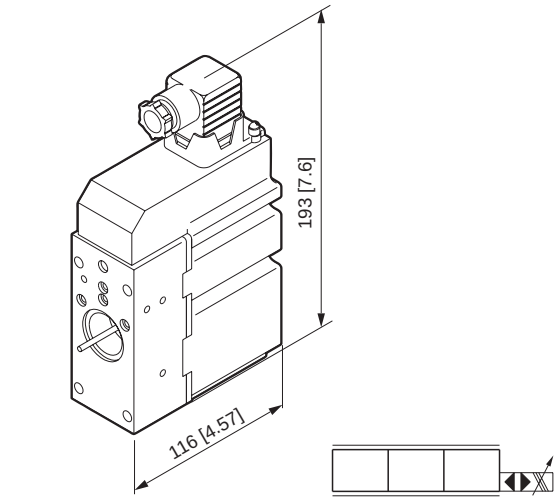
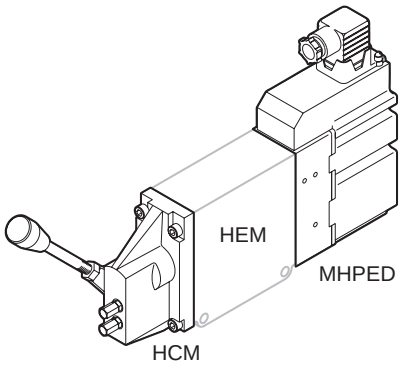


MHPED



Example with module MHPED and manual control HCM

MHPED electrohydraulic PROPORTIONAL module
MHPED is a closed loop electrohydraulic activation unit, whose design is based on digital technology.
MHPED has been specially developed to meet the harsh operating requirements of today's mobile machine market.

MHPED electrical closed loop proportional actuation operates safely and precisely the main spool's shift according to an electrical signal coming from a remote control unit, and is recommended where precise metering control, low hysteresis, fault monitoring, and fast system reaction are paramount.

The input signal, by means of the PCB and the two reducing proportional solenoid valves, is converted into a low pilot pressure which inturn moves the HPV's spool.

The inductive transducer position (LVDT) ensures that the spool is being moved in the correct position, otherwise, in the event of uncontrolled spool positioning, the feed-back signal wuill detect it as an error and it will fast react operator independent (fault monitoring system, see diagrams in the following pages).

MHPED is defined by:
- Capacity to handle three different kinds of input signal control (see chart below).
  The required signal control is to be stated in the order phase.
- Inductive transducer position, LVDT (Linear Variable Differential Transformer)
- Integrated PWM (Pulse Width Modulator)
- Fault monitoring, transistor output for signal source
- Excellent regulation
- Low hysteresis
- Short reaction time

Thanks to the developments in digital electronics, it has been possible to integrate in the MHPED modules, besides all the algorithms needed for the spool movement control, also a wide range of advanced circuits above all conceived for the safety and handling of complete systems.

The use of the module in the **passive or active version** allows the electrohydraulic system to be obtained with different safety degrees, for the choice of which it is essential to know the required functions exactly.

Once this condition has been fullfilled, and work is going on in the area stated above, with the four examples described in the following pages, we can always give you the best solution.

The diagrams represents just a few possibilities, advised by experience, of how the assesment of degree of protection system ought always to be made.
This does not mean that considering the enormity of the subject and need for ever-increasing flexibility and performance of the industrial machinery with tighter and tighter safety rules, custom-built solutions can not be taken into account.

Active version

Voltage	Input signal control		
	0.5 x U_{DC} (A) joystick	**0 ÷ 10 V_{DC}** (B) PLC	**0 ÷ 20 mA** (C) PLC
12 Vdc	**MHPED04108011**	**MHPED04108018**	**MHPED04108026**
24 Vdc	**MHPED04108010**	**MHPED04108020**	**MHPED04108028**

Passive version

Voltage	Input signal control		
	0.5 x U_{DC} (A) joystick	**0 ÷ 10 V_{DC}** (B) PLC	**0 ÷ 20 mA** (C) PLC
12 Vdc	**MHPED04108009**	**MHPED04108022**	**MHPED04108030**
24 Vdc	**MHPED04108007**	**MHPED04108024**	**MHPED04108032**

Aluminum body

Electrical connections for MHPED controls, see page: E-5

MHPED voltage controls for HEM working sections

Rated voltage		12 Vdc	24 Vdc
Power supply voltage range		11 ÷ 15 V	20 ÷ 28 V
Max. ripple		5 %	
End stroke spool current consumption		520 mA	260 mA
Current consumption (neutral position, constant voltage)		36 mA	46 mA
Power consumption		6 W	
Heat insulation		Class H 180 °C [356 °F]	
Fault monitoring system	Max. current on safety output (pin no. 3, page D-5)	50 mA	
	Reaction time at fault	550 ms	
Reaction time (constant voltage)	From neutral position to max. spool travel	110 ÷ 140 ms	
	From max. spool travel to neutral position	70 ÷ 90 ms	
Reaction time (neutral switch)	From neutral position to max. spool travel	130 ÷ 170 ms	
	From max. spool travel to neutral position	70 ÷ 90 ms	
Connector		Standard (IP 65) according to DIN 43650 / ISO 4400	
Enclosure to IEC 529		IP 65	

(A) joystick	Input signal control	Neutral position	0.5 x UDC	
		Control range	0.25 x UDC ÷ 0.75 x UDC	
	Max. current signal control		0.5 mA	1 mA
	Input impedance in relation to 0.5 x UDC		12 kΩ	
(B) PLC	Input signal control	Voltage	0 ÷ 10 VDC	
		Neutral position	5 VDC	
		Control range	0.25 x 10 VDC ÷ 0.75 x 10 VDC	
	Current signal contro		0.5 mA	
	Input impedance in relation to 0 ÷ 10 VDC		20 kΩ	
(C) PLC	Input signal control	Current	0 ÷ 20 mA	
		Neutral position	10 mA	
		Control range	0.25 x 20 mA ÷ 0.75 x 20 mA	
	Input impedance in relation to 0 ÷ 20 mA		0.5 kΩ	

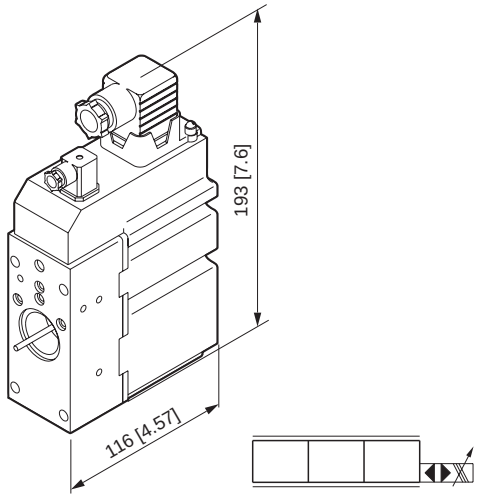
MHPED (active version) modules behaviour in relation to the signal control

UDC	Signal control	Ground	Safety output (pin no. 3)	Effect
24 V	12 V (50% of UDC)	Connected	No output	Spool held electrical in neutral position
24 V	6 V (25% of UDC)	Connected	No output	Full flow P → A
24 V	18 V (75% of UDC)	Connected	No output	Full flow P → B
24 V	20.4 V (85% of UDC)	Connected	Output	Spool stays in neutral position (red light comes on)
24 V	21.6 V (90% of UDC)	Connected	Output	Spool stays in neutral position (red light comes on)
24 V	24 V (100% of UDC)	Connected	Output	Spool stays in neutral position (red light comes on)
24 V	0 V (0% of UDC) selected	Connected	Output	Spool stays in neutral position (red light comes on)
24 V	0 V (0% of UDC) interrupted	Connected	Output	Spool stays in neutral position (red light comes on)
24 V	1 V (4% of UDC)	Connected	Output	Spool stays in neutral position (red light comes on)
0 V	15.6 V (65% of UDC)	Connected	No output	Spool stays in neutral position (no light)
24 V	15.6 V (65% of UDC)	Disconnected	No output	Spool stays in neutral position (no light)

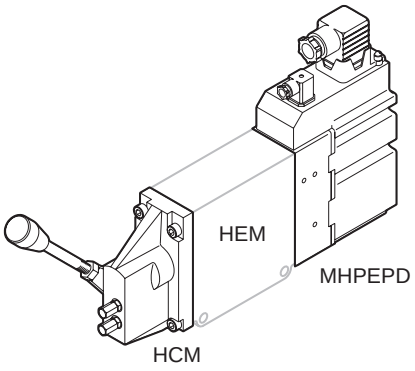
With the same data, given in percentages, the behaviour of the module is equal to the 12 VDC, 0 ÷ 20 mA and 0 ÷ 10 V also.

No. of flashes	Cause
1	LVDT outside of its own position
2	The demanded spool position doesn't correspond to the input signal
3	LVDT is broken
4	Short circuit in the output signal for direction indicator (MHPEPD)
5	Internal electrical faults
6	Short circuit in the proportional solenoid valves
7	Short circuit in the warning output signal (pin no. 3)
8	Input signal control exceeds min. / max. values (15% ÷ 85% of supply voltage)

When an error state is detected the lamp of the module starts flashing red, and the number of flashes indicates the probable cause of failure.



MHPEPD



Example with module MHPEPD and manual control HCM

MHPEPD electrohydraulic PROPORTIONAL module
MHPEPD closed loop electrohydraulic proportional activation unit is the most advanced version of the closed loop control modules.

MHPEPD is defined by:
- Spool direction indicator output;
- Capacity to handle three different kinds of input signal control. The required signal control is to be stated in the order phase;
- Inductive transducer position, LVDT (Linear Variable Differential Transformer);
- Integrated PWM (Pulse Width Modulator);
- Fault monitoring, transistor output for signal source;
- Excellent regulation;
- Low hysteresis;
- Short reaction time.

Besides the afore mentioned features, another purpose of the module is to give an indication of the spool's movement, through an on/off output signal in the smaller connector (also when the spool is manually activated).

The diagrams on page E-11 show an example of how the direction output can be handled to activate or deactivate the Ls on/off pilot solenoid valve by means of the two relay (K1 - K2) and two electrical end of strokes.

This is just an example, as the use of MHPEPD is also destined for more demanding surroundings, that is solutions using artificial intelligence which dialogue at the higher level via bus, and which realize a real distributed control system able to carry out "stand-alone" processes.

This in turn send to the raised level only that information read as "positive" for the safe handling of machine.
All the electrohydraulics features, performance, and choice of safety degree system, are the same of those already described for the MHPED module.

Active version

Voltage	Input signal control		
	0.5 x U_{DC} (A) joystick	**0 ÷ 10 V_{DC}** (B) PLC	**0 ÷ 20 mA** (C) PLC
12 Vdc	**MHPEPD4108048**	**MHPEPD4108058**	**MHPEPD4108066**
24 Vdc	**MHPEPD4108047**	**MHPEPD4108060**	**MHPEPD4108068**

Passive version

Voltage	Input signal control		
	0.5 x U_{DC} (A) joystick	**0 ÷ 10 V_{DC}** (B) PLC	**0 ÷ 20 mA** (C) PLC
12 Vdc	**MHPEPD4108046**	**MHPEPD4108054**	**MHPEPD4108062**
24 Vdc	**MHPEPD4108045**	**MHPEPD4108056**	**MHPEPD4108064**

Aluminum body

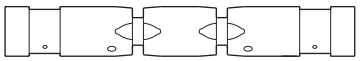
Electrical connections for MHPEPD working sections, see page: E-11

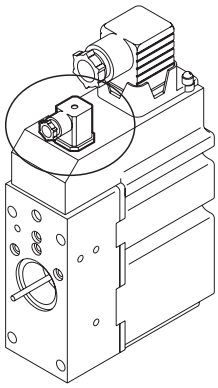
MHPEPD controls for HEM working sections

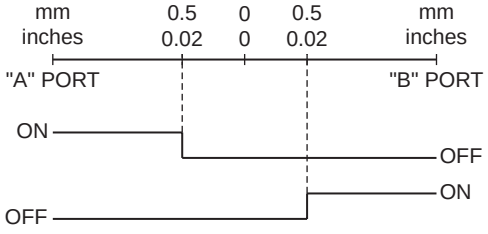
Rated voltage		12 Vdc	24 Vdc
Power supply voltage range		11 ÷ 15 V	20 ÷ 28 V
Max. ripple		5 %	
End stroke spool current consumption		520 mA	260 mA
Current consumption (neutral position, constant voltage)		36 mA	46 mA
Power consumption		6 W	
Heat insulation		Class H 180 °C [356 °F]	
Fault monitoring system	Max. current on safety output (pin no. 3)	50 mA	
	Reaction time at fault	550 ms	
Max. current output signal for indication actuating direction		50 mA	
Reaction time (constant voltage)	From neutral position to max. spool travel	110 ÷ 140 ms	
	From max. spool travel to neutral position	70 ÷ 90 ms	
Reaction time (neutral switch)	From neutral position to max. spool travel	130 ÷ 170 ms	
	From max. spool travel to neutral position	70 ÷ 90 ms	
Connectors		Standard (IP 65) according to DIN 43650 / ISO 4400	
		Spool direction indicator output (IP 65) according to DIN 40050	
Enclosure to IEC 529		IP 65	

(A) joystick	Input signal control	Neutral position	0.5 x UDC	
		Control range	0.25 x UDC ÷ 0.75 x UDC	
	Max. current signal control		0.5 mA	1 mA
	Input impedance in relation to 0.5 x UDC		12 kΩ	
(B) PLC	Input signal control	Voltage	0 ÷ 10 VDC	
		Neutral position	5 VDC	
		Control range	0.25 x 10 VDC ÷ 0.75 x 10 VDC	
	Current signal contro		0.5 mA	
	Input impedance in relation to 0 ÷ 10 VDC		20 kΩ	
(C) PLC	Input signal control	Current	0 ÷ 20 mA	
		Neutral position	10 mA	
		Control range	0.25 x 20 mA ÷ 0.75 x 20 mA	
	Input impedance in relation to 0 ÷ 20 mA		0.5 kΩ	

Spool direction signals







PIN	Center position	Movement to A port	Movement to B port
1	free	free	free
2	no output	Udc (+)	no output
3	no output	no output	Udc (+)
4	To get the manual control this pin must be feeded with the supply voltage. To get the remote control the supply voltage must be taken off from this pin.		