S6
BRAKE SYSTEM

- Power Brake Valves

- Accumulator Charging Valves

HYDRAULIC BRAKES AND SERVO-ASSISTED BRAKE SYSTEMS

SAFIM

030

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01 GENERAL DESCRIPTION

01.01 MAIN FEATURES

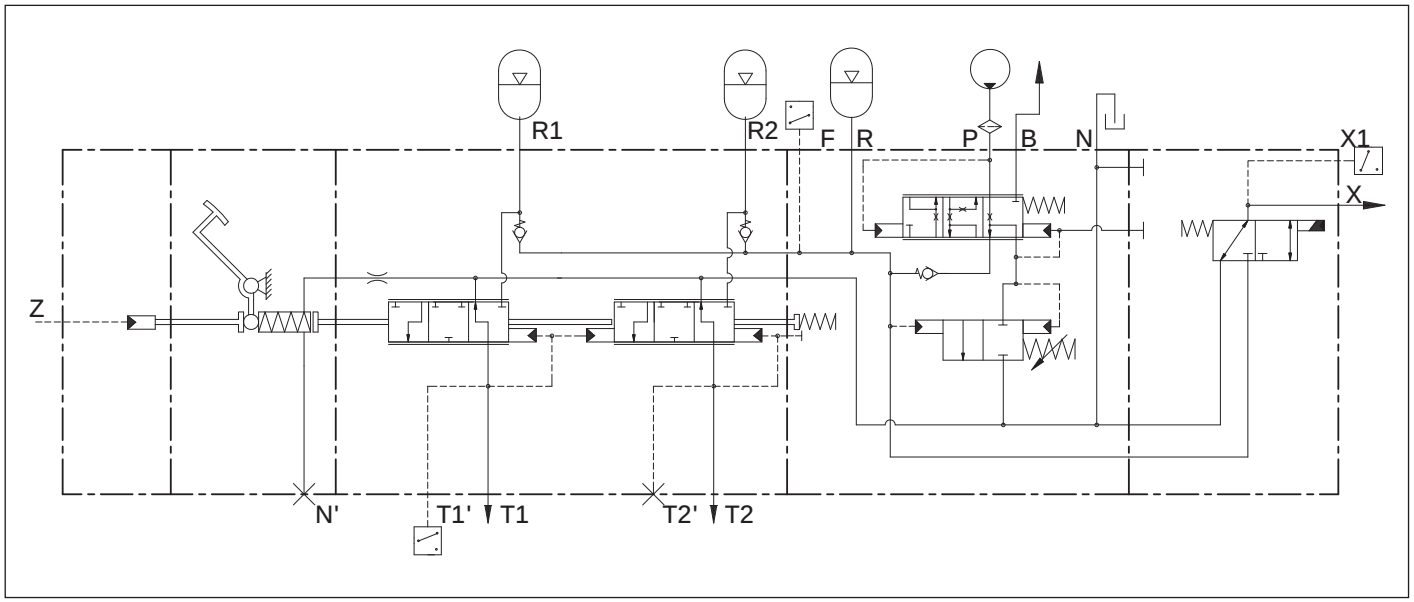
- A single, compact unit
- Positive, progressive braking
- For any vehicle type or size
- No need for special hydraulic circuit, powered by vehicle's existing circuit
- Pressure differentials between brakes
- For use with both negative and positive brakes
- Available in horizontal or vertical versions
- A minimum of hydraulic connections
- Accumulator charging valve for load sensing circuits
- Modular assembly
- Easy to adjust
- Low in maintenance

01.02 DESCRIPTION

Safim S6 Brake System is a compact assembly with all brake components grouped together in a single, modular, easy to-adjust unit.
Modular components mean that customers can select the unit configuration that best suits their particular needs.
Safe, dependable braking in all circumstances is thus assured.
S6 is available in both horizontal and vertical versions. Both versions, whilst the same basic design, offer a choice of different configurations.
S6 is a major innovation in brake systems because it only requires a small number of connections and only uses a small amount of power from the vehicle's existing hydraulic circuit; the remaining power is thus available for other equipment. This innovation is made possible by the charging valve which automatically controls the flow of oil to the hydraulic accumulators.
S6 system is suitable for mounting on medium and large sized vehicles from 1 to 4 brake circuits. Typical examples are: loaders, dumpers, forklift trucks, mobile cranes, cement mixers, excavators, compressors, etc...

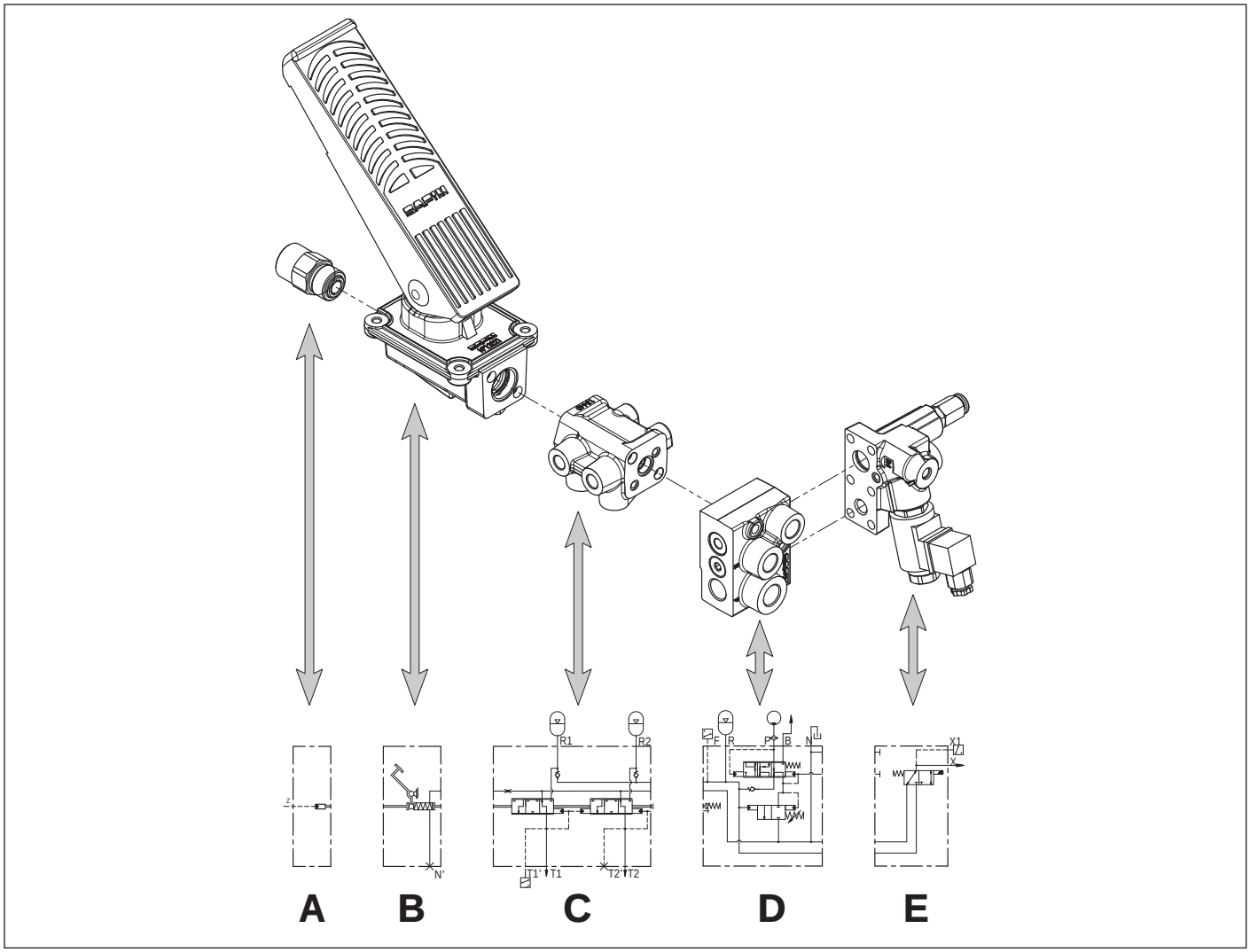
The system is designed for the direct control of mechanical or hydraulic brakes both positive and negative (pressure differentials of 1:2 and 1:4), to provide safe, responsive, and progressive braking at all times.
The technical characteristics of the S6 provide increased braking power with a lower pedal force. Brake pressure is adjusted on the modules connected to the brake circuit. Safim supplies S6 units ready-adjusted to customer specifications. Further adjustment can easily be carried out by the customer if desired.
Fitting the S6 is simple, the unit is virtually maintenance free and Safim customer service will always offer assistance and advice.

01.03 TYPICAL HYDRAULIC SCHEMATIC



P	Feed from pump
B	Feed to service
X	Parking brake
X1	Pressure switch parking brake
N	Tank
R	Accumulator
R1	Accumulator
R2	Accumulator
T1	Feed to front and rear brakes
T1'	Pressure switch stop lights
T2	Feed to front and rear brakes
T2'	Pressure switch stop lights
F	Pressure switch accumulator
Z	work brake cylinder

01.04 GROUP S6 MODULAR CONSTRUCTION



Safim S6 brake System is made up of the following modular components:

A: Horizzontal brake system front module

The horizontal pedal support enables the connection of some devices in place of the cap which normally close the support:
It is possible to mount an hydraulic actuator capable of operating the group held back by steering pressure. Alternatively it is possible to mount devices whose operation is linked to the hydraulic brake as commands or electric inching.

B: Pedal-support unit

The pedal/support unit is used to secure the entire brake system to the floor of the cab.
The main function of the support is to convey the actuating force acting on the pedal to brake modules through some springs that make brake pressure proportional to the stroke.
The following parameters in the unit can be regulated:

- the maximum brake pressure is regulated by means of an adjustable push-rod which limits the return lever travel;
- the pedal angle.

C: Brake modules

These modules control the brake pressure.
Each module is connected to an accumulator. The accumulators are high pressure containers fitted with a special membrane which separates the oil from the gas (nitrogen). The brake modules act as hydraulic distributors receiving oil from accumulators and they send to brake a pressure proportional to the force transmitted to them by support springs. Three threaded connectors link the module to the brakes, accumulator and stop light pressure switch. Longitudinal channelling on the modules provide the hydraulic connection with the tank and the charging unit.

D. Accumulator charging valve

This valve maintains the pressure of the accumulators within the range set by the vehicle manufacturer. This pressure is regulated by adjusting the screw fitted at the end of the cylinder and protected by a cap nut. The accumulator charging valve can be connected in series with other appliances. The valve takes up oil fed by the pump and directed at the accumulators connected to the brake system. The flange is used when there is no need to install an accumulator charging valve (on the vehicle there is a pressure line suitable for power accumulators) or, for reasons of space, it is not possible to assemble a charging valve directly on the group (it's available even the "in line" charging valve that it is connected to the S6 system through circuit hoses).

E: Charging valve cover

The charging valve is completed by a cover that may contain several options. Among these it is possible to insert an electrically driven valve that inhibits the charge to avoid too much absorbed energy during engine ignition and promote the start up. The flange may contain up to two electro 3-way valves for controlling external hydraulic devices as parking and working brakes (acting on the same S6 hydraulic pilot system). It is also possible to insert a pressure reducing valve integrated into this module to power devices that are unable to withstand direct pressure accumulators.

02 TECHNICAL SHEET

02.01 INTRODUCTION

The modular construction of S6 brake system allows a very large number of possible combinations to meet the different needs of installation. The data sheet was designed to define in a more comprehensive and unambiguous way all the features and functionality of S6 system.
The decoding of a S6 system is a string consists of 21 alphanumeric fields, each of which goes to define a specific characteristic of the group.

Individual entries are selected from a list that defines all possible combinations.
A detailed analysis of individual items of data sheet allows to understand the capabilities of the S6 group in all its many versions.

02.02 S6 TECHNICAL SHEET

SAFIM S.p.A.	MODULAR S6 BRAKE SYSTEM TECHNICAL SHEET	SQ002 REV. 3 05/02/2008

SAFIM CODE	REV.	DATE	DRAWING CODE	CUSTOMER CODE

DEALER	FINAL CUSTOMER	VEHICLE CODE	CUSTOMER'S RESPONSIBLE

FUNCTION CODE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

1: S6 system type
- **O** : Horizontal mount system
- **V** : Vertical mount system
- **I** : Without pedal (with push-rod)
- **R** : Remote hydraulic piloted valve
- **D** : Double remote hydraulic piloted valve
- **K** : Reverse modulating valve(horizontal type only)
- **L** : In line accumulator charging valve

2: Brake module diameter
- **8** : Spool D.08mm
- **9** : Spool D.09mm
- **1** : Spool D.10mm
- **4** : Spool D.14mm

3: Number of brake circuits
- **1,2,3,4** : Number of brake circuit
- **-** : No brake circuit present

4: Type of accumulator charging valve power feeding.
- **N** : S6 brake system without charging valve
- **F** : Open centre charging valve.
- **V** : Load sensing charging valve.

5: Remote hydraulic piloting – Inching
- **A** : Piloting cylinder D.10mm
- **B** : Piloting cylinder D.12mm
- **C** : Piloting cylinder D.20mm
- **I** : Double piloting cylinder D.11/20mm
- **V** : Hydraulic inching valve
- **S** : Linear potentiometer for inching piloting
- **H** : Rotary sensor for inching piloting
- **P** : Personalised

6: Check valve
- **N** : Without check valves
- **S** : With check valves in each brake module
- **B** : With selection of the most fill accumulator
- **V** : Park brake accumulator check valve
- **T** : With check valves in each brake module + park brake accumulator check valve
- **P** : With selection of the most fill accumulator + park brake accumulator check valve
- **-** : Not definable feature

7: Pedal support drain
- **I** : Internal drain without M10x1 port
- **C** : Internal drain with M10x1 port plugged
- **E** : External drain with M10x1 port
- **-** : Not definable feature

8: Pedal Type
- **N** : Pedal with rubber protection (standard)
- **C** : Short pedal with rubber protection
- **H** : Pedal with rubber protection and latch
- **F** : Firewall mounting pedal
- **S** : Without pedal, with lever
- **I** : Without pedal, for push-rod
- **P** : Personalised
- **-** : Not definable feature

9: Solenoid valves – Reducing pressure valve
- **3** : 3 way solenoid valve
- **R** : 3 way solenoid valve + reducing pressure valve
- **6** : 2x 3 way solenoid valve
- **X** : 2x 3 way solenoid valve + reducing pressure valve
- **2** : Start unloading valve
- **5** : Start unloading valve + 3 way solenoid valve
- **8** : Start unloading valve + 2x 3 way solenoid valve
- **Y** : Start unloading valve + 2x 3 way solenoid valve + reducing pressure valve
- **-** : No solenoid valve present

10: Thread Type
- **M** : Metric + BPS (sealing with washers)
- **I** : Metric ISO 6149 (sealing with O-ring)
- **S** : UNF-SAE (sealing with O-ring)
- **I+M** : Metric ISO (modules port), Metric + BPS (accumulator charging valve ports)
- **M+I** : Metric ISO (accumulator charging valve ports), Metric + BPS (modules ports)
- **P** : Personalised

11: First circuits braking pressure (Bar)
Max brake pressure of all the circuit before the last

12: Last circuit braking pressure (Bar)
Max brake pressure of the last circuit (This value is different from the previous circuit brake pressure only for differential brake module)

13: Accumulator charging valve cut-in pressure (Bar)

14: Accumulator charging valve cut-off pressure (Bar)

15: Reducing pressure valve setting (Bar)

16: Work brake pressure (Bar)
Indicate this value only if it is different from the braking pressure

17: Piloting cylinder fluid type
- **M** : Mineral oil
- **V** : Brake fluid (DOT3 – DOT4)
- **-** : Not definable feature

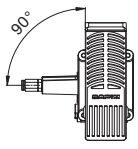
18: Solenid valve coil voltage
- **A** : 12V
- **B** : 24V
- **-** : Not definable feature

19: Accumulator charging flow rate
- **2** : 3 l/min
- **S** : 5.5 l/min (standard)
- **3** : 8.5 l/min
- **4** : 12 l/min
- **-** : Not definable feature

20: Type of remote hydraulic piloting
- **S** : Work brake piloted by accumulator charging valve 3 way solenoid valve
- **N** : External piloting
- **-** : Not definable feature

21: Pedal support orientation
- **0** : 0°
- **S** : 90° (Standard)
- **180** : 180°
- **270** : 270°
- **-** : Not definable feature

(for vertical S6 system type only)



CONTROL PRESSURE SPRING		NOTE		FIRMA COMPILAZIONE
CHARGING VALVE SPRING				FIRMA APPROVAZIONE (RUT, DTS, DAC)
ADJUSTING PEDAL ANGLE				FIRMA MONTAGGIO (MON)

03 TECHNICAL SHEET ITEMS

03.01 POSITION 1 – S6 SYSTEM TYPE

The item 1 of the technical file defines the types of securing group S6. This is the media that contains the holes to the structure of the cabin. In most cases, the pedal through which will run the group is integrated into this module. The support also contains the springs kit that defines the pressure curve and the maximum value of brake pressure.
The item 1 can be:

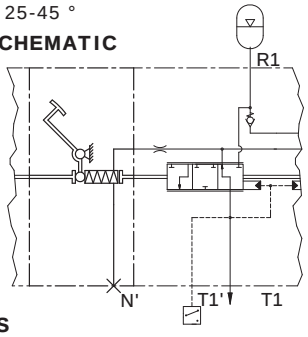
O: Horizontal support
V: Vertical support
I: straight control support
R: Remote controls support
K: Negative support
L: In line accumulator charging valve

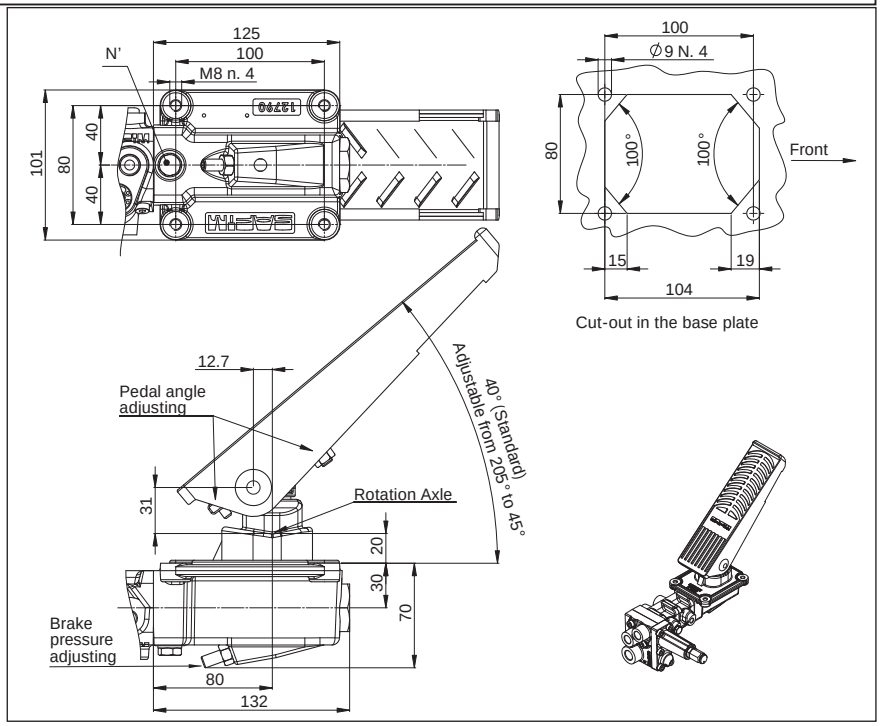
03.01 - POS. 1 | O | HORIZONTAL MOUNT SYSTEM

DESCRIPTION
This support allows to "assemble" a S6 pedal which develops horizontally towards the rear of the cabin. Designed to be mounted under the cab floor has a low vertical space (particularly suitable for vehicles with rotating cabin as excavators). The adjustment of brake pressure is carried out by recording the pedal stroke through an adjusting screw placed at the bottom (the pressure increase by unscrewing the adjusting screw)
It is also possible to adjust the pedal starting angle acting on the two screws under the pedal. A different regulatory of the standard will be listed under heading NOTES of the technical data sheet.

TECHNICAL FEATURES
Working angle : 13 ° - 18 °
Standard inclination angle: 40 °
Tolerance adjustment of the inclination angle ± 2 °
Adjusting angle: 25-45 °

HYDRAULIC SCHEMATIC





CONNECTIONS

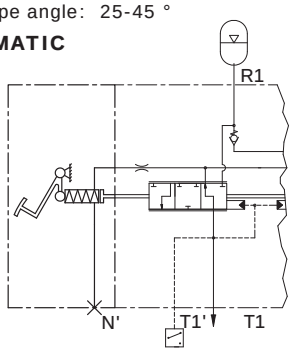
IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
N'	External drainage	M10x1 DIN 3852-1X	M10x1 DIN 3852-1X	M10x1 DIN 3852-1X

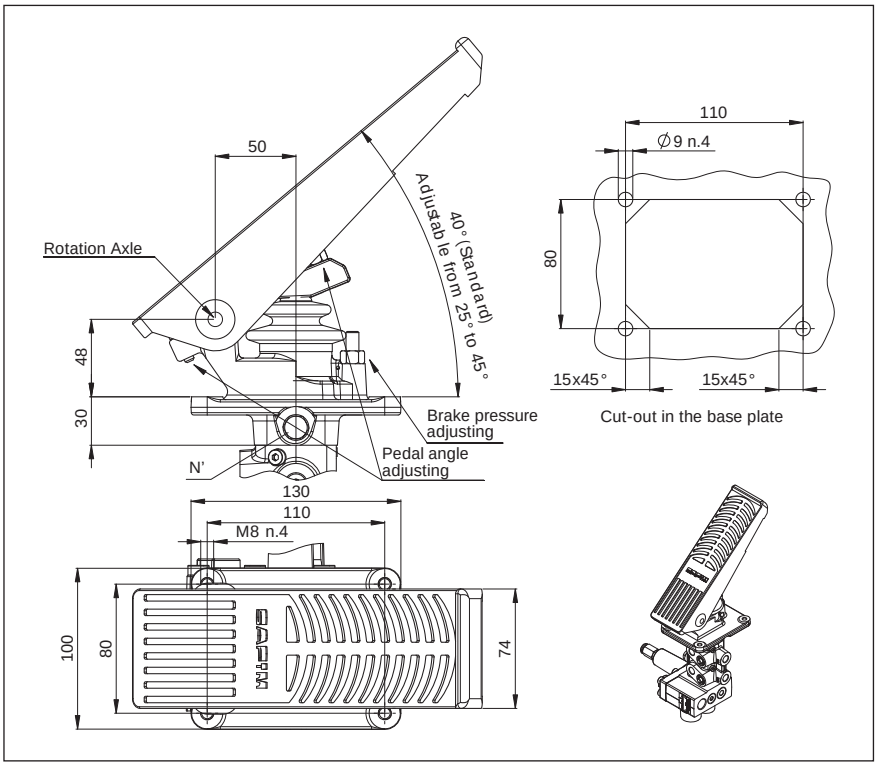
03.01 - POS. 1 | V | VERTICAL MOUNT SYSTEM

DESCRIPTION
The vertical development support allows to "assemble" a S6 pedal to fit under the cabin floor with a low horizontal footprint (Particularly suitable for vehicles where space under the cabin abounds in a vertical way as wheel loaders). The adjustment of brake pressure is carried out by recording the pedal stroke through an adjusting screw on the front of the support. It is also possible to adjust starting inclination angle acting on the two screws under the pedal. A different regulatory standard will be listed under heading NOTES of the technical data sheet. The support can be rotated at intervals of 90° in respect to the rest of the valve (see item 21 of the technical file).

TECHNICAL FEATURES
Working angle: 13 ° - 18 °
Standard inclination: 35 °
Tolerance adjustment of the inclination angle: ± 2 °
Registration of the slope angle: 25-45 °

HYDRAULIC SCHEMATIC





CONNECTIONS

IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
N'	External drainage	M10x1 DIN 3852-1X	M10x1 DIN 3852-1X	M10x1 DIN 3852-1X

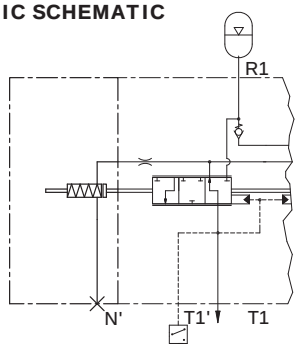
03.01 - POS. 1 | I | WITHOUT PEDAL (WITH PUSH-ROD)

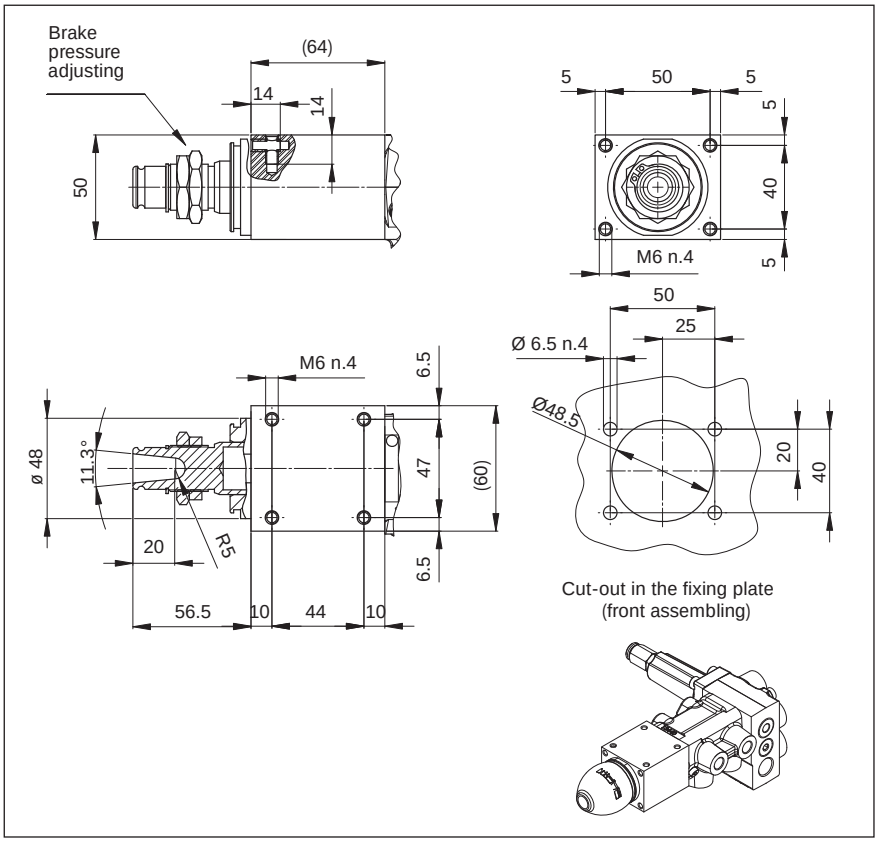
DESCRIPTION
The support derived from the aluminium block has no integrated brake pedal, but the actuating force runs through a push rod as the master cylinders. This type of support is particularly suitable for “special” cabins where it is not possible to use a standard pedal with floor support and must be built a special one.

The block presents two sets of holes:
Front fixing (to be used only for S6 valve without charging valve).
Wall fixing.

TECHNICAL FEATURES
Working stroke : 13 mm – 17 mm

HYDRAULIC SCHEMATIC

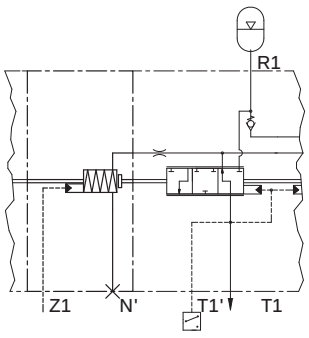


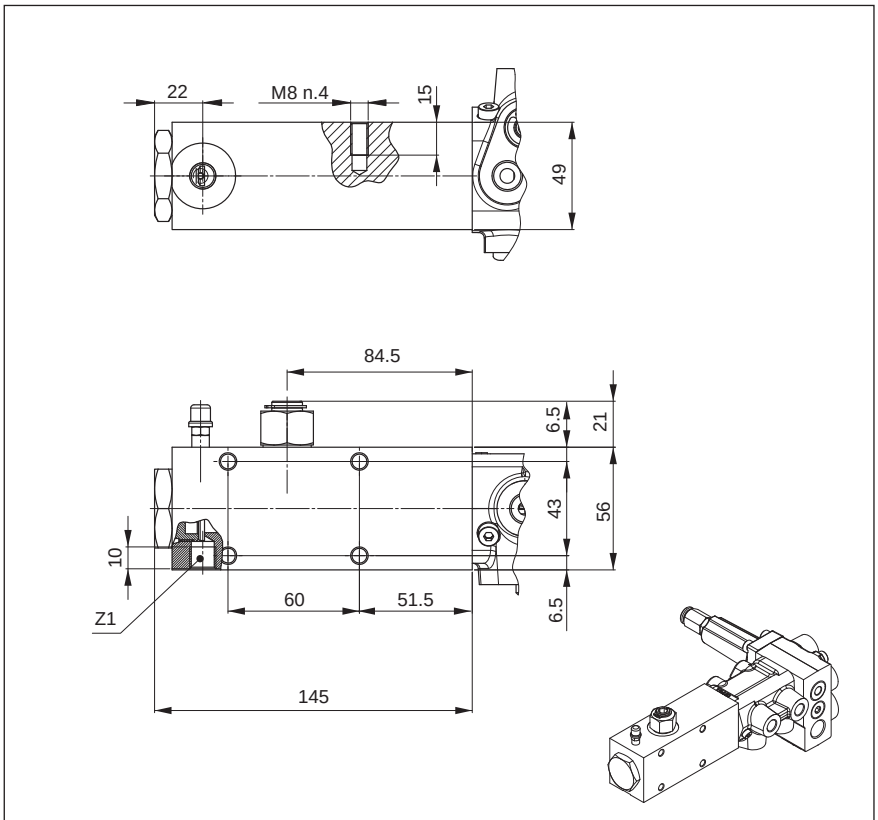


03.01 - POS. 1 | R | REMOTE HYDRAULIC PILOTED VALVE

DESCRIPTION
The support to be used to achieve a S6 remote control system is prepared to receive a command under pressure from a master cylinders or by another S6 system. This type of S6 system is applicable to multiple driving seat vehicles, or where the cabin is located far from vehicle brakes.
Usually the remote hydraulic piloted valve is combined with one or two direct master cylinders ø 22 rif. 022164MN or ø19 rif. 021279MN.

HYDRAULIC SCHEMATIC





CONNECTIONS

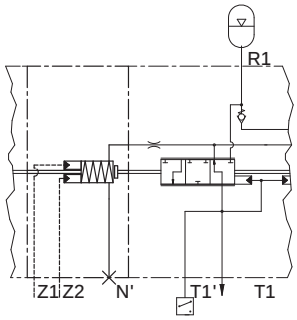
IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
Z1	Pilot signial	M12x1.5 DIN 3852-1X	M12x1.5 DIN 3852-1X	M12x1.5 DIN 3852-1X

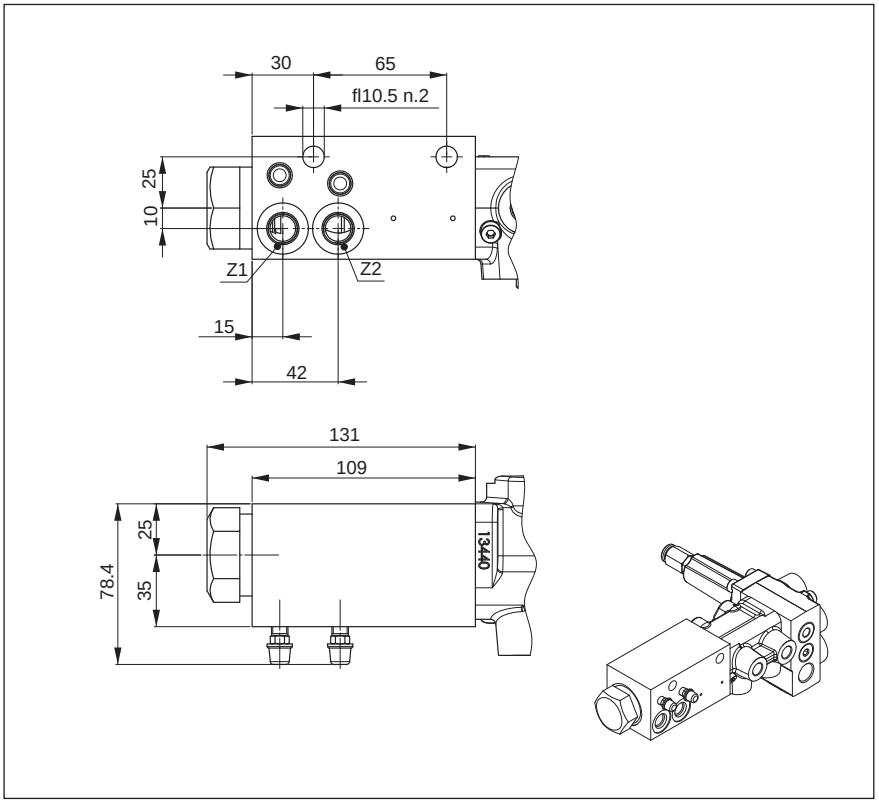
03.01 - POS. 1 | D | DOUBLE REMOTE HYDRAULIC PILOTED VALVE

DESCRIPTION

The dual hydraulic pilot support is used to command a remote S6 system. This type of S6 system is applicable on vehicles that provide the opportunity to drive from two separate locations, or when you want to have redundancy of the piloting signal through two independent circuits.

HYDRAULIC SCHEMATIC





CONNECTIONS

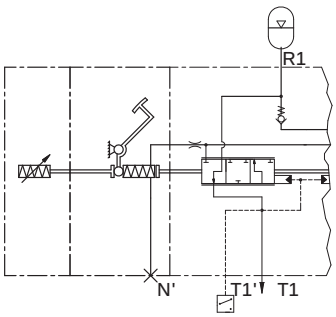
IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
Z1	Pilot signal	M14x1.5 ISO 6149	M14x1.5 ISO 6149	M14x1.5 ISO 6149
Z2	Pilot signal	M14x1.5 ISO 6149	M14x1.5 ISO 6149	M14x1.5 ISO 6149

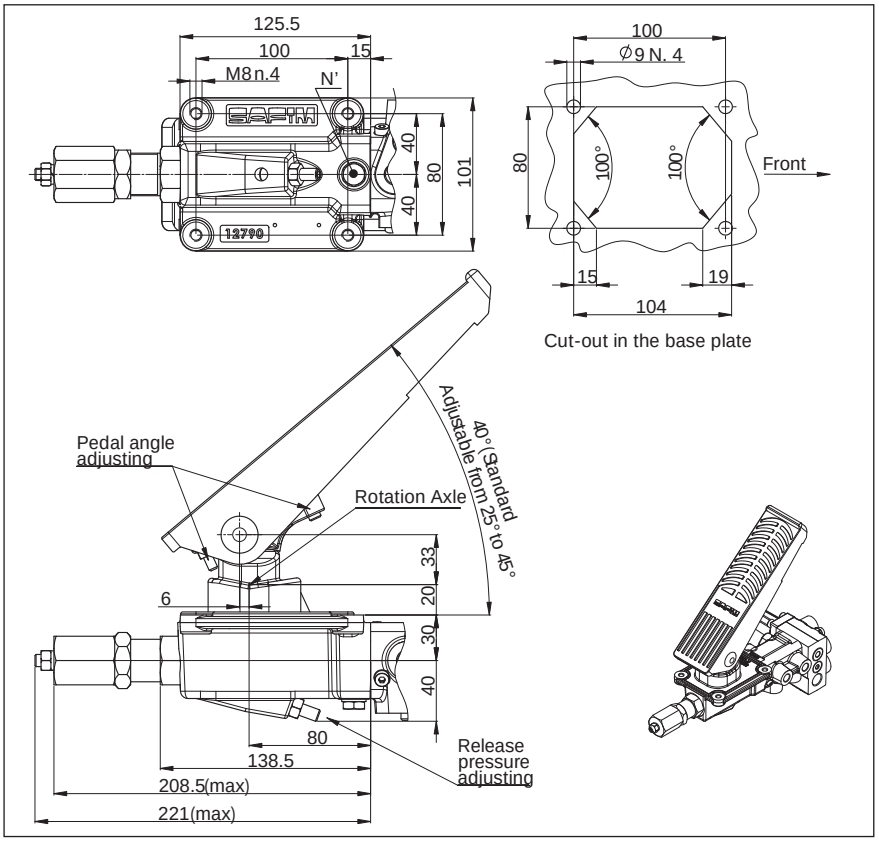
03.01 - POS. 1 | K | REVERSE MODULATING VALVE(HORIZONTAL TYPE ONLY)

DESCRIPTION

The negative support is used in specific applications where the S6 system must provide maximum brake pressure when it is not operated. Acting on pedal, the pressure is also progressively reduced to zero.
The negative support can only be achieved in the horizontal footprint version, but unlike the S6 systems that have O under item 1 of the data sheet, in the negative ones the pedal encumbrance spread horizontally forward.

HYDRAULIC SCHEMATIC





CONNECTIONS

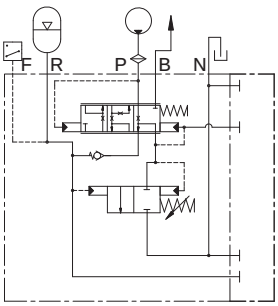
IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
N'	External drainage	M10x1 DIN 3852-1X	M10x1 DIN 3852-1X	M10x1 DIN 3852-1X

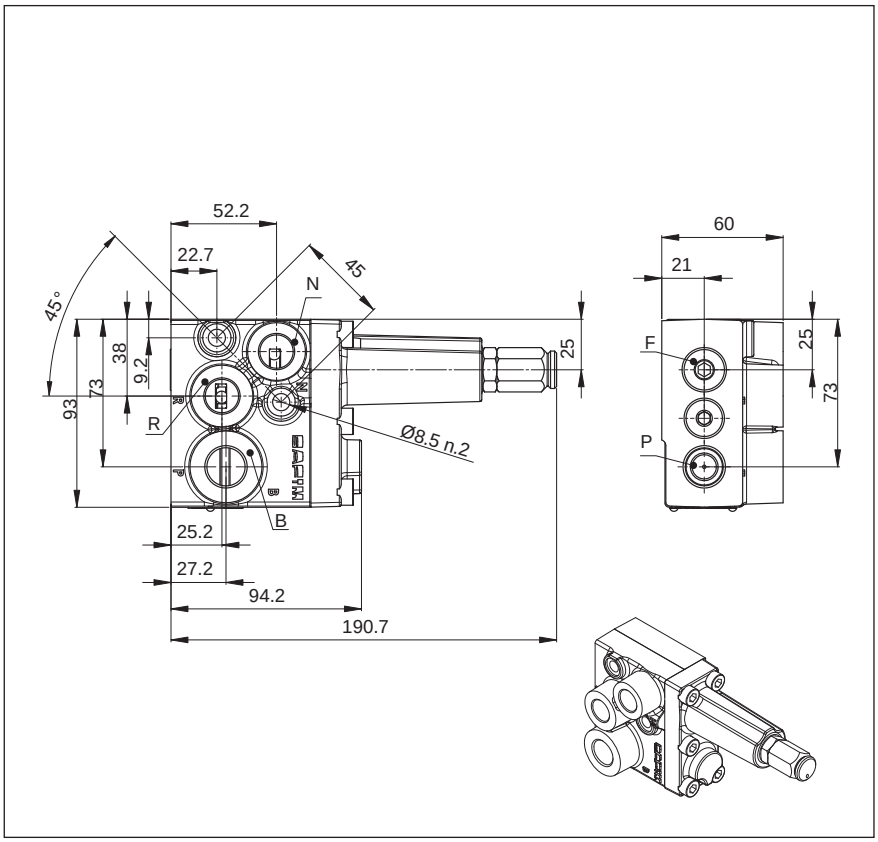
03.01 - POS. 1 | L | IN LINE ACCUMULATOR CHARGING VALVE

DESCRIPTION

The L item identifies a charging valve that has no connection holes with the brake modules to be mounted separately in-line.

HYDRAULIC SCHEMATIC





03.02 POSITION 2 – BRAKE MODULE DIAMETER

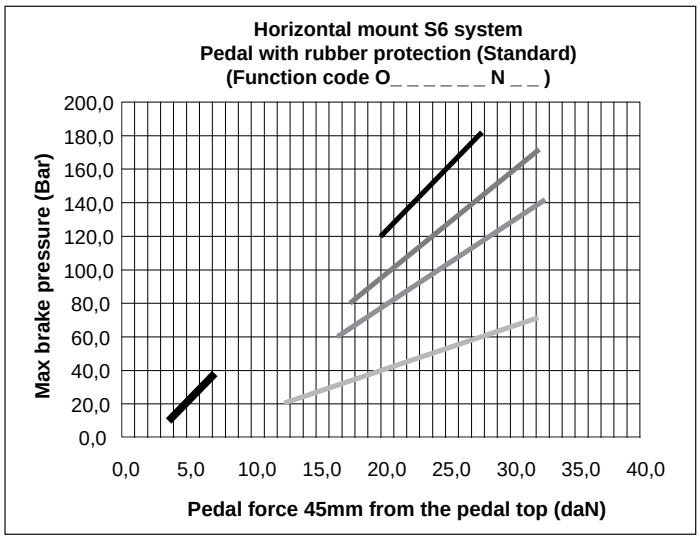
Item n°2 of the technical data sheet defines the diameter of the brake modules spool that is sensitive to brake pressure. Reducing the diameter of the piston distributors it possible to obtaine higher brake pressure. The following table gives an indication of brake pressure achievable with each spool diameter.

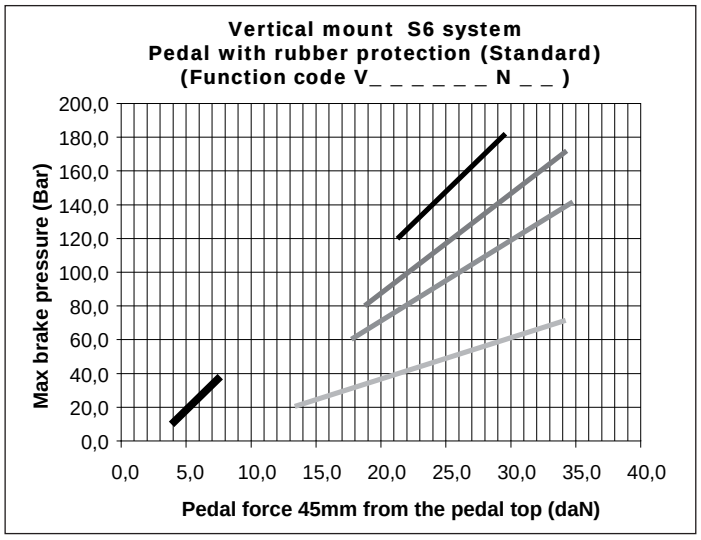
DIAMETER	DESCRIPTION	MAX BRAKE PRESSURE
14	Low brake pressure	20 Bar – 70 Bar
10	Medium brake pressure	60 Bar – 140 Bar
9	High brake pressure	80 Bar – 160 Bar
8	Very high brake pressure	120 Bar – 180 Bar

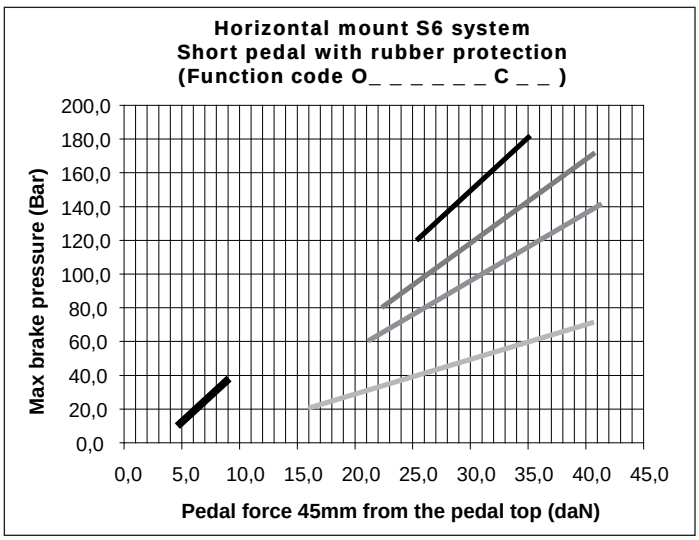
In the charts below is shown the needed strength to brake to a given brake pressure with the various types of pedal.

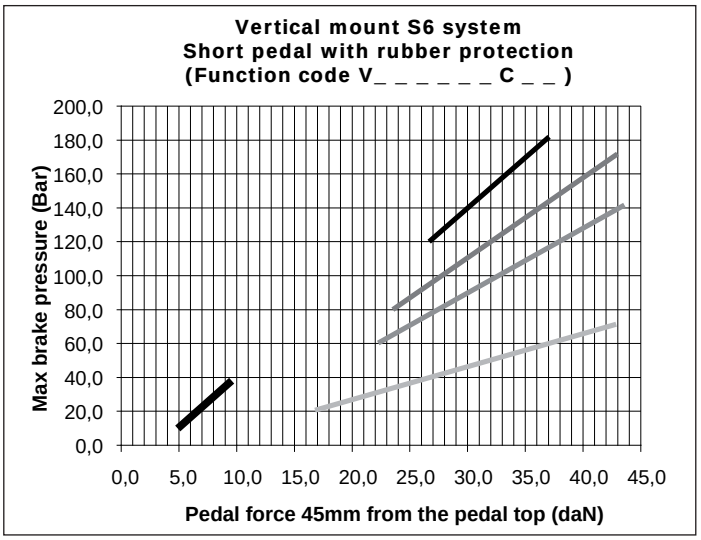
The item n°2 can be:

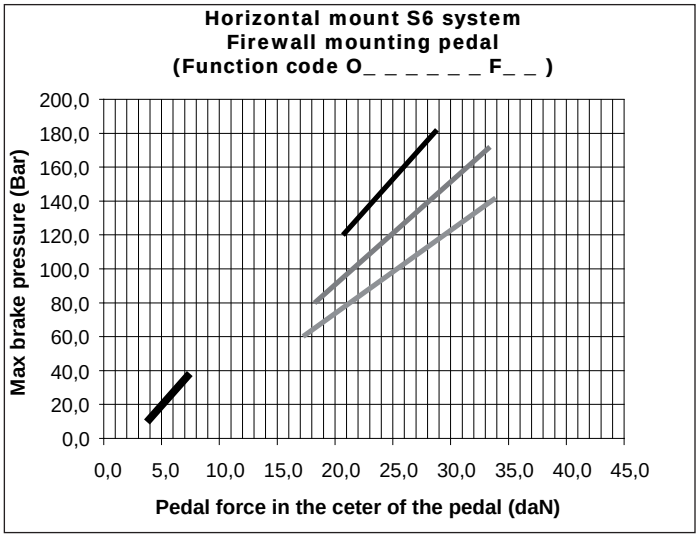
8: spool D. 8 mm (throttle)
9: spool D. 9 mm
1: spool D. 10 mm
4: spool D. 14 mm

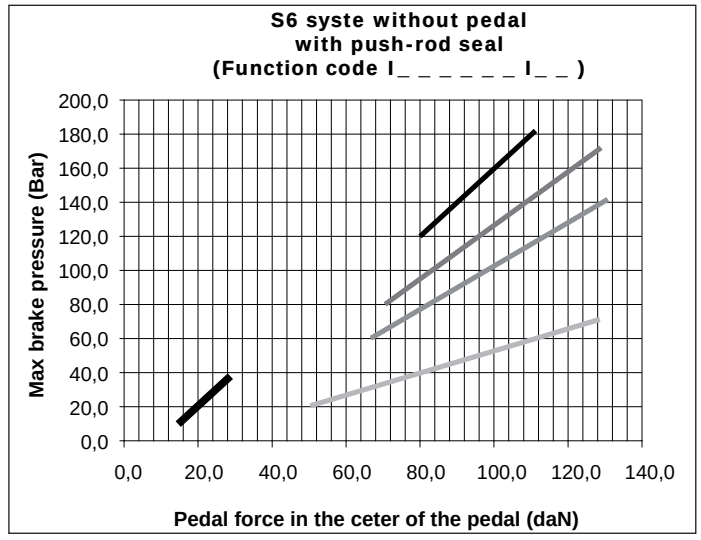












03.03 POSITION 3 - NUMBER OF BRAKE CIRCUITS

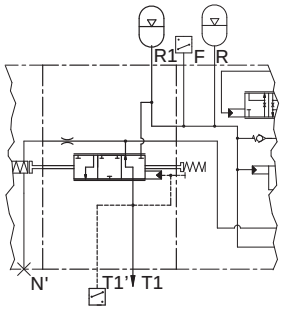
The modular construction of S6 brake system allows to assemble groups containing from 1 to 4 brake modules depending on the needs of circuit. The axial footprint of each brake form is 40mm. Every brake module determines an independent brake circuit with its accumulator, protected by unidirectional valve from the other circuits. A brake system with balancing valve in the modules can be assembled with only 2 brake modules (see section 6 LOCATION – CHECK VALVES).

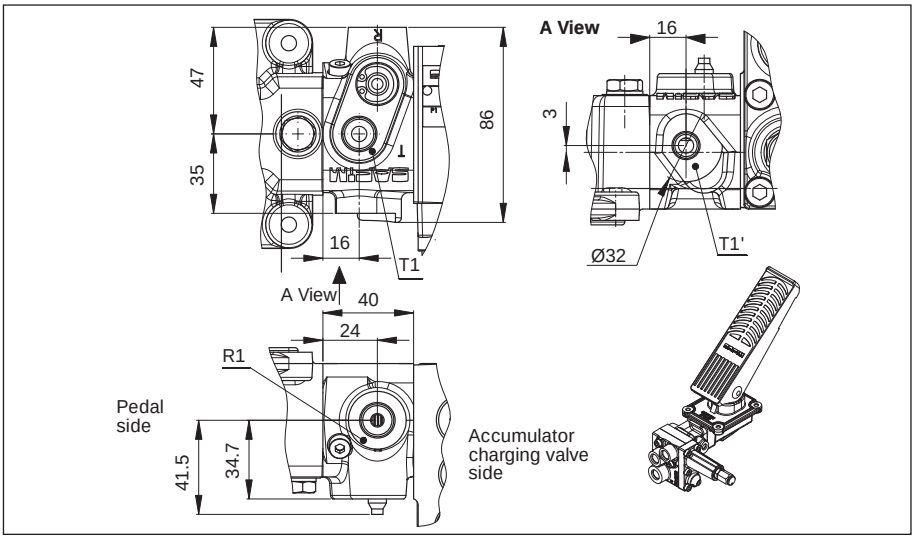
Item 3 can be:
1: N.1 brake circuit
2: N.2 brake circuits
3: N.3 brake circuits
4: N.4 brake circuits
-: No brake circuit

03.03 - POS. 3 | 1 | N. 1 BRAKE CIRCUIT

DESCRIPTION
A single brake circuit module is used in those vehicles with just a single braked axle , or in those vehicles that don't need a redundant brake circuit.

HYDRAULIC SCHEMATIC

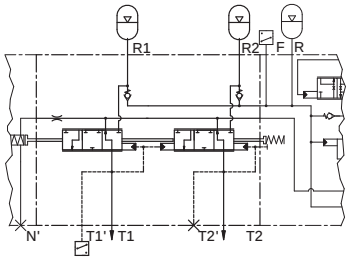


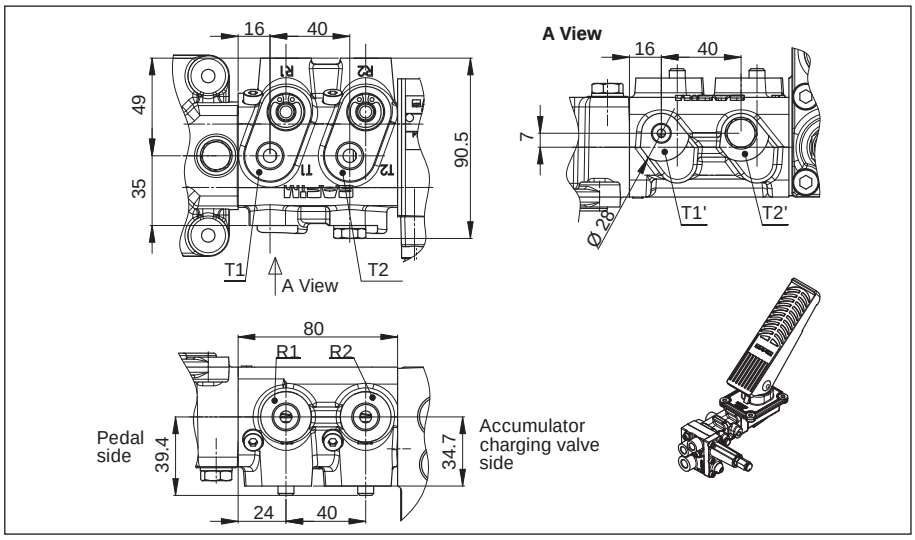


03.03 - POS. 3 | 2 | N. 2 BRAKE CIRCUIT

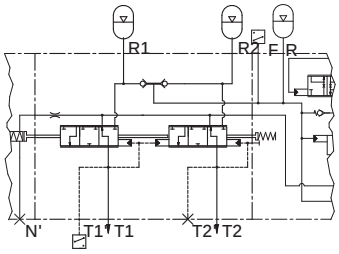
DESCRIPTION
A double brake circuit module is used in those vehicles that need a redundant brake solution, with two independent brake circuits. The connection port position is different between the type with single check valve for each circuit "S", and the configuration with reverse select check valve "B".

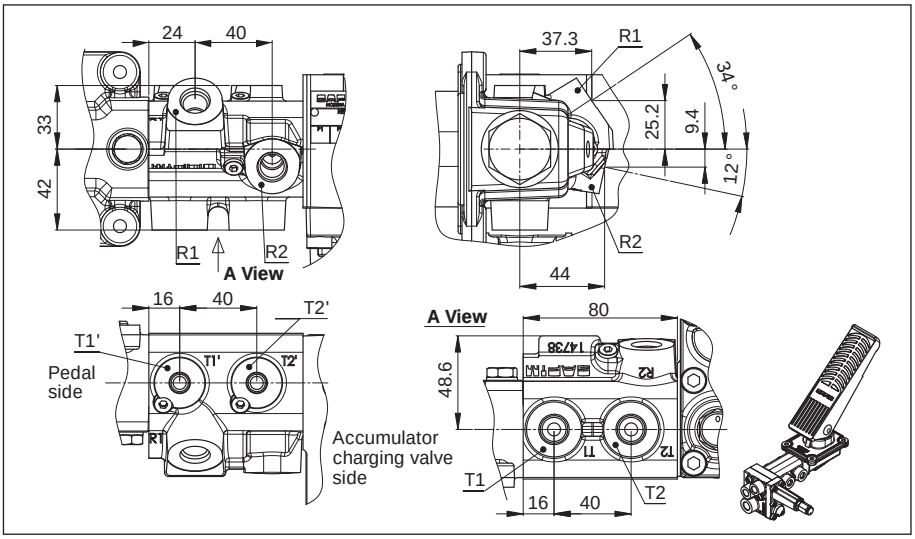
HYDRAULIC SCHEMATIC





HYDRAULIC SCHEMATIC

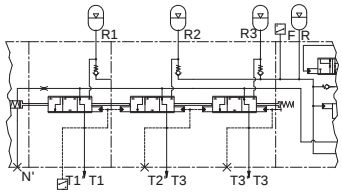


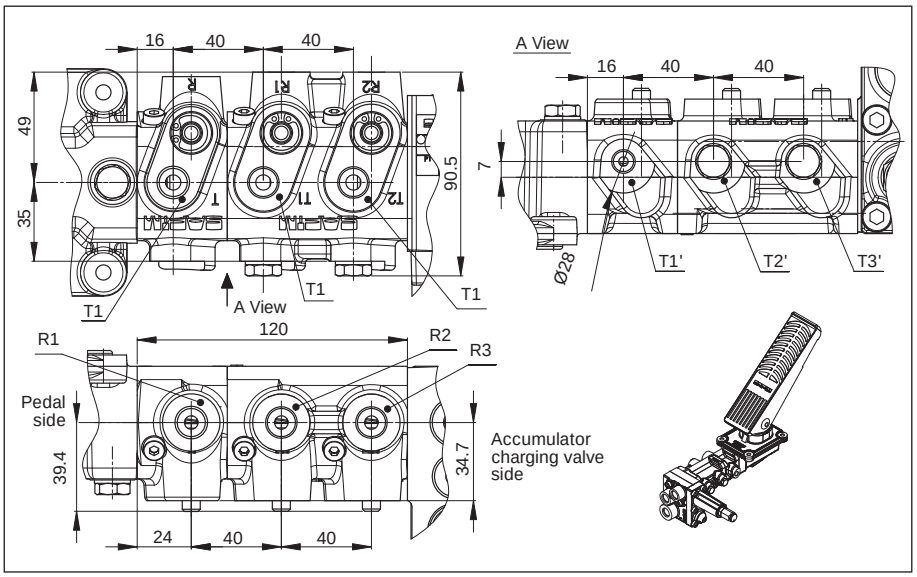


03.03 - POS. 3 | 3 | N. 3 BRAKE CIRCUIT

DESCRIPTION
One single circuit module plus one double brake circuit module is used to obtain 3 independent brake circuits.

HYDRAULIC SCHEMATIC

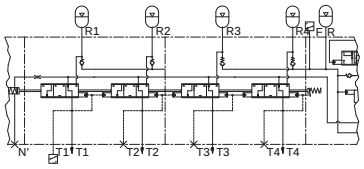


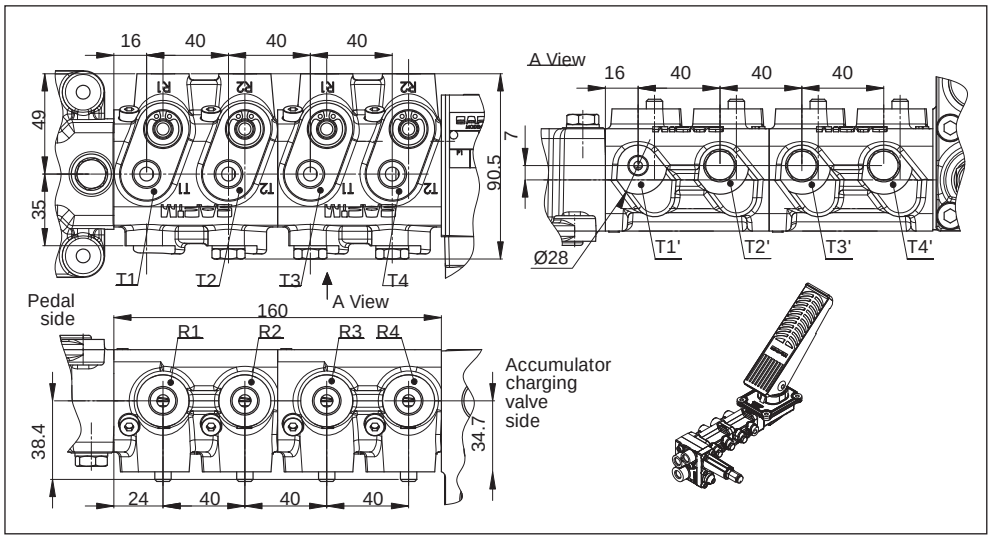


03.03 - POS. 3 | 4 | N. 4 BRAKE CIRCUIT

DESCRIPTION
Two double brake circuit modules are used to obtain 4 independent brake circuits.

HYDRAULIC SCHEMATIC





CONNECTION

IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
R1, R2, R3, R4	Accumulator	M14x1.5 DIN 3852-1X	M14x1.5 ISO 6149	9/16-18 UNF SAE J475
T1, T2, T3, T4	Brake	M14x1.5 DIN 3852-1X	M14x1.5 ISO 6149	9/16-18 UNF SAE J475
T1', T2', T3', T4'	Pressure switch	M10x1 DIN 3852-1X	M10x1 ISO 6149	7/16-20 UNF SAE J475

03.04 POSIT. 4 - TYPE OF ACCUMULATOR CHARGING VALVE POWER FEEDING

Item 4 of the technical data sheet defines whether the system is equipped with an accumulator charging valve and its type of circuits.

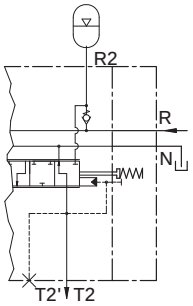
Item 4 can be:
N: S6 brake system without charging valve
F: Open centre charging valve
V: Load sensing charging valve

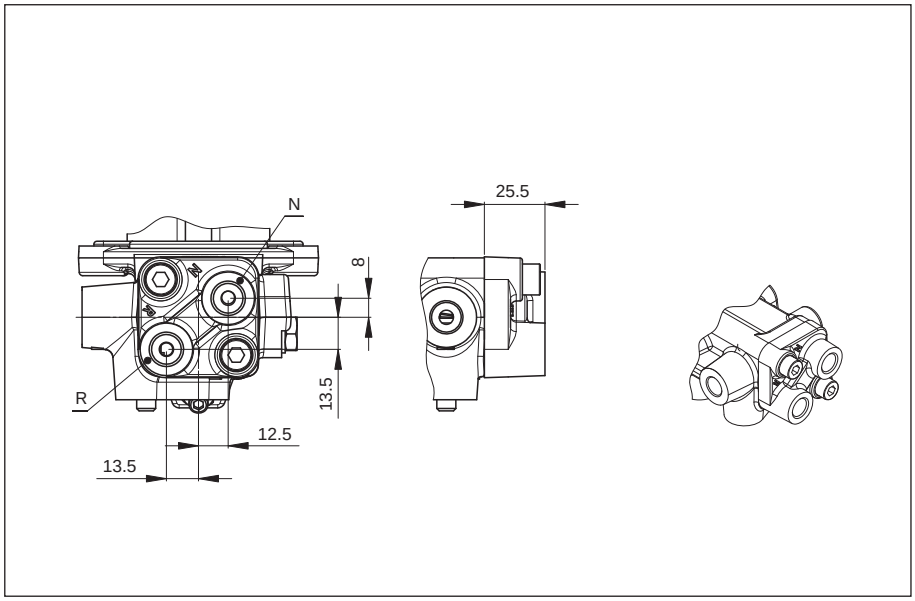
03.04 - POS. 4 | N | S6 BRAKE SYSTEM WITHOUT CHARGING VALVE

IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
R	Accumulator	M14x1.5 DIN 3852-1X	M14x1.5 ISO 6149	9/16-18 UNF SAE J475
N	Tank	M14x1.5 DIN 3852-1X	M14x1.5 ISO 6149	9/16-18 UNF SAE J475

DESCRIPTION
A closing flange with the connection ports for tank and feed is used to close the brake module, in the case where no accumulator charging valve is installed on the brake valve body.
A brake valve without accumulator charging valve is normally used when:
- The space available for the valve installation is not sufficient for the integrated charging valve.
- The accumulator is re-charged using a different system than accumulator charging valve. For example the Master Priority Valve®.

HYDRAULIC SCHEMATIC





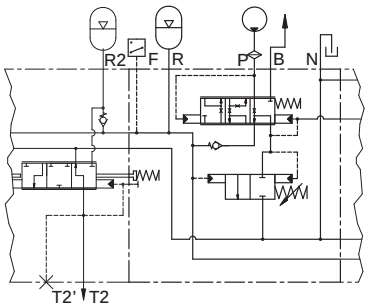
02.03.04 - POS. 4 | F | OPEN CENTER CHARGING VALVE

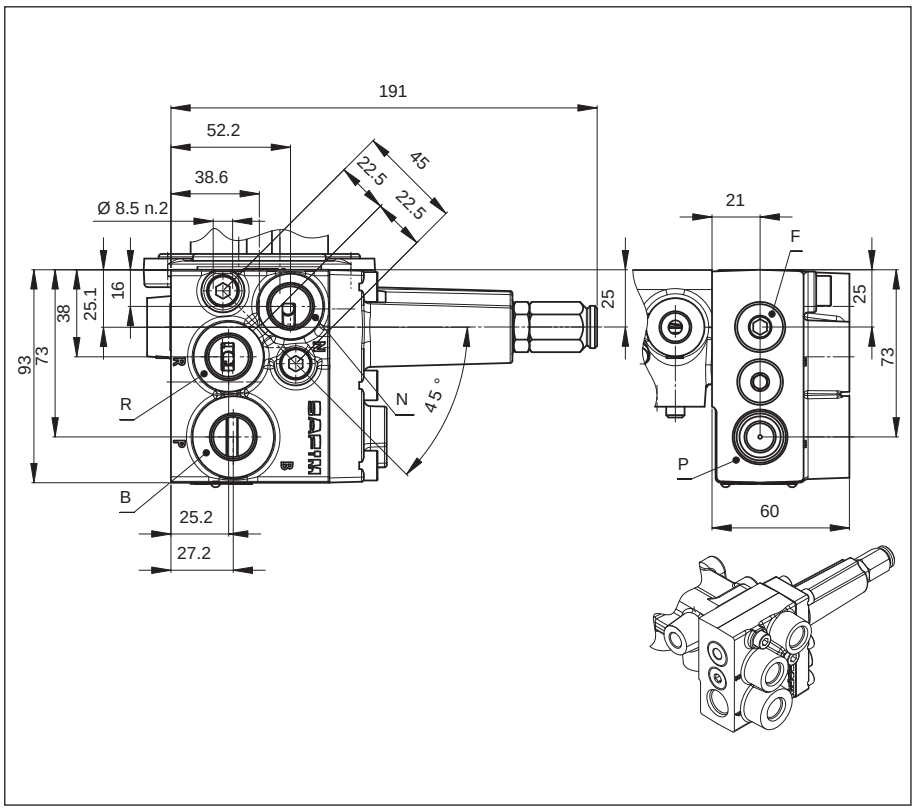
DESCRIPTION
Open centre accumulator charging valve is the more common system used to recharge accumulators.

LIMITS OF USE

Inlet oil flow	3 l/m – 70 l/m
Max pressure in P	225 Bar
Max pressure in B	225 Bar
Max pressure in R	225 Bar
Max pressure in N	0.5 Bar (An independent line to tank must be provided)
Type of oil	hydraulic oil according to DIN 51524
Filtering level	NAS 1638 category 8
Oil viscosity	from 1.9° cSt to 5.4° cSt to 50°C
Temperature	-30°C / + 90°C

HYDRAULIC SCHEMATIC





IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
P	Feeding	G ½ DIN 3852-2X	M22x1.5 ISO 6149	7/8-14 UNF SAE J475
B	Other service or tank	G ½ DIN 3852-2X	M18x1.5 ISO 6149	3/4-16 UNF SAE J475
R	Accumulator	M18x1.5 DIN 3852-1X	M18x1.5 ISO 6149	3/4-16 UNF SAE J475
N	Tank	M18x1.5 DIN 3852-1X	M18x1.5 ISO 6149	3/4-16 UNF SAE J475
F	Low pressure accumulator pressure switch	M10x1 DIN 3852-1X	M10x1 DIN 3852-1X	7/16-20 UNF SAE J475

02.03.04 - POS. 4 | V | LOAD SENSING CHARGING VALVE

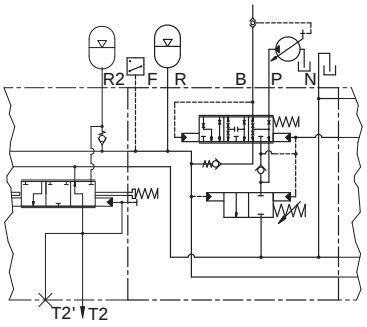
DESCRIPTION

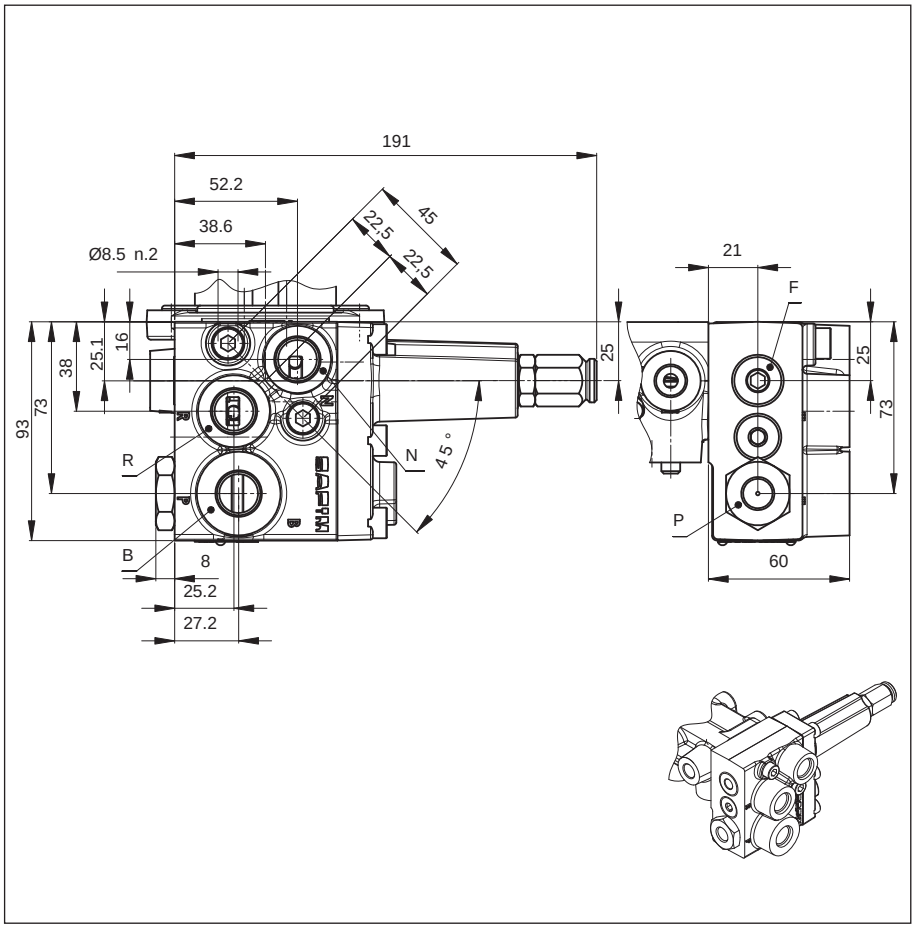
A load sensing accumulator charging valve could be easily used in a circuit fed by a variable displacement piston pump. For further information see the paragraph “s6 brake system feeding ways”.

LIMITS OF USE

Max pressure in P	225 Bar
Max pressure in B	225 Bar
Max pressure in R	225 Bar
Max pressure in N	0.5 Bar (An independent line to tank must be provided).
Type of oil	hydraulic oil according to DIN 51524
Filtering level	NAS 1638 category 8
Oil viscosity	from 1.9° cSt to 5.4° cSt to 50°C
Temperature	-30°C / + 90°C

HYDRAULIC SCHEMATIC





IDENTIFICATION	DESCRIPTION	THREADS TYPE (ITEM 10 OF THE SHEET)		
		M	I	S
P	Feeding	-	M14x1.5 DIN 3852-1X	9/16-18 UNF SAE J475
B	Load sensing	-	M18x1.5 ISO 6149	3/4-16 UNF SAE J475
R	Accumulator	-	M18x1.5 ISO 6149	3/4-16 UNF SAE J475
N	Tank	-	M18x1.5 ISO 6149	3/4-16 UNF SAE J475
F	Low – pressure accumulator pressure switch	-	M10x1 DIN 3852-1X	7/16-20 UNF SAE J475

03.05 POSITION 5 - REMOTE HYDRAULIC PILOTING-INCHING

Support pedal mounted horizontally enables the connection of some devices in place of the cap which normally closes the support. It is possible to mount an hydraulic actuator that allows to operate the brake valve by an under pressure pilot usually called “Working brake actuator”. Alternatively it is possible to assembly devices whose operation is linked to the braking as hydraulic or electrical commands to the deactivation of transmission usually called “Inching”.

Item 5 can be:
A: Piloting cylinder D.10mm
B: Piloting cylinder D.12mm
C: Piloting cylinder D.20mm
I: Double piloting cylinder D.11/20mm
V: Hydraulic inching valve
S: Linear potentiometer for inching piloting
H: Rotary sensor for inching piloting
P: Personalised

REMOTE HYDRAULIC PILOTING

The remote hydraulic piloting is a small cylinder that controls the pedal through a pressure; then the brake valve can be driven directly from the pedal or through pressure from a remote control panel.
The easy way to pilot a S6 brake system is through a simple master cylinder. If the command is ON / OFF, it is possible to provide valves and pipe connected in the integrated S6 group (See item 20).
In this case, we recommend:

MODULE DIAMETER (ITEM 2 OF THE SHEET)	CYLINDER DIAMETRO	ITEM 5 OF THE SHEET
8	10	A
9	12	B
10	12	B
14	20	C

Warning: the brake work can not be used as a parking brake and should only be used with driver.
The pressure that we must provide to pilot to curb the S6 system at the maximum pressure must meet the following relationship:
Driving pressure> = [(Brake pressure) x (spool area) + 12 daN] / (pilot area).
If the pressure comes to pilot in an impulsive way it is necessary to enter a restrictor to reduce the impact of pressure that the S6 braking system will suffer.

LIMITS OF USE

TYPE OF OIL		MINERAL OIL	BRAKE FLUID
TEMPERATURE RANGE	°C	-20° / +90°	-30°/+100°
MAXIMUM PILOT PRESSURE	bar	150	150

03.05 - POS. 5 | A-B-C | REMOTE HYDRAULIC PILOTING

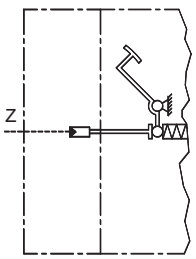
PILOT FEATURE

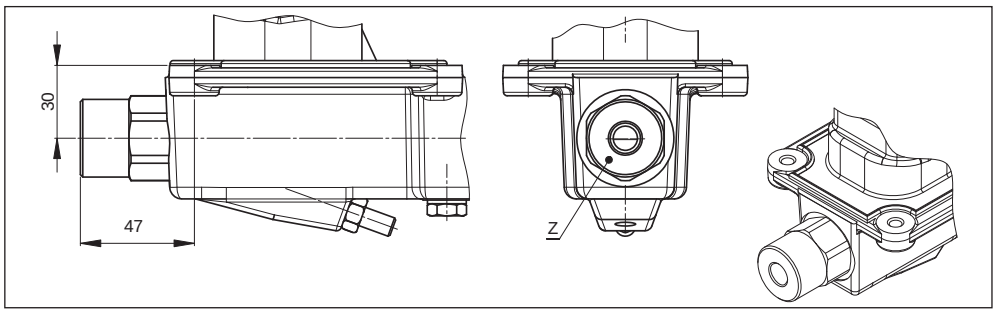
ITEM 5 OF THE SHEET		A	B	C
PILOT PISTON DIAMETER	mm	10	12	20
MAXIMUM PILOT DISPLACEMENT	cm^3	1.3	1.9	5.3

CONNECTION

IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
Z	Pilot signal	M14x1.5 DIN 3852-1X	M14x1.5 DIN 3852-1X	M14x1.5 DIN 3852-1X

HYDRAULIC SCHEMATIC





03.05 - POS. 5 | I | DOUBLE PILOTING CYLINDER D.11/20MM

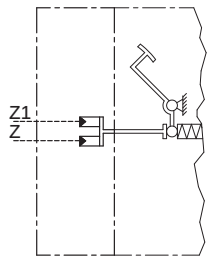
DESCRIPTION

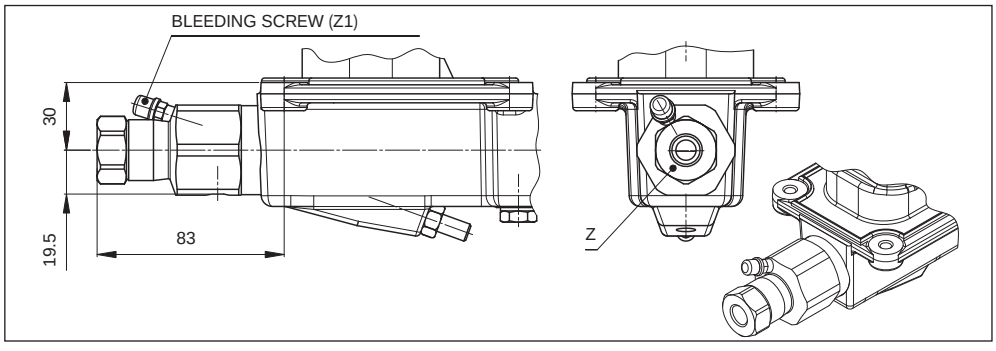
This is used when both electrically operated service brake, and second brake pedal in a remote position with hydraulically pilot are required.

CONNECTION

IDENT.	DESCRIPTION	PILOT PISTON DIAMETER (mm)	MAXIMUM PILOT DISPLACEMENT (cm^3)	THREADS TYPES (ITEM 10 OF THE SHEET)		
				M	I	S
Z	Pilot signal	11	1,6	M14x1.5 DIN 3852-1X	M14x1.5 DIN 3852-1X	M14x1.5 DIN 3852-1X
Z1	Pilot signal	20	5,3	M10x1 DIN 3852-1X	M10x1 DIN 3852-1X	M10x1 DIN 3852-1X

HYDRAULIC SCHEMATIC





INCHING

Some categories of vehicles (blades, forklifts...) require a gradual separation of transmission while brake pressure increases. Some hydrostatic transmissions models can be driven through a pressure signal, other models can be driven by an electrical signal. For this purpose valves or sensors connected to the support can be adopted, Safim regulates according to the braking performance on the basis of values agreed with the customer.

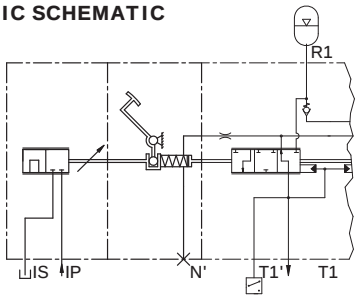
03.05 - POS. 5 | **V** | **HYDRAULIC INCHING VALVE**

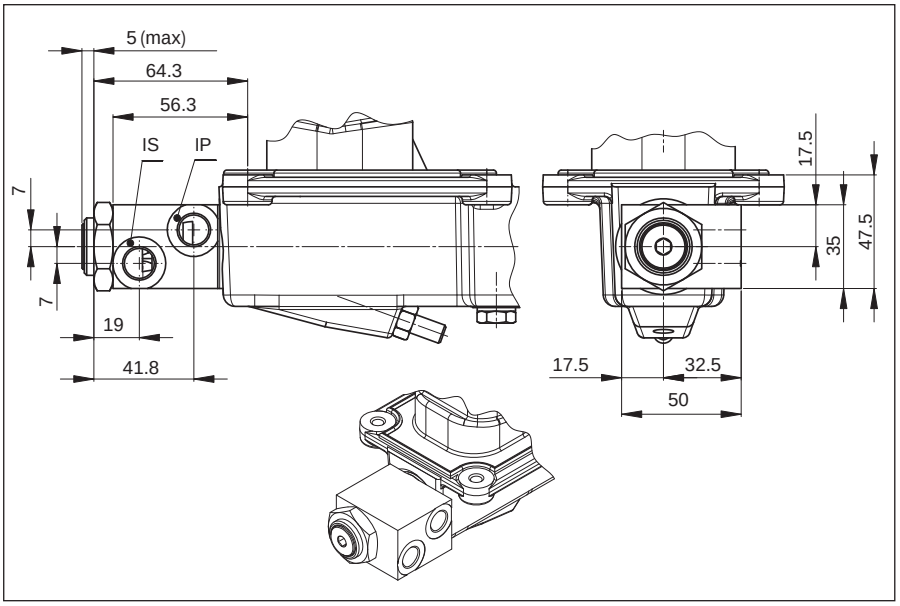
DESCRIPTION

The purpose of this valve is to modulate the driving power of the transmission, by means of the brake pedal. (for hydraulically controlled transmissions).

The valve conveys the signal oil from the transmission "IP" to tank "IS" in a manner proportional to the pedal stroke. With pedal not applied the transmission gives the maximum force. By pressing the pedal the transmission force is firstly gradually reduced, then the brake pressure is gradually increased. The inching valve can be adjusted to obtain the desired "cross" between transmission force and brake force. The valve will be supplied with the inching valve set as defined by the customer.

HYDRAULIC SCHEMATIC





IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
IP	Inching LINE	M14x1.5 DIN 3852-1X	M14x1.5 DIN 3852-1X	M14x1.5 DIN 3852-1X
IS	Tank	M14x1.5 DIN 3852-1X	M14x1.5 DIN 3852-1X	M14x1.5 DIN 3852-1X

03.05 - POS. 5 | **S** | **LINEAR POTENTIOMETER FOR INCHING PILOTING**

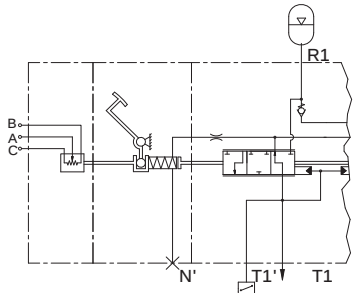
DESCRIPTION

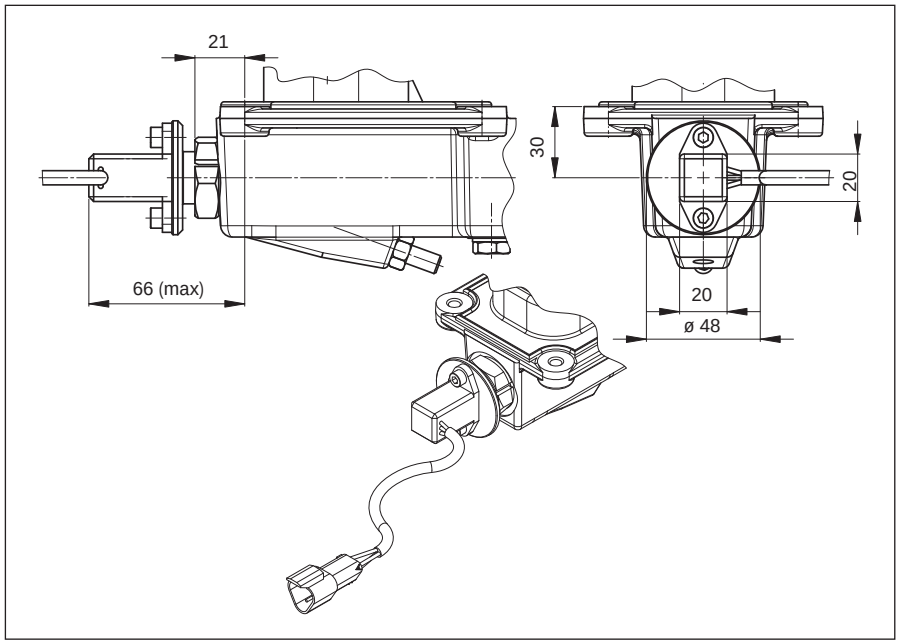
A linear potentiometer could be installed to provide a signal for electrically controlled transmissions and to give the inching function.
The Linear potentiometer works in the first part of the pedal stroke, when the inching function must be controlled.

TECHNICAL FEATURES

Resitance varies from 0 ohms (with a foot rest) to 5Kohm with pedal operating.
Connector: DEUTSCH DT04-3P
A: Red wire (Wiper)
B: Yellow wire (Full extended)
C: Green wire (Full retracted)

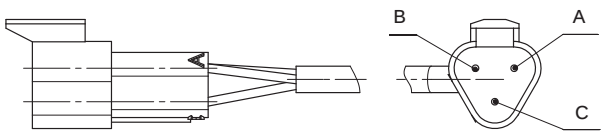
HYDRAULIC SCHEMATIC





IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
IP	Inching LINE	M14x1.5 DIN 3852-1X	M14x1.5 DIN 3852-1X	M14x1.5 DIN 3852-1X
IS	Tank	M14x1.5 DIN 3852-1X	M14x1.5 DIN 3852-1X	M14x1.5 DIN 3852-1X

CONNECTOR DRAWING



DEUTSCH DT04-3P
CONNECTOR

03.05 - POS. 5 | **H** | **ROTARY SENSOR FOR INCHING PILOTING**

DESCRIPTION

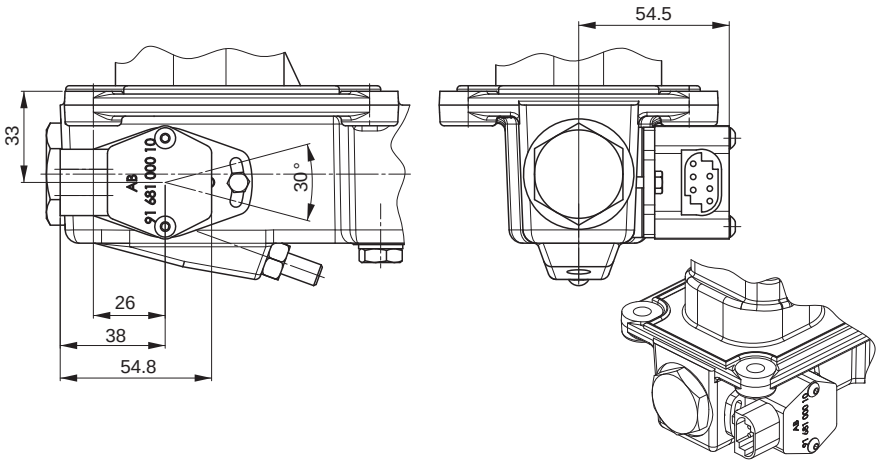
A rotary Hall effect sensor detects the piston stroke and it is able to provide a voltage signal proportional to the pedal stroke.
The sensor position can be registered to advance or delay the inching intervention compared to the brake action.

The sensor can be supplied pre-setted, in this case must be listed in the note of the data sheet the output value that we must have with a brake pedal in a released position.

Standard mounting allows the use of several sensor types (Hall effect / potentiometer, single / double signals).

Rotary sensors can also be used in combination with:

- Reverse modulating valve type (position 1 "K")
- Inching valve
- Work brake cylinder



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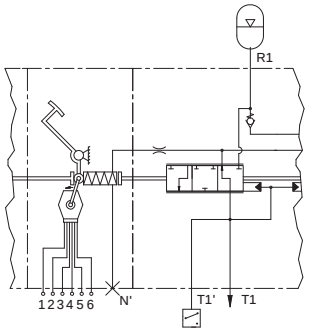
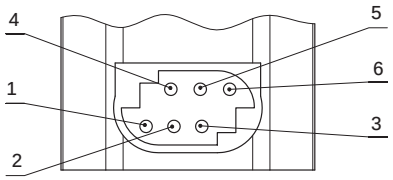


SENSOR TECHNICAL SHEET:

CODE	CONSTRUCTOR	WORK ANGLE (°)	OUTPUT		CONNECTOR TYPE	SAFETY TIPE
			Signal 1	Signal 2		
MO16722	ELOBAU	±35° (70°)	Current 4-20mA	-	AMP Micro Quadlok	IP 67
MO16796	ELOBAU	±35° (70°)	Current 4-20mA	Current 4-20mA	AMP Micro Quadlok	IP 67
MO16507	AB Electronic	±45° (90°)	Voltage 0.5-4.5V	Voltage 0.5-4.5V	AMP Micro Quadlok	IP 67
MO15508	AB Electronic	±45° (90°)	Voltage 0.5-4.5V	-	AMP Micro Quadlok	IP 67
MO16834	AB Electronic	±60° (120°)	Voltage 0.5-4.5V	Voltage 0.3-4.3V	AMP Micro Quadlok	IP 67

CONNECTOR DRAWING



AMP Connector
Micro Quadlok

PIN LAYOUT

Signal 1	Signal 2
1: +	5: +
2: -	6: -
4: OUT	3: OUT

03.06 POSITION 6 - CHECK VALVE

Item 6 of the technical file defines the type of separation between brake circuits and the accumulator dedicated to the solenoid valve for parking brake.

Item n°6 be:
N : Without check valve
S : With check valve in each brake module
B : With selection of the most fill accumulator
V : Park brake accumulator check valve
T : With check valve in each brake module + park brake accumulator check valve
P : With selection of the most fill accumulator + park brake accumulator check valve
- : Not definable feature

03.06 - POS. 6 | N | WITHOUT CHECK VALVE

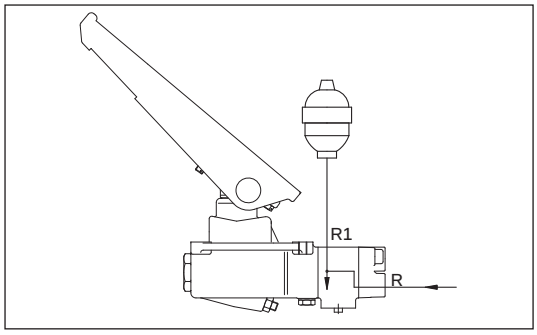
SINGLE CIRCUIT WITHOUT CHARGING VALVE

It is used for one-brake circuits where the accumulator charging valve does not supply other services and does not have a second accumulator.

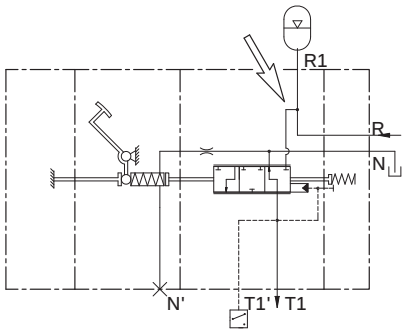
A check valve does not protect the accumulator used to feed the brake; a potential break down on the supply line determines the impossibility to perform any brake function.

1	2	3	4	5	6	7	8	9	10
O		**1**	**N**		N			**-**	

SEMPLIFY SCHEDULE



HYDRAULIC SCHEMATIC

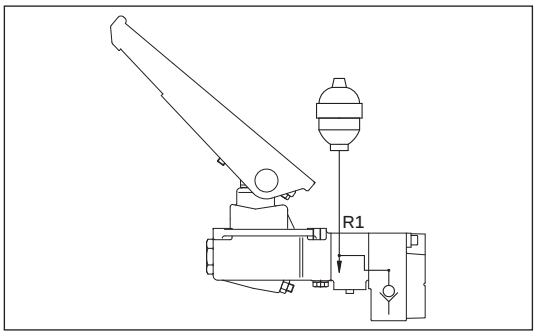


SINGLE CIRCUIT WITH CHARGING VALVE

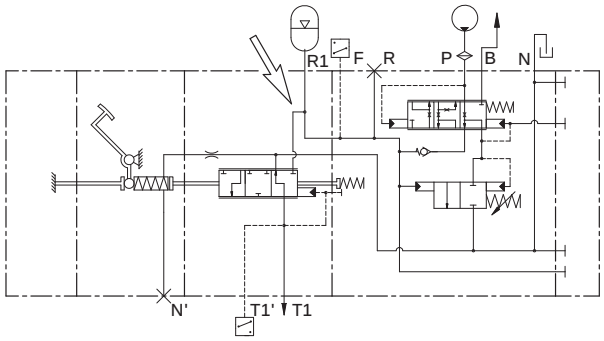
It is used for one brake circuits where the accumulator charging valve does not supply services outside the brake system.
The accumulator used to feed the brake is protected by a check valve embedded into the charging valve and do not require a specific check valve on the module.

1	2	3	4	5	6	7	8	9	10
O		**1**	**F**		N			**-**	

SEMPLIFY SCHEDULE



HYDRAULIC SCHEMATIC

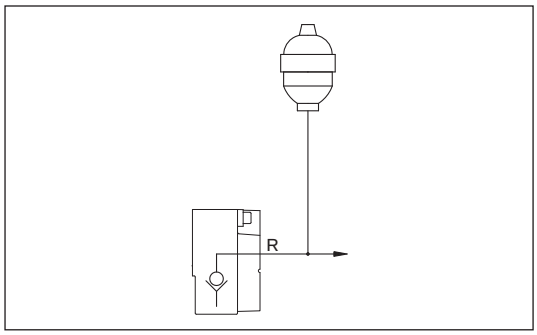


IN LINE ACCUMULATOR CHARGING VALVE

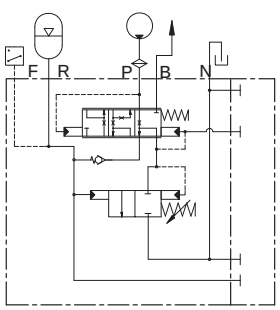
It is used to create a reserve of energy in the form of under pressure oil stored in an accumulator to supply closed centre services. Concerning charging valves that are not assembled in a S6 brake system, item N is referred to the check valve specifically used to protect the accumulator used to feed the parking brake.

1	2	3	4	5	6	7	8	9	10
L	**-**	**-**	**F**	**-**	N	**-**	**-**	**-**	

SEMPLIFY SCHEDULE



HYDRAULIC SCHEMATIC

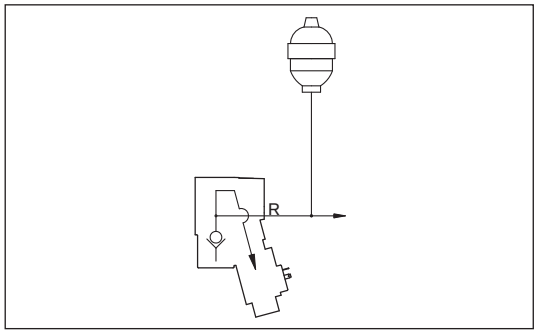


IN LINE ACCUMULTOR CHARGING VALVE AND SOLENOID VALVE FOR PARKING BRAKE

Check valves are not normally used with single circuit brake valves , because just one accumulator can feed the valve.
This solution can also be used in system with more circuits (i.e. one brake circuit plus one 3-ways solenoid valve for the parking brake), where no one circuit has to be protected from the other circuits.

1	2	3	4	5	6	7	8	9	10
L	**-**	**-**	**F**	**-**	N	**-**	**3**	**-**	

SEMPLIFY SCHEDULE



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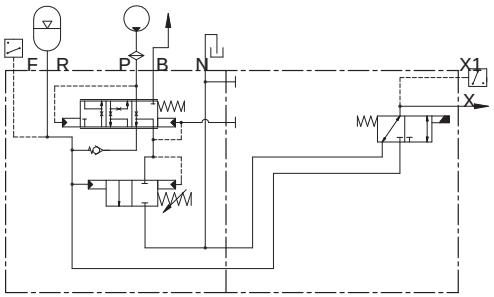


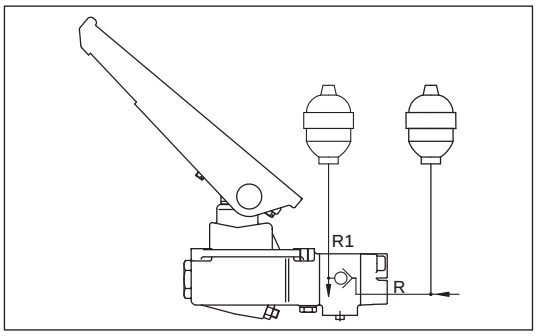
03.06 - POS. 6 | S | WITH CHECK VALVE IN EACH BRAKE MODULE

SINGLE CIRCUIT WITHOUT CHARGING VALVE

It is used for single brake circuits where the accumulator charging valve feeds also other services and it is considered necessary to isolate the power brake circuit. The accumulator dedicated to feed the brake is protected by a special check valve; a potential break on the line of power does not impact on the accumulator that remains still full, allowing some brakes.

1	2	3	4	5	6	7	8	9	10
O		**1**	**N**		S			**-**	

SEMPLIFY SCHEDULE



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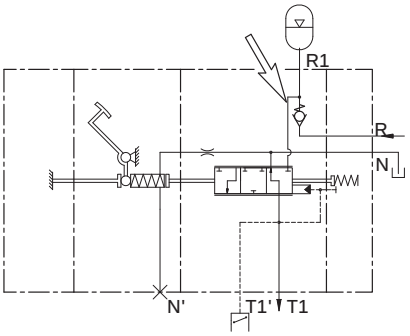


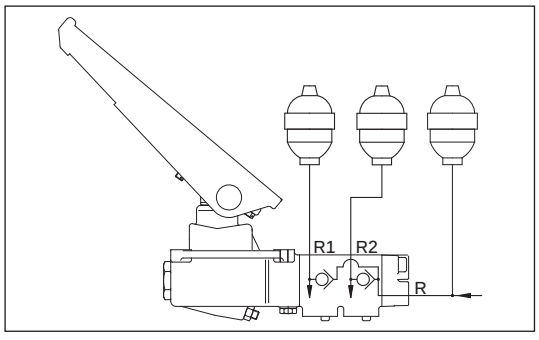
DOUBLE CIRCUIT WITHOUT CHARGING VALVE

It is used for double brake circuits where the brake accumulator charging valve feeds also other services and it is considered necessary to isolate the power brake circuits.

The accumulators dedicated to feed the brake are protected by specific unidirectional valve; a potential break on the line of power does not impact on the accumulator that remains still full, allowing some brakes.

1	2	3	4	5	6	7	8	9	10
O		**2**	**N**		S			**-**	

SEMPLIFY SCHEDULE



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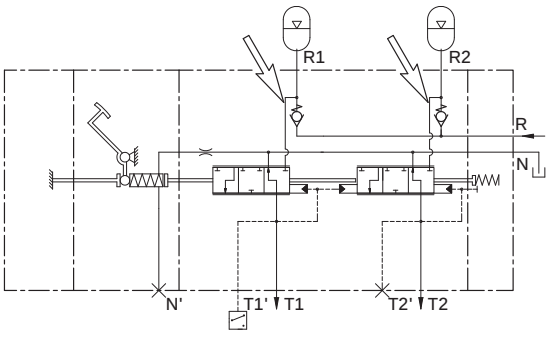
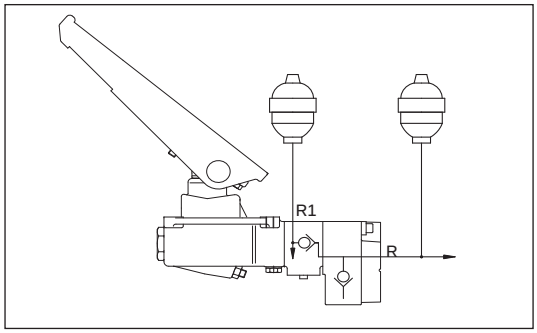


SINGLE CIRCUIT WITH CHARGING VALVE

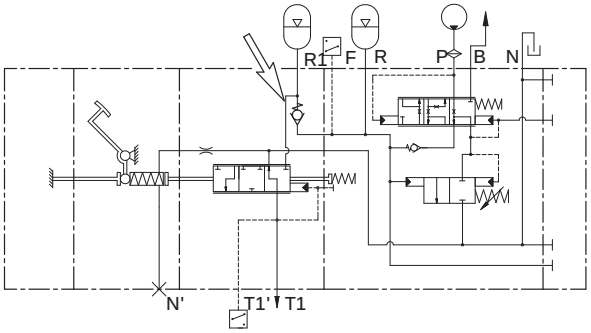
It is used for single brake circuits where the charging valve accumulator feeds also other services and it is considered necessary to isolate the power supply circuit brake.
The accumulator dedicated to feed the brake is protected by a special check valve; a potential break on the line that feeds the external services do not affect on the accumulator that remains powerful, allowing some brakes.

1	2	3	4	5	6	7	8	9	10
O		**1**	**F**		S			**-**	

SEMPLIFY SCHEDULE



HYDRAULIC SCHEMATIC

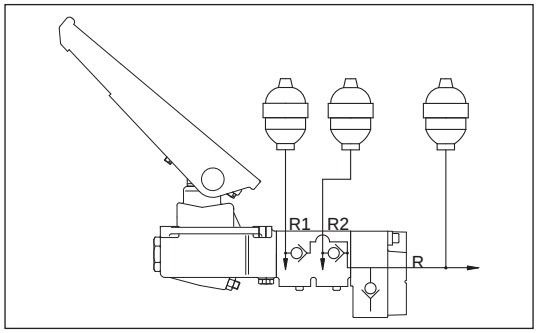


DOUBLE CIRCUIT WITH CHARGING VALVE

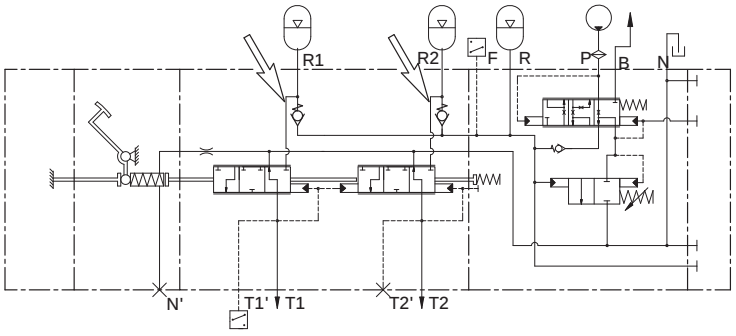
It is used for double brake circuits where the charging valve accumulator feeds also other services and it is considered necessary to isolate the power supply circuit brake.
The accumulators dedicated to feed the brake are protected by a special check valve; a potential break on the line that feeds the external services do not affect on accumulators that remain powerful, allowing some brakes.

1	2	3	4	5	6	7	8	9	10
O		**2**	**F**		S			**-**	

SEMPLIFY SCHEDULE



HYDRAULIC SCHEMATIC

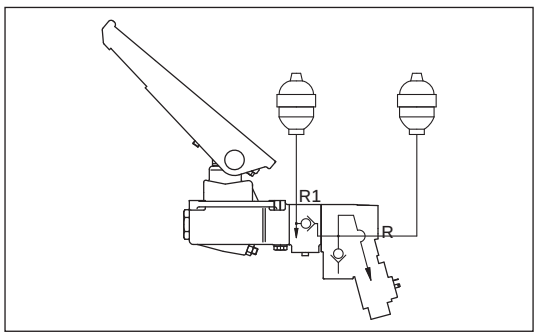


SINGLE CIRCUIT WITH CHARGING VALVE AND SOLENOID VALVE FOR PARKING BRAKE

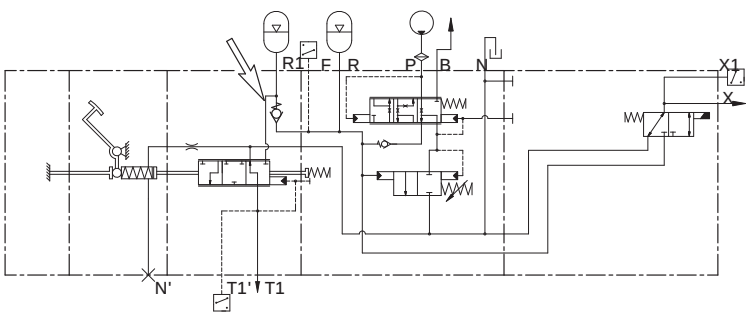
It is used for single brake circuits where the charging valve accumulator does not feed also other external services but it is provided with a 3-way solenoid valve to release the negative parking brake.
The accumulator dedicated to feed the brake is protected by a special check valve; the main accumulator instead feeds the parking brake without specific protection.

1	2	3	4	5	6	7	8	9	10
O		**1**	**F**		S			**3**	

SEMPLIFY SCHEDULE



HYDRAULIC SCHEMATIC



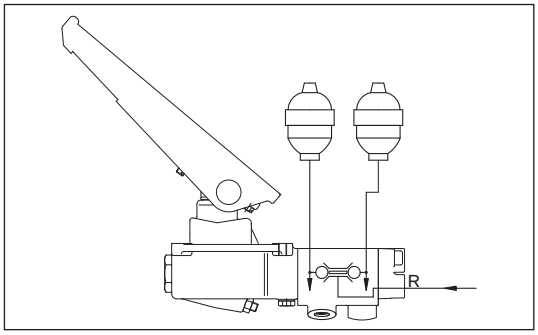
03.06 - POS. 6 | **B** | **WITH SELECTION OF THE MOST FILL ACCUMULATOR**

DOUBLE CIRCUIT WITHOUT CHARGING VALVE

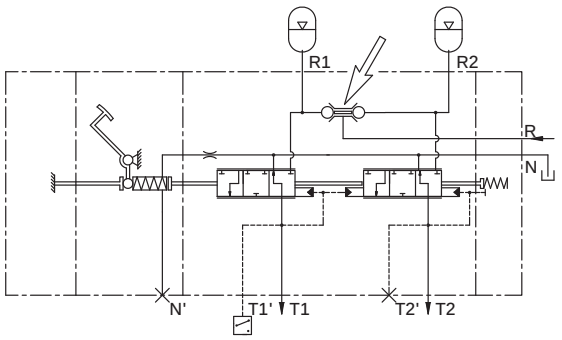
The balancing valve helps to keep the lower pressure accumulator connected with the feed line of the charging valve, while the higher pressure one is protected by a check valve.
Used for double circuits brake systems where the S6 brake system is feed by an external charging valve without need to place a third accumulator.
The accumulators used to feed the brake are protected by a balancing valve; a potential break on the power line determines the loss of one of the two circuits while the higher pressure accumulator at the time of the collapse remains still in charge allowing some brake operations.

1	2	3	4	5	6	7	8	9	10
O		**2**	**N**		B			**-**	

SEMPLIFY SCHEDULE



HYDRAULIC SCHEMATIC

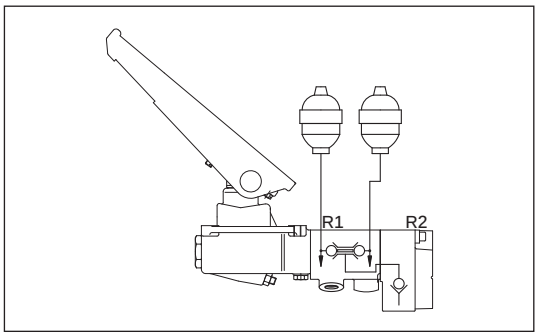


DOUBLE CIRCUIT WITH CHARGING VALVE

The balancing valve helps to keep the lower pressure accumulator connected with the feed line of the charging valve, while the higher pressure one is protected by a check valve.
Used for double circuits brake systems where there is no need to put a third accumulator.
The accumulators used to feed the brake are protected by a balancing valve and by the internal check valve of the accumulator charging valve.

1	2	3	4	5	6	7	8	9	10
O		**2**	**F**		B			**-**	

SEMPLIFY SCHEDULE



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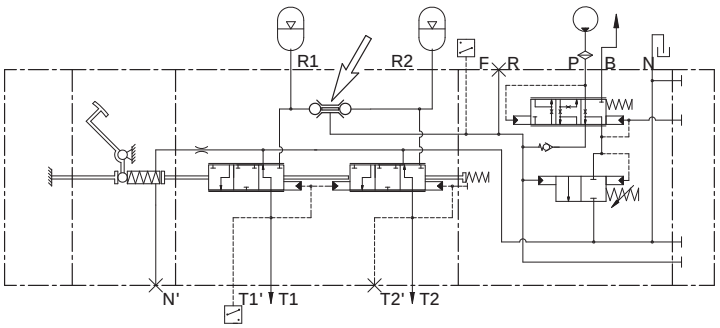
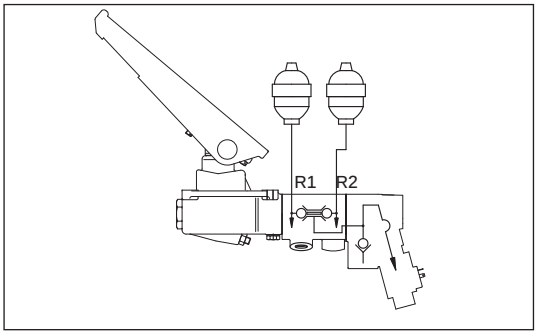


DOUBLE CIRCUIT WITH CHARGING VALVE AND SOLENOID VALVE FOR PARKING BRAKE

The balancing valve helps to keep the lower pressure accumulator connected with the feed line of the charging valve, while the higher pressure one is protected by a check valve.
Used for double circuits brake systems where there is no need to put a third accumulator.
The accumulators used to feed the brake are protected by a balancing valve, the parking brake is fed by the lowest pressure brake accumulator. In case of supply line failure of the parking brake, the vehicle loose also one of the two braking circuits, but it is still possible to perform some brake operations with the circuit that at the time of failure had the higher pressure accumulator.

1	2	3	4	5	6	7	8	9	10
O		**2**	**F**		B			**3**	

SEMPLIFY SCHEDULE



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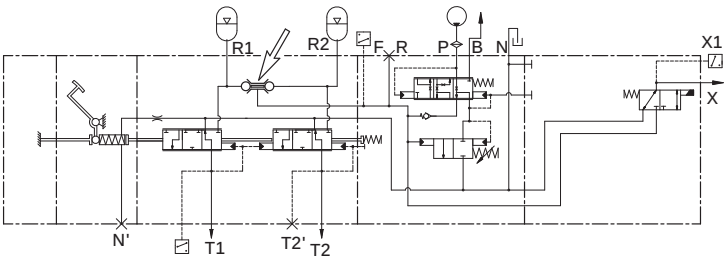


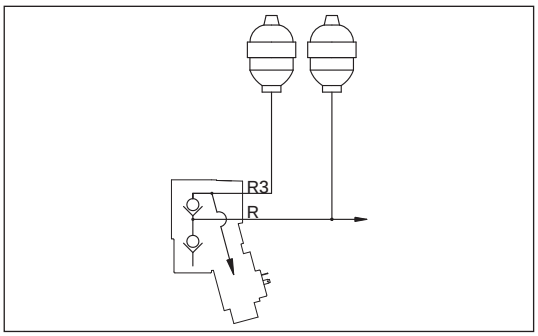
03.06 - POS. 6 | **V** | **PARK BRAKE ACCUMULATOR CHECK VALVE**

IN LINE ACCUMULATOR CHARGING VALVE AND SOLENOID VALVE FOR PARKING BRAKE

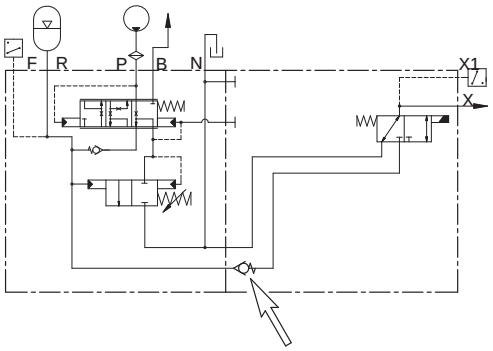
It is used to create a reserve of energy in the form of under pressure oil stored in an accumulator to feed closed centre services.
For charging valves that are not assembled in a S6 brake system item V is referred to the one way valve used to protect the accumulator in charge to feed the parking brake.

1	2	3	4	5	6	7	8	9	10
L	**-**	**-**	**F**	**-**	V	**-**	**-**	**3**	**-**

SEMPLIFY SCHEDULE



HYDRAULIC SCHEMATIC



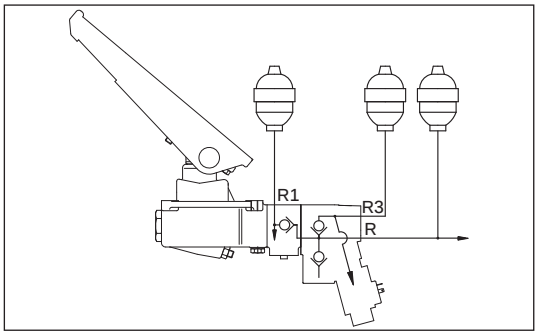
03.06 - POS. 6 | **T** | **WITH CHECK VALVE IN EACH BRAKE MODULE+PARK BRAKE ACCUMULATOR CHECK VALVE**

SINGLE CIRCUIT WITH CHARGING VALVE AND SOLENOID VALVE FOR PARKING BRAKE

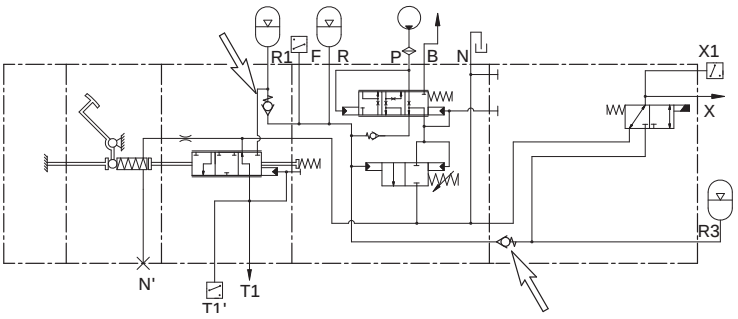
It is used for single circuits brake systems where the accumulator charging valve can feed external services and is provided with a 3-way solenoid valve to release the negative parking brake.
The accumulator used to feed the brake system and the one dedicated to the negative brake are both protected by a specific check valve.

1	2	3	4	5	6	7	8	9	10
O		**1**	**F**	**-**	T	**-**	**-**	**3**	**-**

SEMPLIFY SCHEDULE



HYDRAULIC SCHEMATIC

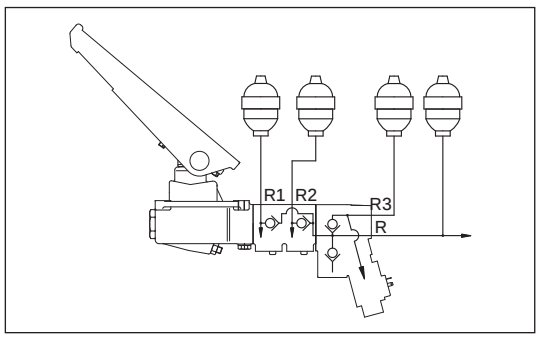


DOUBLE CIRCUIT WITH CHARGING VALVE AND SOLENOID VALVE FOR PARKING BRAKE

It is used for double circuits brake systems where the accumulator charging valve can feed external services and is provided with a 3-way solenoid valve to release the negative parking brake.
Accumulators used to feed the brake system and the one dedicated to the negative brake are both protected by a specific check valve.

1	2	3	4	5	6	7	8	9	10
O		**2**	**F**		T			**3**	

SEMPLIFY SCHEDULE



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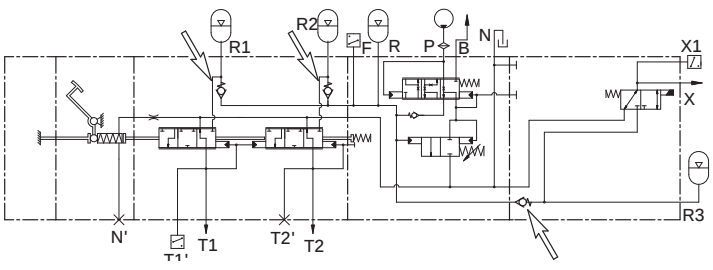


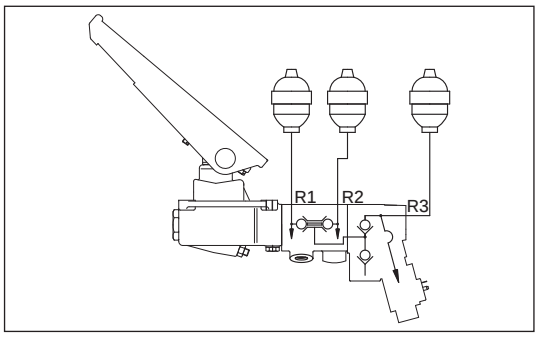
03.06 - POS. 6 | **P** | **WITH SELECTION OF THE MOST FILL ACCUMULATOR + PARK BRAKE ACCUMULATOR CHECK VALVE**

DOUBLE CIRCUIT WITH CHARGING VALVE AND SOLENOID VALVE FOR PARKING BRAKE

The balancing valve helps to keep the lowest pressure accumulator connected with the feed line of the charging valve, while the higher pressure one is protected by a check valve.
Used for double circuits brake systems where there is no need to put a third accumulator.
The accumulators used to feed the brake are protected by a balancing valve, the parking brake is fed by a specific accumulator protected by a check valve.
In case of supply line failure of the parking brake, the vehicle loose also one of the two braking circuits, but it is still possible to perform some brake operations with the circuit that at the time of failure had the higher pressure accumulator.

1	2	3	4	5	6	7	8	9	10
O		**2**	**F**		P			**3**	**-**

SEMPLIFY SCHEDULE



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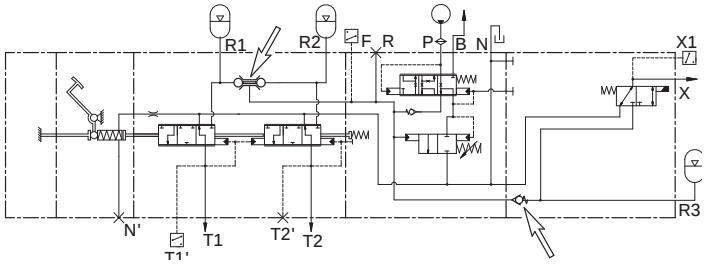


03.07 POSITION 7 - PEDAL SUPPORT DRAIN

The springs package area is in oil bath connected to tank, in order to prevent corrosion and improve his life.

In the same support the springs package area can be connected to tank by a separated external drainage.

SUPPORT TYPE: HORIZONTAL (O) AND VERTICAL (V) SUPPORT

DRAINAGE TYPE	ITEM 7 OF THE SHEET	
Internal (standard)	C	
External	E	Contact Safim for further informations

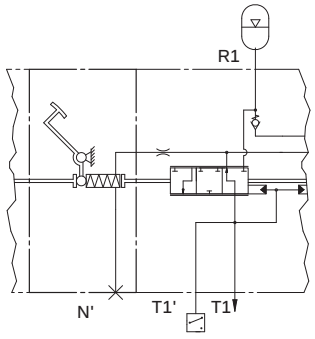
OTHER SUPPORT

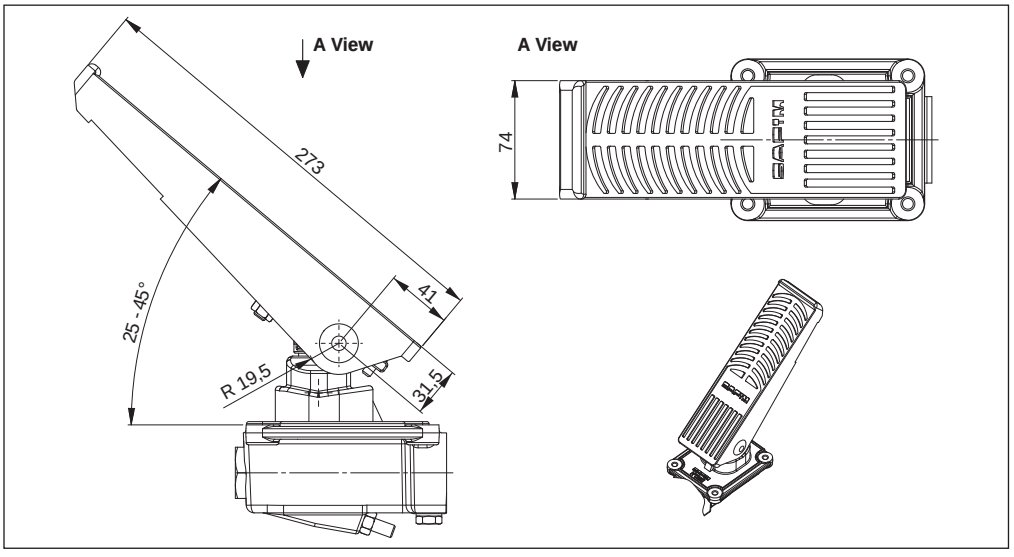
DRAINAGE TYPE	ITEM 7 OF THE SHEET	
Internal	I	

03.08 POSITION 8 - PEDAL TYPE

03.08 - POS. 8 | **N** | **PEDAL WITH RUBBER PROTECTION (STANDARD)**

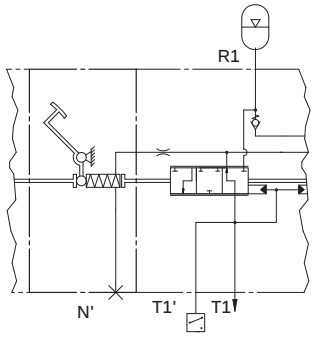
HYDRAULIC SCHEMATIC

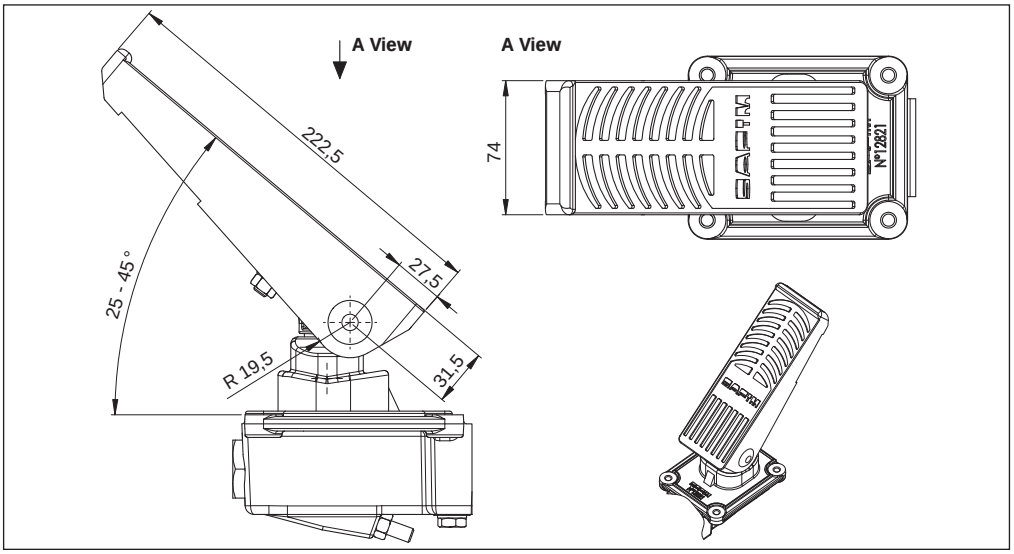




03.08 - POS. 8 | C | SHORT PEDAL WITH RUBBER PROTECTION

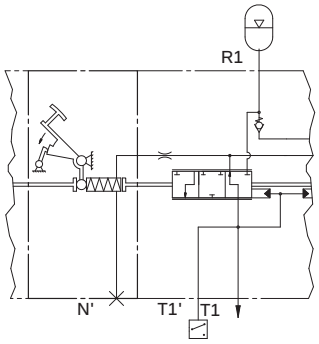
HYDRAULIC SCHEMATIC

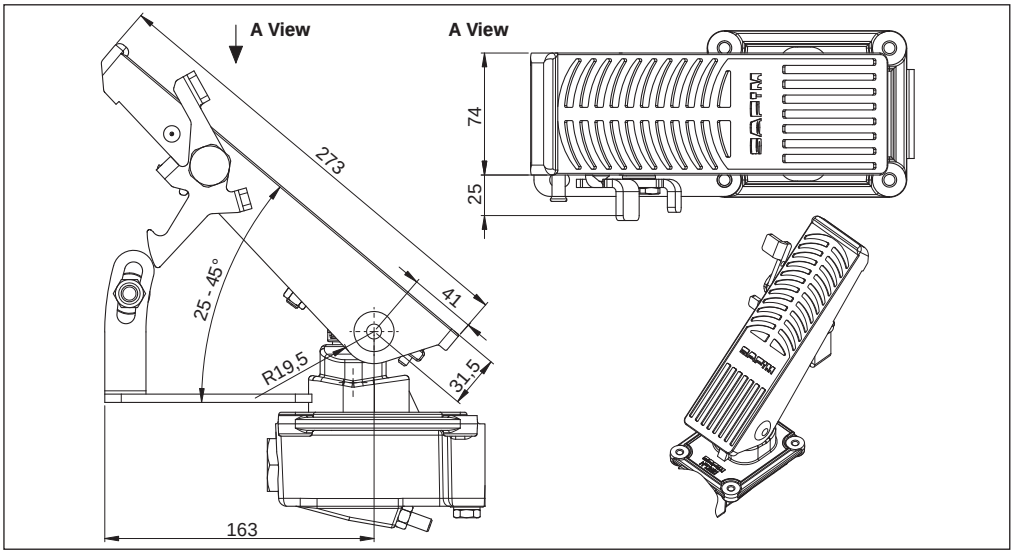




03.08 - POS. 8 | H | PEDAL WITH RUBBER PROTECTION AND LATCH

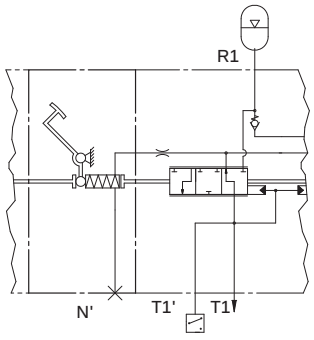
HYDRAULIC SCHEMATIC

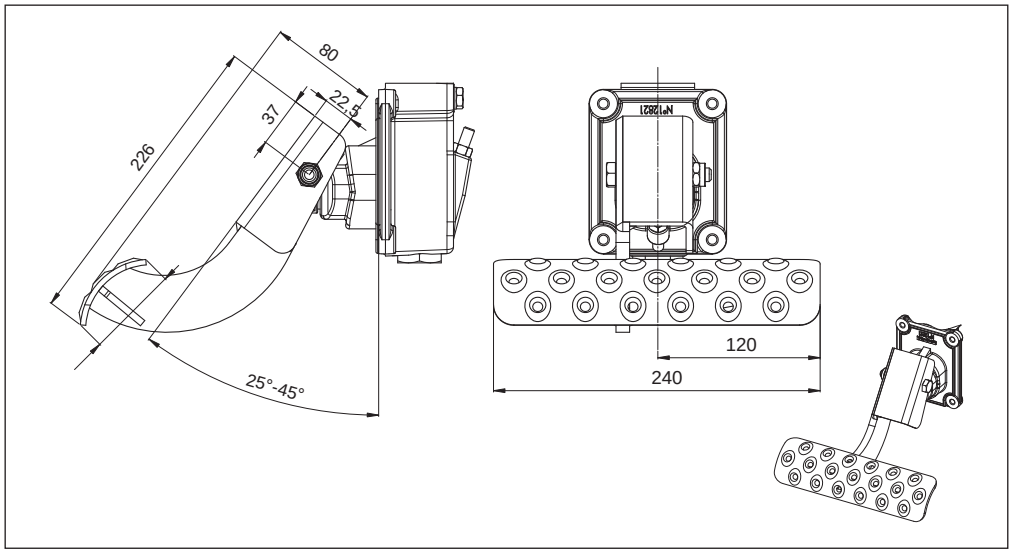




03.08 - POS. 8 | F | FIREWALL MOUNTING PEDAL

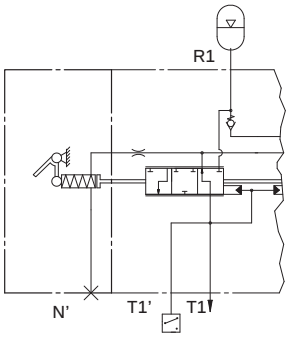
HYDRAULIC SCHEMATIC

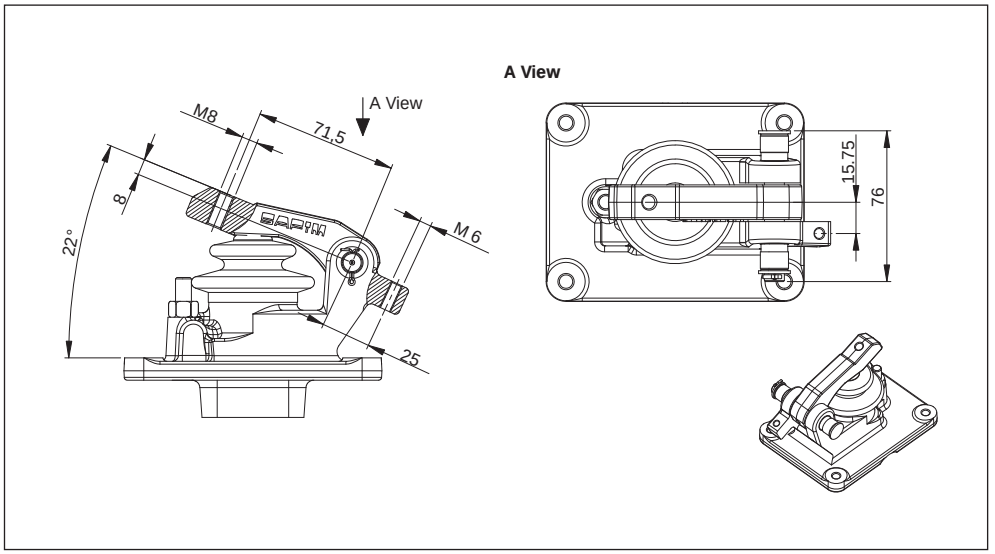




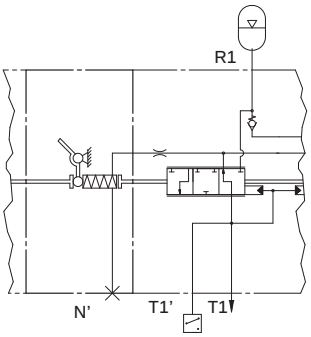
03.08 - POS. 8 | S | WITHOUT PEDAL, WITH LEVER

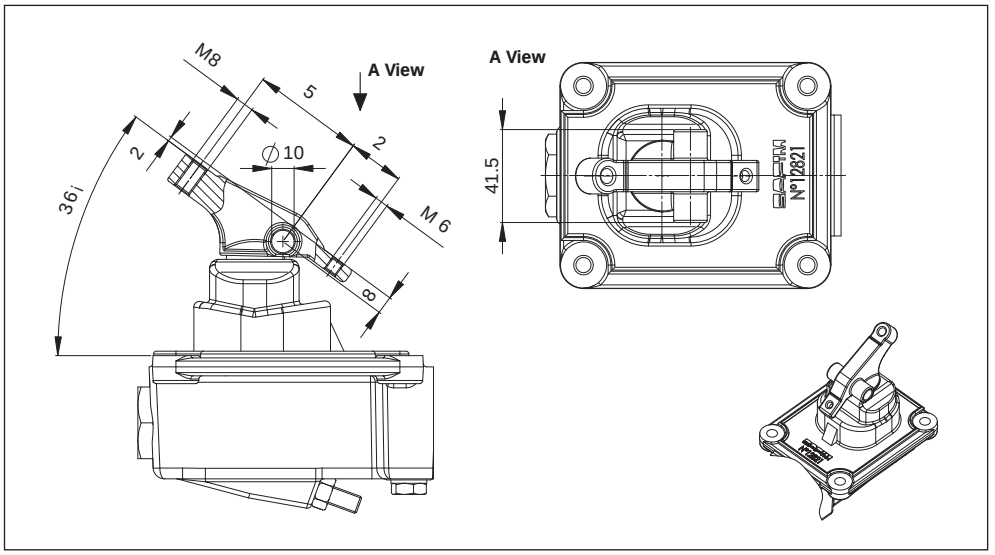
HYDRAULIC SCHEMATIC





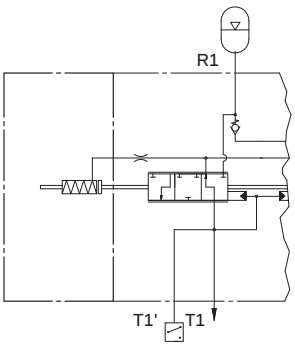
HYDRAULIC SCHEMATIC

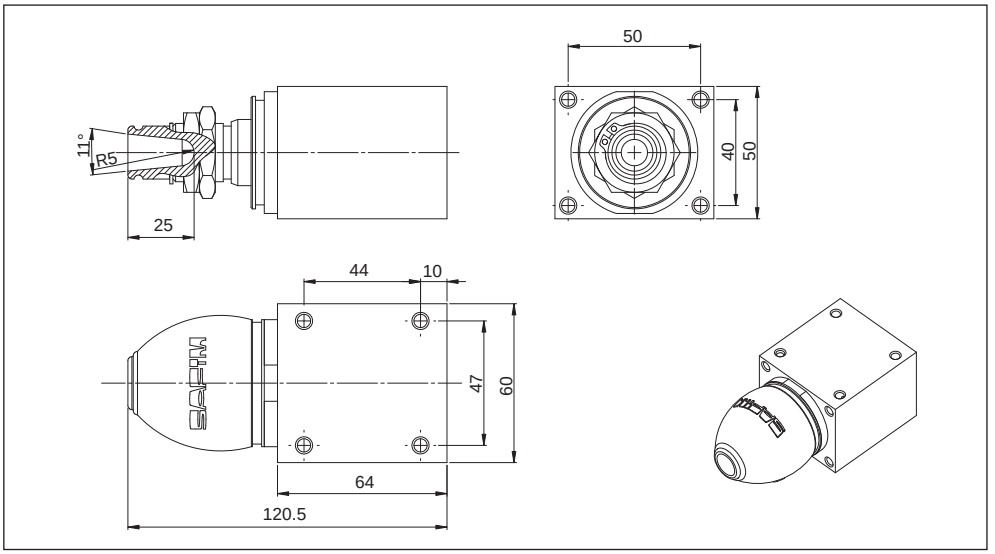




03.08 - POS. 8 | I | WITHOUT PEDAL, WITH PUSH-ROD

HYDRAULIC SCHEMATIC





03.09 POSITION 9 - SOLENOID VALVES-REDUCING PRESSURE VALVE

DESCRIPTION

The function code position 9 defines the solenoid valves and the pressure reduction valve integrated on the accumulator charging valve.

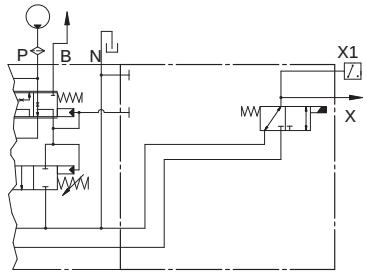
The function code position 9 can be:
3 : 3 way solenoid valve
R : 3 way solenoid valve + reducing pressure valve
6 : 2x 3 way solenoid valve
X : 2x 3 way solenoid valve + reducing pressure valve
2 : Start unloading valve
5 : Start unloading valve + 3 way solenoid valve
8 : Start unloading valve + 2x 3 way solenoid valve
Y : Start unloading valve + 2x 3 way solenoid valve + reducing pressure valve
- : No solenoid valve present

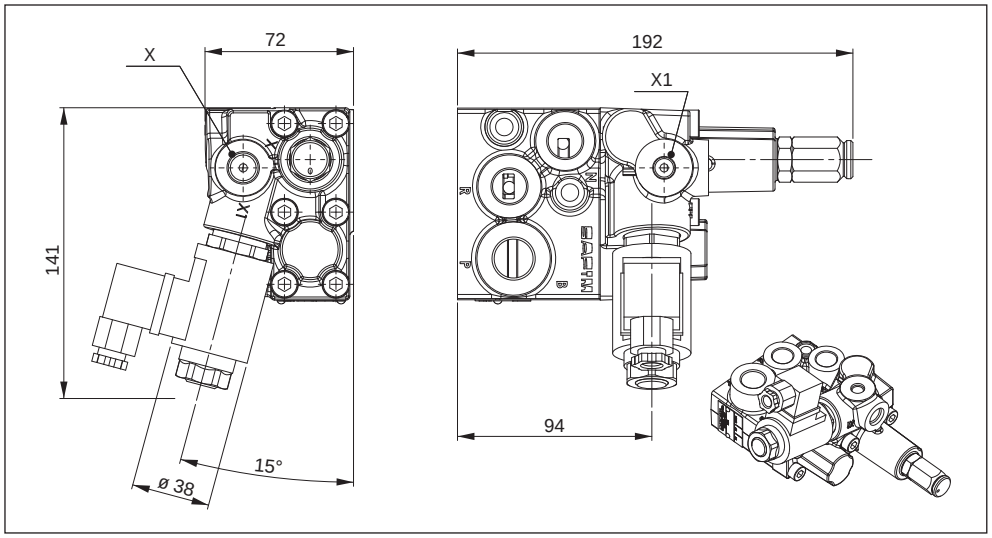
03.09 - POS. 9 | 3 | 3 WAY SOLENOID VALVE

DESCRIPTION

A 3-way solenoid valve is used to pilot the activation/release of the parking brake (spring applied), by using accumulator pressure. When the solenoid is not activated the brake is on.

HYDRAULIC SCHEMATIC





CONNECTIONS

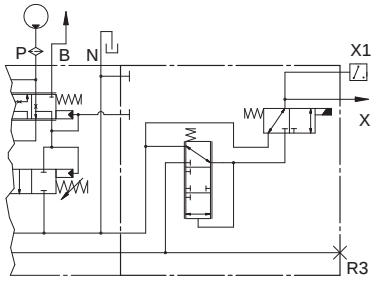
IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
X	Parking brake	M14x1.5 ISO 6149	M14x1.5 ISO 6149	9/16-18 UNF SAE J475
X1	Pressure switch	M10x1 ISO 6149	M10x1 ISO 6149	7/16-20 UNF SAE J475

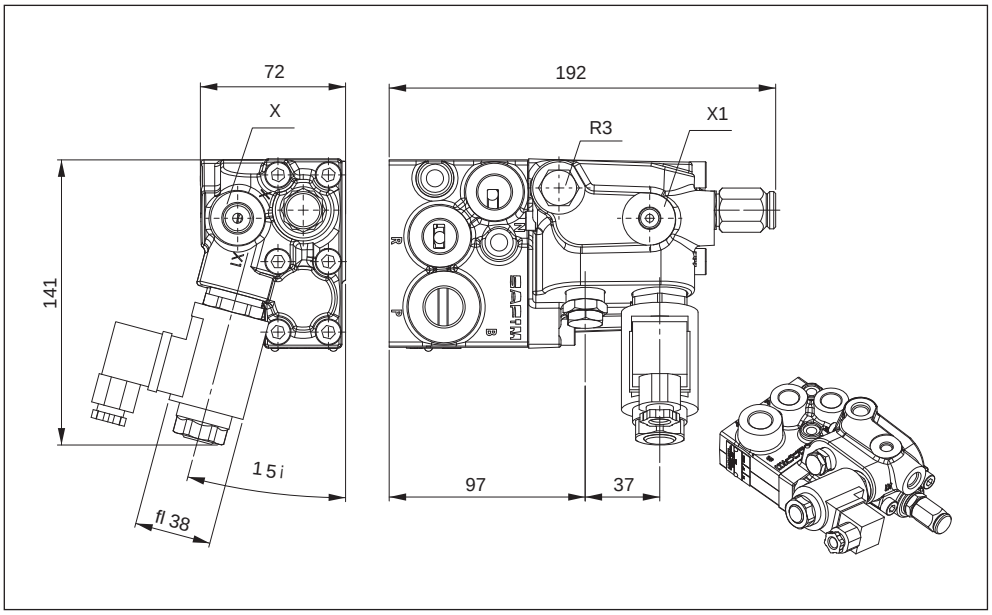
03.09 - POS. 9 | R | 3 WAY SOLENOID VALVE + PRESSURE REDUCING VALVE

DESCRIPTION

An integrated pressure reducing valve is used to feed the 3-way solenoid valve to pilot the parking brake. This option is used when the accumulator pressure is too high for parking brake release, so the pressure reducing valve feeds the 3-way solenoid valve with a pressure level accepted by the parking brake. Usually one accumulator is installed for parking brake purpose only.

HYDRAULIC SCHEMATIC





CONNECTIONS

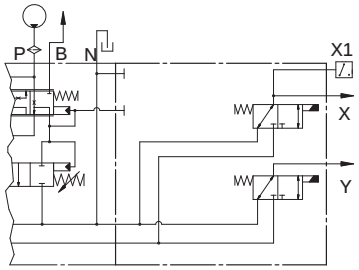
IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
X	Parking brake	M14x1.5 ISO 6149	M14x1.5 ISO 6149	9/16-18 UNF SAE J475
X1	Pressure switch	M10x1.0 ISO 6149	M10x1.0 ISO 6149	7/16-20 UNF SAE J475
R3	Accumulator	M14x1.5 ISO 6149	M14x1.5 ISO 6149	9/16-18 UNF SAE J475

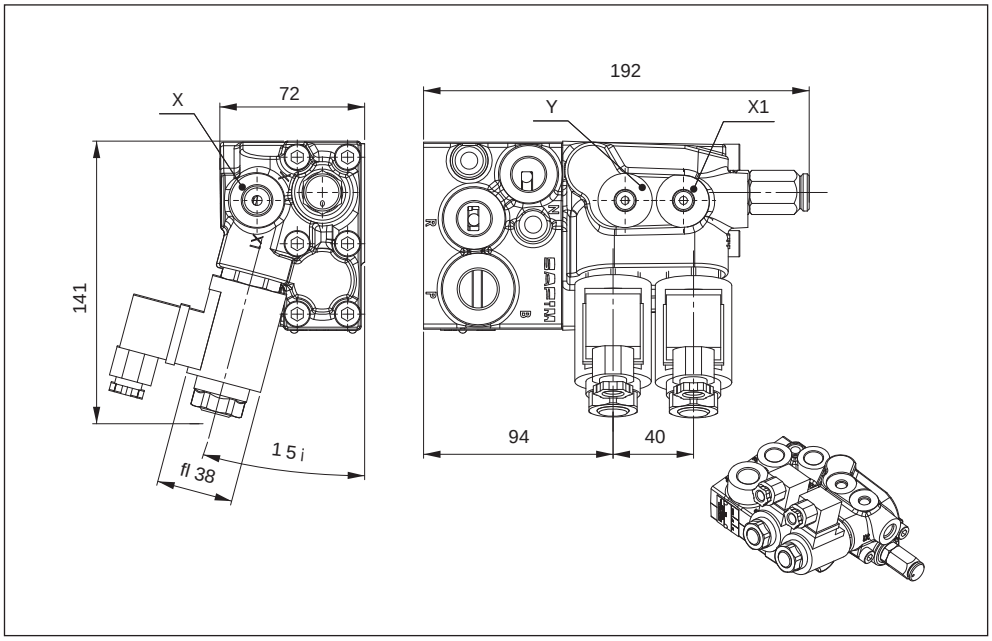
03.09 - POS. 9 | 6 | 2X 3 WAY SOLENOID VALVE

DESCRIPTION

Two 3-way solenoid valves are installed, fed by the accumulator pressure. Usually this solution is used to pilot the parking brake with one valve, and to electrically activate the service brake by piloting a work brake cylinder with the other (see Position 5 and 20).

HYDRAULIC SCHEMATIC





CONNECTIONS

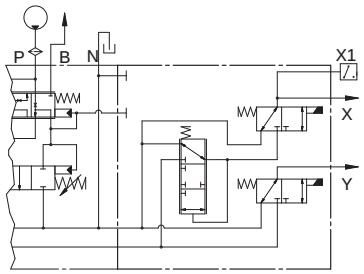
IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
X	Parking brake	M14x1.5 ISO 6149	M14x1.5 ISO 6149	9/16-18 UNF SAE J475
X1	Pressure switch	M10x1 ISO 6149	M10x1 ISO 6149	7/16-20 UNF SAE J475
Y	Working brake	M10x1 ISO 6149	M10x1 ISO 6149	7/16-20 UNF SAE J475

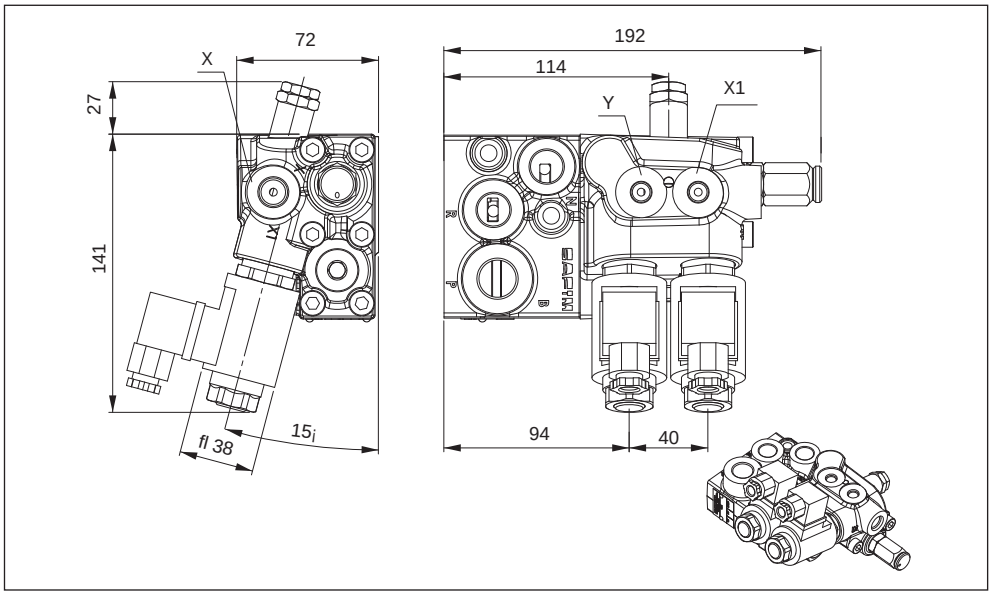
03.09 - POS. 9 | X | 2X 3 WAY SOLENOID VALVE + PRESSURE REDUCING VALVE

DESCRIPTION

As above, with the difference that the second 3-way solenoid valve is fed by a pressure reducing valve. It is used in place of the above solution when the parking brake needs a reduced pressure compared to the accumulator pressure.

HYDRAULIC SCHEMATIC





CONNECTIONS

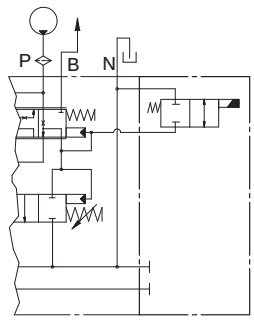
IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
X	Parking brake	M14x1.5 ISO 6149	M14x1.5 ISO 6149	9/16-18 UNF SAE J475
X1	Pressure switch	M10x1 ISO 6149	M10x1 ISO 6149	7/16-20 UNF SAE J475
Y	Working brake	M10x1 ISO 6149	M10x1 ISO 6149	7/16-20 UNF SAE J475

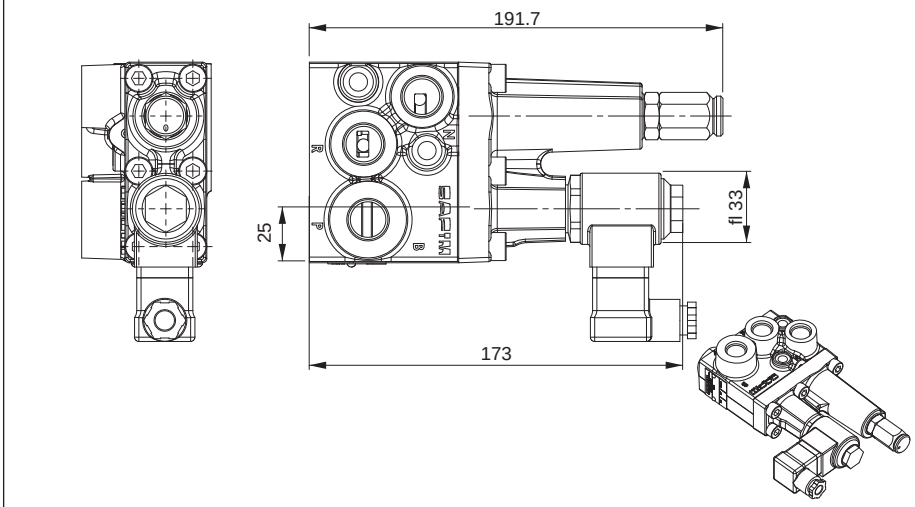
03.09 - POS. 9 | **2** | **START UNLOADING VALVE**

DESCRIPTION

A 2-way solenoid valve is installed with the function of inhibiting the accumulator automatic recharge while the solenoid is activated. This is used to inhibit the accumulator recharge during engine start-up, to avoid overloading of the starter motor.
This is useful in cold climes and in cases where a large displacement gear pump feeds the accumulator charging valve.

HYDRAULIC SCHEMATIC





CONNECTIONS

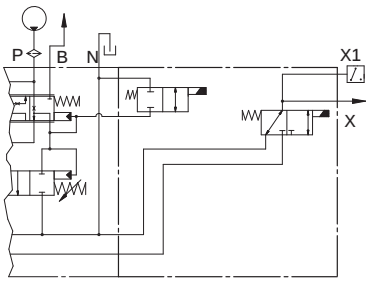
IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
X	Parking brake	M14x1.5 ISO 6149	M14x1.5 ISO 6149	9/16-18 UNF SAE J475
X1	Pressure switch	M10x1 ISO 6149	M10x1 ISO 6149	7/16-20 UNF SAE J475
Y	Working brake	M10x1 ISO 6149	M10x1 ISO 6149	7/16-20 UNF SAE J475

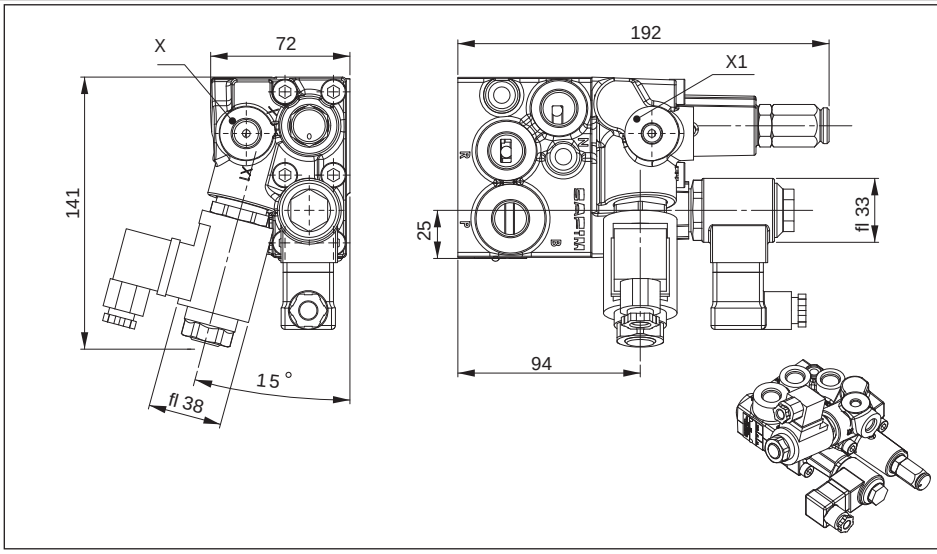
03.09 - POS. 9 | **5** | **START UNLOADING VALVE + 3 WAY SOLENOID VALVE**

DESCRIPTION

One 2-way plus one 3-way solenoid valves are installed for the start-unloading purpose, and to pilot a parking brake.

HYDRAULIC SCHEMATIC





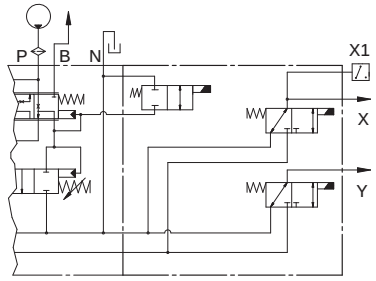
CONNECTIONS

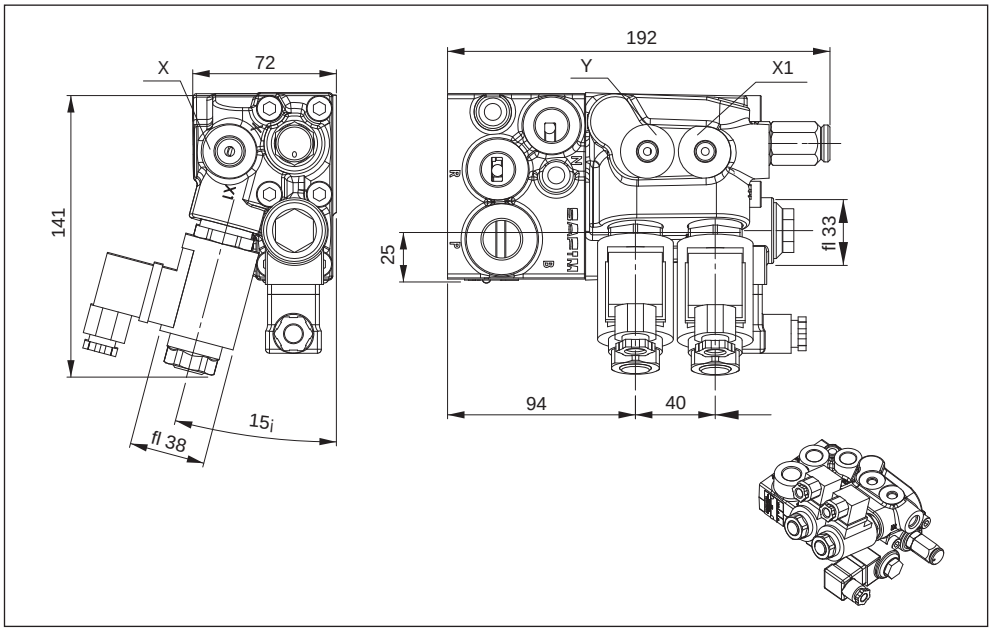
IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
X	Parking brake	M14x1.5 ISO 6149	M14x1.5 ISO 6149	9/16-18 UNF SAE J475
X1	Pressure switch	M10x1 ISO 6149	M10x1 ISO 6149	7/16-20 UNF SAE J475

03.09 - POS. 9 | **8** | **START UNLOADING VALVE + 2X 3 WAY SOLENOID VALVE**

DESCRIPTION
One 2-way plus two 3-way solenoid valves are installed for the start-unloading purpose, to pilot a parking brake, and to electrically activate the service brake.

HYDRAULIC SCHEMATIC





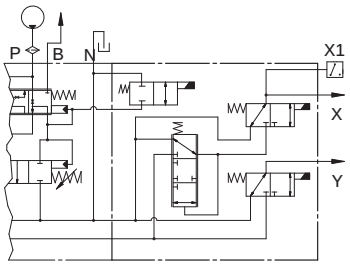
CONNECTIONS

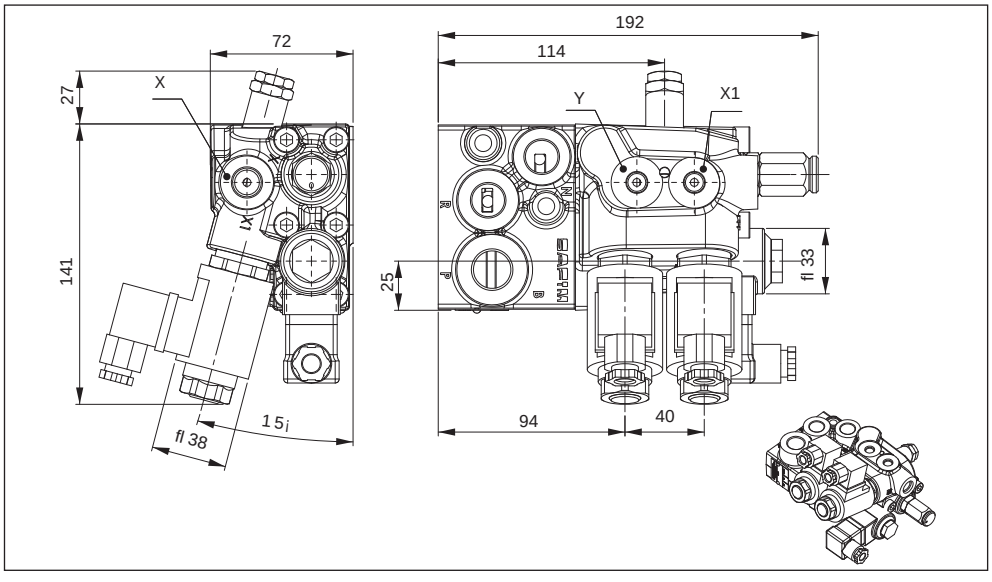
IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
X	Parking brake	M14x1.5 ISO 6149	M14x1.5 ISO 6149	9/16-18 UNF SAE J475
X1	Pressure switch	M10x1 ISO 6149	M10x1 ISO 6149	7/16-20 UNF SAE J475
Y	Working brake	M10x1 ISO 6149	M10x1 ISO 6149	7/16-20 UNF SAE J475

03.09 - POS. 9 | **Y** | **START UNLOADING VALVE + 2X 3 WAY SOLENOID VALVE + PRESSURE REDUCING VALVE**

DESCRIPTION
As above, with the difference that the second 3-way solenoid valve is fed by a pressure reducing valve. It is used instead of the above solution when the parking brake needs a reduced pressure compared to the accumulator pressure.

HYDRAULIC SCHEMATIC





CONNECTIONS

IDENTIFICATION	DESCRIPTION	THREADS TYPES (ITEM 10 OF THE SHEET)		
		M	I	S
X	Parking brake	M14x1.5 ISO 6149	M14x1.5 ISO 6149	9/16-18 UNF SAE J475
X1	Pressure switch	M10x1 ISO 6149	M10x1 ISO 6149	7/16-20 UNF SAE J475
Y	Working brake	M10x1 ISO 6149	M10x1 ISO 6149	7/16-20 UNF SAE J475

03.10 POSITION 10 - THREAD TYPE

Item 10 can be:
M: Metric Thread DIN 3852-1X and BSPP Thread DIN 3852-2X
I: Metric Thread ISO 6149
S: UNF Thread SAE J475
I+M: Metric thread ISO 6149 (brake modules ports), metric thread DIN 3852-1X and BSPP thread DIN 3852-2X (accumulator charging valve ports)
M+I: Metric thread DIN 3852-1X (brake modules ports), metric thread ISO 6149 (accumulator charging valve ports)
P: Personalised

03.11 POSITION 11 - FIRST CIRCUITS BRAKING PRESSURE (BAR)

The function code position 11 defines the brake pressure of the circuits from the first to the next to last.

03.12 POSITION 12 - LAST CIRCUIT BRAKING PRESSURE (BAR)

The function code position 12 defines the brake pressure of the last circuit. For S6 single circuit the value is not required " – ". Usually the brake pressure is the same in all the brake circuit. Some vehicles need different pressure in the systems, it is possible to use a different reaction area in the last circuit. This circuit is called "differential module". A differential module multiplies the pressure of the first module to a ratio obtained by the two areas.

Differential modules available:

MODULE DIAMETER (mm)	LAST MODULE RACTION DIAMETER (mm)	PRESSURE RATIO
10	6	2.8
10	7	2.0
10	8	1.6
14	7	4.0
14	8	3.1
14	9	2.4
14	10	2.0

Es: module diameter 14 mm, last module reaction diameter 9 mm, first circuit setting pressure at 50 bar.

Last circuit setting pressure: _____
50 * 2.4 = 120 bar

The first circuit pressure and the differential module are in a fixed relation, the operator cannot adjust separately the two settings.

The differential module has to be confirmed by Safim.

03.13 POSITION 13 - ACCUMULATOR CHARCHING VALVE CUT-IN PRESSURE (BAR)

For S6 provided with accumulator charging valve (pos.4 "F" or "V",) it defines the cut-in pressure. For S6 without charging valve is not required " – ".
The cut-in pressure should be chosen, together with accumulators volume, accumulator nitrogen pre-charge pressure, and pressure-switch setting, to guarantee an adequate supply of oil in case of lack of oil feeding.
Cut-in must be higher than the max brake pressures, the higher between pos. 11 and 12.
Cut-in must be choose in a way that cut-out pressure doesn't overtake the maximum system pressure, see position 14 for cut-in / cut-out difference value. If the accumulator pressure is used to operate a spring brake, consider the possibility to don't overtake the max pressure allowed by the spring brake to avoid the use of a pressure-reducing valve.
Choose the pressure at 5bar steps.

03.14 POSITION 14 - ACCUMULATOR CHARCHING VALVE CUT-OFF PRESSURE (BAR)

It defines the cut-off pressure of the charging valve.
For S6 without charging valve is not required " – ".
Standard Cut-off pressure can be choose from the following table

CUT-IM PRESSURE (bar)	CUT-IN/CUT-OFF DIFFERENCE (bar)
Up to 65	25
Over 65 to 105	30
Over 105 to 150	35
Over 150 to 210	45

For special request out-in /cut-off pressure could be increased or reduced, contact Safim for more information.

03.15 POSITION 15 - REDUCING PRESSURE VALVE SETTING (BAR)

The function code position 15 defines the setting of the pressure-reducing valve if installed; see pos. 9 ("R","X","Y"). If not installed "-".

The pressure could be choose from 25 to 70bar at 5bar steps. For different setting contact Safim.

03.16 POSITION 16 - WORK BRAKE PRESSURE (BAR)

If on the valve is installed a work brake cylinder, it's possible to choose a maximum brake pressure controlled by the work brake cylinder lower than that the maximum controlled by the pedal.

If the maximum pressures are equal, it is not required " – ".
If it is lower write the pressure

03.17 POSITION 17 - PILOTING CYLINDER FLUID TYPE

If on the valve is installed a work brake or a pilot cylinder, position 17 defines the type of fluid that could be used.

M: for mineral oil.
V: for Brake fluid (DOT3 – DOT4)
-: if not installed

03.18 POSITION 18 - SOLENOID VALVE COIL VOLTAGE

If on the valve are installed one or more solenoid valve it defines the tension setting.

A: for system at 12 volts
B: for systems at 24 volts
-: Without solenoid valve

03.19 POSITION 19 - ACCUMULATOR CHARGING FLOW RATE

It defines the charging flow rate of the charging valve.
S: is the standard flow rate 5.5 l/min
2: low flow rate 3 l/min
3: high flow rate 8.5 l/min
4: high flow rate 12 l/min
-: without charging valve
Usually standard flow rate of 5.5 l/min is the preferred, as it is a good compromise from charging time and flow used.

03.20 POSITION 20 - TYPE OF REMOTE HYDRAULIC PILOTING

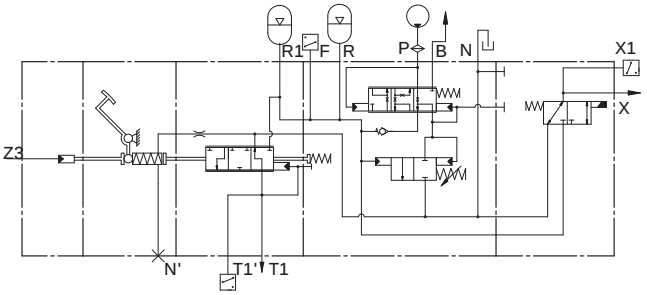
Item 20 can be:
N: External piloting (no tube connection)
S: Work brake piloted by accumulator charging valve 3 way solenoid valve
-: : Not definable feature

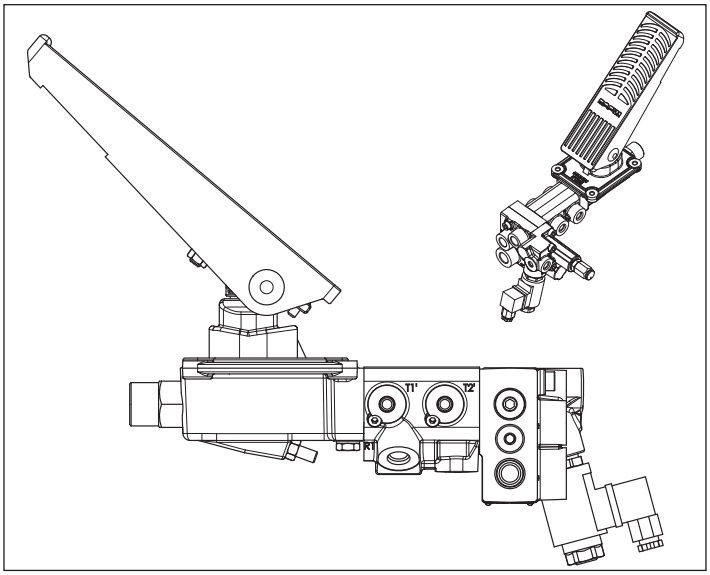
It's possible to define this position only for horizontal S6 brake valve equipped with work brake cylinder (position 5) and 3-way solenoid valve. In all other conditions it is a not definable position **-**.

03.20 - POS. 20 | N | EXTERNAL PILOTING (NO TUBE CONNECTION)

DESCRIPTION
Although it's possible to connect the work brake cylinder with a pipe to the 3-way solenoid valve, this is not recommended "N" (because the 3-way controls a different user, and the work brake is controlled by an external pilot.
To pilot the work brake cylinder is suggested to use a flow restrictor, to avoid too fast application of the service brake.

HYDRALIC SCHEMATIC

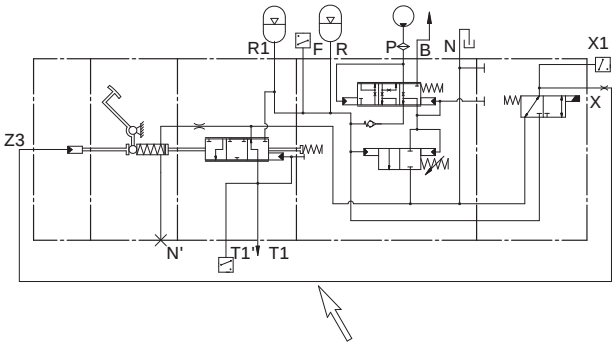


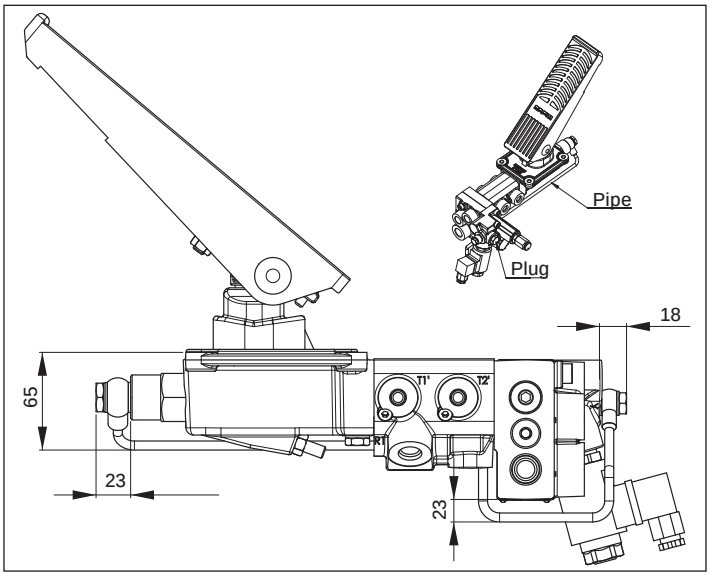


03.20 - POS. 20 | S | WORK BRAKE PILOTED BY ACCUMULATOR CHARGING VALVE 3 WAY SOLENOID VALVE

DESCRIPTION
A metal hose connects the 3-way solenoid valve controller port, to the work brake cylinder. It should be provided with an adequate restrictor, to avoid too fast brake application.

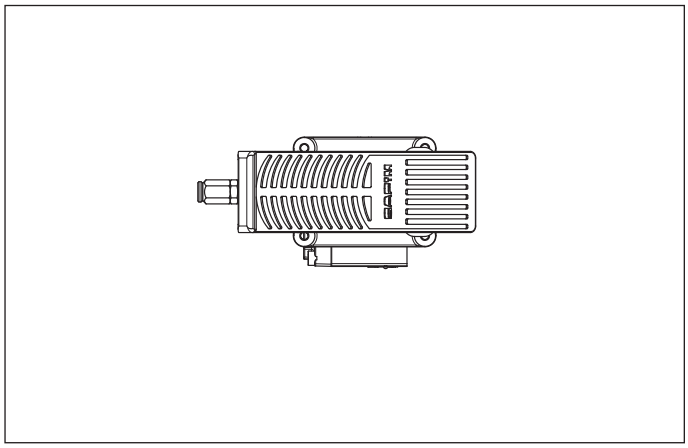
HYDRALIC SCHEMATIC



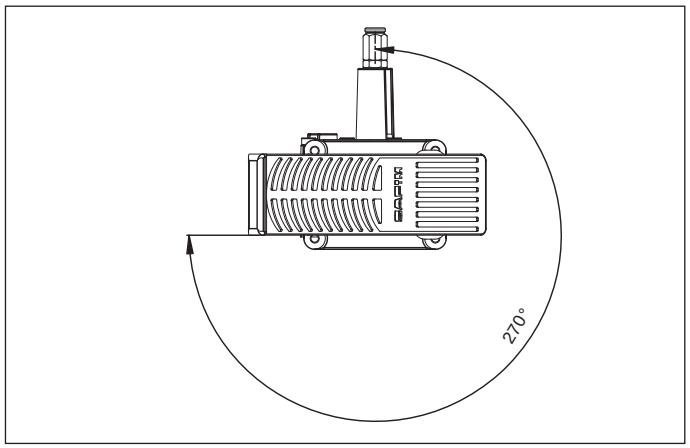


03.21 POSITION 21 - PEDAL SUPPORT ORIENTATION

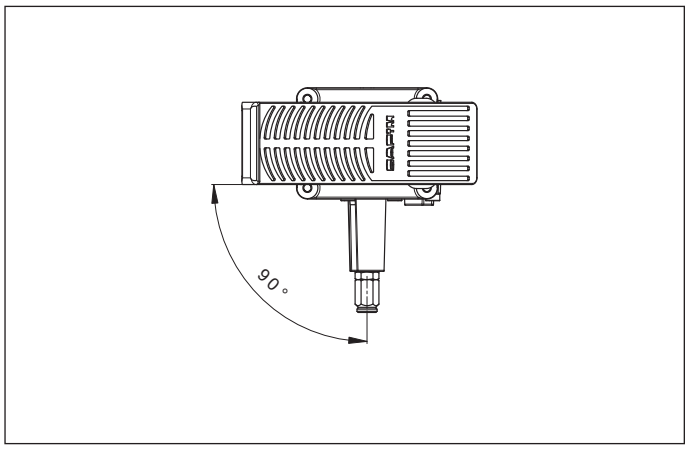
03.21 - POS. 21	0	0°



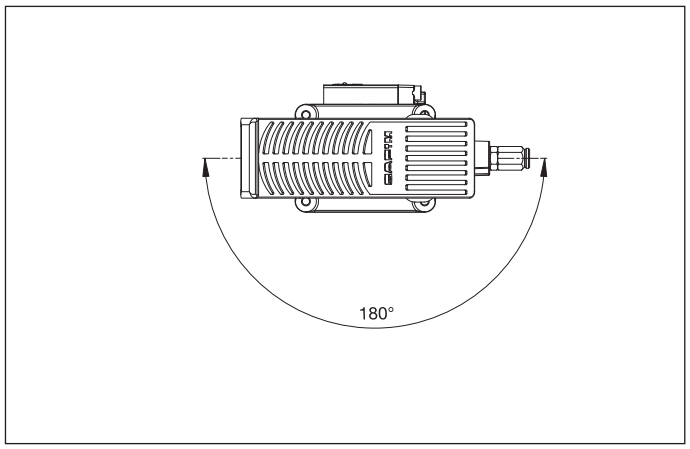
03.21 - POS. 21	270	270°



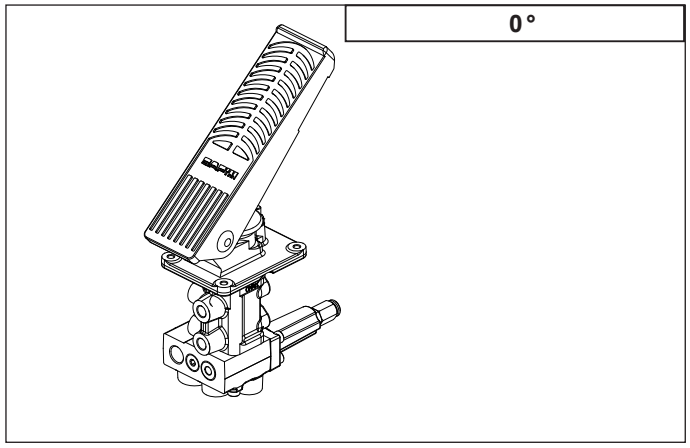
03.21 - POS. 21	S	90° (STANDARD)



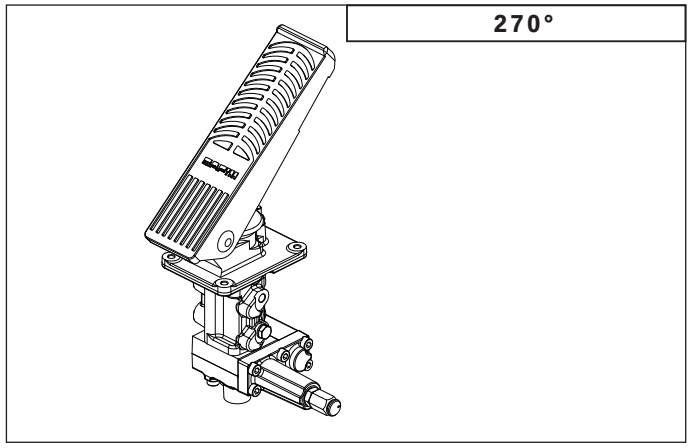
03.21 - POS. 21	180	180°



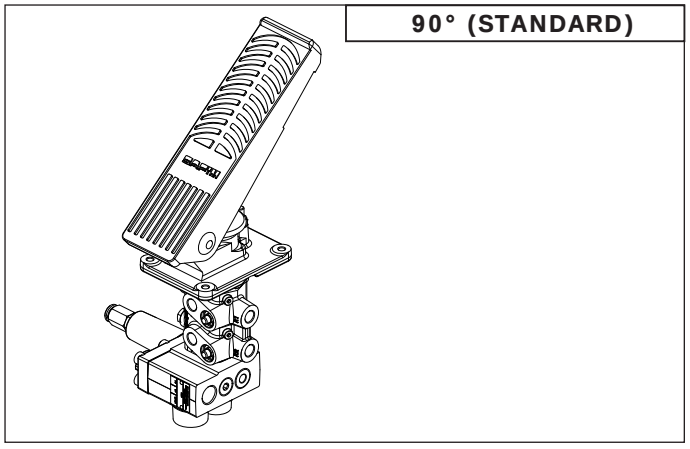
0°



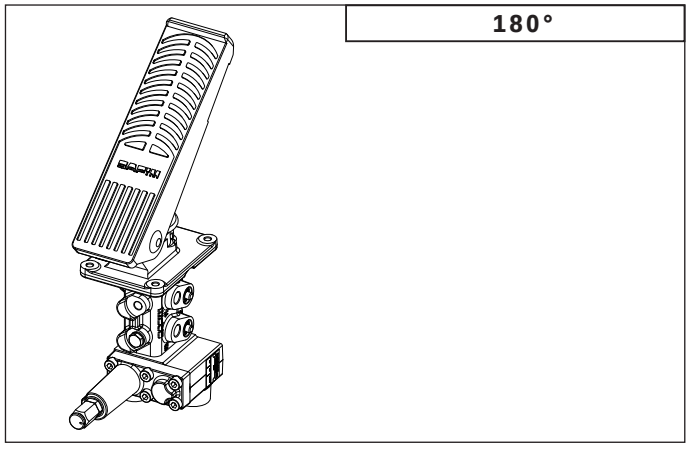
270°



90° (STANDARD)



180°

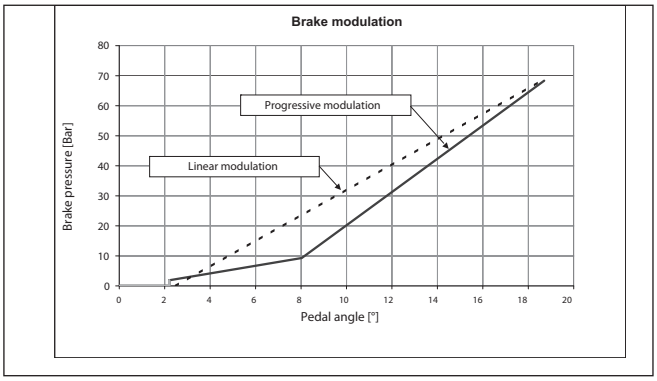


03.22 OTHER SPECIFICATION

03.22 - POS. 22 CONTROL PRESSURE SPRING

DESCRIPTION

The brake pedal is connected to a spring-set that actson the brake spool. Usually the spring-set is made in a way to produce a dual ramp pressure increase. In the first part of the pedal stroke, a slow increase of pressure is used to modulate in a precise way the vehicle deceleration, and in the second part of the pedal stroke the pressure increase ratio is faster in order to obtain the highest pressure.
Some spring-sets have an initial step increase of pressure which provides faster brake actuation, by reducing the time to feed the brake.
Other spring-sets have a single ramp modulation curve.
Safim recommends that The type of spring-set must be selected in relation to the specific vehicle application . Safim technical service will provide support for this selection.
The spring-set is identified on the technical datasheet by and identification letter.



03.22 - POS. 22 CHARGING VALVE SPRING

DESCRIPTION

Charging valve pressure jump can be found in the attached table, for each cut-in setting range. Although a setting of the pressure jump is possible, whenever possible the standard jump has to be used.
The spring-set is identified on the technical datasheet by and identification letter.

Identification letter	Cut-in pressure (Bar)	Cut-off – Cut-in pressure (Bar)
C	Up to 65	25
F	Over 65 to 80	30
E	Over 80 to 105	30
A	Over 105 to 150	35
B	Over 150 to 210	45

03.22 - POS. 22 ADJUSTING PEDAL ANGLE

DESCRIPTION

The brake pedal angle is adjustable. Standard pedal angle could be found in the attached table, with the setting range.
Pedal angle has to be specified on the technical datasheet, otherwise standard angle will be used.
Pedal angle is set with a tolerance of ±2°.

S6 system Type	Pedal Angle (°)	Standard pedal angle (°)
Horizontal mount system (O)	From 25° to 45° (step 5°)	40°
Vertical mount system (V)	From 25° to 45° (step 5°)	35°
Negative brake system (K)	From 25° to 45° (step 5°)	40°

03.22 - POS. 22 NOTE

DESCRIPTION

Any special requirements have to be written in the note field space.

04 S6 BRAKE SYSTEM FEEDING WAYS

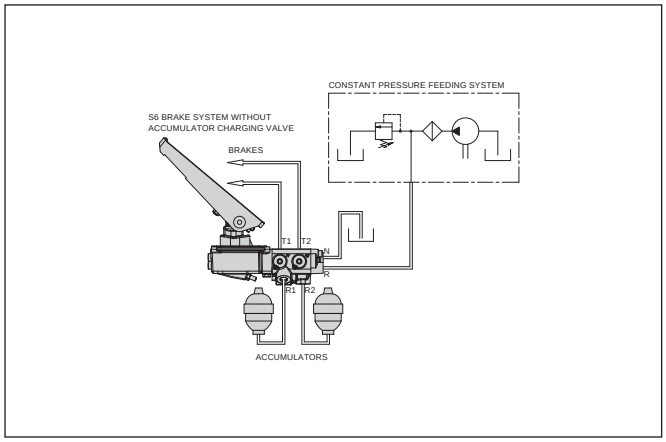
04.01 INTRODUCTION

In this catalogue section, there is description of the systems that could be used to feed the brake valve, analyzing for each solution: safety feature, performance, and components used.
The feeding system, is determinant for the safety of the vehicle, and for the brake efficiency.
Usually the correct feeding way is to place the steering in first priority to preserve its efficiency in case of oil lack of another circuit component. Than after the steering the brake feeding must be preserved, eventually in parallel with the trailer brakes. All other uses should have lower priority.
In most applications, the accumulator charging valve provide the service brake and its feeding must be preserved respect to the other user, except the steering feeding.
Although in other cases the accumulator charging valve feeds uses not related to the service brake, in these cases the priority of feeding is not important.

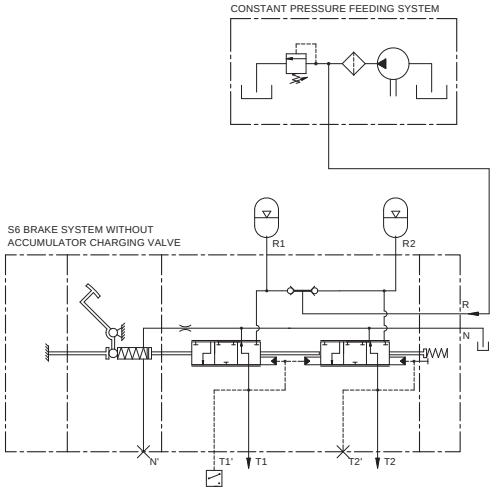
04.02 CONSTANT PRESSURE LINE

CONSTANT PRESSURE LINE (TO FEED THE S6 BRAKE SYSTEM WITHOUT CHARGING VALVE)

INSTALLATION LAYOUT



HYDRAULIC SCHEMATIC



ADVANTAGE

- Is the simplest solution, that doesn't need any charging valve to recharge the accumulators.

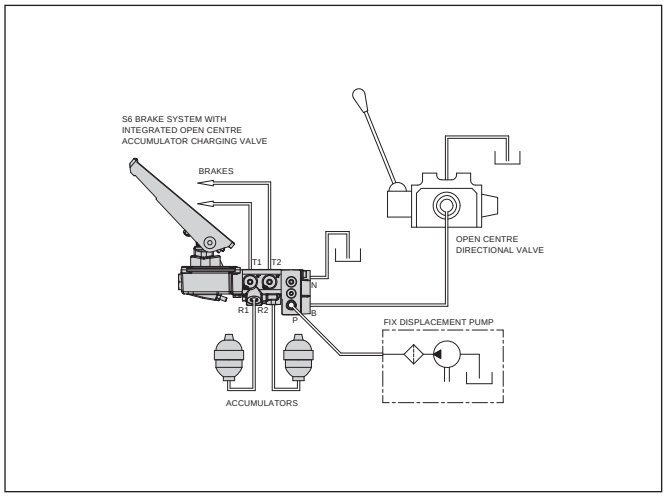
DISADVANTAGE

- Constant pressure must be always higher than the brake pressure. So normally this system couldn't be used for the brake accumulator recharging.
- If brake pressure is lower than constant pressure, but pressure difference is little, than this solution could be used but the accumulators volume request is large, as the limited pressure difference doesn't allow an efficient recharge.
- Accumulator feeding is not in priority respect to main hydraulic system, so this is not the better safety condition.

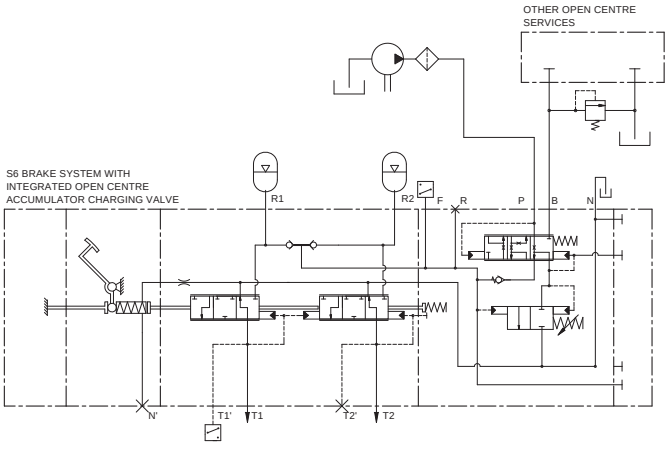
04.03 DEDICATED FIX DISPLACEMENT PUMP - S6

DEDICATED FIX DISPLACEMENT PUMP (TO FEED THE CHARGING VALVE)

INSTALLATION LAYOUT



HYDRAULIC SCHEMATIC



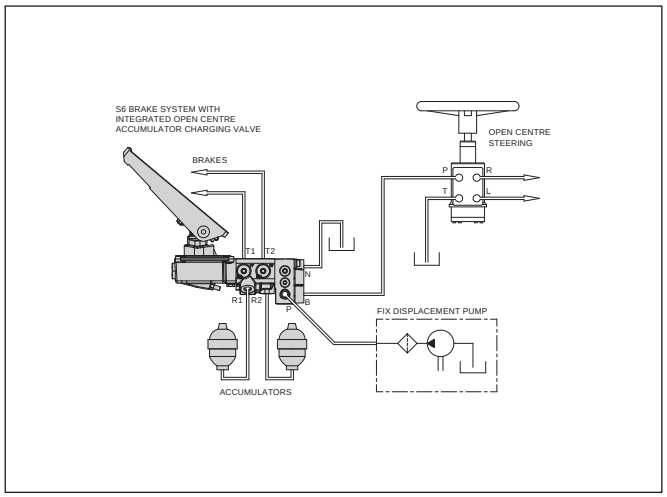
ADVANTAGE

- Simple circuit, independent from other components related to drive safety.
- The wide range of feeding flow accepted by the charging valve (3-70 l/min) makes easier the installation.
- Exceed flow of the charging valve could be used to feed other components not related to the drive safety.
- During the accumulator recharge a little flow (usually 5.5 l/min) is used to recharge the accumulator, but the remaining flow is available on the exceeding port. Usually there is always flow available on exceeding port.

04.04 FIX DISPLACEMENT PUMP - S6 - STEERING

FIX DISPLACEMENT PUMP PLACED ON THE VEHICLE FOR STEERING FEEDING

INSTALLATION LAYOUT



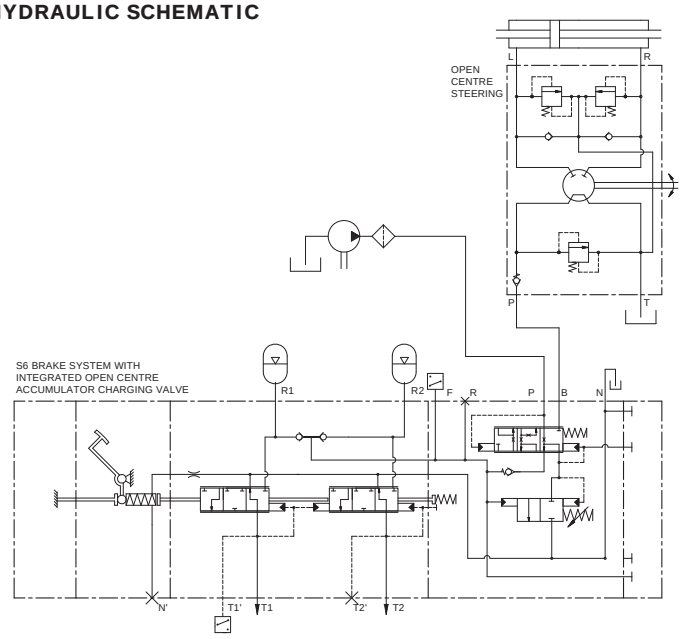
ADVANTAGE

- Simple circuit that use the steering pump for the feeding.

DISADVANTAGE

- The priority levels are not corrects, as the brake has priority respect to the steering.
- Steering could be affected by force increase, or little shocks during the accumulator recharging. This occurs more frequently with small displacement pump.
- It's not possible to feed other users.

HYDRAULIC SCHEMATIC



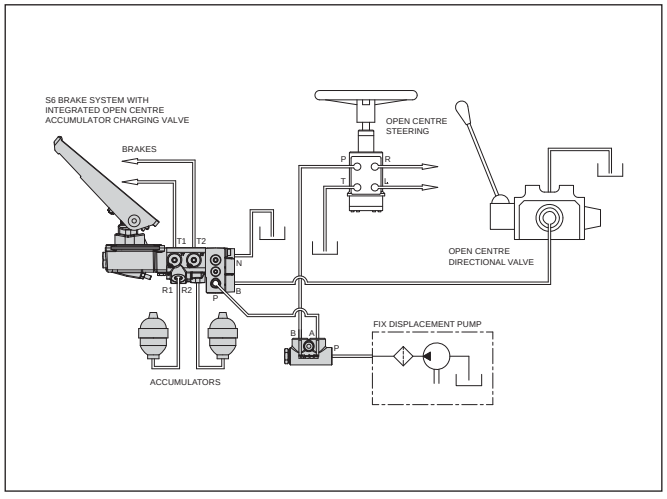
NOTE

If the feeding pump provide a little flow, it's suggested to set the charging valve with reduced recharging flow (3 l/min), in order to leave more flow for the steering during the accumulators recharge. See Position 19 (accumulator charging flow rate).

04.05 FIX DISPLACEMENT PUMP - PRIORITY VALVE - STEERING - S6

FIX DISPLACEMENT PUMP PLACED ON THE VEHICLE FOR STEERING FEEDING BY A PRIORITY VALVE (STEERING AT 1ST PRIORITY LEVEL)

INSTALLATION LAYOUT



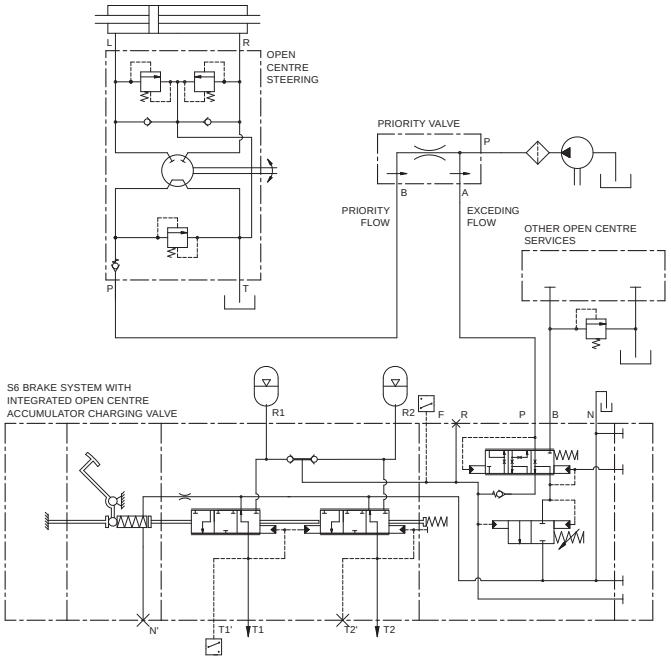
ADVANTAGE

- Priority levels are correct, with steering in priority respect to the brake.

DISADVANTAGE

- Since a constant priority flow is continuously send to the steering, the pump must provide an exceeding flow for the accumulator charging valve also with engine at minimum speed. So the pump must have a larger displacement than as request by steering.
- When the engine speed increase, all exceeding flow is send to the charging valve, and the steering performance is the same as at minimum speed.
- High pressure drop, because the flow go through two priority valves, the first in-line, the second inside the charging valve.

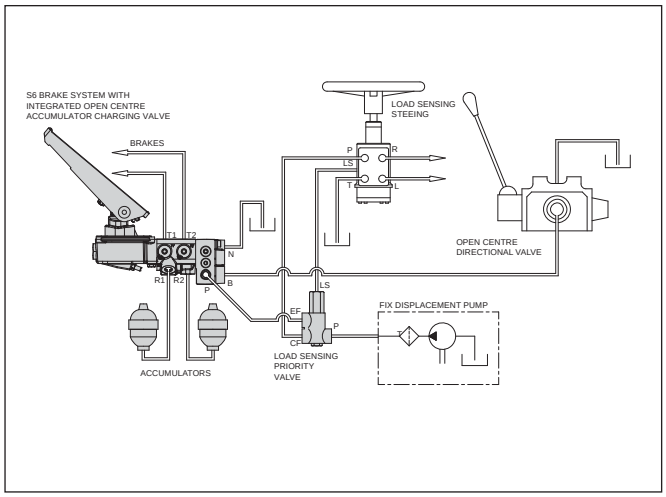
HYDRAULIC SCHEMATIC



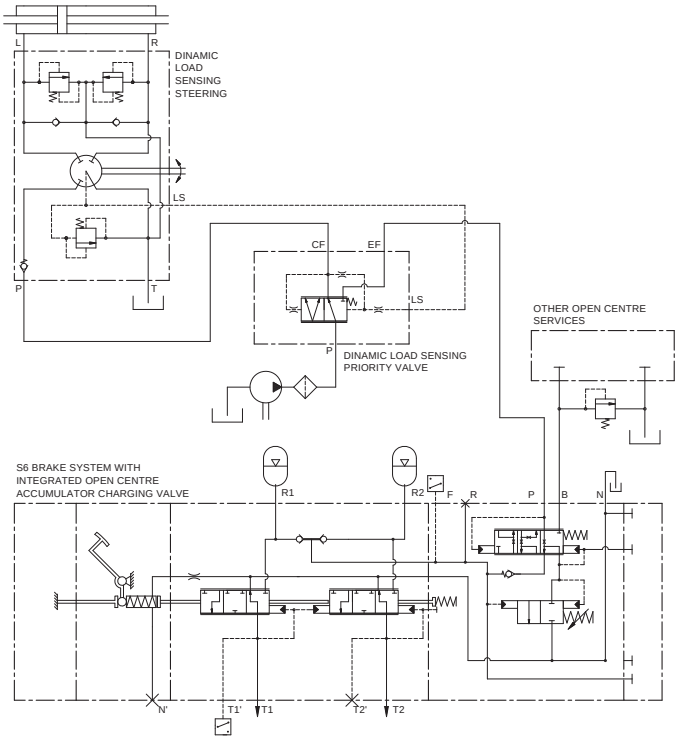
04.06 FIX DISPLACEMENT PUMP - LS PRIORITY VALVE - LS STEERING - S6

FIX DISPLACEMENT PUMP AND LOAD SENSING PRIORITY VALVE FOR STEERING FEEDING (OPEN CENTRE ACCUMULATOR CHARGING VALVE)

INSTALLATION LAYOUT



HYDRAULIC SCHEMATIC



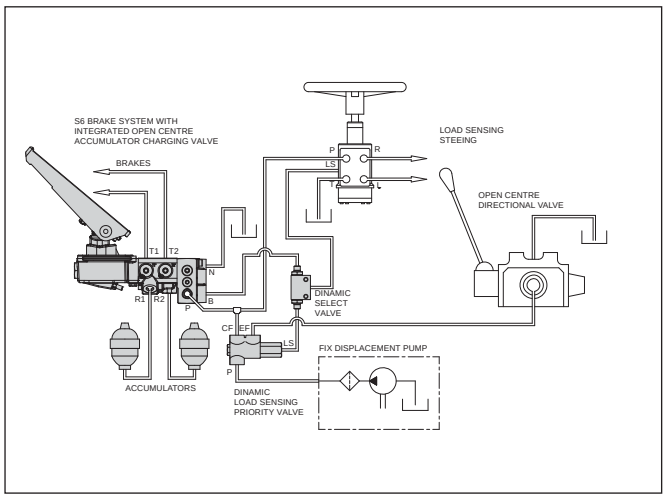
ADVANTAGE
- Priority levels are correct. Steering has priority respect to the brake, and the brake has priority respect to other users.
- All the pump flow is available for steering, improving it's performance.

DISADVANTAGE
- Maximum flow is limited at the maximum flow of the accumulator charging valve (70 l/min).
- High pressure drop, because the flow go through two priority valves, the first in-line, the second inside the charging valve.

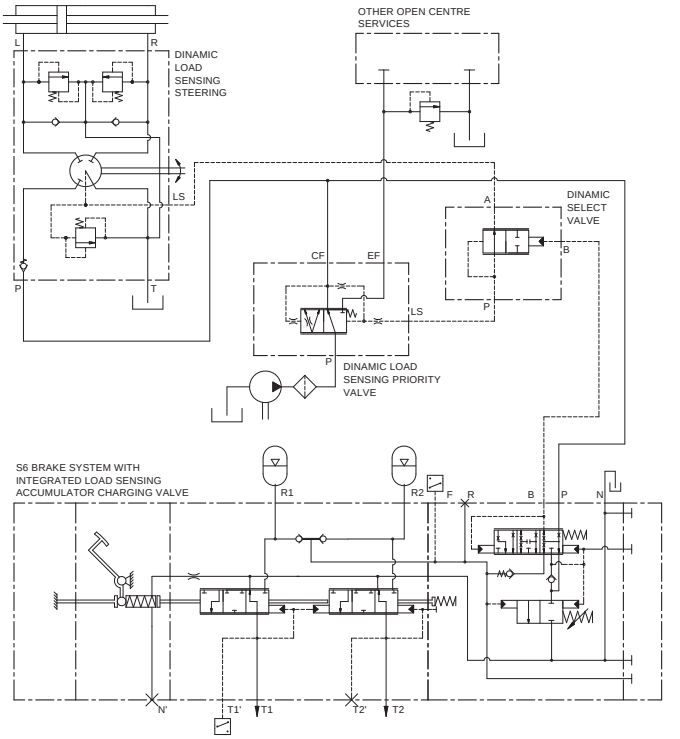
04.07 FIX DISPLACEMENT PUMP - LS PRIORITY VALVE - LS STEERING & LS S6

FIX DISPLACEMENT PUMP AND LOAD SENSING PRIORITY VALVE FOR STEERING FEEDING (LOAD SENSING ACCUMULATOR CHARGING VALVE)

INSTALLATION LAYOUT



HYDRAULIC SCHEMATIC



ADVANTAGE
- Brake valve can be easy installed on system with load sensing steering (dynamic select valve is available on SAFIM catalogue)
- Flow rate is limited only by the priority valve choose.

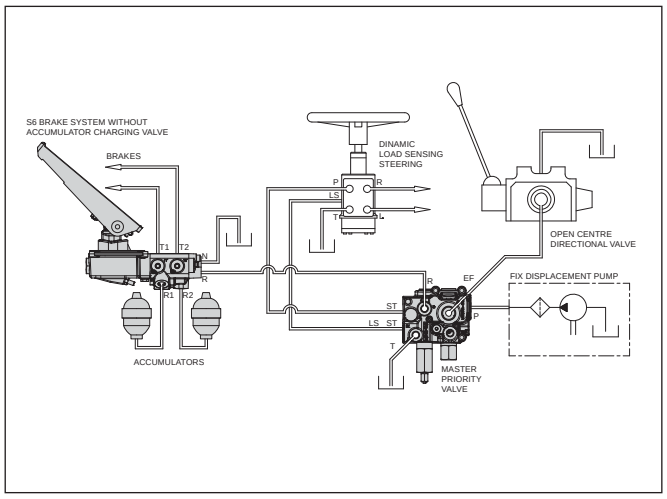
DISADVANTAGE
- Brake and steering are on the same priority level (although flow request from charging valve is always limited).

NOTE
Easy adaptable to exixting systems.

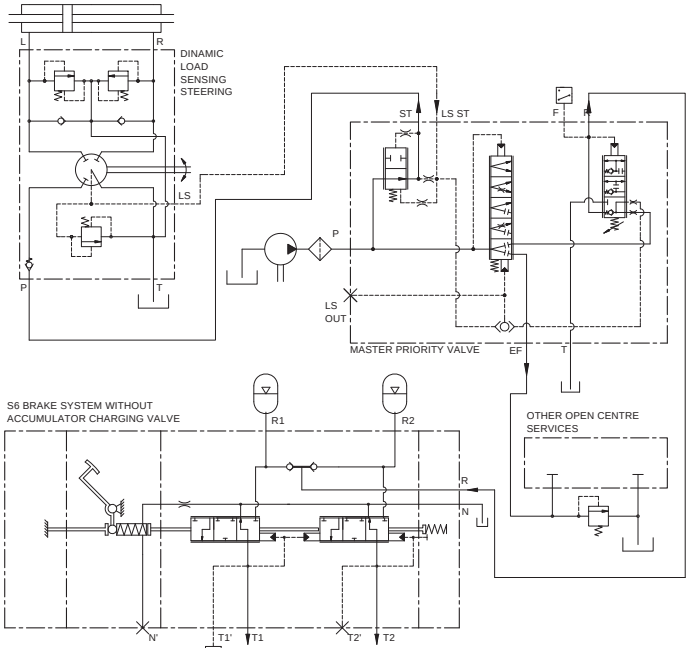
04.08 FIX DISPLACEMENT PUMP - MASTER PRIORITY VALVE®

FIX DISPLACEMENT PUMP AND MASTER PRIORITY VALVE® FOR ALL SERVICES FEEDING

INSTALLATION LAYOUT



HYDRAULIC SCHEMATIC



ADVANTAGE

- Simple and rational circuit.
- Priority levels are correct. Steering has priority respect to the brake, and the brake has priority respect to other users.
- All the pump flow is available for steering, improving it's performance.
- Maximum flow can be up to 160 l/min and up to 250 Bar of maximum pressure.

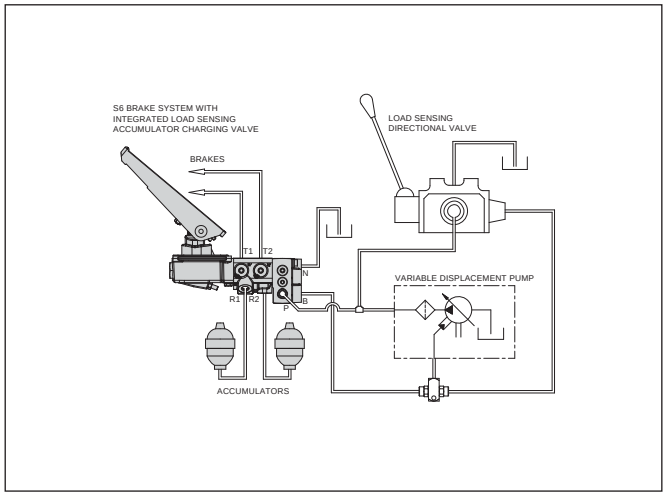
NOTE

Solution suggested for system with fix displacement pump and load sensing steering.

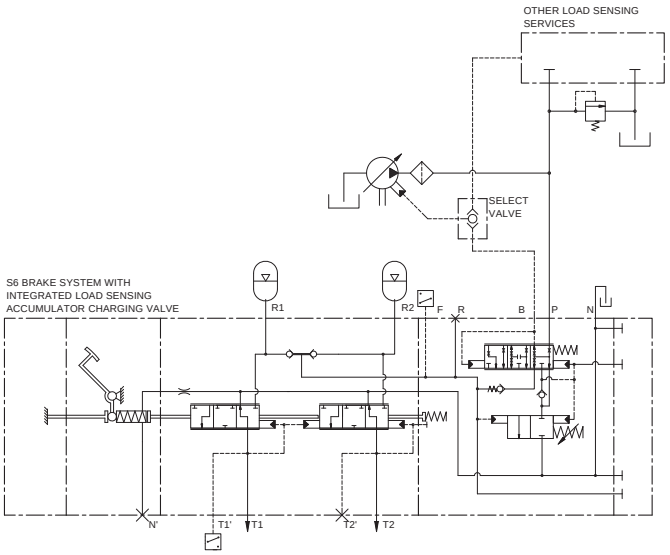
04.09 VARIABLE DISPLACEMENT PUMP - LS S6

VARIABLE DISPLACEMENT PUMP PRESENT ON THE VEHICLE FOR SERVICES FEEDING (LOAD SENSING CHARGING VALVE)

INSTALLATION LAYOUT



HYDRAULIC SCHEMATIC



ADVANTAGE

- Brake valve can be easy installed on system with a load sensing pump that feed load sensing user.

DISADVANTAGE

- Brake has not priority. Brake functionality could be compromised.

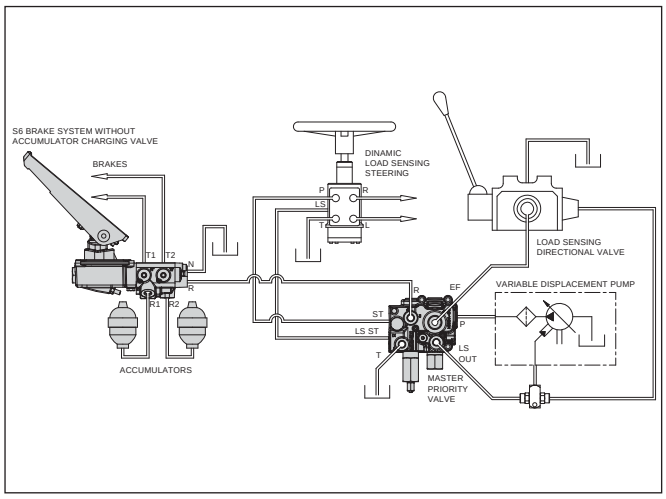
NOTE

Could be a good solution, if the user in parallel with the brakes, does never take all the flow for more than few seconds. Otherwise this solution cannot be adopted.

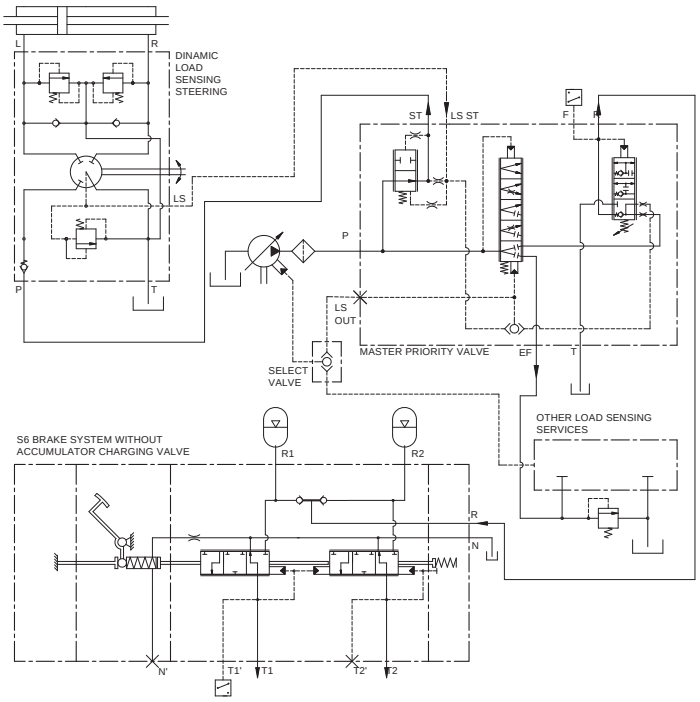
04.10 VARIABLE DISPLACEMENT PUMP - MASTER PRIORITY VALVE®

VARIABLE DISPLACEMENT PUMP AND MASTER PRIORITY VALVE® FOR ALL SERVICES FEEDING

INSTALLATION LAYOUT



HYDRAULIC SCHEMATIC



ADVANTAGE

- Simple and rational circuit.
- Priority levels are correct. Steering has priority respect to the brake, and the brake has priority respect to other users.
- The whole pump flow is available for steering, improving it's performance.
- Maximum flow can be up to 160 l/min and up to 250 Bar of maximum pressure.
- Optimized energy efficiency, due to the load sensing pump, and the use just one priority valve.

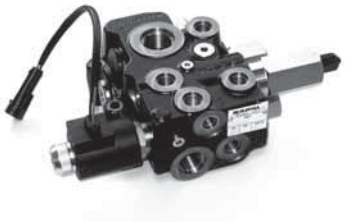
NOTE

Solution suggested for system with load sensing pump and steering.

PRODUCTS

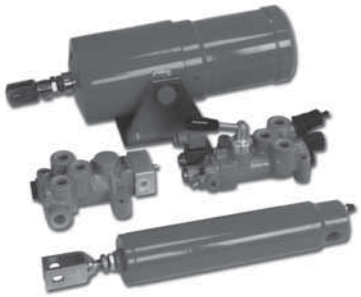
MASTER CYLINDERS
Master cylinders with or without hydraulic booster, single or double circuit, single bore or step-bore piston.

SAFIM S6 BRAKE VALVES
Full power brake valve available in differet configuration.



MASTER PRIORITY VALVE®
Master Priority Valve® feeds ,with a single pump, steering, brakes and working equipment.

WHEEL CYLINDERS
Standard, spring actuated and multi-function brake cylinders.



FARM TRACTORS HYDRAULIC BRAKING
Hydraulic trailer brake valves for European and Italian omologation, quick-release couplings, service and parking brake cylinders for trailer.

ACCESSORIES
Accessories to complete the hydraulic brakes system.

QUALITY

SAFIM *was awarded the following quality certificates: ISO 9001 in the year 1999, VISION 2000 in the year 2002.*

CERTIFICATO

Nr 50 100 1898 - Rev. 02

Si attesta che / *This is to certify that*

IL SISTEMA QUALITÀ DI
THE QUALITY SYSTEM OF

SAFIM S.p.A.

VIA LIVINGSTONE 6
I-41010 MODENA (MO)

È CONFORME AI REQUISITI DELLA NORMA
HAS BEEN FOUND TO COMPLY WITH THE REQUIREMENTS OF

UNI EN ISO 9001:2000

Questo certificato è valido per il seguente campo di applicazione
This certificate is valid for the following product or service range

Progettazione e fabbricazione di componenti idraulici per il comando dei freni di macchine operatrici semoventi e trainate (EA 17)

Design and manufacture of hydraulic components to operate the brakes of self-propelled and towed operating vehicles (EA 17)

Data di emissione / Issue date: 2008 -06 -23
Data di scadenza / Expiry date: 2011 -06 -13

Per l'Organismo di Certificazione
For the Certification Body
TÜV Italia S.r.l.

Claus Spallinger
Management Representative

Rinnovo del certificato emesso per la prima volta in data 2002-07-01

"La validità del presente certificato è subordinata a sorveglianza periodica a 12 mesi e al riesame completo del sistema di gestione aziendale con periodicità triennale"

"The validity of the present certificate depends on the annual surveillance every 12 months and on the complete review of company's management system after three-years."

TÜV Italia • Gruppo TÜV SÜD • Via Carducci 125, Pal. 23 • 20099 Sesto San Giovanni (MI) • Italia • www.tuv.it

SAFIM *SAFIM was awarded the quality certificate ISO 14001-2004 in the year 2006.*

CERTIFICATO

Nr 50 100 5496

Si attesta che / *This is to certify that*

IL SISTEMA DI GESTIONE AMBIENTALE DI
THE ENVIRONMENTAL MANAGEMENT SYSTEM OF

SAFIM S.p.A.

VIA LIVINGSTONE 6
I-41100 MODENA (MO)

È CONFORME AI REQUISITI DELLA NORMA
HAS BEEN FOUND TO CONFORM TO THE REQUIREMENTS OF

UNI EN ISO 14001:2004

Questo certificato è valido per il seguente campo di applicazione
This certificate is valid for the following product or service range

Progettazione e fabbricazione mediante lavorazioni meccaniche, assemblaggio e collaudo di componenti idraulici per il comando di freni di macchine operatrici semoventi e trainate (EA 18)

Design and manufacture of hydraulic devices for brakes control of self-propelled and towed operating vehicles, through machining, assembling and testing (EA 18)

Data/date: 2006-01-09
Data di scadenza/Expiry date: 2009-01-03
Lead Auditor: Guglielmo Romanini

Per l'Organismo di Certificazione
For the Certification Body
TÜV Italia S.r.l.

Alessio Galiazzo
Technical Responsible

TÜV Italia srl • Gruppo TÜV SÜD • Via Carducci 125, Pal. 23 • 20099 Sesto San Giovanni (MI) • Italia • www.tuv.it

SAFIM S.p.A.
Via Livingstone 6
41100 MODENA – ITALY
www.safim.it
info@safim.it

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