Modular Hydro-Pneumatic Suspension System
Improving Suspension Performance with a Proper Setup: Quicker and Better Adaptation to Applications

Technical Features

- \( p_{\text{max}} \) up to 250 bar (3600 PSI)
- Reduces vibrations in axle, wheel, cabin and payload suspension systems
- Basic and advanced suspension solutions with additional options
- Automatic control of cylinder position and suspension comfort parameters
- Serves all loads and cylinder sizes
- Modular system design with standard modules easily adaptable for specific applications
- Hydraulic modules
- Electronic control unit (ECU), touch display (TD) and accumulators
- Position and pressure sensors
- Variable settings for different operating and loading conditions
- Flexible configurations of ECU and TD

Suspension Systems in mobile machines

Hydro-pneumatic suspension systems improve comfort 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

Axle suspensions
All wheel suspensions
Cab suspensions
Drawbar and payload suspensions
**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 TD, 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.

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**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 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.
HS1-B**/ Basic Suspension - Level Control. Basic Module

**Description**

**Application**

In the MHPS System the BASIC MODULE (B) is always needed. 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.

**Technical Features**

- One solenoid control system
- Fine and fast proportional adjustment of cylinder position to load changes
- Proportional flow rate options max. 5 lpm and max. 25 lpm
- Optional accumulators

**Functional Description**

The BASIC MODULE provides 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 disconnected 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 suspension circuit is disconnected by a pilot-operated check valve.

**Technical Data**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. operating pressure at ports P</td>
<td>250 (3600) bar (PSI)</td>
</tr>
<tr>
<td>Max. operating pressure at ports T</td>
<td>100 (1450) bar (PSI)</td>
</tr>
<tr>
<td>Max. flow</td>
<td>45 (11.9) l/min (GPM)</td>
</tr>
<tr>
<td>Weight</td>
<td>3.22 (7.1) kg (lbs)</td>
</tr>
</tbody>
</table>

**Solenoid Technical Data**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of coil</td>
<td>V DC 12 / 24</td>
</tr>
<tr>
<td>Limit current</td>
<td>A 2.5 / 1.5</td>
</tr>
<tr>
<td>Resistance nominal at 20 °C (68 °F)</td>
<td>Ω 2.3 / 13.4</td>
</tr>
<tr>
<td>PWM Frequency</td>
<td>Hz 200</td>
</tr>
<tr>
<td>Max. allowable voltage variation</td>
<td>% ±10%</td>
</tr>
</tbody>
</table>

**Characteristics**

Measured at \( v = 32 \text{ mm}^2/\text{s} \) (156 SUS)
HS1-BS** Basic Suspension - Level Control. Basic Module - 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.

**Technical Features**
Same as Basic Module
- Decoupling of two suspension cylinders level-controlled at the same time
- Optional accumulators

**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.

**Technical Data**

Max. operating pressure at ports P bar (PSI) 250 (3600)
Max. operating pressure at ports T bar (PSI) 100 (1450)
Max. flow l/min (GPM) 45 (11.9)
Weight kg (Ibs) 5,22 (11.5)

**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%

**Ordering Code**

Example of the Ordering Code

<table>
<thead>
<tr>
<th>Ports</th>
<th>HS1</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS</td>
<td>M14 x 1.5</td>
</tr>
<tr>
<td>CP1, CP2</td>
<td>M16 x 1.5</td>
</tr>
<tr>
<td>P, T</td>
<td>M18 x 1.5</td>
</tr>
<tr>
<td>PS2</td>
<td>M22 x 1.5</td>
</tr>
<tr>
<td>S</td>
<td>G 1 x 4</td>
</tr>
</tbody>
</table>

System code example: HS1-BS2**/*-*

**Modular Hydro Pneumatic Suspension System**

**Level Control - Basic Modules**
- Basic module
- Basic module - Stabilization

**Pressure Sensor at Basic Module**
- Without Pressure Sensor
- Pressure Sensor at Basic Module

**Basic Module Relief Pressure setting**
(in range up to 250 bar (3600 PSI)
250 bar (3600 PSI)

**Flow Rate of Basic Module**
- 5 l/min
- 25 l/min

**Surface treatment Steel parts**
- 240 h salt spray (ISO 9227)
- 900 h salt spray (ISO 9227)

**Seals**
- NBR
- V FPM (Viton)

**Plate Material and Surface treatment**
- Steel - 900 h salt spray (ISO 9227)

**Connector type of Solenoid**
- Axial AMP Junior Timer (2 pins; male)
- Deutsch DT 04-2P (2 pins; male)

**Rated supply voltage of solenoid**
- 12 V DC
- 24 V DC
The advanced suspension with the ROD SIDE MODULE CONSTANT (RC) is used for suspension applications with medium and high load ratio between minimum and maximum load.

It is typically used for:

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

### Technical Features

- The same features as the Basic module
- Controls the preload pressure in the suspension cylinder's rod side (up to 200 bar, 2900 PSI)
- Pressure relief valve setting dependent on application
- Overpressure relief and service function through Basic module
- Optional accumulators

### 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.

### Technical Data

<table>
<thead>
<tr>
<th>Port</th>
<th>Pressure (bar/PSI)</th>
<th>Flow (l/min/GPM)</th>
<th>Weight (kg/lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P, T, RS</td>
<td>250 (3630)</td>
<td>45 (11.9)</td>
<td>6,12 (13.4)</td>
</tr>
<tr>
<td>LS, PS1</td>
<td>100 (1450)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PS2</td>
<td>200 (2900)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>200 (2900)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 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%

### Application Example

Min. and max. pressure settings depend on the application. Typically for a system with 200 bar maximum pump pressure the p<sub>min</sub> and p<sub>max</sub> is about 30 to 150 bar also depending on the accumulator precharge pressure.
HS1-B*/*-RCH* Advanced Suspension - Preload Control. Rod Side Module Characteristic

### 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.

**Technical Features**

- The same features as the Basic module
- Higher suspended load compared to RC
- Higher comfort compared to RC
- Pressure valve settings depend on the application
- Overpressure relief and service function through Basic module
- Optional accumulators

**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.

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### Technical Data

| Max. operating pressure at ports P | bar (PSI) | 250 (3600) |
| Max. operating pressure at ports T | bar (PSI) | 100 (1450) |
| Max. Limit pressure at Rod Side | bar (PSI) | 200 (2900) |
| Overcentre Valve Pilot Ration Options | 3:1 / 5:1 |
| Max. flow | l/min (GPM) | 45 (11.9) |
| Weight | kg (Ibs) | 5 (11) |

### 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% |

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### Characteristics

**measured at ν = 32 mm²/s (156 SUS)**

**Level of comfort**

- HIGH
- Standard

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**Application example**

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.
**Description**

**Application**

Variable, adjustable preload of the suspension cylinder's rod side is achieved by using advanced suspension ROD SIDE MODULE VARIABLE (RV). RV is preferably used in high-end applications, in which suspension parameters need to be adjusted freely.

**Technical Features**

- Fine and fast proportional adjustment of rod side preload
- Pressure sensor included
- Accumulators optional
- Overpressure relief and service function through Basic Module

**Functional Description**

The Rod side Module Variable (RV) provides pressure control of rod side of the suspension cylinder. It proportionally feeds or drains the suspension cylinder's rods side chamber. When the valve is not energized, the oil in the rod side chamber of the suspension circuit is disconnected by a pilot-operated check valve.

**Technical Data**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. operating pressure at ports P</td>
<td>250 (3600) bar (PSI)</td>
</tr>
<tr>
<td>Max. operating pressure at ports T</td>
<td>100 (1450) bar (PSI)</td>
</tr>
<tr>
<td>Max. flow l/min (GPM)</td>
<td>45 (11.9)</td>
</tr>
<tr>
<td>Weight kg (lbs)</td>
<td>5,35 (11.8)</td>
</tr>
</tbody>
</table>

**Solenoid Technical Data**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of coil V DC</td>
<td>12 / 24</td>
</tr>
<tr>
<td>Limit current A</td>
<td>2,5 / 1,5</td>
</tr>
<tr>
<td>Resistance nominal at 20 °C (68 °F)</td>
<td>2.3 / 13.4 Ω</td>
</tr>
<tr>
<td>PWM Frequency Hz</td>
<td>200</td>
</tr>
<tr>
<td>Max. allowable voltage variation</td>
<td>±10%</td>
</tr>
</tbody>
</table>

**System code example:**

HS1-B*/25-RV*-*

**Characteristics**

**Level of comfort**

- HIGH
- Standard

**Application example**

Min. and max. pressure settings depend on the application. Typically for a system with 200 bar maximum pump pressure the p<sub>min</sub> and p<sub>max</sub> is about 30 to 150 bar also depending on the accumulator precharge pressure.
Description

Application
As a cost-effective alternative for RC, the RODSIDE MODULE BOOST PLATE (RB) is made to pressurize the rodside of the suspension cylinder with full pump pressure. Accordingly, the LS Signal can be boosted. Possible applications are:

› 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
› Optional pressure sensors and accumulator

Functional Description
This Module establishes a direct connection from the pump pressure to the rodside of the suspension cylinder.

Technical Data

Max. operating pressure at ports P bar (PSI) 250 (3600)
Max. operating pressure at ports T bar (PSI) 100 (1450)
Max. Limit pressure at Rod Side bar (PSI) 250 (3600)
Max. flow l/min (GPM) 45 (11.9)
Weight kg (lbs) 5,22 (11.5)

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%

Ordering Code

HS1-B*/25-RB*-*

Modular Hydro Pneumatic Suspension System

Level control - Basic modules
Basic module
Basic module - Stabilization

Pressure sensor at Basic Module
Without Pressure Sensor
Pressure Sensor at Basic Module

Basic Module Relief Pressure setting
(in range up to 250 bar (3600 PSI)
250 bar (3600 PSI)

Flow Rate of Basic Module
5 l/min (1.32 GPM)
25 l/min (6.60 GPM)

Rod Side Module - Preload Control
Rod Side Module - Boost Plate
Rod Side Module - Constant
Rod Side Module - Characteristic
Rod Side Module - Variable

RCH Pilot Ratio
3:1
5:1

RV Option - Pressure Sensor
Without Pressure Sensor
Pressure Sensor at Basic Module

Surface treatment Steel parts
240 h salt spray (ISO 9227)
900 h salt spray (ISO 9227)

No designation: B
No designation: V

Connectors

Axial AMP Junior Timer (2 pins; male)
Deutsch DT 04-2P (2 pins; male)

Rated supply voltage of solenoid
12 V DC
24 V DC

RC and RCH Pressure Relief level setting
* in range up to 200 bar (2900 PSI)
200 bar

RCH Options - Overcentre Valve Pressure setting
* in range up to 400 bar (5800 PSI)
250 bar (3630 PSI)

RCH Options - Pressure Sensor at Basic Module
5 l/min (1.32 GPM)
25 l/min (6.60 GPM)
HS1-B*/P* Optional Suspension - Damping Control. Piston side Module Switchable / Proportional

**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 prop. adjustment of the suspension’s damping
- Flow rates up to 80 lpm (21.1 GPM) in PP and 40 lpm (10.6 GPM) in PS-version (each at 10 bar Δp). Manual override PP flow 15 lpm for 10 bar.
- Accumulators optional

**Functional Description**

The piston side module influences the oil flow between accumulator and piston side of the cylinder. The piston side module switchable PS is a directional control valve, opens or closes the connection between accumulator and 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.

**Technical Data**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Measured at (v = 32 \text{ mm}^2/\text{s} (156 \text{ SUS}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure drop of PS Module P *- AP</td>
<td><img src="image" alt="Graph" /></td>
</tr>
</tbody>
</table>

| System code example: HS1-B*/25-PP |

<table>
<thead>
<tr>
<th>Port</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS, PS1</td>
<td>M14x1,5</td>
</tr>
<tr>
<td>P, T</td>
<td>M18x1,5</td>
</tr>
<tr>
<td>PS2, AP</td>
<td>M22x1,5</td>
</tr>
<tr>
<td>S</td>
<td>G 1/4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Port</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Max. operating pressure at ports</td>
</tr>
<tr>
<td>T</td>
<td>Max. operating pressure at ports</td>
</tr>
<tr>
<td></td>
<td>Max. flow</td>
</tr>
<tr>
<td></td>
<td>Flow rates (PS/PP)</td>
</tr>
<tr>
<td></td>
<td>Weight</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Solenoid Technical Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of coil</td>
<td>V DC</td>
</tr>
<tr>
<td>Limit current A</td>
<td>2.5 / 1.5</td>
</tr>
<tr>
<td>Resistance nominal at 20 °C (68 °F) Q</td>
<td>2.3 / 13.4</td>
</tr>
<tr>
<td>PWM Frequency Hz</td>
<td>200</td>
</tr>
<tr>
<td>Max. allowable voltage variation %</td>
<td>±10%</td>
</tr>
</tbody>
</table>

The coil current which initializes the flow through the proportional directional valve can differ due to the production tolerances about in a range of ± 6% of the limit current.
**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) -30 ... 80 (-22 ... 176)

Fluid temperature range (FPM) °C (°F) -20 ... 50 (-4 ... 122)

Ambient temperature range °C (°F) -20 ... 80 (-4 ... 176)

Viscosity range mm²/s (SUS) 10 ... 500 (49 ... 2450)

Duty cycle % 100

Enclosure type to EN 60529 IP 67 (for connector type E3A), IP 69K (for connector type E12)

Maximum degree of fluid contamination Class 21/18/15 according to ISO 4406

Mounting position unrestricted

Manual override All electric-operated valves can have manual override closed with retaining nut against undesired usage

Vibration Endurance

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**Ordering Code**

Example of the Ordering Code

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**Surface treatment**

**Steel parts**

Standard

A 240 h salt spray (ISO 9227)

B 900 h salt spray (ISO 9227)

**Seals**

NBR

FPM (Viton)

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**Material and Surface treatment**

Steel - 900 h salt spray (ISO 9227)

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**Connector type of Solenoid**

Axial AMP Junior Timer (2 pins; male)

Deutsch DT 04-2P (2 pins; male)

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**Rated supply voltage of solenoid**

12 V DC

24 V DC

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**Spool Symbol**

Normally Open

Normally Closed

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**RCH Options - Overcentre Valve Pressure setting**

Example 250 bar (3600 PSI) 3

5:1

RV Option - Pressure Sensor Without Pressure Sensor 0

Pressure Sensor at Basic Module 2

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**RCH Options - Pressure Relief setting**

Example 200 bar (2900 PSI) 20
Preselected Module Combinations

Front Axle Suspension Tractors

Basic Module + Rod Side Module Characteristic

Basic Module [B] for suspension-cylinder leveling
Rod Side Module Characteristic [RCH] for load dependent spring rate control

Front Axle Suspension “High-End” Tractors

Basic Module + Piston Side Module Proportional + Rod Side Module Variable
Product Code: HS1-B2/25/25RV2/25/20/O4-12E12-EA

Basic Module [B] for suspension-cylinder leveling
Piston Side Module Proportional [PP] for damping control
Rod Side Module Variable [RV] for fully variable spring rate control

<table>
<thead>
<tr>
<th>Ports</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS, PS1</td>
<td>M14x1,5</td>
</tr>
<tr>
<td>P, T, RS</td>
<td>M18x1,5</td>
</tr>
<tr>
<td>PS2</td>
<td>M22x1,5</td>
</tr>
<tr>
<td>S</td>
<td>G 1/4</td>
</tr>
</tbody>
</table>
Application Examples

Preselected Module Combinations

Trailer - Drawbar Suspension

Basic Module + Rod Side Module Boost Plate
Product Code: HS1-B0/25/25RB0-12E12-E-A

Basic Module [B] for suspension-cylinder leveling
Rod Side Module Boost Plate [RB]

Vineyard Tractor Front Axle Suspension

Basic Module Stabilized+ Rod Side Module Characteristic

Basic Module Stabilized [BS] for stabilized suspension-cylinder leveling;
no flow between suspension cylinders
Rod Side Module Characteristic [RCH] for load dependent spring rate control
**Preselected Module Combinations**

### Sprayer All Wheel Suspension

**Front Axle:**
- Basic Module + Rod Side Module Variable  
  Product Code: HS1-B0/25/25RV0/25/0-24E12-EV-A

Basic Module [B] for left suspension-cylinder leveling  
Rod Side Module Variable [RV] for right suspension-cylinder leveling

**Rear Axle:**
- Basic Module Stabilized  
  Product Code: HS1-BS2/25/25/0-24E12-AV-A

Basic Module Stabilized [BS] for stabilized rear suspension cylinders

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**Ports Size**
- LS, PS1 M14x1,5  
- P, T, RS M18x1,5  
- PS2 M22x1,5  
- S G 1/4
Preselected Module Combinations

**Trailer - Axle Suspension**

Basic Module + Rod Side Module Constant  
Product Code: HS1-B0/2S/2S/RC0-12E12-E-A

Basic Module [B] for suspension-cylinder leveling  
Rod Side Module Constant [RC] for fixed spring rate

**Cab Suspension**

Basic Module  

Basic Module [B] for level control and suspension
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. For this purpose, the ECU has four current controlled PWM-outputs, as well as six analog inputs (0 … 10V), digital in+out+CAN (I/O+CAN).

### Technical Data

<table>
<thead>
<tr>
<th></th>
<th>ECU</th>
<th>TD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total dimensions</td>
<td>152 x 150 x 56 mm (5.98 x 5.90 x 2.20 in)</td>
<td>142 x 98 x 53 mm (5.59 x 3.86 x 2.09 in)</td>
</tr>
<tr>
<td>Plug connections</td>
<td>AMP 1 0967280 1, 42 PINS</td>
<td>Tyco-AMP 1437288-6</td>
</tr>
<tr>
<td>Interfaces</td>
<td>RS 232, CAN (5080)</td>
<td>RS 232, 2x CAN (5080)</td>
</tr>
<tr>
<td>Supply</td>
<td>V 8 ... 32 mA</td>
<td>V 9 ... 36 mA</td>
</tr>
<tr>
<td>Current consumption at 24 V</td>
<td>60 mA</td>
<td>max. 240 mA</td>
</tr>
<tr>
<td>Temperature range</td>
<td>°C (°F) -40 ... 85 (-40 ... 185)</td>
<td>°C (°F) -40 ... 85 (-40 ... 185)</td>
</tr>
<tr>
<td>Weight</td>
<td>0.65 kg (1.43 lbs)</td>
<td></td>
</tr>
</tbody>
</table>

### Technical Features

- Pre-programmed based on module configuration
- Easy-to-use control of the ECU
- Usable for service purposes

### Functional Description

The display unit is an optional attachment to the ECU and for general as well as for service purposes. The 4.3” TFT color graphic LCD with LED backlight has a resolution of 480x272 pixels and is connected to the ECU via CAN-bus. It is used for adjustment of the set points of level, spring rate and damping, as well as for service functions.
### Technical Features

- 70° angular measuring range
- Supply 10 to 30 V 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

![Dimensions Diagram]

### Ordering Code

<table>
<thead>
<tr>
<th>Component</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic Control Unit</td>
<td>EC-**-EA-T0-*</td>
<td>as per installation</td>
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<tr>
<td>Electronic Touch Display</td>
<td>EC-**-E0-TA-*</td>
<td>as per installation</td>
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<tr>
<td>Universal Mounting Kit for Touch Display</td>
<td>EC-O00-E0-TA-M1</td>
<td>32584500</td>
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<td>Dashboard mounting Kit</td>
<td>EC-O00-E0-TA-M2</td>
<td>32584700</td>
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<tr>
<td>Pressure Sensor (Metri Pack 150)</td>
<td>PSC 250-1844</td>
<td>32549300</td>
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<tr>
<td>Angle Sensor</td>
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* For types and sizes of accumulators please consult with the factory.