Description

B-HE10.22-en

02/2001 Rev.02

Anti-Skid Valves

GV12A

GV12-1A

GV12-1B

GV12-2

GV12-ESRA

KNORR-BREMSE

Systems for Rail Vehicles

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1 General features

The anti-skid valve is a component of the electronic anti-skid system for rail vehicles.

It operates as an actuator in the anti-skid control circuit. The anti-skid valve is controlled by the electronic control unit. The anti-skid valve may be operated to reduce the brake cylinder pressure C in steps or to increase it again up to the level D set by the distributor valve.

The anti-skid valves GV12-1A/GV12-2 are distinguished from the GV12A type by an extended valve bracket which presents in C an additional fitting thread for receiving a measuring adapter. GV12-2 is provided with a low-performance valve magnet which can be controlled by the electronic unit through semiconductor devices. In general the valve magnets of the anti-skid valves are not wired.

2 Installation in the brake system
(see Fig. 1)

The anti-skid valve is pneumatically connected at D to the distributor valve or the pressure transformer, respectively, and at C to the brake cylinder to be controlled.

The electrical connexion with the electronic control unit is established through a three-core line. Provisions for disconnection with a three-pin plug are made at the anti-skid valve. The two wires II and III are provided for driving the two valve magnets for venting or charging control while wire I serves as the common return line.

3 Design
(see Fig. 1)

The anti-skid valve comprises essentially a valve housing with two switching diaphragms, a twin valve magnet, two side plates for the connection of the valve magnet with the housing, and a valve bracket.

The housing includes two valve seats (V_D and V_C). Either valve seat is adapted to be opened or closed, respectively, by one of the diaphragms.
The D-diaphragm is provided to open or shut off the path from the D-chamber (from the distributor valve) to the C-chamber (to the brake cylinder).
The C-diaphragm is provided for establishing the communication of the C-chamber with O (atmosphere).
The twin valve magnet is composed of two 2/3-way solenoid valves (VM1 and VM2) having coils accommodated in a common plastic housing. The pins for the electric connexion are integrally cast on the housing.

In the non-energized condition the force of the armature springs urge the two armatures into a position in which the outer valve seats are sealed while the inner valve seats are open (as shown in Fig. 1).

The two side plates enclose the control chambers S_D and S_C for the diaphragms and the conductors leading to the twin valve magnet.
The valve is screw-fastened on a valve bracket which presents the two fitting threads for the D- and the C-pipes. With the valve being disassembled from the valve bracket the nozzles d_D and d_C are easily accessible.

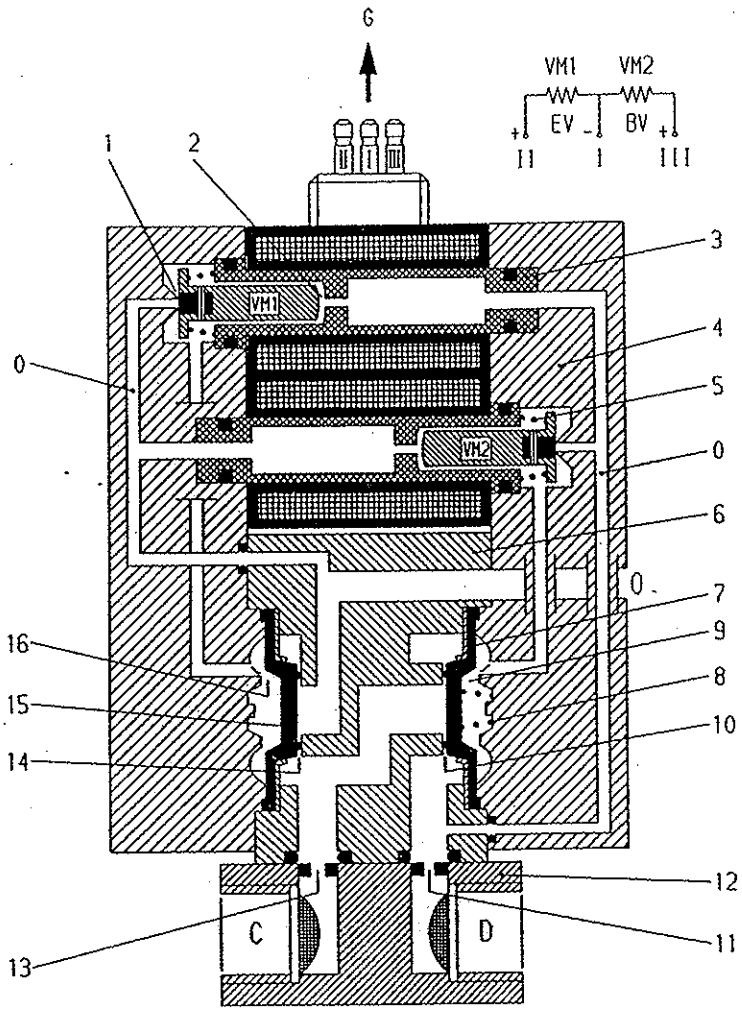
4 Operation

4.1 Brake application and brake release without anti-skid function (valve magnets VM1 and VM2 are not energized)

4.1.1 Brake released
(Fig. 1)

The valve is depressurized. The conical spiral spring retains the D-diaphragm in close fit on the valve seat V_D.

Fig. 1 **Anti-Skid Valve GV12...**
Brake released (valve unpressurized)



1	outer valve seat	9	Control chamber S_D	C	to the brake cylinder
2	inner valve seat	10	Valve seat V_D	D	to the distributor valve or the pressure transformer
3	Twin valve seat	11	Nozzle d_D	G	to the anti-skid control unit
4	Side plate	12	Valve bracket		
5	Armature spring	13	Nozzle d_C		
6	Housing	14	Valve seat V_C		
7	Diaphragm D	15	Diaphragm C		
8	Conical spiral spring	16	Control chamber S_C		

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4.1.2 Brake application
(see Fig. 2)

The D-pressure acts upon the D-diaphragm. This diaphragm is urged into the right-hand extreme position against the action of the conical spiral spring as the control chamber S_D remains in depressurized condition. The valve seat V_D is open.

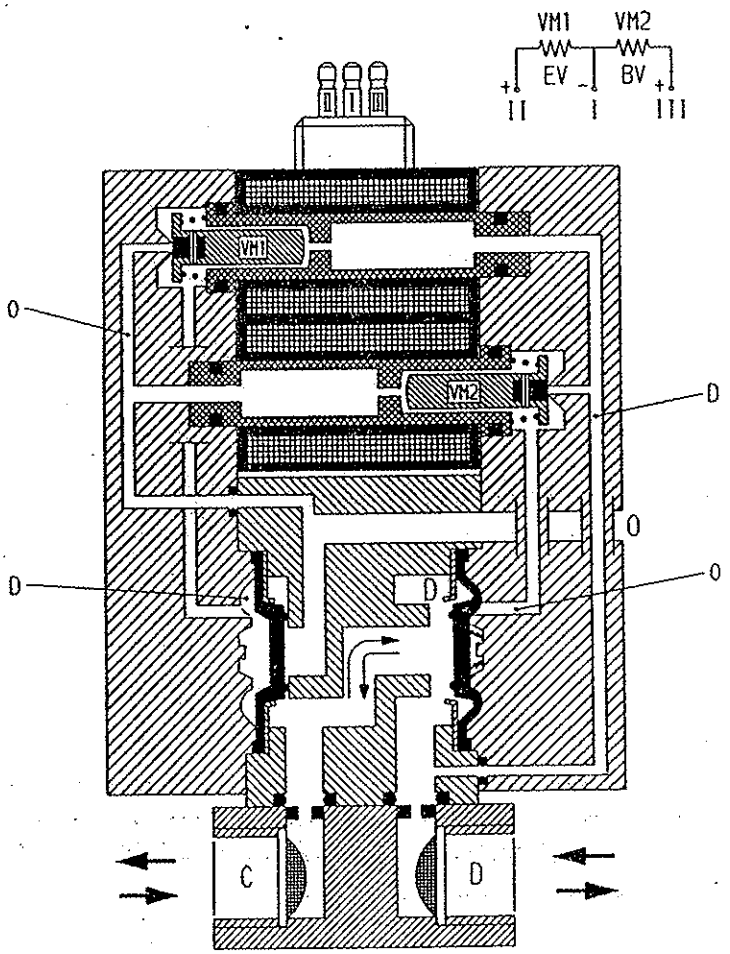
On the other hand, the control chamber SC is pressurized at D-pressure level through the open inner valve seat of magnet VM1. The D-pressure (relative to the area of the valve seat V_C) produces the effect of a closing force acting upon the C-diaphragm. The valve seat V_C is closed. The passage from D to C is open. With this condition nothing prevents the vehicle brake from being applied.

4.1.3 Brake release
(Fig. 2)

The valve is maintained in the position described in 4.1.2 above also when the brake is released so that the passage between D and C is cleared.
The D-diaphragm closes merely at a low D-pressure as soon as the force of the conical spiral spring outbalances the D-pressure (relative to the effective diaphragm area).
With a continued D-pressure reduction the C-pressure is then completely released through valve seat V_C.

Fig. 2 **Anti-Skid Valve GV12...**

a) Brake application and release without anti-skid function
b) Brake re-application by anti-skid function
} VM1 and VM2 not energized



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4.2 Brake release by anti-skid function (Fig. 3)

Both valve magnets are energized.

The control chamber S_D is pressurized at D-pressure level through magnet VM2. At the D-diaphragm the pressure is balanced; the conical spiral spring urges the diaphragm to bear against the valve seat V_D. The D-pressure is shut off.

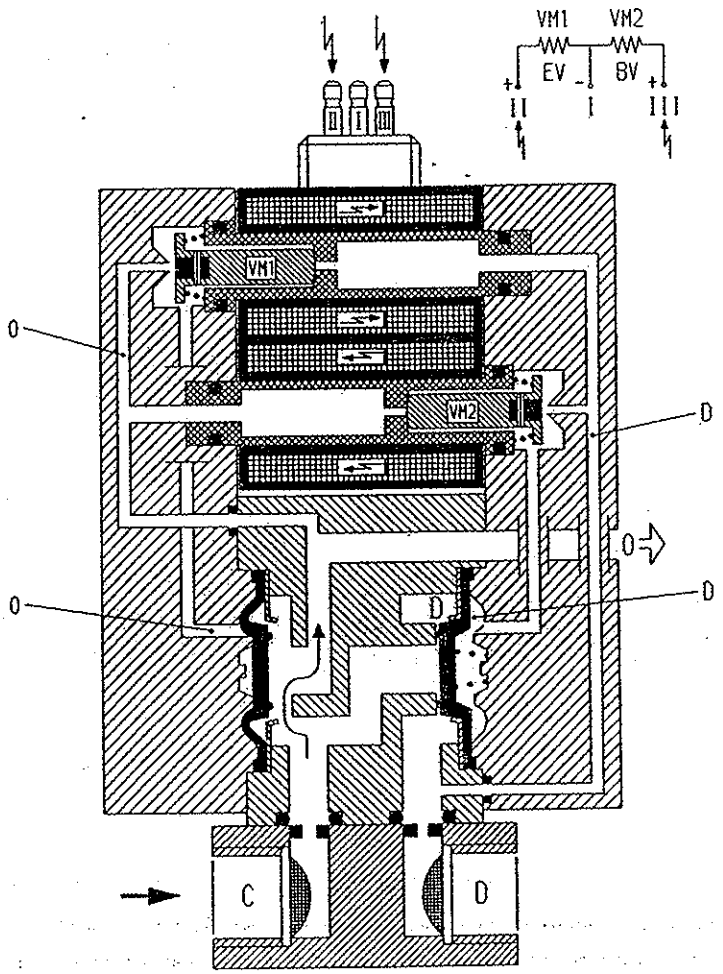
The control chamber S_C is vented. The C-pressure urges the C-diaphragm to the left side. The valve seat VC is open; the pressure escapes through V_C to O.

4.3 Brake re-application by anti-skid function (Fig. 2)

Both valve magnets are non-energized. The control chamber S_D is vented, S_C is charged. The function corresponds to the condition described in 4.1.2 above.

Fig. 3 **Anti-Skid Valve GV12...**

Brake release with anti-skid function, VM1 and VM2 energized



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4.4 Pressure maintained by anti-skid function (Fig. 4)

The valve magnet VM1 is not energized, VM2 is energized. Both control chambers (S_D, S_C) are pressurized at D-pressure level.
The diaphragms close the valve seats V_D and V_C.
The C-pressure is shut off relative to D and O.

With appropriate control of the valve magnets it is possible to create steps of constant pressurization during both the venting and the charging phases.

It is therefore possible to achieve a function of rapid (without pressure steps) or slow (by incremental pressure steps) control of pressurization or pressure reduction, depending on the requirements of the anti-skid control logic.

The pressure gradient for charging and venting (without pressure steps) is determined by the nozzles d_D and d_C. The nozzle dimensions depend on the C-chamber to be controlled.

5 Installation in the vehicle

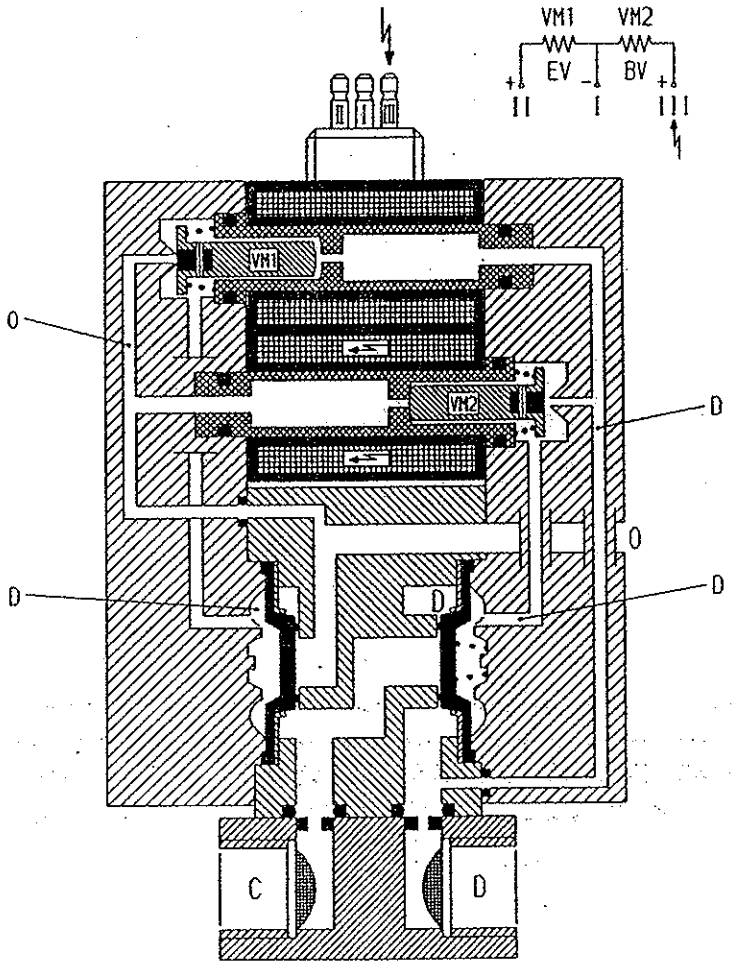
The anti-skid valve must be installed at the coach body with its venting opening facing downward.

Definitely mind that the feed pipe to the brake cylinder to be controlled is short and unthrottled so as to minimize delay times and leakage as far as possible.

The anti-skid valves (except for GV12A) have a test port on the valve bracket for measuring the C-pressure. This test port must be closed airtight before the vehicle is placed in service.

The mounting dimensions and the specifications are indicated in the associated installation drawing.

Fig. 4 **Anti-Skid Valve GV12...**
Pressure stabilization by anti-skid function



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