

Modular Hydro-Pneumatic Suspension System

Improving Suspension Performance with a Proper Setup: Quicker and Better Adaptation to Applications



Technical Features

- Reduces vibrations in axle, wheel, cabin and payload suspension systems
- Automatic control of cylinder position and suspension comfort parameters
- Modular system design with standard modules easily adaptable for the specific needs of the applications
- Variable settings for different operating and loading conditions
- Basic and advanced suspension solutions with additional options
- > Serves all loads and cylinder sizes
- Cast iron block and all steel parts are zinc-coated for 520 h protecti on acc. to ISO 9227
- \rightarrow p_{max} up to 250 bar (3600 PSI)
- > Position and pressure sensors
- > Flexible configurations of ECU

Suspension Systems in Mobile Machines

Hydro-pneumatic suspension systems improve comfort, safety and productivity of vehicles by isolating the vehicle's chassis and cab - and thus the driver and the payload/implements - from the undesired vibrations from the ground. This is done by hydraulic means - a cylinder and an accumulator act as a combination of spring and damper. With the regulation of oil flow and preload pressure an optimal suspension performance can be achieved.

The health and safety directive 2002/44/EG implements high standards for the daily permissible vibration exposure to the driver. Particularly during off-road work, the usage of our hydro-pneumatic suspension extends the possible working time. It increases comfort and driving safety. The driver is more relaxed and therefore he can complete work processes faster and with more precision.

Possible Fields of Applications





System Integration

The modular control system consists of a hydraulic manifold, which is connected to an ECU. The ECU is the command and control center, it coordinates and regulates all the functions of the hydraulic manifold. The necessary input for the commands is provided by data from the Control Panel, various sensors and the vehicle's bus system. In the basic suspension configuration the hydraulic manifold is connected to the suspension cylinder so it can control the position of the cylinder. For a high variance between maximum and minimum load, the advanced suspension is able to control the pressure in the cylinder's rod side chamber. Shut-off and damping-control can be achieved using optional Modules.



Modularity

The fast available, adaptable modular assembly kit allows to easily achieve customer tailored solutions. By selecting standard modules, various settings can be tested easily to determine the best configuration.

Proportional level control

Unique proportional control allows adaption to various driving conditions faster and more sensitively than traditional hydraulic and pneumatic suspension control systems.

Intelligent automatic and easy manual adjustment

Simple pre-selection of desired suspension behavior in manual and automatic mode. The automatic intelligent mode monitors vehicle behavior and adapts the suspension setting to achieve best comfort.

Full application support

For a proper suspension set-up ARGO-HYTOS offers full support in machine integration including advice concerning of geometry and mechanical parts.

Cost-effective solutions

Thanks to the modular design MHPS allows cost effective solutions even for small volumes. If there is no need for a modular design ARGO-HYTOS is able to adapt the results from functional testing into a customized hydraulic manifold.



Depending on the requested functionality, one of the systems shown below can be used

MHPS system – the modular system, used in machines where demand wide range of suspension functions such as proportional level control, damping control, variable spring rate control, as well as safety algorithms by tracking the signals of pressure and position sensors.

MSC system is mainly used in applications where there is no demand for proportional height control. Many applications request only a basic ON/OFF levelling, no advanced real-time setting of the suspension parameters. In addition, there is a strong demand for easy implementation and setup.

Possible fields of applications		All wheel suspensions	Cab suspensions, 4 point	Axle suspensions	Cab suspensions, 1/2 point	Drawbar and payload suspensions	
Sustam	MHPS	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
System	MSC	×	×	\checkmark	\checkmark	\checkmark	×

Key advantages of the MHPS and MSC suspension systems include

Increase operator comfort



Protect vehicle from vibration



Decrease braking distances



Improve working efficiency



Increase transport speed



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ON / OFF Level Control - Switch control

MSC



Description

Application

The manifold is used for suspension applications with small load ratios between between minimum and maximum load. Can be used in all mobile applications equipped with LS, constant pressure and open center supply systems.

Typically used for

- Cab suspension
- > Light duty axle suspension

Technical Features

- > Optional damping control with additional manifold
- > Automatic/manual control
- > All steel parts are zinc-coated for 520 h protection acc.
- to ISO 9227

Functional Description

The manifold controls the piston position of the hydraulic cylinder.

The 3/2 screw-in cartridge directional control valve connects according to spool position the piston side of cylinder and accumulator with P-channel (the system is pressurised) or with T-channel (system is unloaded). The pilot operated poppet valve secures the system pressure at the switched-off control system. Optionally, a pressure relief valve can be used as a pressure limiter (with an additional valve in a line body (or in a customized manifold). The volumetric flow upstream / downstream the cylinder and the dynamic of the system is adjusted by flow restrictor. The manifold can be connected to a single cylinder accumulator set or optionally to two sets with the same load. The LS port is intended for load-sensing regulation of the pump.

	1	
Max. operating pressure at port P	bar (PSI)	200 (2900)
Max. operating pressure at port T	bar (PSI)	100 (1450)
Max. operating pressure at port PS	bar (PSI)	250 (3600)
Max. flow	l/min (GPM)	10 (2.64)
Weight	kg (lbs)	1.67 (3.68)
Surface treatment of valves	Zinc-coated,	520 h in NSS (ISO 9227)

Surface treatment of valves	ZINC-COaled, 520 IT IN N55 (ISO 9227)			
Surface treatment of manifold	Anodized aluminium alloy			
Solenoid Technical Data				
Type of coil - supply voltage	V DC	12 / 24		
Limit current	А	1.83 / 0.95		
Max. allowable voltage variation	%	±10		

Ports	ISO 1179-1
P, PS	G 3/8″
Т	G 1/2″
LS	G 1/4″





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Description

Application

The double block is used for independent control of two suspension cylinders. Can be used in all mobile applications equipped with LS, constant pressure and open center supply systems.

Typically used for

- > Axle suspension
- > Independent suspension for two wheels

Technical Features

- > Optional damping control with additional manifold
- > Automatic/manual control
- > All steel parts are zinc-coated for 520 h protection acc. to ISO 9227

Functional Description

The manifold controls the piston position of the hydraulic cylinders connected with accumulators to the ports PSL and PSR. The 3/2 screw-in cartridge directional control valves connects according to spool position the piston side of the cylinders and accumulators with the P-channel (the system is pressurised) or with T-channel (system is unloaded). The pilot operated poppet valves secures the system pressure at the switched-off control system. The pressure relief valve protects the system from the pressure overloading and allows an adjustment of the maximum system pressure. The normally closed throttle valve is a service valve used for unloading the system. The volumetric flow upstream / downstream the cylinder and dynamic of the system can be optionally adjusted by flow restrictors. The LS port is intended for load-sensing regulation of the pump. Two check valves ensure the connection of the LS port to the side (PSL, PSR) with the higher pressure.

Max. operating pressure at ports P	bar (PSI)	200 (2900)
Max. operating pressure at ports T	bar (PSI)	100 (1450)
Max. operating pressure at ports PSL, PSR	bar (PSI)	250 (3600)
Max. flow	l/min (GPM)	30 (8)
Weight	kg (lbs)	6.52 (14.37)

Surface treatment of valves	Zinc-coated, 520 h in NSS (ISO 9227)				
Surface treatment of manifold	Anodized aluminium alloy				
Solenoid Technical Data					
Type of coil - supply voltage	V DC	12 / 24			
Limit current	А	1.83 / 0.95			
Max. allowable voltage variation	%	±10			

Ports	ISO 1179-1		
P, PSL, PSR	G 1/2″		
Т	G 3/4″		
LS	G 1/4″		





MSC / MHPS











Description

Application

The Basic Module is used for suspension applications with small load ratios between min. and max. load. It is typically used for cab suspensions and light duty axle

suspensions - heavy duty axle suspensions with mechanical preload. Can be used in all mobile applications equipped with LS, constant pressure and open center systems.

Typically used for

- Axle suspension
- Cab suspension

Technical Features

- > One solenoid control system
- > Fine and fast proportional adjustment of cylinder position
- > Proportional flow rate options max. 5 l/min and max. 25 l/min
- > Pressure sensors optional
- > Optional damping control with additional manifold
- > Automatic/manual control
- Cast iron block and all steel parts are zinc-coated for 520 h protection acc. to ISO 9227

Functional Description

The BASIC MODULE provides proportional position control of the suspension cylinder. It proportionally feeds or drains the suspension cylinder's piston chamber. When the valve is not energized, the oil in the suspension circuit is separated by a pilot-operated check valve. The pressure relief valve limits the pressure in the suspension system. A service throttle valve (normally closed) can be used to drain the system.

Max. operating pressure at port P	bar (PSI)	250 (3600)
Max. operating pressure at port T	bar (PSI)	100 (1450)
Max. operating pressure at port PS2	bar (PSI)	310 (4500)
Max. flow	l/min (GPM)	45 (11.9)
Weight	kg (lbs)	6.9 (15.2)

Solenoid Technical Data				
Type of coil	V DC	12/24		
Limit current	А	2.5/1.5		
Resistance nominal at 20 °C (68 °F)	Ω	2.3 / 13.4		
PWM frequency	Hz	200		
Max. allowable voltage variation	%	±10		

Ports	HS2
LS, PS1	M14 x 1.5
Р, Т	M18 x 1.5
PS2	M22 x 1.5
S	G 1/4



Proportional Level Control - Basic Module - Double Level control circuit





Description

Application

The BASIC MODULE DOUBLE (BB) offers the functionality of two Basic Modules (BM) integrated in one block. The two-level control valves share one pressure relief valve as well as one service valve. The BB is often used in applications where only little installation space is available, often in combination with standalone damping valves (e.g. PPSA).

Typically used for

- Independent wheel suspension
- > Axle suspension
- > Cab suspension

Technical Features

- > Two cylinders share common pressure relief & service valve
- > Block without flanges
- > Proportional flow rate options max. 5 l/min and max. 25 l/min
- > Pressure sensors optional
- > Optional damping control with additional manifold
- Cast iron block and all steel parts are zinc-coated for 520 h protection acc. to ISO 9227

Functional Description

Basically, the same function as two BASIC MODULES however the shared pressure relief valve has to be considered when calculating the respective cylinder size. The BB has no flange surface thus damping pressure control has to be realized with external parts (PPSA / PSSA) if needed.

bar (PSI)	250 (3600)
bar (PSI)	100 (1450)
bar (PSI)	310 (4500)
l/min (GPM)	45 (11.9)
kg (Ibs)	10.3 (22.7)
	bar (PSI) bar (PSI) bar (PSI) l/min (GPM) kg (lbs)

Solenoid Technical Data				
Type of coil	V DC	12 / 24		
Limit current	А	2.5/1.5		
Resistance nominal at 20 °C (68 °F)	Ω	2.3/13.4		
PWM frequency	Hz	200		
Max. allowable voltage variation	%	±10		



Ports	HS2
LS, PS1	M14 x 1.5
P, RS, *	M18 x 1.5
PS2, T	M22 x 1.5
S1, S2	G 1/4



Proportional Level Control - Basic Module with stabilization





Description

Application

The BASIC MODULE WITH STABILIZATION (BS) is used for the same applications as the Basic Module, particularly for vehicles with a narrow track width and a high center of gravity.

Typically used for

> Independent wheel suspension

Technical features

- > Same features as Basic Module
- Decoupling of two suspension cylinders level-controlled at the same time
- > Pressure sensors optional
- > Optional damping control with additional manifold
- Cast iron block and all steel parts are zinc-coated for 520 h protection acc. to ISO 9227

Functional Description

The Basic Module Stabilization (BS) offers the same functions as the standard Basic Module.

The additional advantage is that two cylinders can be level-controlled with one BS and yet act as individual springs when levelling is inactive.

Max. operating pressure at port P	bar (PSI)	250 (3600)
Max. operating pressure at port T	bar (PSI)	100 (1450)
Max. operating pressure at port CP1 / CP2	bar (PSI)	310 (4500)
Max. flow	l/min (GPM)	45 (11.9)
Weight	kg (lbs)	9.1 (20.1)

Solenoid Technical Data		
Type of coil	V DC	12 / 24
Limit current	А	2.5/1.5
Resistance nominal at 20 °C (68 °F)	Ω	2.3/13.4
PWM frequency	Hz	200
Max. allowable voltage variation	%	±10

Ports	HS2
LS	M14 x 1.5
CP1, CP2	M16 x 1.5
Р, Т	M18 x 1.5
PS2	M22 x 1.5
S	G 1/4

Proportional Level Control

Characteristics

Unique, integrated valve design

Unique proportional control allows adaption to various driving conditions faster and more sensitively than traditional hydraulic suspension control systems.

Compared to other available proportional 4/3 directional valves, the SD2P-B4 valve needs only one solenoid for both actuation directions (usually two solenoids are needed). This design provides several benefits (e.g. more compact design, fewer electric connectors).

Technical Features

- > One solenoid control system
- > Fine and fast proportional adjustment of cylinder position to load changes
- > Precise controllability
- > Quick response



Note:

The specific placement of the spool edge and the specific function of the proportional directional control valve are protected by US patent 9,505,288 B2 and EP 2772373.

This original technical soloution is the intellectual property of Fluid Systems Partners Holding AG and is subject to legal protection.







Advanced Suspension - Preload Control Rod side Module Constant RC







Description

Application

The advanced suspension with the Rod side MODULE CONS-TANT (RC) is used for suspension applications with medium and high load ratios between minimum and maximum load.

Typically used for

- > Heavy duty axle suspensions
- > Trailer drawbar suspensions
- > All wheel suspensions with a high load ratio

Technical Features

- Controls the preload pressure in the suspension cylinder's rod side (up to 200 bar; 2900 PSI) at the same time
- > Pressure relief valve setting dependent on application
- Overpressure relief and service function through BASIC MODULE
- > Optional damping control with additional manifold
- Cast iron block and all steel parts are zinc-coated for 520 h protection acc. to ISO 9227

Functional Description

The advanced suspension with the rod side module constant (RC) sets a constant pressure in the rod side chamber of the suspension cylinder. This pressure creates a preload which allows a higher ratio between minimum

and maximum suspension load. This is particularly important when using diaphragm accumulators.

Max. operating pressure at port P	bar (PSI)	250 (3600)
Max. operating pressure at port T	bar (PSI)	100 (1450)
Max. operating pressure at port PS2	bar (PSI)	310 (4500)
Max. Limit pressure at port RS	bar (PSI)	200 (2900)
Max. flow	l/min (GPM)	45 (11.9)
Weight	kg (lbs)	10.5 (23.2)

Solenoid Technical Data							
Type of coil	V DC	12 / 24					
Limit current	A	2.5 / 1.5					
Resistance nominal at 20 °C (68 °F)	Ω	2.3 / 13.4					
PWM frequency	Hz	200					
Max. allowable voltage variation	%	±10					

Ports	HS2
LS, PS1	M14 x 1.5
P, T, RS	M18 x 1.5
PS2	M22 x 1.5
S	G 1/4



Advanced Suspension - Preload Control Rod side Module Constant RC

Rod side module - Constant RC





Pressure Piston Side [bar (PSI)]

Min. and max. pressure settings depend on the application. Typically for a system with 200 bar maximum pump pressure the p_{min} and p_{max} is about 30 to 150 bar also depending on the accumulator precharge pressure.

Ordering Code

ŀ	IS2 - B	S 2	/ 2	5 / 2	25 R	C 6	5 - 1	2 E1	2A - I	B \	/
Modular hydro pneumatic suspension system											Seals No designation NBR
Level control basic module basic module - stabilization	BBS										V FPM (Viton) Surface treatment
Pressure sensor without pressure sensor pressure sensor at basic module		0 2								В	520 h salt spray (ISO 9227) Connector type of solenoid
Pressure relief valve setting 250 bar (3600 PSI)			25						E3A E12A		axial AMP junior timer - (2 pins; male) axial Deutsch DT04-2P - (2 pins; male)
Flow rate 5 I/min (1.32 GPM) 25 I/min (6.60 GPM)				5 25				12 24			Rated supply voltage of solenoid 12 V DC 24 V DC
Rod side module - constant					RC		6			R	C module - pressure relief valve setting e.g. 60 bar (870 PSI)



Advanced Suspension - Preload Control Rod side Module Characteristic RCH







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Description

Application

The advanced suspension with the rod side MODULE CHARACTERISTIC (RCH) is made for the same applications as the RC but with an extended working range (e.g. for front loader work) and achieving good comfort particular in medium and high load conditions. RCH is typically used for tractor front-axle suspensions and rear-axles on combines and self-propelled forage harvesters.

Typically used for:

- > Higher suspended load compared to RC
- > Higher comfort compared to RC
- > All wheel suspensions with a high load ratio

Technical Features

- > Pressure valve settings depend on the application
- Overpressure relief and service function through BASIC MODULE
- > Optional damping control with additional manifold
- Cast iron block and all steel parts are zinc-coated for 520 h protection acc. to ISO 9227

Functional Description

By hydraulically sensing the pressure on the piston side, the Rod side pressure is adjusted to the load conditions. At very low suspended loads (e.g. mounted plow unloading axle) the Rod side pressure is increased automatically, which creates an additional hydraulic preload in the suspension, thus improving the ride behavior.

Max. operating pressure at port P	bar (PSI)	250 (3600)
Max. operating pressure at port T	bar (PSI)	100 (1450)
Max. operating pressure at port PS2	bar (PSI)	310 (4500)
Max. Limit pressure at port RS	bar (PSI)	200 (2900)
Overcentre valve pilot ration options		3:1 / 5:1
Max. flow	l/min (GPM)	45 (11.9)
Weight	kg (lbs)	11.1 (24.5)

Solenoid Technical Data		
Type of coil	V DC	12/24
Limit current	A	2.5/1.5
Resistance nominal at 20 °C (68 °F)	Ω	2.3 / 13.4
PWM Frequency	Hz	200
Max. allowable voltage variation	%	±10

Ports	HS2
LS, PS1	M14 x 1.5
P, T, RS	M18 x 1.5
PS2	M22 x 1.5
S	G 1/4



Advanced Suspension - Preload Control Rod side Module Characteristic RCH

Rod side module - Characteristic RCH





Min. and max. pressure settings depend on the application. Typically for a system with 200 bar maximum pump pressure the p_{min} and p_{max} is about 30 to 150 bar, also depending on the accumulator precharge pressure.

Ordering Code





Advanced Suspension - Preload Control Rod side Module - Boost Plate





Ordering Code

Modular hydro pneumatic	HS2 - E	BS 2	2 / 2	25 / 2	.5 R	B - 1	2 E1	2A - I	B \	/
suspension system										Seals
Level control	R									V FPM (Viton)
basic module - stabilization	BS								R	Surface treatment
Pressure sensor without pressure sensor pressure sensor at basic module		0 2						E3A		Connector type of solenoid axial AMP junior timer - (2 pins; male)
Pressure relief valve setting 250 bar (3600 PSI)			25					EIZA		Rated supply voltage of solenoid
Flow rate 5 l/min (1.32 GPM)				5			12 24			12 V DC 24 V DC
25 l/min (6.60 GPM)				25		RB				Rod side module - Boost plate

Description

Application

As a cost-effective alternative for RC, the Rod side MODULE BOOST PLATE (RB) is made to pressurize the Rod side of the suspension cylinder with full pump pressure. Accordingly, the LS Signal is boosted.

Typically used for

> trailer drawbar suspension or simple axle suspensions

Technical Features

- Controls the preload pressure in the suspension cylinder's rod side
- Overpressure relief and service function through BASIC MODULE
- Cast iron block and all steel parts are zinc-coated for 520 h protection acc. to ISO 9227

Functional Description

This Module establishes a direct connection from the pump pressure to the rod side of the suspension cylinder.

Max. operating pressure at port P	bar (PSI)	250 (3600)
Max. operating pressure at port T	bar (PSI)	100 (1450)
Max. operating pressure at port PS2	bar (PSI)	310 (4500)
Max. Limit pressure at port RS	bar (PSI)	250 (3600)
Max. flow	l/min (GPM)	45 (11.9)
Weight	kg (Ibs)	8.5 (18.7)
Solenoid Technical Data		
Type of coil	V DC	12/24
Limit current	A	2.5/1.5
Resistance nominal at 20 °C (68 °F)	Ω	2.3 / 13.4
PWM frequency	Hz	200
Max. allowable voltage variation	%	±10

Ports	HS2
LS, PS1	M14 x 1.5
P, T, RS	M18 x 1.5
PS2	M22 x 1.5
S	G 1/4



Optional Suspension - Damping Control

Piston side Module Switchable / Proportional





Ports	HS2
LS, PS1	M14 x 1.5
Р, Т	M18 x 1.5
PS2, AP	M22 x 1.5
S	G 1/4

Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)



Regulation diagram



The coil current which initializes the flow through the proportional directional valve can differ due to the production tolerances about in a range of $\pm 6\%$ of the limit current.

Description

Application

The PISTON SIDE MODULE SWITCHABLE (PS) is used in applications, in which the suspension needs to be shut off in certain working conditions (e.g. for high working precision during tractor front loader work).

The PROPORTIONAL (PP) version offers the same features as the switchable version but is freely adjustable. A shut off is also possible in the proportional version of this module but additionally, it is preferred in applications with high comfort requirements and strongly varying loading and application conditions.

Technical Features

- Fine and fast proportional adjustment of the suspension's damping
- > Flow rates up to 30 l/min (7.9 GPM) in PP and 50 l/min (13.2 GPM) in PS-version (each at 10 bar Δ p). Manual override PP flow 15 l/min for 10 bar
- Cast iron block and all steel parts are zinc-coated for 520 h protection acc. to ISO 9227

Functional Description

Technical Data

The piston side module influences the oil flow between the accumulator and the piston side of the cylinder. The piston side module switchable PS is a directional control valve, opens or closes the connection between the accumulator and the cylinder. When the connection is open, the suspension is switched on; when it is closed the suspension is shut off. Depending on the application or safety restrictions the neutral spool position can be normally open or normally closed. The piston side module proportional PP is equipped with a proportional valve that offers the ability to control flow between the piston side of the cylinder and the accumulator proportional to the current applied to the valve's solenoid. The PP can be used in applications, in which the damping of the suspension has to be adjustable.

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		1	1
Max. operating pressure at port P		bar (PSI)	250 (3600)
Max. operating pressure at port T		bar (PSI)	100 (1450)
Max. operating pressure at port PS2		bar (PSI)	310 (4500)
Max. flow		l/min (GPM)	45 (11.9)
Flavor maters at A.a. 10 have	PS	l/min (GPM)	50 (13.2)
Flow rates at Δp =10 bar	PP	l/min (GPM)	30 (7.9)
Weight		kg (lbs)	10.1 (22.3)
Solenoid Technical Data			
Type of coil		V DC	12/24
Limit current		A	2.5/1.5
Resistance nominal at 20 °C (68 °F)	Ω	2.3/13.4	
PWM frequency	Hz	200	
Max. allowable voltage variation	%	±10	





Description

Application

The piston side module stand alone is used where installation space close to the cylinders is too small for combination of BM+PP or where high flows occur.

Technical Features

- > Flow up to 135 l/min for the switchable module PS
- > Flow up to 75 l/min for the proportional module PP

Functional Description

Same functionalities as flangable modules on page 15 but for higher flows.

Technical Data

Piston side module -	PP (pi	ston side mo	odule proporti	onal)	PS (piston side modul switchable)					
- damping control	Unit	Size	Size 06		Size 10		Size 06		Size 10	
	l/min (GPM)	40 (1	0.6)	75 (1	75 (19.8)		60 (21.1)		135 (37)	
Max. operating pressure at port P	bar (PSI)	350 (5080)								
Hysteresis	%		≤	6		-				
Weight	kg (lb)	3.21 (7.08)	8.9 (1	9.6)	2.5	(5.5)	8.9 (19.6)	
Nominal supply voltage	V	12 DC	24 DC	12 DC	24 DC	12 DC	24 DC	12 DC	24 DC	
Limit current	А	2.5	1.0	1.9	1.1	2.72	1.29	3.17	1.73	
Supply voltage range	V	11.214.7	20 30	11.214.7	20 30	10.813.2	21.626.4	10.813.2	21.626.4	

Ordering Code

HS2 - PP	SA 1	12	2/0	C 4	0 - 1	2 E1	2A -	B \	/	
Modular hydro-pneumatic suspension system										
Function piston side module switchable stand alone piston side module proportional stand alone PPS	A								No designation V	Seals NBR FPM (Viton)
Number of piston side modules 1 module	1									
Number of ports 2 - port 4 - port		2 4						В	S 520 h sa	urface treatment It spray (ISO 9227)
Spool type normally open normally closed			O C				E3A E12A		Connector axial AMP junior t axial deutsch DTO	type of solenoid imer (2 pins; male) 4-2P (2 pins; male)
Flow rate of piston side module PS module - 60 l/min @ $\Delta p = 10$ bar PS module - 135 l/min @ $\Delta p = 10$ bar PP module - 40 l/min @ $\Delta p = 10$ bar PP module - 75 l/min @ $\Delta p = 10$ bar			(13 2	60 35 40 75		12 24	L		Rated supply vol	tage of solenoid 12 V DC 24 V DC



General Technical Data



Max. pressure in the LS - port	bar (PSI)	210 (3050)		
Hydraulic fluid		Hydraulic oils of power classes (HL, HLP) to DIN 51524		
Fluid temperature range (NBR)	°C (°F)	-3080 (-22176)		
Fluid temperature range (FPM)	°C (°F)	-2080 (-4176)		
Ambient temperature range	°C (°F)	-2050 (-4122)		
Viscosity range	mm²/s (SUS)	10500 (492450)		
Duty cycle	%	100		
Enclosure type to EN 60529		IP67 (for connector type E3A), IP69K (for connector type E12A)		
Maximum degree of fluid contamination		Class 21/18/15 according to ISO 4406		
Mounting position		unrestricted		
Manual override	All electric-operat	Il electric-operated valves can have manual override closed with retaining nut against undesired usage		
Metric ports / Inch ports		acc ISO 9974-1 / ISO 11926		

Ordering Code

Example of the Ordering Code



MHPS / MSC

EC Electronic Controllers





Technical Features

- > Robust case
- > Pre-programmed based on module configuration
- > CAN Interface
- Can be used in all type of mobile machines (agriculture, building construction, forestry)

Functional Description

THE ELECTRONIC CONTROL UNIT (ECU) is a controller for mobile hydraulics programmed with special ARGO-HYTOS application software to control all modules of the MHPS and MSC systems.

Housing dimenstions	mm (in)	60 x 60 x 30 (2.36 x 2.36 x 1.18)
Plug connections		24 pins, Sicma 211 PL249S0005
Interfaces		RS 232, CAN (5080)
Supply	V	8 32
Current consumption	mA	30
Temperature range	°C	-40 85 (-40 185)
Environmental protection		IP6K6 and IP6K8

ECU Electronic control unit	MSC	MHPS		
Level control outputs	up to 2 on/off or proportional	up to 4 proportional		
Damping control outputs (on/of or proportional)	up to 2 manual	up to 4 manual, adaptive, loadsensitive and semi-active		
Spring rate control	-	available		
Boost valve control		available		
Display	only via laptop	via laptop or machine display connseted via CAN communication		
CAN connection	service and start up only	service, start up and normal operation		
External enable signal	available			
Status LED / Heartbeat		available		
Safety function	Loop check	Loop check, traction warning, rolling/tipping warning, pressure compensated levelling and diagonal level control for all wheel suspension		
Level sensor input	4	4		
Pressure sensor input	-	4		
User inputs: switch, potentiometer, push-button	1 - switch for damping or 1 potentiometer for damping, 2 pushbuttons for levelling	CAN-messages to operate certain functions		







Ordering Code for ECU

	EC	<u>U</u> - <u>0</u>	01	<u>A</u> - <u>0</u>	4 - 000	123 - 0	01	
Electronic Control Unit	ECU						001 002	Serial No. (Firmware) Version No. 1 Version No. 2
Project Controller MHPS MSC		001 002				*****		AP project Client list
Application All wheel suspension Boom suspension Cabine suspension Drawbar suspension (Trailers) Front axle suspension Rear axle Susupension Other applications			A B C D F R O		00 01 02 03 04 05			Hydraulic Suspension System No hydraulics Tractor "Regular" Tractor "High-End" Tractor "Wineyard" Sprayer Trailer – Drawbar



MHPS / MSC

EC Electronic Controllers - Cable Harness

MHPS System



MSC System





MHPS / MSC AS Angle Sensor



Technical Features

- > 70° angular measuring range
- > Supply 10 to 30V DC
- > 3-PIN AMP Superseal 1.5 plug

Functional Description

A position sensor is always required for position control of the BM in combination with the ECU. The sensor has an angular measuring range of 70° based on a non-contacting measuring principle and an output signal of 0.5 to 4.5 V.

Connection is done via a 3-PIN AMP Superseal 1.5 plug.

Dimensions in mm (in)



Pressure Sensor



Technical Features

- > Large pressure measuring range up to 400 bar (5800 PSI)
- > Various measuring ranges for achieving higher accuracy
- > Integrated pulse-snubber improving pressure shock resistance
- > Current or voltage output signal

Functional Description

The pressure sensor can be used with the BM and / or the RMV and is required for the spring rate control of the RMV in combination with the ECU. There are several types of operating pressure ranges available and it is issued as an analog voltage signal.



MHPS / MSC Dimensions of the blocks in mm (in)

ON / OFF Level Control - Switch control

Product Code: HS2-S0/0/40-12E12A









ON / OFF Level Control - Switch control double

Product Code: HS2-SS0/25/40-12E12A







Ports	ISO 1179-1
P, PSL, PSR	G 1/2″
Т	G 3/4″
LS	G 1/4″



Product Code: HS2-B2/25/25/0-12E3A-B



Proportional Level Control - Basic Module - Double Level control circuit

Product Code: HS2-BB2/25/25-12E12A-B











Ports	Size
LS, PS1	M14 x 1.5
P, T, RS	M18 x 1.5
PS2	M22 x 1.5
S1, S2	G 1/4



Product Code: HS2-BS2/25/25/0-12E12A-BV-A



Preload Control Rod side Module Constant RC

Product Code: HS2-B0/25/25RC/60-12E12A-B-A











Ports	ISO 1179-1
LS, PS1	M14 x 1.5
P, T, RS	M18 x 1.5
PS2	M22 x 1.5
S	G 1/4



Product Code: HS2-B0/25/25RCH5/59/9-12E12A-B



Preload Control Rod side Module - Boost Plate



