSH WITH FILLING CHOKE	-	1	-	-	-	4A55178/4		6 NOS. HOLES OF #1.1		
30	BUSH WITH FILLING CHOKE	1	-	-	-	-	4A55178/9		8 NOS. HOLES OF #1.1		
27	O-RING	1	1	1	1	1	4A42182			B	
26	O-RING	1	1	1	1	1	4A40125/1			B	
25	O-RING	1	1	1	1	1	4A50884			B	
24	SPRING WASHER A12	4	4	4	4	4	DIN127				
23	HEX. NUT	4	4	4	4	4	DIN934	6 S			
22	HEX. HEAD BOLT M12x50	4	4	4	4	4	DIN931	8 G			
21	CIRCLIP (INTERNAL) 40x1.75	1	1	1	1	1	DIN472				
20	ROUND CORD RING	1	1	1	1	1	5A37523			B	
19	SEALING RING	1	1	1	1	1	4A52904			B	
18	K-RING	1	1	1	1	1	N890/105.2			B	
17	SEALING RING	1	1	1	1	1	4A27763/23			B	
16	ROUND CORD RING	1	1	1	1	1	4A27763/26			B	
15	K-RING	3	3	3	3	3	N894/14.8			B	
14	FILTER	1	1	1	1	1	4A42197			B	
13	K-RING	1	1	1	1	1	N891/20.8			B	
S.NO.	DESCRIPTION	a	b	c	d	e	DRG.NO.	MATERIAL	REMARKS	CAT.	
		NO.OFF									

12	SEALING RING	1	1	1	1	1	4A27763/31				B	
11	COMP. SPRING	1	1	1	1	1	4A37656/7				C	
10	CAP SCREW	1	1	1	1	1	4A56790					
9	SCREW BUSH	-	-	-	1	-	4A81275					
9	SCREW BUSH	1	1	1	-	1	4A94644					
7	DUST FILTER	1	1	1	1	1	4A42381	I-15917			B	
6	VALVE PLATE	1	1	1	1	1	4A56792	I-24962			C	
4	PISTON	-	-	-	1	-	4A81271	I-39341				
4	PISTON	1	1	1	-	1	4A94642	I-48681				
3	BRAKE APPLICATION CHOKE	-	-	-	-	1	4A68034/2	I-29429				
3	BRAKE APPLICATION CHOKE	1	-	-	-	-	4A68034/6			FOR K-TYPE C.B.B (16" UNIT)		
3	BRAKE APPLICATION CHOKE	-	-	1	-	-	4A68034/5			FOR K-TYPE C.B.B (12" UNIT)		
3	BRAKE APPLICATION CHOKE	-	-	-	1	-	4A68034/4	I-39400				
3	BRAKE APPLICATION CHOKE	-	-	1	-	-	4A68034/3	I-29428		C.I BRAKE BLOCK		
3	BRAKE APPLICATION CHOKE	-	1	-	-	-	4A68034/2	I-29429		C.I BRAKE BLOCK		
2	COVER	1	1	1	1	1	4A81284	I-39345				
1	HOUSING COMPLETE	-	-	-	-	1	3A68055					
1	HOUSING COMPLETE	-	-	1	1	-	3A68055	I-29426				
1	HOUSING COMPLETE	-	1	-	-	-	3A68055	I-29427				
1	HOUSING COMPLETE	1	-	-	-	-	3A68055	I-29386				
	TRIPLE VALVE Fe 114 SoGr. 5"	-	-	-	-	x	1A 60053/e			PRESENTLY USED IN METRO		
	TRIPLE VALVE Fe 114 SoGr. 3"	-	-	-	x	-	1A 60053/d	I-3909B				
	TRIPLE VALVE Fe 114 SoGr. 12"	-	-	x	-	-	1A 60053/c	I-29424		C.I-B.B /K-TYPE C.B.B		
	TRIPLE VALVE Fe 114 SoGr. 14"	-	x	-	-	-	1A 60053/b	I-29425				
	TRIPLE VALVE Fe 114 SoGr. 16"	x	-	-	-	-	1A 60053/a	I-29886		C.I-B.B /K-TYPE C.B.B		
S.NO.	DESCRIPTION	a	b	c	d	e	DRG.NO.	MATERIAL	REMARKS	CAT.		
		NO.OFF										

STABILIZING VALVE

1. General

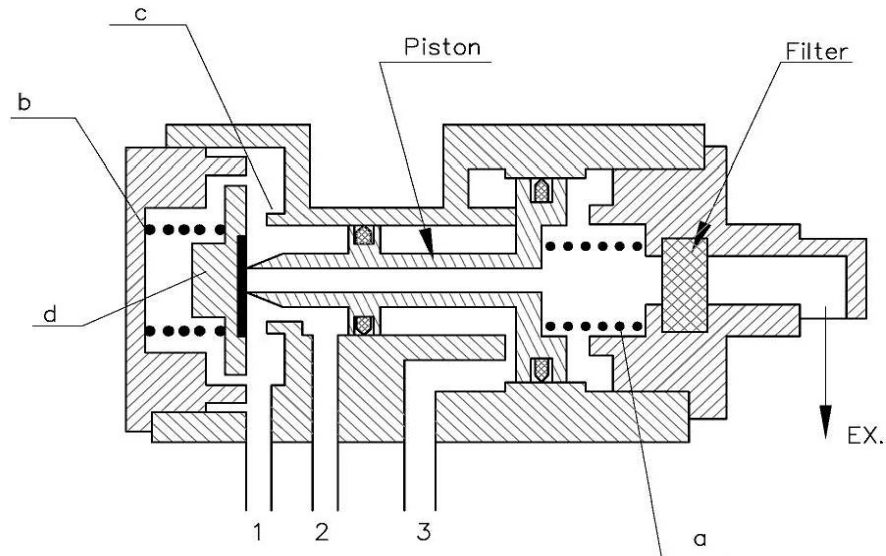
The stabilizing valve drawing no. 3A 47492/1 is used in conjunction with the electrically controlled air brake. It is mounted on the Valve bracket of the EP brake unit. The purpose of this valve is to reduce the pressure in the auxiliary reservoir to about 0.2 kg/cm² (3 psi) below the pressure reigning in the automatic brake pipe. This reduction is necessary in order to prevent the direct release triple valve connected to the EP brake unit from being moved out of release position into lap position by pressure fluctuations which may occur. The stabilizing valve reduces the pressure in the auxiliary reservoir by connecting it with a bulb in the Valve bracket. The stabilizing valve is controlled by the pressure in the brake cylinder.

2. Design

The stabilizing valve consists of a body with 3 chambers, containing a stepped piston. These chambers are connected by ports to the respective pipe connections in the Valve bracket. The piston is fitted in the body with K type air seals and contains a longitudinal air passage. The body has an exhaust port at one side, protected by a filter. Next to the exhaust port is fitted a spring 'a' which holds the piston in its left hand end position. On the other side of the piston is a double seated valve which is held against its seat by a spring 'b'.

3. Operation

In release position, i.e. when the brake cylinders are exhausted the piston is pushed to the left by spring 'a' upto the stop, lifting the double seated valve from its seat 'c' against the force of the spring 'b'. This establishes communication between chambers 1 and 2. The valve seat 'd' remains closed so that the exhaust port is shut off. When air is admitted to the brake cylinder on application of the brake the air pressure also acts in chamber 2 and on the piston. The latter is pressed to the right against the force of the spring 'a'. Spring 'b' presses the double seated valve onto its seat 'c', isolating chamber 1. The valve seat 'd' is opened, thus establishing communication between chamber '2' and the exhaust. As soon as the brake is released again and the cylinders exhausted, the stabilizing valve returns to its initial position.



- 1 = TO AUXILIARY AIR RESERVOIR
- 2 = TO BULB
- 3 = FROM BRAKE CYLINDER

STABILISING VALVE

CONSTRUCTION, OVERHAULING AND MAINTENANCE

The stabilizing valve at the time of POH should be stripped off completely. The valve consists of a housing (item 1) made out of bronze. Inside the housing is a valve piston (item 2), which divides the housing into three different chambers, namely aux. reservoir (R.), bulb (K) and brake cylinder (C). During application of the brakes, the valve piston moves to the left against the force of a spring (item 10) and the bulb is exhausted to the atmosphere. Two K rings (item 3 & 4) are provided in the valve piston for dividing K and C chambers. The valve head (item 5) rests on its sealing surface against of the spring (item 8). During release operation, the valve piston lifts this valve head against the force of the spring (item 8) thereby connecting chambers R and K. An exhaust plug (item 13) is provided on to the locking screw (item 11). A filter (item 14) is provided in chamber R passage for filtering the air going into the bulb. To overhaul the stabilizing valve, it is dismantled from the unit bracket and is completely stripped open. All the rubber parts are cleaned in soap water solution. K rings (item 3 & 4) must be replaced during every POH. The valve head (item 5) is to be checked for the seat depression. Replace it if the **depression is more than 0.2 mm**. Since the valve piston moves inside the polished surface of the housing every time the brakes are applied or released, the housing to be especially checked for wear and tear. Also check for the finish of the surface on which the two K rings move. The housing must be replaced if such defects are observed on its sealing surface. Both the compression springs (item 8 & 10), which are constantly under compression and tension, must be replaced **after a period of 3 years**, but rusty or damaged springs must be replaced as and when found with such defects. Every time the locking screw (item 6) is opened, sealing ring (item 7) must be replaced. Before assembling the valve, all the parts must be cleaned thoroughly. Light grease be applied on the K-rings and inside the housing. Filter (item 14) should be cleaned with petrol and dried before fitting it back. Special care should be taken while tightening locking screw (item 6) so as to protect the valve head (item 5) for any damage. Generally, this locking screw should be tightened fully by hand and finally with a ring spanner. The round cord rings (item 9) must be replaced every time the valve comes for POH.

TESTING

The stabilizing valve after overhauling is to be tested on a separate test bench to drg. no. 4A 80570 and to prof 3044. This testing will indicate leakage in general as well as leakage in between any of the three chambers. The testing will also indicate proper functioning of the valve and the timings for exhausting or charging the bulb K, which will ensure an easy movement of the valve piston and also proper valve lift.

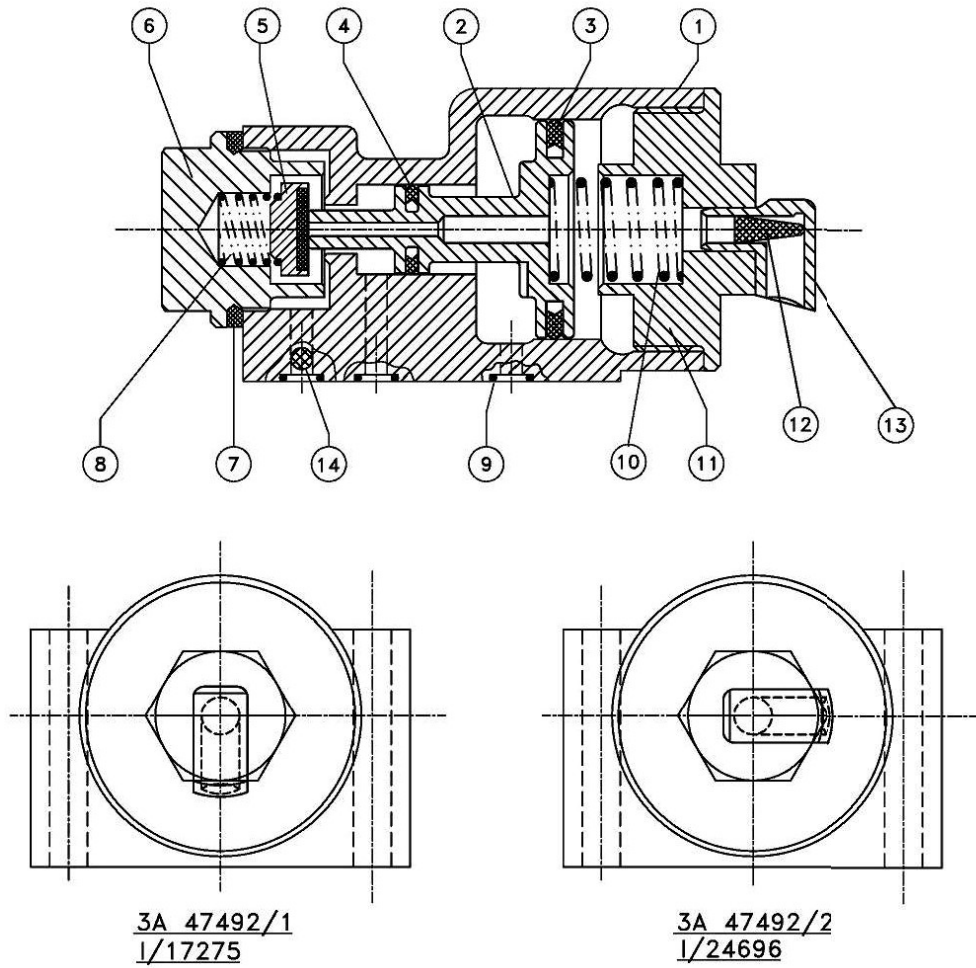
ADJUSTMENT

No adjustments are required to be made in the stabilizing valve after it has been thoroughly inspected on the test bench.

OPERATIONAL CHECKS

Due to constant application and release in the brake system on the running trains, chances of moisture condensate in the bulb of EP unit bracket are there.

The water condensate may cause brake binding and, hence, it should be **drained out after every 3 months or so**. Provision for draining the water in the bulb has been provided in the fabricated EP bracket (a plug at the lower reservoir). Hex. Allen key of 10mm A/F (across flat) to be used and its sealing ring should be replaced. Also in our casted aluminium bracket, a plug, almost at the same position is located for draining out water condensate. For draining out water, stabilizing valve has to be taken out from the EP unit. The bulb is further cleaned with air pressure and the plug is then again screwed in. In case of any leakage from the mounting of the stabilizing valve, the mounting round cord rings should be replaced. Also check the exhaust port with soap water and in case of any leakages, the valve is to be dismantled and overhauled.



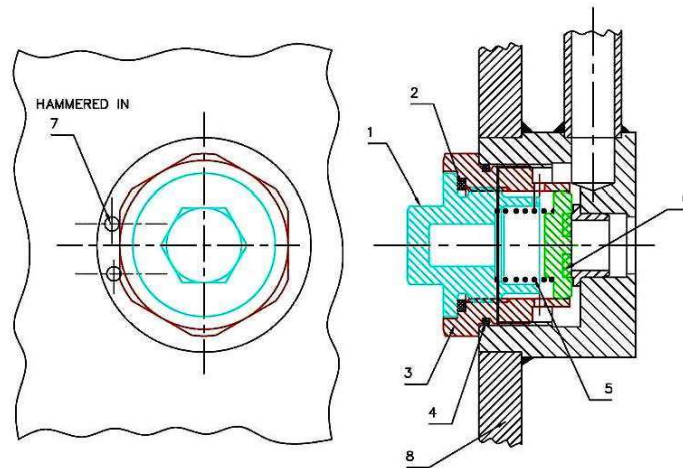
7	SEALING RING (A30x36)	DIN 7603	1	A	14	FILTER	4EP 43157	1	B
6	LOCKING SCREW	4A 47496	1		13	EXHAUST PLUG ASSY.	4A 34520	1	
5	VALVE HEAD	4A 47235	1	C	12	FILTER	4B 62338	1	B
4	K - RING	N890/16	1	B	11	LOCKING SCREW	4EP 5296	1	
3	K - RING	N890/40	1	B	10	COMP. SPRING	4A 28000	1	C
2	VALVE PISTON	4A 47495	1	C	9	ROUND CORD RING	4A 38204	3	B
1	HOUSING	3A 47494	1		8	COMP. SPRING	4A 30485/B	1	C
S.NO.	DESCRIPTION	DRG.NO.	NO. OFF	CAT.	S.NO.	DESCRIPTION	DRG.NO.	NO. OFF	CAT.

STABILISING VALVE

CHECK VALVE (DRG. NO. OA 68051)

The check valve in the EP unit works as a one way valve. During electric application the air from the application magnet valve and limiting valve goes to the brake cylinder through this check valve. During the full application, air pressure from the limiting valve strikes the valve

plate (item 31), lifts it against the force of the spring (item 32) and goes to the brake cylinder. When the pressure under and above the valve plate equalizes, it automatically closes the passage and it rests on its seat. In case of any leakages from the exhaust port of the EP bracket open the locking screw (item 33) and clean / replace the valve plate. Complete EP units are to be tested in the accordance with prof 3108, respectively on the main test bench to drg. no. 3A 83149. EP units thus tested and passed will give absolutely trouble-free service in the day to day operation of the trains. **It is always recommended to use genuine spare parts for longer life and better service.**



8	BRACKET		1	
7	GROOVE DOWEL PIN	DIN 1473	1	
6	VALVE PLATE	4A 42896	1	C
5	COMPRESSION SPRING	4A 59987	1	C
4	O-RING	4A 70745	1	B
3	GUIDE SCREW	4A 67970	1	
2	O-RING	4A 27763/17	1	B
1	LOCKING SCREW	4A 68415	1	
S.NO.	DESCRIPTION	DRG.NO.	NO.OFF	CAT.

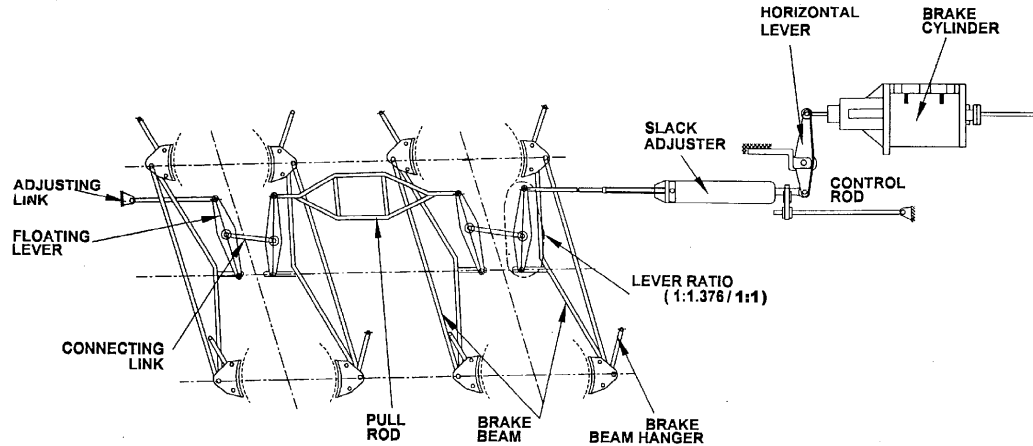
CHECK VALVE

BRAKE RIGGING

Brake rigging is provided to control the speed of the coach by transferring the braking force from the brake cylinder to the wheel tread. Brake rigging can be divided into two groups i.e. Bogie mounted brake rigging and coach under frame mounted brake rigging.

Coach Under Frame Mounted Brake Rigging

In 16.25 t axle load bogie the four lever used in bogie brake rigging are each with lever ratio of **1:1.376** and hence the total Mechanical advantage in a bogie is **5.504**.

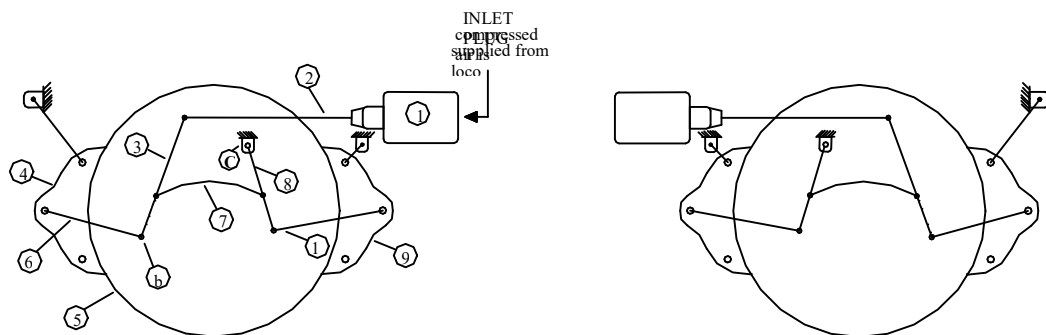


COACH UNDERFRAME BRAKE RIGGING

Bogie Mounted Brake Rigging

Bogie brake rigging has been modified to incorporate a total mechanical advantage of **7.644** per bogie for non-ac coaches and **8.40** per bogie for ac coaches.

LOAD TRANSFER TRANSFER IN ICF/RCF TROLLEY



SCHEMATIC BOGIE BRAKE GEAR ARRANGEMENT FOR BOGIE MOUNTED BRAKE SYSTEM

VERTICAL LOAD:

Under frame – Side Bearer—Wearing Piece—Wearing Plate—Floating Bolster—Bolster Spring—Lower Spring Plank—BSS Block—BSS Hanger—BSS Hanger Pin—Bogie Frame—Axle Box Spring—Axle Box Spring Seat—Axle Box—Bearing—Wheel—Rail—Earth.

Tractive Force:

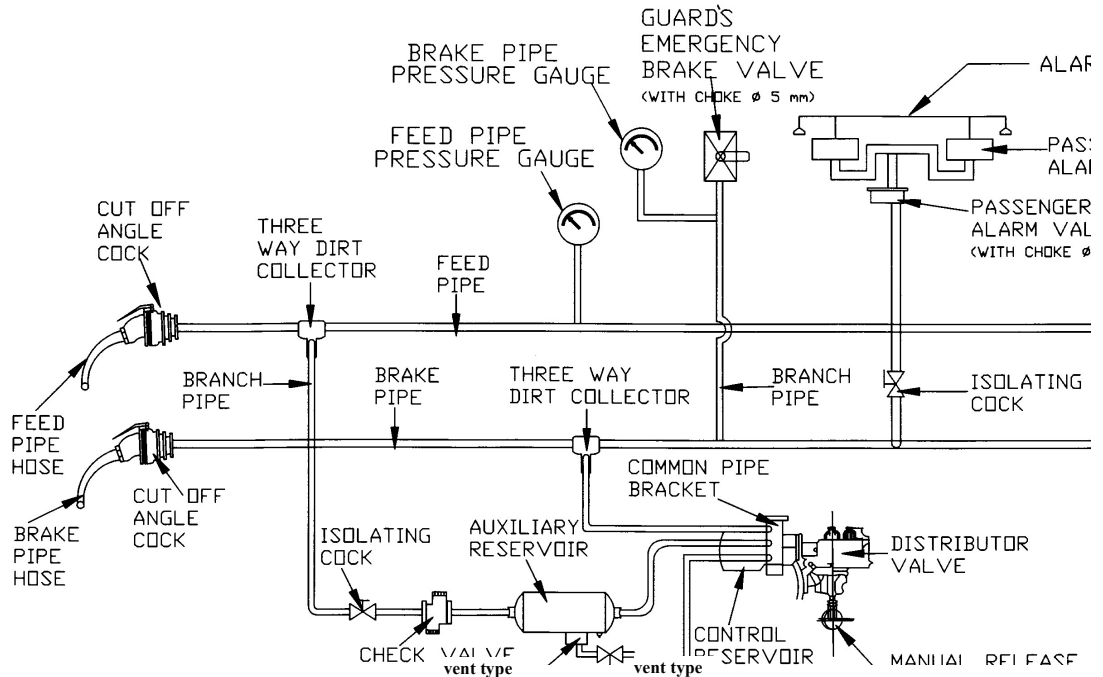
Under frame – Centre Pivot Arrangement—Floating Bolster—Anchor Link—Bogie Frame—Axle Guide Arrangement—Axle Box Roller Bearing—Axle Journal—Wheel.

AIR BRAKE SYSTEM

INTRODUCTION

In Air Brake system compressed air is used for operating the brake system. The locomotive compressor charges the feed pipe and the brake pipes throughout the length of the train. The feed pipe is connected to the auxiliary reservoir and the brake pipe is connected to the brake cylinder through the distributor valve. Brake application takes place by dropping the pressure in the brake pipe.

The schematic layout shown illustrates the underframe mounted twin pipe graduated release air brake system on main line coaches. The components and their relative location is indicated in the schematic layout.



SCHEMATIC LAYOUT OF TWIN PIPE GRADUATED RELEASE AIR BRAKE SYSTEM

Note: Pressure gauges are installed only in guard's brake van.

Principle of operation of Twin pipe graduated release air brake system : This can be discussed under the following three heads

- (i) **Charging** (ii) **Application** and (iii) **Release**

Charging the brake system

- Brake pipe throughout the length of train is charged with compressed air at **5 Kg/cm²**.
- Feed pipe throughout the length of train is charged with compressed air at **6 Kg/cm²**.
- Control reservoir is charged to **5 Kg/cm²**.
- Auxiliary reservoir is charged to **6 Kg/cm²**.

Brake application stage

- For brake application the brake pipe pressure is dropped by venting air from the driver's brake valve. Subsequently the following actions take place
- The control reservoir is disconnected from the brake pipe.
- The distributor valve connects the auxiliary reservoir to the brake cylinder and the brake cylinder piston is pushed outwards for application of brakes.
- The auxiliary reservoir is however continuously charged from feed pipe at **6 Kg/cm²**.

Description	Reduction in B. P. Pressure
Minimum Brake Application	0.5 to 0.8Kg/cm ²
Service Brake Application	0.8 to 1.0Kg/cm ²
Full Service Brake Application	1.0 to 1.5Kg/cm ²
Emergency Brake Application	Brake pipe is fully exhausted and its pressure reduces to almost zero.

Brake release stage:

- Brakes are released by recharging brake pipe to **5 Kg/cm²** pressure through the driver's brake valve.
- The distributor valve isolates the brake cylinder from the auxiliary reservoirs.
- The brake cylinder pressure is vented to atmosphere through DV and the Brake cylinder piston moves inwards.

The various Air Brake sub-assemblies and components are:

- i) Common pipe bracket
- ii) Intermediate piece
- iii) Brake pipe and feed pipe
- iv) Brake pipe coupling
- v) Cut-off angle cock
- vi) Brake cylinder
- vii) Dirt collector
- viii) Auxiliary reservoir
- ix) Slack adjuster
- x) Distributor valve
- xi) isolating cock
- xii) PEASD
- xiii) PEAV
- xiv) Check valve

The brief details of the air brake components and its maintenance and test procedure is described below:

COMMON PIPE BRACKET

Common pipe bracket is mounted on the coach under frame and is suitable for use with all type of distributor valves presently in use on main line coaches.

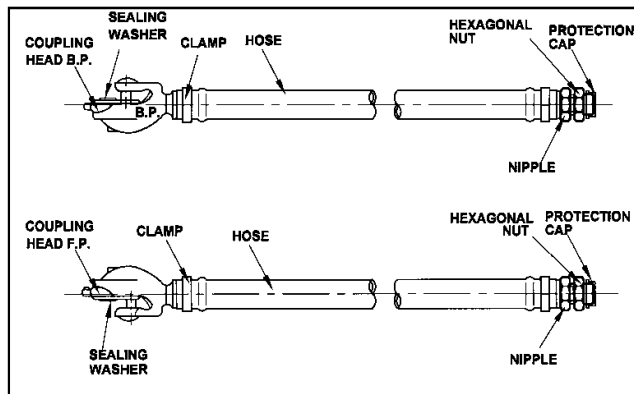
INTERMEDIATE PIECE (SANDWICH PIECE)

An intermediate piece is mounted on the common pipe bracket to fit the distributor valve on the common pipe bracket. The intermediate piece serves the purpose of blanking all the other ports on the common pipe bracket other than required for a particular make of distributor valve. Each type of distributor valve is mounted on the common pipe bracket with its own intermediate piece.

AIR BRAKE HOSES

Brake Pipe & Feed Pipe Hoses

To maintain continuity through out length of train, the brake pipe (BP) feed pipe (FP) are fitted with flexible hoses. Each hose is provided with palm end coupling. For easy identification, coupling heads are painted with green colour for B.P white colour for F.P. Also raised letters 'BP' and 'FP' are embossed on coupling heads representing Brake Pipe and Feed Pipe respectively. Hose couplings must be checked for leakage of air

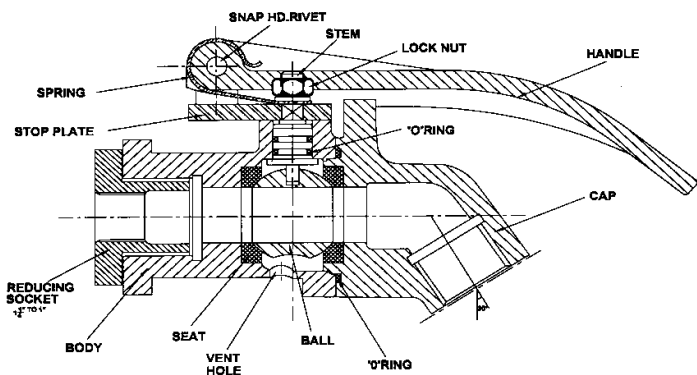


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CUT OFF ANGLE COCK

Cut off angle cocks are provided both on brake pipe & feed pipe on either end of each coach to facilitate coupling and uncoupling of air hoses. When the handle of the cut off angle cock is placed in closed position it cuts off the passage of compressed air, there by facilitating coupling and uncoupling action.

The cut off angle cock consists of two parts viz. cap and body which are secured together by bolts. The cap and the body together hold firmly the steel ball inside it, which seated is on nitrile rubber seat. The ball has a special profile with the provision of a groove at the bottom portion for venting the air to the atmosphere.



On the top surface of the body a bore is provided for placing the stem, to which a self locking type handle is fixed. When the handle is placed parallel to the cut off angle cock the inlet port of the cut off angle cock body is connected to the outlet port, through the hole provided in steel ball. Thus air can easily pass through the cock. This position of the handle is known as open position. When the handle is placed perpendicular to the cock body the steel ball gets rotated and the spherical and groove portion of the ball presses against the sealing ring at inlet and outlet port, there by closing the passage of inlet air and venting

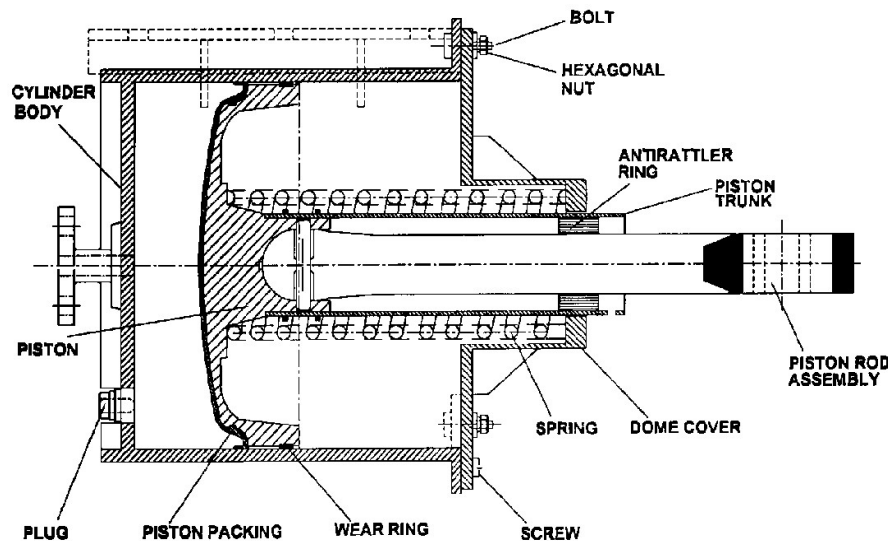
the outlet air through the vent hole. This position of the handle is known as closed position.

With the stem one leaf spring is provided which presses the operating handle downwards. By virtue of this, handle gets seated in deep grooves at ON / OFF position resulting in a mechanical lock.

Under normal working conditions, the handle of all cut off angle cocks of BP are kept open except the rear end angle cocks (BP). This facilitates in charging the complete air brake system with compressed air supplied by the compressor housed in the locomotive. Cut off angle cock fitted on the brake pipe is painted green.

BRAKE CYLINDER

On every coach fitted with air brake system two brake cylinders are provided for actuating the brake rigging for the application and release of brakes. During application of brakes the brake cylinder develops mechanical brake power by outward movement of its piston assembly after receiving air pressure from Auxiliary reservoir through the distributor valve. This is transmitted to the brake shoes through a combination of levers. During release action of brakes the compression spring provided in the brake cylinder brings back the rigging to its original position. The cylinder body is made out of sheet metal or cast iron and carries the mounting bracket, air inlet connection, ribs and flange. To the cylinder body, a dome cover is fitted with the help of bolts and nuts. The dome cover encloses the spring and the passage for the piston trunk, which is connected to the piston by screws. The piston is of cast iron having a groove in which piston packing is seated. Piston packing is of oil and abrasion resistant rubber material and is snap fit to the piston head. The packing has self lubricating characteristic which ensures adequate lubrication over a long service period and extends seal life considerably. The piston packing also seals the air-flow from the pressure side to the other side and is guided by the wear ring. The wear ring prevents the friction between cylinder body and the piston head. The piston sub assembly incorporates a push rod, which can articulate and take minor variations in alignment during fitment/operation. For preventing knocking during running, a rubber anti rattler ring is also provided.

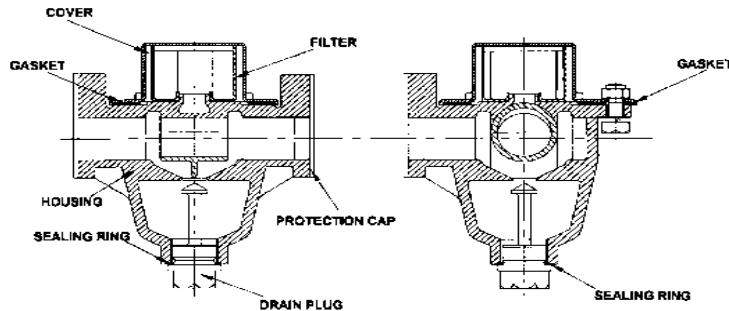


Dirt Collector -- Salient features

Dirt Collector is placed in the brake pipe line and feed pipe line at a point from where a branch is taken off to the distributor valve and the auxiliary reservoir. The air entering into the dirt collector from the brake pipe and feed pipe is guided through suitably shaped passages in the dirt collector body to produce centrifugal flow. The air is then filtered through additional filter assembly before it is passed to outlet on branch pipe side to provide dust proof air to the distributor valve /auxiliary reservoir after arresting fine dust particles. The dirt contained in the air descends down and gets deposited in the dirt

chamber. However, fine particles are also arrested in the filter assembly. The dust particles accumulated in the dirt chamber are removed by opening the drain plug. Rubber gasket is provided between the cover and housing to prevent leakage. Similarly leather washer is provided between the housing and the drain plug to prevent leakage.

The dirt collector is to be completely dismantled and overhauled in every POH.



AUXILIARY RESERVOIR -- SALIENT FEATURES

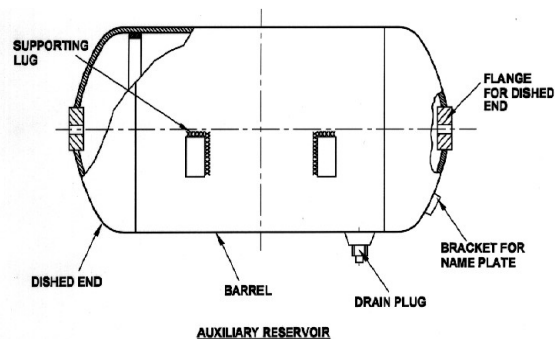
The auxiliary reservoir is a cylindrical vessel made of sheet metal. On both the ends of the reservoir, flanges are provided for pipe connections. One end of the auxiliary reservoir is connected to the brake pipe through the distributor valve. Auxiliary reservoir is charged through the feed pipe to a pressure of 6kg/sq cm. At the bottom of the auxiliary reservoir, a drain cock is provided for draining out the condensate /moisture. The auxiliary reservoir should be overhauled in every POH.

Note: The dimension & tolerances of the auxiliary reservoir shall be as indicated in latest revision of RDSO drawing number SK-96081.

PASSENGER EMERGENCY ALARM SYSTEM

Passenger emergency alarm system consists of two components:

- (i) Passenger Emergency Alarm Signal Device (PEASD).
- (ii) Passenger Emergency Alarm Valve (PEAV).



These two components in combination give an indication to the driver that some passenger is in need to stop the train. The indication is transmitted from the coach when the passenger pulls the chain.

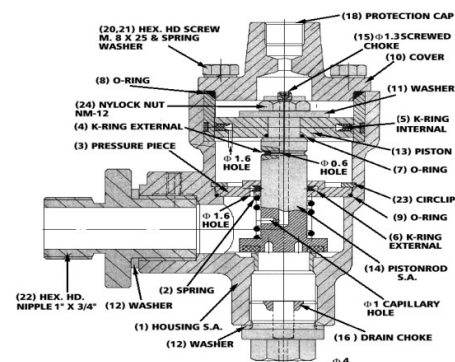
PASSENGER EMERGENCY ALARM SIGNAL DEVICE

Passenger Emergency Alarm Signal Device (PEASD) is a manually operated pilot vent valve. It is operated through mechanical force exerted by pulling the alarm chain provided inside the coaches for emergency use.

The passenger emergency alarm signal device does not need any maintenance during normal service except when it is found damaged or is due for periodic overhauling.

Overhauling

The passenger emergency alarm signal device should be completely dismantled and overhauled during every POH or if there is any specific trouble.



PASSENGER EMERGENCY ALARM VALVE (PEAV)

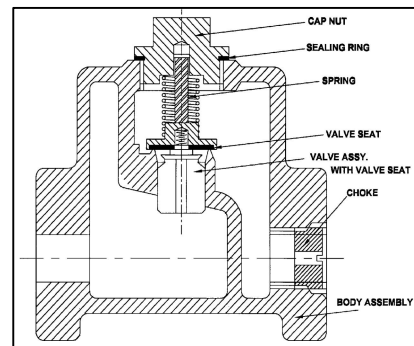
Passenger coaches are fitted with an alarm chain pull arrangement to enable passengers to stop the train by pulling the alarm chain from within the coach in case of any emergency. Alarm chain in turn is connected to the two Passenger Emergency Alarm Signal Device which are situated at either side of one end wall of the coach. PEASD'S are connected to the Passenger Emergency Alarm Valve PEAV through a 10mm control pipe. BP pressure is fed to the PEAV through a 20mm branch pipe. In the event of alarm chain pull air is depleted from the control pipe connecting PEAV and PEASD causing BP pressure to exhaust through the 4mm choke in the PEAV. This causes partial application of brakes. This drop in pressure in the brake pipe line is also observed in the flow meter fitted in the locomotive for the driver to stop the train.

CHECK VALVE

Check valve with choke (non return valve) is fitted in the branch line of feed pipe before auxiliary reservoir. check valve allows flow of air in one direction as indicated by the arrow on the body and reverse flow of air is prevented thus avoiding fall in auxiliary reservoir pressure. a choke of 3 mm is fitted at the outlet port of the valve to have a uniform filling of air in the auxiliary reservoir of all the coaches in a rake. the check valve with choke is completely dismantled and overhauled once in every POH or when there is some specific trouble.

ISOLATING COCK

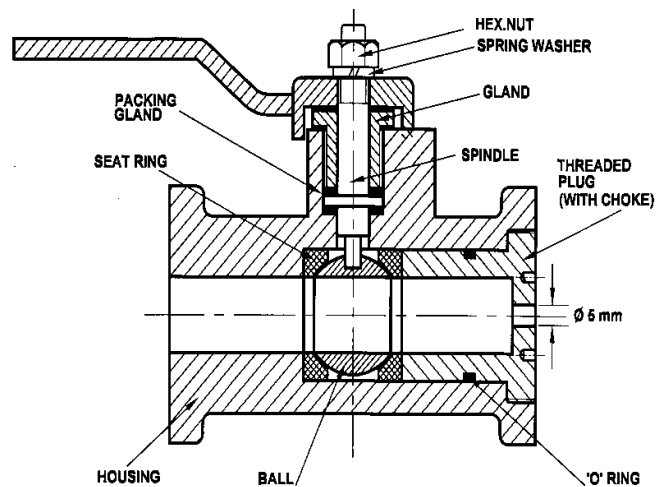
Ball type isolating cocks are provided on the feed pipe branch line before the auxiliary reservoir as well as on branch pipe leading to brake cylinders and passenger emergency alarm valve. Isolating cocks can be operated to cut-off air supply to these equipments as per the service requirements. In recent coaches ball type isolating cocks vent type is provided on the branch pipe leading to brake cylinder drain brake cylinder pressure in the event of brake binding. The isolating cocks are to be completely dismantled and overhauled once in every POH or when there is some specific trouble.



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GUARD'S EMERGENCY BRAKE VALVE -- Salient Features

The guard's emergency brake valve consists of a housing in which a ball is housed. The ball has a through hole similar to the isolating cock. To the ball a handle is fixed at the top. By operating the handle the ball can be rotated along the vertical axis. When the hole in the ball gets aligned with the inlet and the exhaust port the compressed air can pass through the valve. However, for restricting the flow of air a choke of 5mm is fitted in the exhaust port for controlling the rate of BP exhaust. The inlet port of the valve is connected to the brake pipe. In case of an emergency, the



guard moves the handle of the guard's emergency brake valve so that it is placed parallel to the inlet pipe. This action causes the air from the brake pipe to be exhausted to the atmosphere through a choke of 5 mm. The drop in pressure in the brake pipe can also be observed in the air flow meter provided in the locomotive cabin and the driver applies the brakes for stopping the

train. The handle of the guard's emergency brake valve has to be reset manually to normal position before the brake pipe pressure is recharged.

The guard's emergency brake valve should be completely dismantled and overhauled in every POH.

SLACK ADJUSTER -- Salient Features

Slack adjuster (also known as brake regulator) is a device provided in the brake rigging for automatic adjustment of clearance/slack between brake blocks and wheel. It is fitted into the brake rigging as a part of mechanical pull rod. The slack adjuster is double acting and rapid working i.e. it quickly adjusts too large or too small clearance to a predetermined value known as 'A' dimension. The slack adjuster maintains this 'A' dimension throughout its operation. The slack adjuster, type IRSA-450 is used in passenger coaches, It is composed of the following parts

- Adjuster spindle with screw thread of quick pitches (non self-locking).
- Traction unit containing adjuster nut, adjuster tube and adjuster ear etc.
- Leader nut unit containing leader nut and barrel etc.
- Control rod with head.

The out standing features of slack adjuster IRSA-450 are:

Fully Automatic i.e. once initially set, no manual adjustment is further necessary at any time during its operation.

Double-Acting i.e. The brake shoe clearance is adjusted to its correct value both ways, either when it has become too large (owing to wear of the brake shoes and wheels) or when it has become too small (e.g. owing to renewal of 'worn out brake blocks').

Rapid working i.e. correct brake shoe clearance is automatically restored after one or two applications of the brake.

Verification i.e. If resistance occurs early in the brake application, caused by heavy brake rigging, e.g. an ice coating on the brake shoes, etc., in such cases the slack adjuster does not pay out slack immediately, but indexes the amount of slack to be paid out. If the slack really is too small, the slack adjuster will pay out this indexed slack at the next brake application. Thus false payout will not occur.

True Slack Adjuster i.e. The slack adjuster adjusts incorrect slack only, thus giving the brake its best possible pre-adjusted limit of piston strokes, ensuring a smooth and efficient braking force at all times.

Shock Resistant i.e. Train shocks will not cause false take-up or payout of slack. When brakes are released, the moving parts of the slack adjuster are securely locked.

BOGIE MOUNTED AIR BRAKE SYSTEM

In order to overcome the problems of slack adjuster failure as well as problems associated with cast iron brake blocks, a design of brake system incorporating 8" size two cylinders on each bogie along

Note: The Slack Adjuster takes up 100 mm per braking. Dimension A1 will be 98 + 1/-4 mm

with 'K' type high friction composite brake blocks has been introduced.

DESIGN FEATURES OF THE SYSTEM

This type of system is exactly similar to the standard air brake system except for the following:

- a) External slack adjuster is removed/ eliminated
- b) Four cylinder of 8" size is provided for each coach in place of two cylinders of 14" in standard air brake system. These cylinders have built in single acting slack adjuster for taking the slack created between wheel and brake block on account of wheel / brake block wear. Mounting of cylinders is done on either side of the bogie frame in between central longitudinal members connecting the bogie transom to the headstocks. Each cylinder controls the braking on one wheel set. Each cylinder has a piston take up stroke of **32 mm** and adjustment capacity of **305 mm** (Ref. Drg. RDSO Sk- 81057)
- c) High friction composite brake blocks of 'K' type have been used.
- d) Bogie brake rigging has been modified to incorporate a total mechanical advantage of **7.644 per bogie** for non-AC coaches and **8.40 per bogie** for AC coaches.

- e) Curved profile pull rods have been used to interconnect levers controlling braking one wheel set. These pull rods provided with one additional hole for the adjustment of slack between wheel and block after specified amount of wear.
- f) Since brake cylinders have been mounted on the bogie frame, 15mm. bore pneumatic pipeline has been laid over bogie frame to inter connect the brake cylinders of one bogie. Output pipe line of distributor valve has been connected to bogie pneumatic line through flexible hoses to provide flexibility to around dynamic movement.

WORKING PRINCIPLE

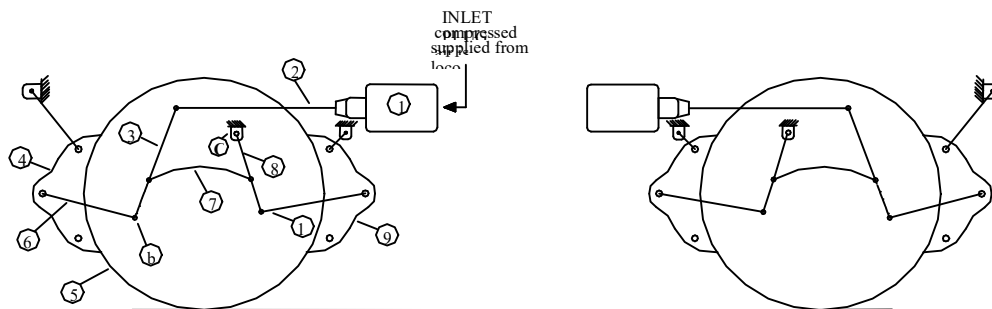
There is no change in the overall brake system in bogie-mounted arrangement up to the action of distributor valve. Here the system will respond to action on A-9 valve in similar fashion as in the case of standard air brake system. Working of bogie mounted brake system beyond distributor valve is explained below.

Application

For application of brakes, driver moves the handle of A-9 valve in the application position. By this movement the brake pipe pressure is reduced which is sensed by distributor valve to operate brake cylinder (1). Pneumatic pressure in the brake cylinder causes piston assembly (2) to move outward thereby causing lever (3) to rotate about its fulcrum (a) thus bringing brake block (4) to come in contact with the wheel (5) through the brake beam (6). Since lever (3) is hung on the bogie frame through lever hangers, it will start moving forward about fulcrum (b) after brake block (4) has contacted wheel (5). This forward motion of the lever (3) about fulcrum (b) will cause pull rod (7) to move forward thereby causing lever (8) to swing about fulcrum (c) and hence resulting in contact of brake block (9) against wheel (5) through brake beam (10).

Extent of brake cylinder pressure developed in the brake cylinder will depend upon the extent of reduction in brake pipe pressure. Maximum brake cylinder pressure developed is **3.8 +/- 0.1 kg/cm²** as in the case of standard air brake.

For release of the brakes, driver moves handle of A-9 valve to release position. By this movement, the brake pipe is charged to the required pressure of **5 kg/cm²**. This actuates the distributor valve and brake cylinder is cut off from the auxiliary reservoir. The air from brake cylinder is exhausted to atmosphere and



BMBC ARRANGEMENT

brakes are released.

Slack up Action

Cylinders of bogie mounted brake system are provided with automatic slack take up features. As soon as the piston stroke exceeds a pre determined value (on account of either brake block or wheel or both) a ratchet with adjusting screw fitted inside the cylinder turns thereby increasing the length of the piston rod automatically. During return stroke, the adjusting movement takes place. A red paint mark on the adjusting tube assembly indicates that piston unit has extended over its full range and requires resetting of pull rod (7).

COMPARISON OF IMPORTANT PARAMETERS

In the underframe mounted brake gear arrangement, it is seen that there are 51 pin joints per bogie in the system. To reduce the number of pin joints, levers, pull rods and push rods, bogie mounted brake system for mainline coaches have become a viable alternative. Comparison of bogie brake system with conventional air brake system for various parameters is as follows:-

<i>Item</i>	Convent-ional Air Brake System	Bogie Mounted Brake System
Weight reduction (as compared to conventional air brake system)	-	492 kg.
Braking distance at 110 kmph (18 coaches)	905 m	800 m
No. of pins and bushes	102	84
Brake block wear rate	3 cc/kwh	1.325 cc/kwh

Hand Brake Attachment

On the Piston trunk of brake cylinder hand brake trunions are fitted whenever it is required. During the service application the hand brake trunion does not move. The maximum hand brake stroke required at the trunion corresponds to maximum brake cylinder stroke.

Re-Setting

A red paint mark on the Adjusting tube sub-assembly indicates that the piston unit has extended over its full range and requires re-setting. The design of brake rigging unit is done in such a way that range of slack adjuster covers the life of brake blocks so that resetting and replacing the brake blocks will be done at the same time. While keeping the adjusting screw stationary, by turning the adjusting tube sub-assembly in clock wise direction the distance between piston to cross head is reduced to minimum level. The resetting of unit takes place at position.

Procedure for Re-setting

Hold the latch out of engagement with the resetting plate. The adjusting tube should be turned in clockwise direction by means of the lugs until it reaches the inner end. Then re-engage the latch.