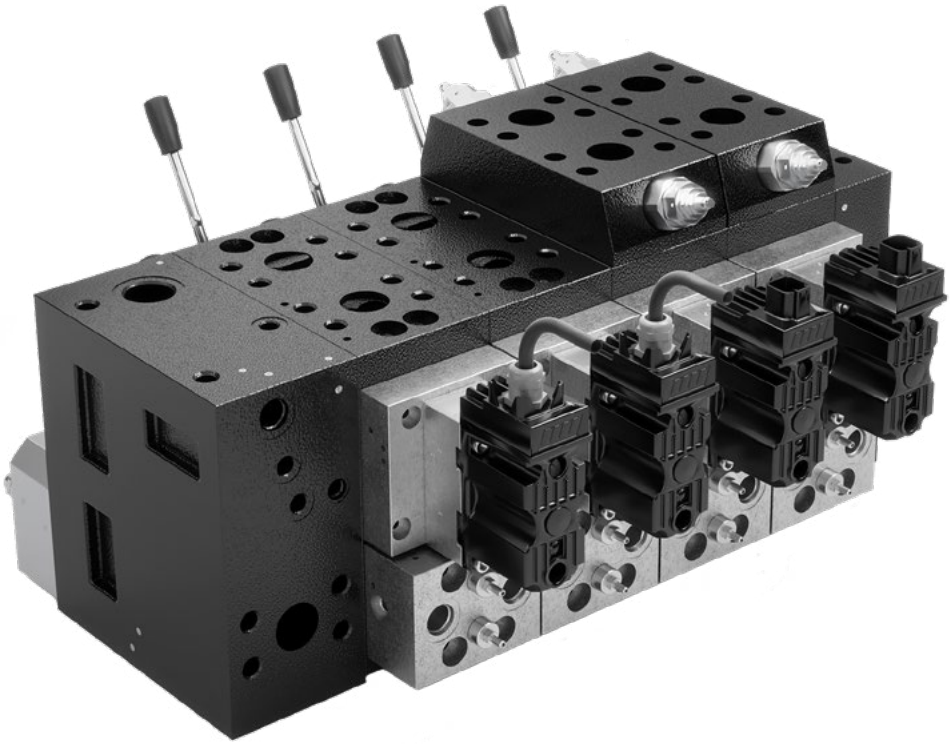
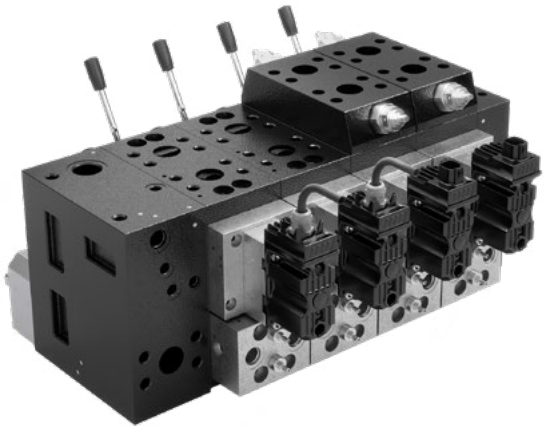
PDV315 Proportional Directional valve



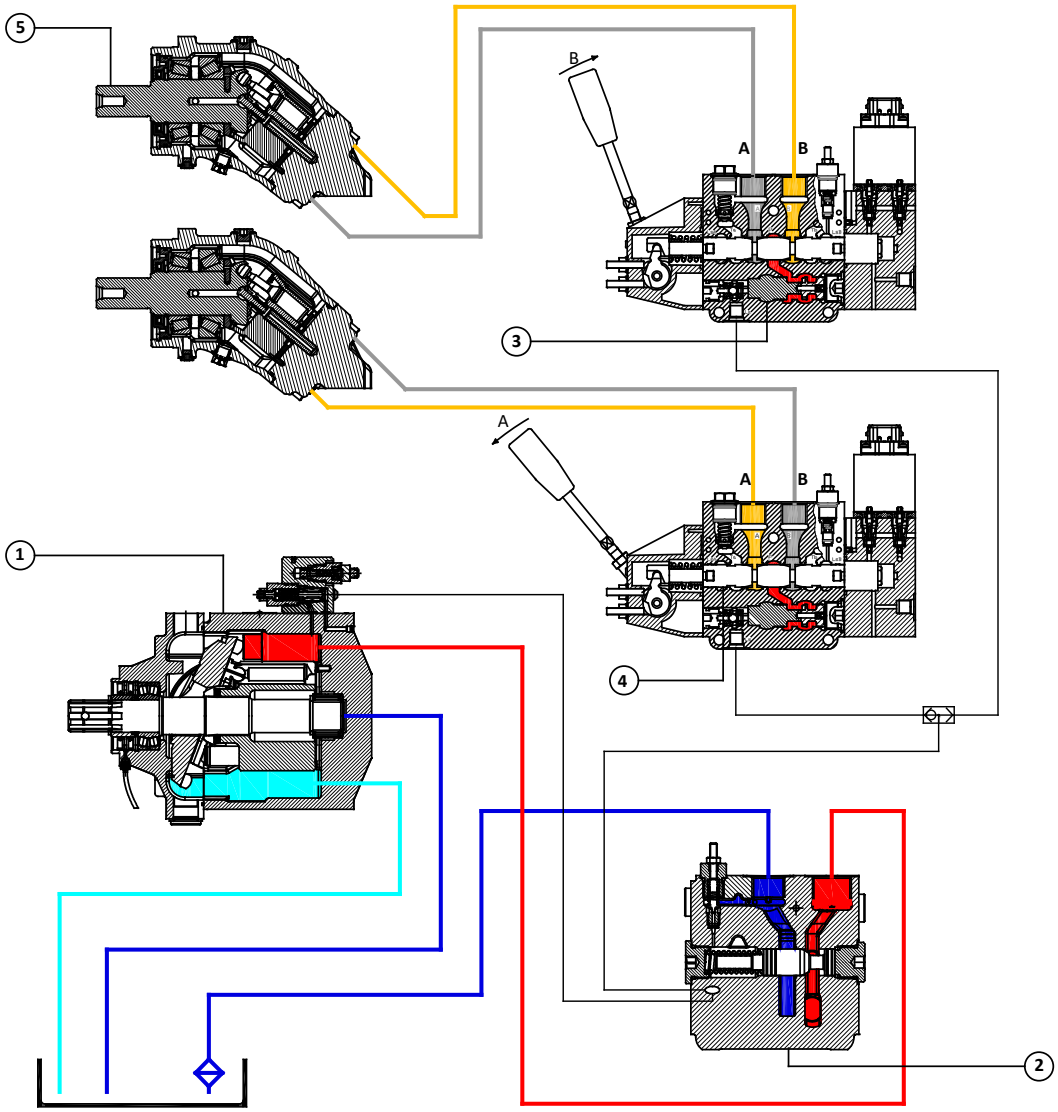
PDV315 Proportional valve
General description

PDV315 is a hydraulic proportional directional valve, designed to offers a wide range controls options and flexibility.
The **PDV315** modular system enables bankable groups to perform many individual tasks, to meeting and exceeding the changing control needs of the off-highway machines of today, and well into the future to maximize the efficiency, controllability and reliability of vehicles.



PDV315 main features:

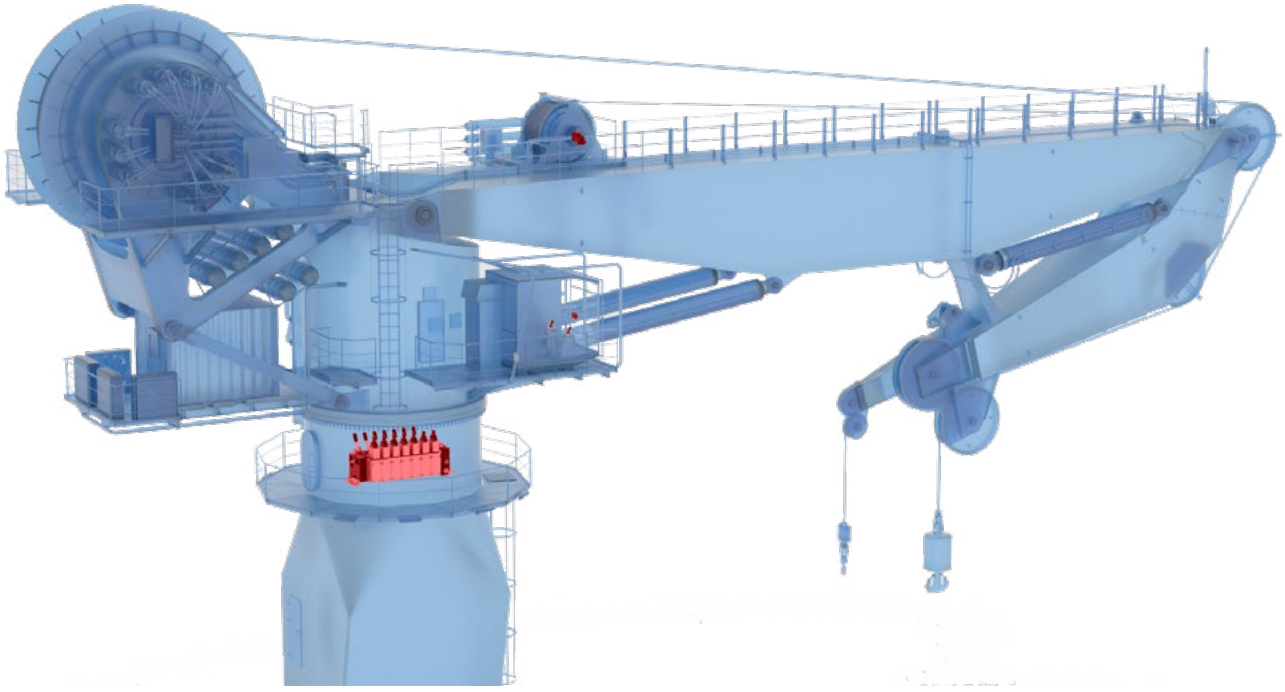
- Load sensing up-stream pressure compensation
- High flow/low pressure drop capability
- Integrated pump unloading system
- Integrated cut-off pump system
- Open/closed centre shifting system
- Precise metering capabilities
- LSA-LSB electrical unloading
- LSA-LSB electrical working pressure remote control
- Constant flow regardless of pressure
- Working sections symmetrical flow
- Optional priority inlet for steering or different priority functions
- Optional dual hydraulic pilot and electrohydraulic control
- ATEX and IECEx configuration
- CAN-Bus comunication
- EMC immunity ensures high safety with regard to electro-magnetic compatibility



High pressure port of **PPV** piston pump ① supply the closed centre inlet section of **PDV315** proportional valve ② which in turn feeds the down-stream working sections.
The **PDS** spool neutral position ④ unload the LS pump signal to tank, so that the swashplate angle is towards the minimum displacement and pressure in stand-by setting.
The spool position determines the flow demands (speed rotation) of the two **HPM** motors ⑤.
The PDS main spool compares the pressure drop before and after the spool notches (differential pressure Δp), and therefore, the pump flow remain constant.
If the differential pressure increase, the pump swashplate is swivelled back towards the minimum displacement, and if the differential pressure decrease, the swashplate angle increase towards the max flow displacement until balance is restored within the valve.

Actuators load determines the working pressure, and the built-in pressure compensator ③ enable simultaneously function regardless of different working pressure.

PDV315 Proportional Directional Valve
Example of application with OMFB hydraulic package



1. PPV90 load sensing piston pump

2. Pump slitter gear box

3. I/O controller PHSI7101008

4. PDV74/6 closed centre inlet

5. Electronic double axis joystick PEJD

6. Graphic display PDHI703000

7. PPM40 piston motors

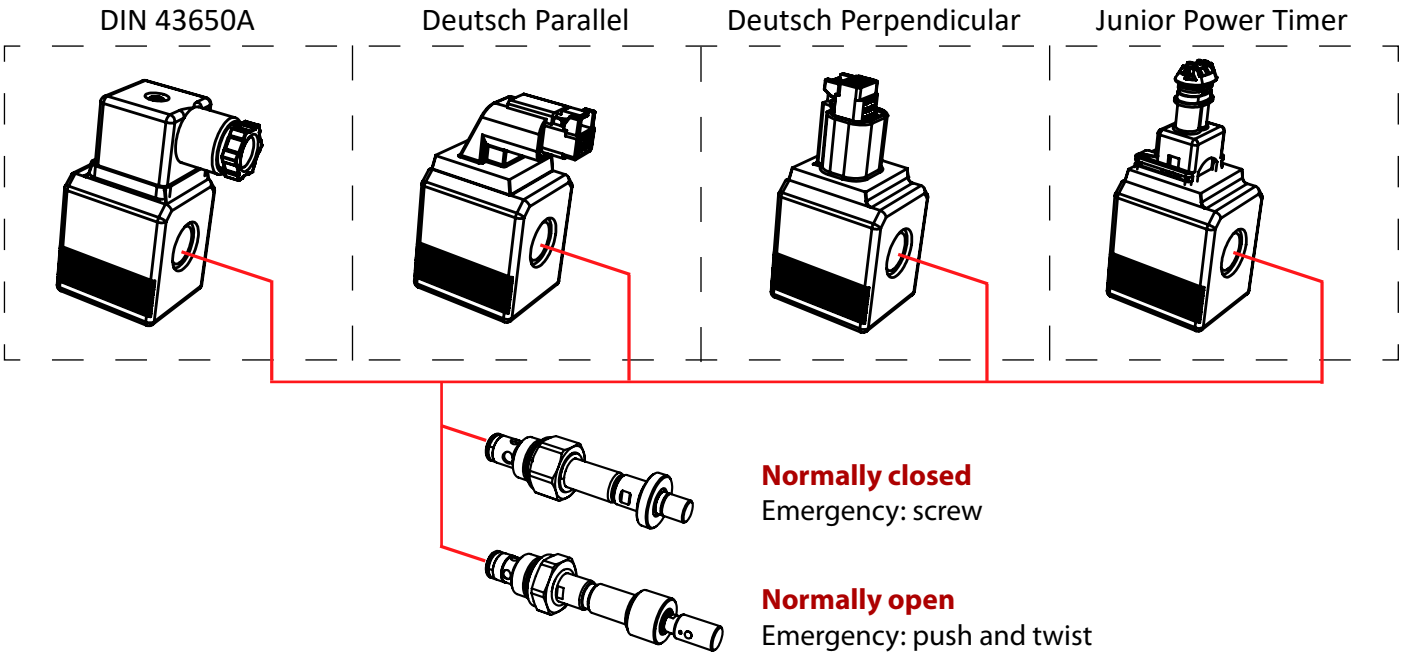
PDV315 Proportional Valve
Technical data

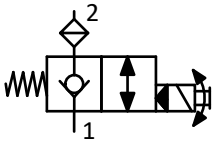
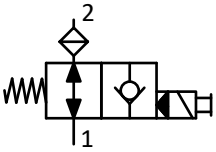
The hydraulic features listed in this chart, are typical measured data obtained by using mineral based hydraulic oil according to DIN 51524 with a viscosity of 21 mm²/sec [102 SUS] and a temperature of 50 °C [122 °F]

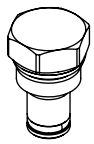
Oil flow rate	PDI inlet section, P port		**600 l/min (max)**	**158 US gal/min**
	PDIM - Mid inlet section, P port		**600 l/min**	**158 US gal/min**
	A, **B** port with pressure compensator		**500 l/min**	**132 US gal/min**
Max. pressure	**P** port	Pressure relief valve setting	**400 bar**	**5800 psi**
		Working pressure	**370 bar**	**5370 psi**
	A, **B** port		**370 bar**	**5370 psi**
	Ty port, directly to tank			
	T port	Static	**25 bar**	**363 psi**
		Dynamic	**35 bar**	**508 psi**
Max. pilot pressure oil supply			**30 bar**	**435 psi**
Oil temperature	Recommended		**30 ÷ 65 °C**	**86 °F ÷ 149 °F**
	Min		**-30 °C**	**-22 °F**
	Max		**90 °C**	**194 °F**
Ambient temperature			**-30 ÷ 60 °C**	**-22 ÷ 140 °F**
Oil viscosity	Operating range		**12 ÷ 75 mm²/sec**	**65 ÷ 347 SUS**
	Min		**4 mm²/sec**	**39 SUS**
	Max		**460 mm²/sec**	**2128 SUS**
Spool stroke	Standard		**9 mm**	**0,35 in**
	Flow control proportional range		**7,5 mm**	**0,3 in**
	Pressure control propotional range		**7,5 mm**	**0,3 in**
Daed band spool	Flow control		**1,5 mm**	**0,06 in**
	Pressure control		**1,5 mm**	**0,06 in**
Max internal leakage A/B port at 100 bar [1450 psi] and 21 mm²/sec		**A/B T** without shock valves	**100 cm³/min**	**6,1 in³/min**
		A/B T with shock valves	**115 cm³/min**	**7 in³/min**
Filtration	Max. contamination: class 9 according to NAS 1638 (20/18/15 according to ISO 4406)			

PDH module - hydraulic control		
Pilot pressure	Spool start movement	4 bar / 58 psi
	Spool end stroke	15 bar / 218 psi
Max. pilot pressure		30 bar / 436 psi

PDV74 internal filters, mesh 100 µm
Mineral oil hydraulic fluid: according to DIN 51524 and 51525 or ISO 6743/4 PDV74 can also be used with phosphate esters (HFDR), water-glycol (HFC) or water oil (HFB) mixes, subject to our Technical Dept. approval

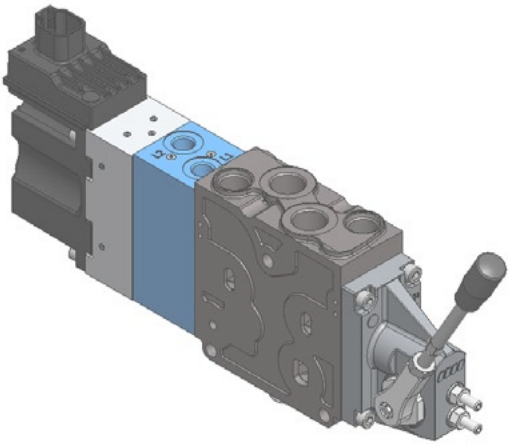


Code numbers PIU solenoid LS unloading valve codes			
Cartridge valve type	Connector type	12 Vdc	24 Vdc
Normally closed Emergency: screw 	DIN 43650A	**PIU0C023200**	**PIU0C013200**
	Deutsch Parallel	**PIU0C021200**	**PIU0C011200**
	Deutsch Perpendicular	**PIU0C022200**	**PIU0C012200**
	Junior Power Timer	**PIU0C024200**	**PIU0C014200**
Normally open Emergency: push and twist 	DIN 43650A	**PIU0A023100**	**PIU0A013100**
	Deutsch Parallel	**PIU0A021100**	**PIU0A011100**
	Deutsch Perpendicular	**PIU0A022100**	**PIU0A012100**
	Junior Power Timer	**PIU0A024100**	**PIU0A014100**

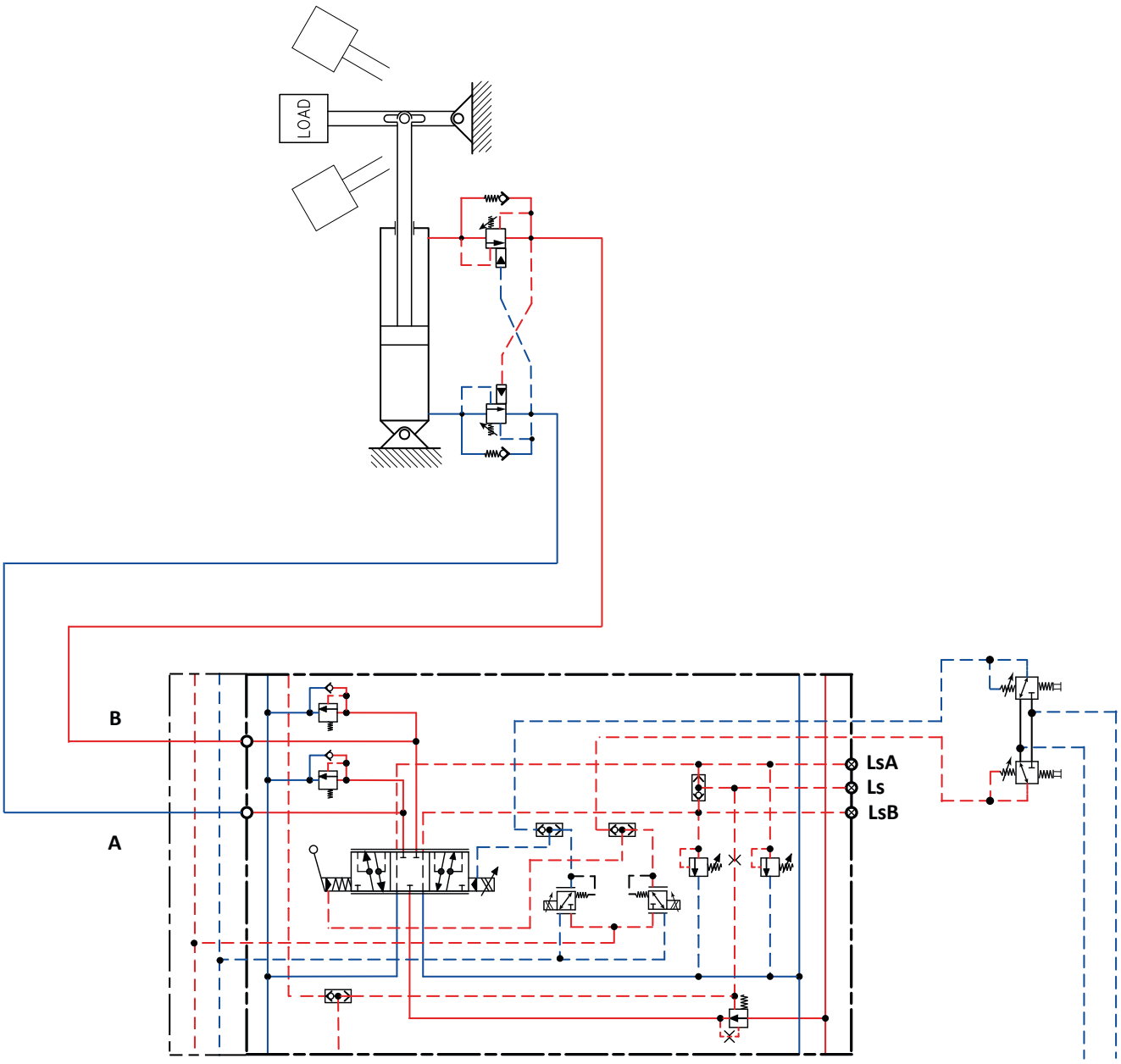
Plug for LS unloading cavity		
Plug cavity	Hydraulic scheme	Code numbers
		**PIP10000000**

Max. operating pressure		**350 bar**	
Max. internal leakage		**350 bar, 46 mm²/sec 1 cm³/min**	
max pressure drop		**< 1,5 bar**	
Expected life - 350 bar, 0,5 Hz (1s on / 1s off)		**10.000.000 cycles**	
Response time for LS pressure relief		**< 280ms**	
Oil temperature	**Recommended**	**30 ÷ 60 °C**	
	Min.	**-30 °C**	
	Max.	**90 °C**	
Ambient temperature		**-30 ÷ 60 °C**	
Max. coil surface temperature		**160 °C**	
Oil viscosity	**Operating range**	**10 ÷ 90 cSt**	
	Min.	**4 mm²/sec**	
	Max.	**460 mm²/sec**	
Degree of enclosure	**Connector DIN 43650**	**IP65**	
	Connector Deutsch DT04-2p	**IP67**	
		IP69K integrated to coil	
Rated voltage		**12 Vdc**	**24 Vdc**
Supply voltage		**10,6 ÷ 14,6 Vdc**	**20,4 ÷ 28,6 Vdc**
Working temperature		**-30 ÷ 80 °C**	
Maximum coil surface temperature		**175 °C**	
Heat insulation		**Class H (180 °C)**	
Resistance		**7,5 Ω**	**29,9 Ω**
Current consumption		**1,6 A**	**0,8 A**
Power consumption		**19 W**	

PDV315 Proportional Valve
PDZ module - Dual spool control



PDZ is a small HIC body that can be matched with any kind of PDV74 working section PDW, to get hydraulic and electro-hydraulic spool control

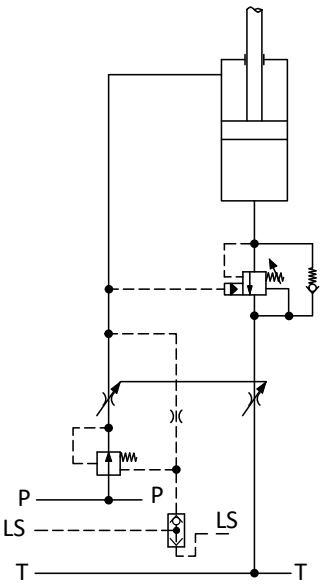


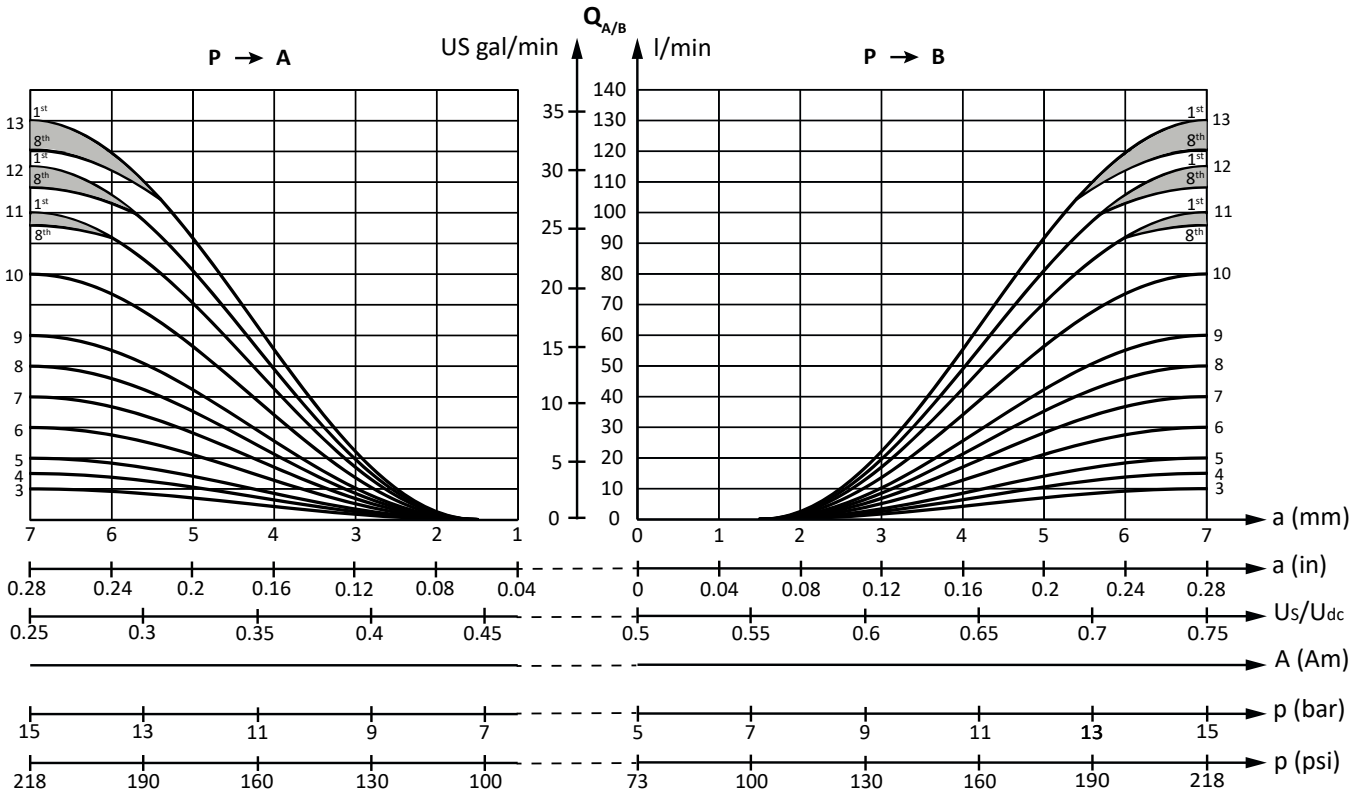
PDZ overrall dimensions	For open loop spool control	For closed loop spool control
	PDZ70000000 1/4" BSPP - 12 mm deep	**PDZ** 1/4" BSPP - 12 mm deep
	PDZ [7⁄16 in-20 UNF-2B - 0,47 in deep]	**PDZ** [7⁄16 in-20 UNF-2B - 0,47 in deep]

Oil flow characteristics

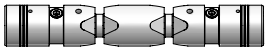
With flow control spool, the oil flow depends on type of PDW module (with or without pressure compensator) and type of pump (fixed or variable displacement).

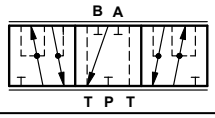
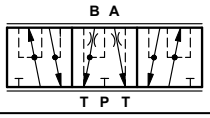
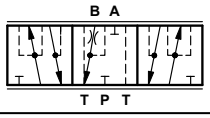
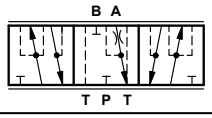
In the below chart, the ordinate numbers refer to spool size, and the ordinal numbers refer to the same spool size but fitted in a different position with related lost flow.



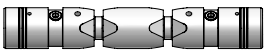


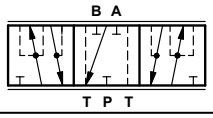
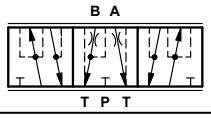
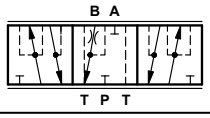
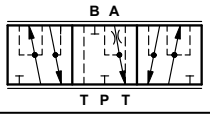
Double acting flow control spool



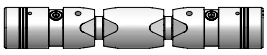
Size	Max oil flow pressure compensated **l/min**	Code numbers and symbol			
					
		4-way, 3-position - A, B closed	4-way, 3-position, A, B → T	4-way, 3-position, B → T; A closed	4-way, 3-position, A → T; B closed
1					
2					
3					
4					
5					
5,5					
6					
7					
8					
9					
10					
11					
12					
13					

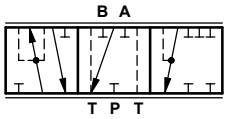
Double acting asymmetric flow control spool



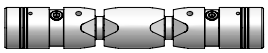
Max oil flow pressure compensated **l/min**		Code numbers and symbol			
					
A	**B**	4-way, 3-position - A, B closed	4-way, 3-position, A, B → T	4-way, 3-position, B → T, A closed	4-way, 3-position, A → T, B closed
15	**7,5**				
20	**40**				
25	**15**				
30	**40**				
40	**20**				
40	**30**				
40	**60**				
50	**30**				
60	**40**				
65	**30**				
75	**30**				
80	**40**				
110	**40**				
130	**60**				

Single acting flow control spool



Size	Max oil flow pressure compensated **l/min**	Symbol and code numbers	
			
		3-way, 3-position P → A	3-way, 3-position P → B
1	**7,5**		
2	**15**		
3	**20**		
4	**30**		
5	**40**		
6	**50**		
7	**60**		
8	**80**		
9	**100**		

Double acting flow control spool, floating position

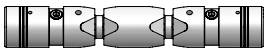


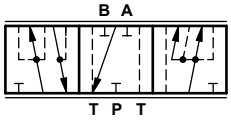
Size	Max oil flow pressure compensated **l/min**	Symbol and code numbers	
			
		3-way, 4-position floating position on A port	3-way, 4-position floating position on B port
1	**10**		
2	**15**		
3	**25**		
4	**40**		
5	**50**		

Spool centered set, code numbers (needed for any kind of flow control spool)

Tightening torque		Tightening torque
6^{+1}_{0} Nm		6^{+1}_{0} Nm
$53,1^{+8,85}_{0}$ lb*in		$53,1^{+8,85}_{0}$ lb*in
Manual control	**PDR00300101**	
Hydraulic - Electrohydraulic	**PDR00300102**	

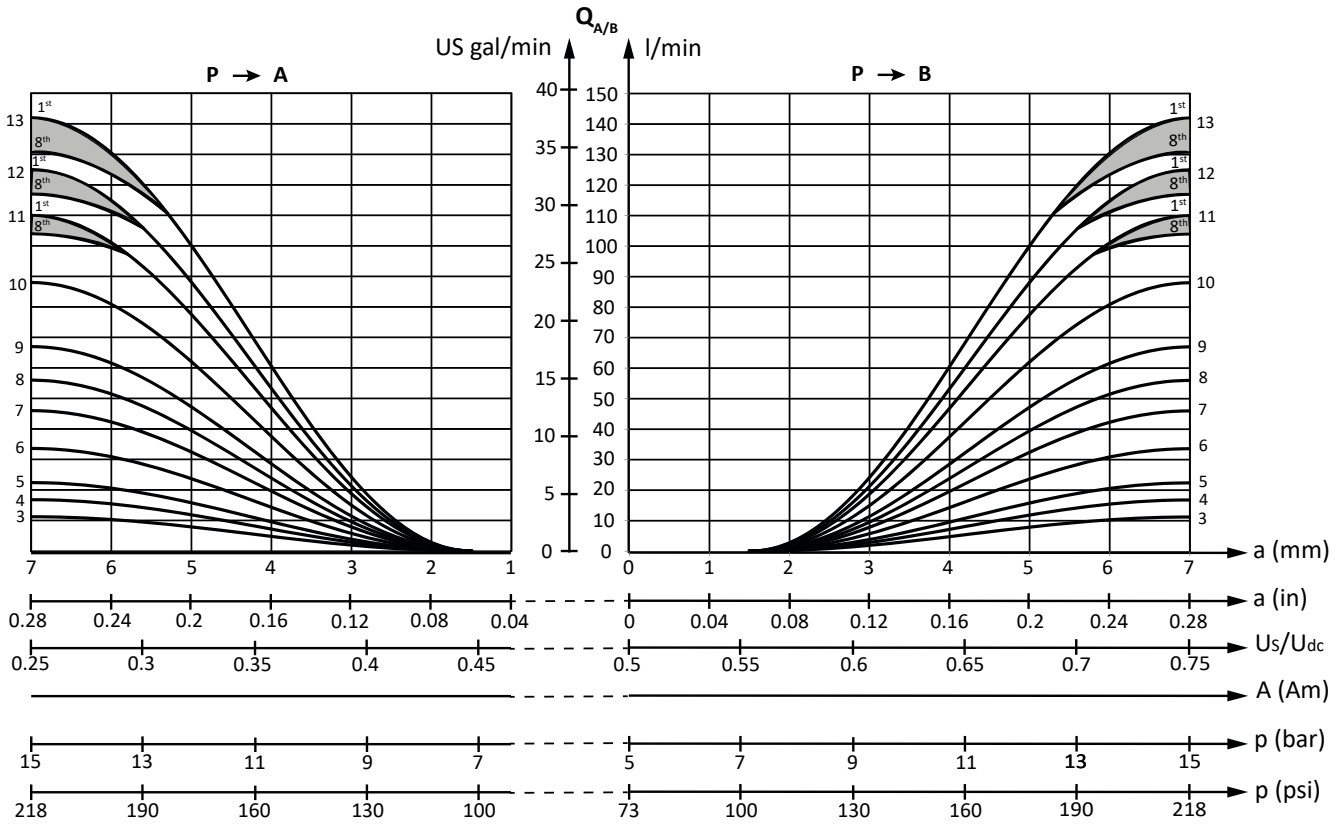
Double acting flow control, regenerative function



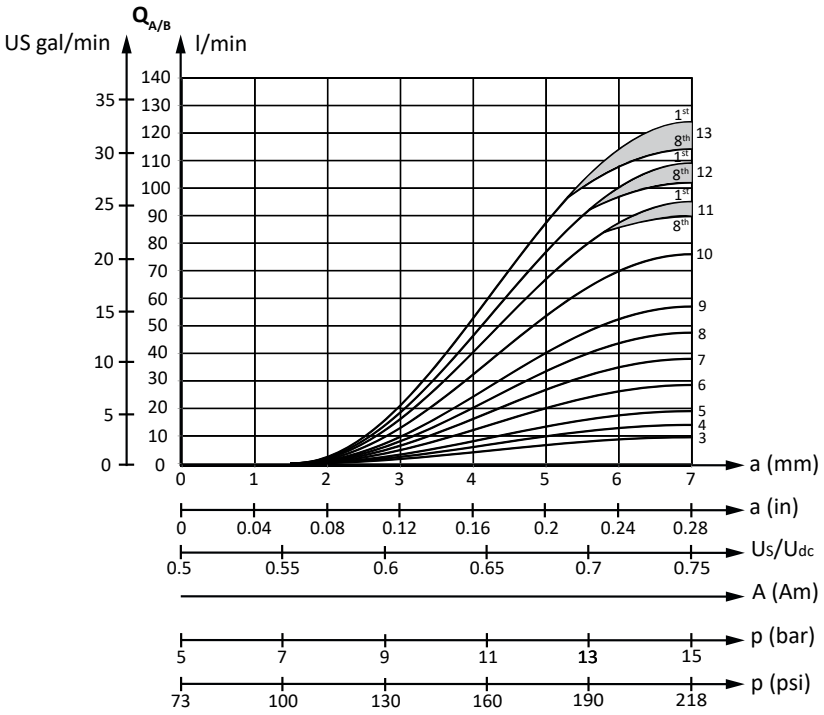
Size	Max oil flow pressure compensated **l/min**	Symbol and code numbers	
			
		Regenerative circuit on A port	Regenerative circuit on B port
1	**7,5**		
2	**15**		
3	**20**		
4	**30**		
5	**40**		
6	**50**		
7	**60**		
8	**80**		
9	**100**		
10	**130**		

Spool centered set, code numbers (needed for any kind of flow control spool)

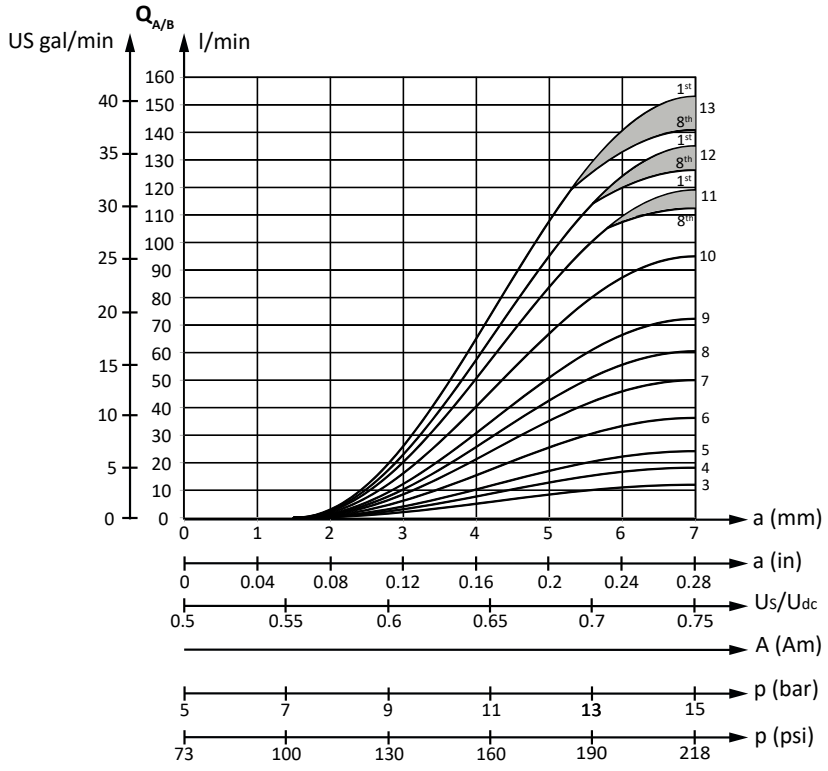
Tightening torque		Tightening torque
6^{+1}_{0} Nm		6^{+1}_{0} Nm
$53,1^{+8,85}_{0}$ lb*in		$53,1^{+8,85}_{0}$ lb*in
Manual control	**PDR00300101**	
Hydraulic - Electrohydraulic	**PDR00300102**	


$Q_{A/B}$
US gal/min
l/min
P → A
P → B
1st
8th
a (mm)
a (in)
Us/Udc
A (Am)
p (bar)
p (psi)

Oil flow characteristics PDW without pressure compensator, and pump differential pressure setting = 16 bar



Oil flow characteristics PDW without pressure compensator, and pump differential pressure setting = 25 bar



<table>
<tr><th>Product</th><th>Description</th><th>Aluminium</th><th>Cast iron</th></tr>
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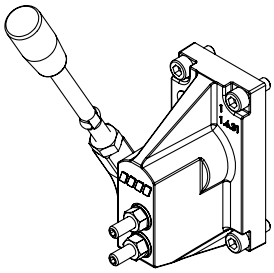
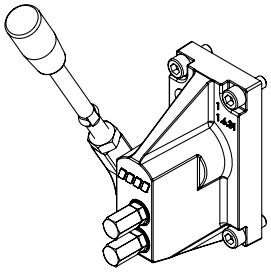
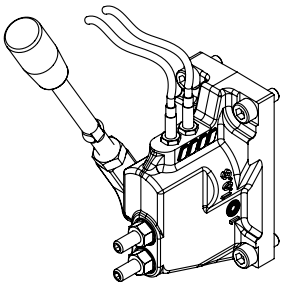
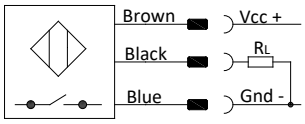
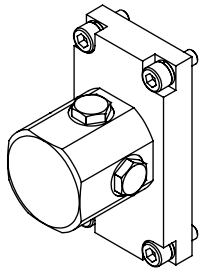
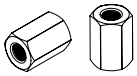
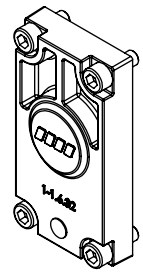
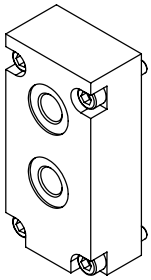
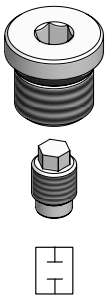
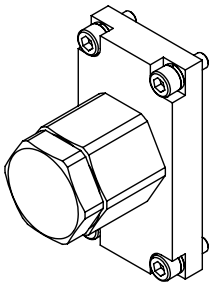
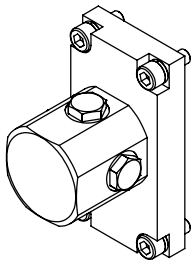
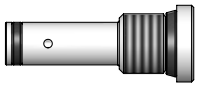
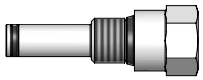
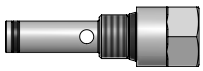
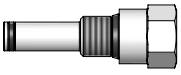
  </td><td rowspan="4">Mechanical actuation</td><td colspan="2">With lever</td></tr>
<tr><td>PDM10101000</td><td>PDM11101000</td></tr>
<tr><td colspan="2">Without lever</td></tr>
<tr><td>PDM101000000</td><td>PDM11100000</td></tr>
<tr><td>PDM
  </td><td>Mechanical actuation, with flow adjustement nuts protection</td><td>PDM10200000</td><td>PDM11200000</td></tr>
<tr><td rowspan="3">PDM
  </td><td rowspan="3">Mechanical actuation with directional sensors for electrical monitoring of spool valve movement
 

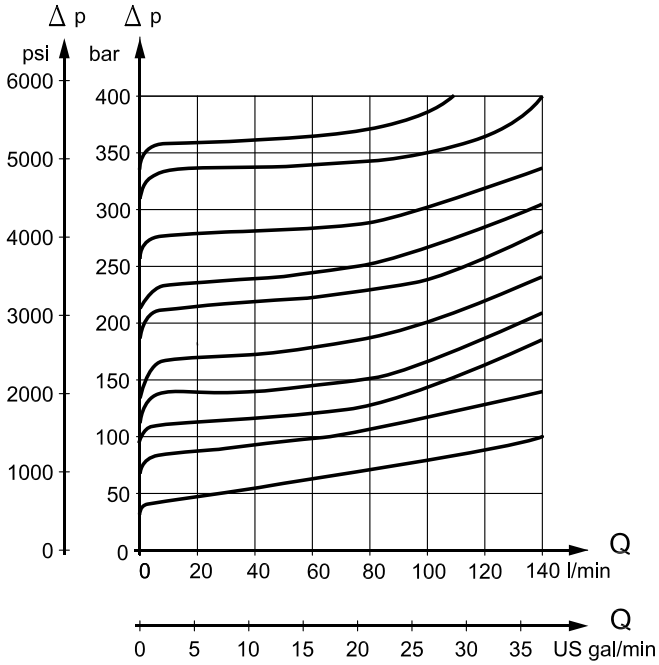
Vcc 10 V ... 30 V
I L < 200 mA</td><td colspan="2">With lever</td></tr>
<tr><td colspan="2">Normally closed: PDM1111100</td></tr>
<tr><td colspan="2">Normally open: PDM1112100</td></tr>
<tr><td rowspan="2">PDF
  </td><td rowspan="2">Friction detent (for mechanical actuation only)</td><td colspan="2">Cast iron only</td></tr>
<tr><td colspan="2">PDF10000000</td></tr>
<tr><td>  </td><td>Flow adjustement protection nuts for PDM mechanical control</td><td colspan="2"></td></tr>
</table>

Product	Description	Aluminium	Cast iron
PDC 	Rear cover for mechanical actuation	**PDC00000000**	**PDC10000000**
PDH 	Hydraulic actuation	A/B pilot port 1/4 BSPP deep: 12 mm (0,47 in) **PDH70000000**	A/B pilot port 1/4 BSPP deep: 12 mm (0,47 in) **PDH71000000**
		A/B pilot port 7/16-20UNF-2B deep: 12 mm (0,47 in) **PDH70000100**	A/B pilot port 7/16-20UNF-2B deep: 12 mm (0,47 in) **PDH71000100**
	Pilot LS A/B relief valve	10 ÷40 bar	**PLS0A100000**
		41 ÷ 80 bar	**PLS0A200000**
		81 ÷ 380 bar	**PLS0A400000**
	Plug for pilot LS A/B relief valve cavity	**PLS0P000000**	

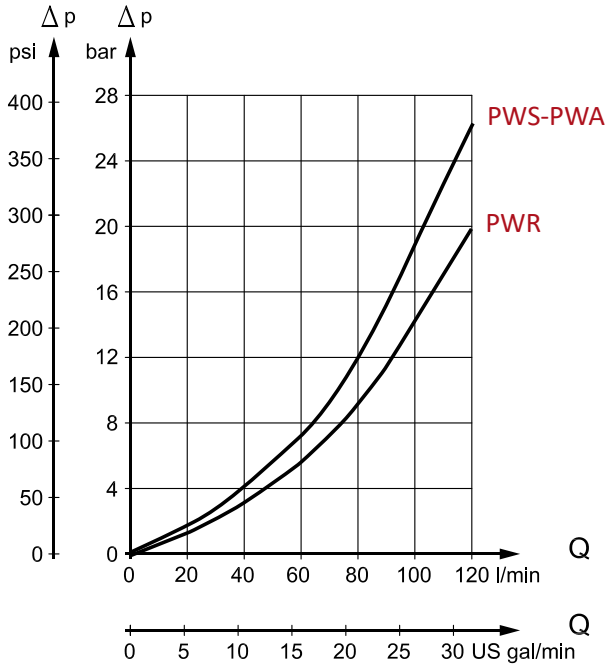
Product	Description	Aluminium	Cast iron
PDD 	Mechanical spool lock device, manual release	P→A - lock P→B - free **PDD30100000**	
		P→A - free P→B - lock **PDD30010000**	
		P→A - lock P→B - lock **PDD30110000**	
		P→A - float P→B - free **PDD30200000**	
		P→A - free P→B - float **PDD30020000**	
PDF 	Friction control		**PDF12000001**

Product	Description	Code numbers	
PIZ 	For PDI with internal pilot oil supply	**PIZ10000000**	
PIY 	For PDI with external pilot oil supply	A/B pilot port 1/4 BSPP deep: 12 mm (0,47 in) **PIY10000000**	A/B pilot port 7/16-20UNF-2B deep: 12 mm (0,47 in) **PIY10000010**
	For PDE with external drain line electrical actuation	A/B pilot port 1/4 BSPP deep: 12 mm (0,47 in) **PED10000000**	A/B pilot port 7/16-20UNF-2B deep: 12 mm (0,47 in) **PED10000010**
	For PDE with internal drain line electrical actuation	**PEI10000000**	
	For PDE with LS carry-over	A/B pilot port 1/4 BSPP deep: 12 mm (0,47 in) **PED20000000**	A/B pilot port 7/16-20UNF-2B deep: 12 mm (0,47 in) **PED20000010**
	For PDE prearranged LS carry-over	**PEI10000000**	

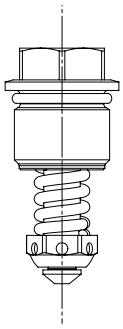
PWS, PWA and PWB are shock suction valves design to absorb shock effects only, and they should never be used as a pressure relief valves.
PWS, PWA and PWB are set at an oil flow of 10 l/min.
If the hydraulic actuator requires a pressure relief valve function, a PDW module with built-in LS A/B pilot pressure limit valves should be used

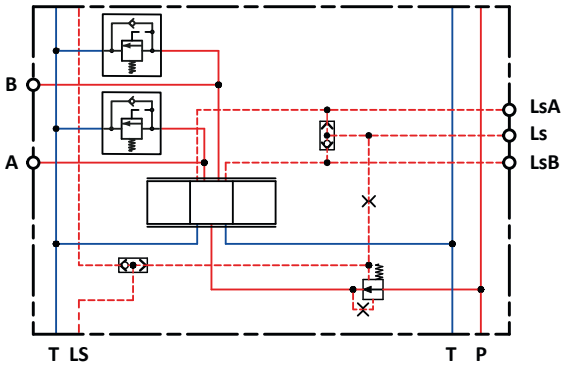


PWR suction valve



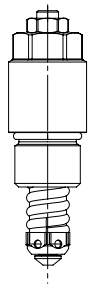
PWS shock and suction valve for A/B port. **Not adjustable**

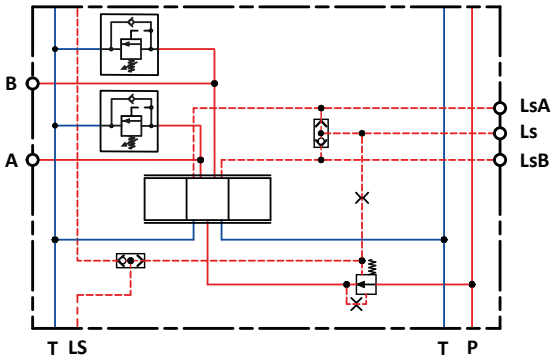




Setting Pressure*(bar)*	Code numbers
50	**PWS7M180050**
70	**PWS7M180070**
90	**PWS7M180090**
110	**PWS7M180110**
130	**PWS7M180130**
150	**PWS7M180150**
180	**PWS7M180180**
200	**PWS7M180200**
230	**PWS7M180230**
260	**PWS7M180260**
290	**PWS7M180290**
320	**PWS7M180320**
350	**PWS7M180350**
380	**PWS7M180380**

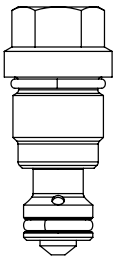
PWA shock and suction valve for A/B port. **Adjustable**

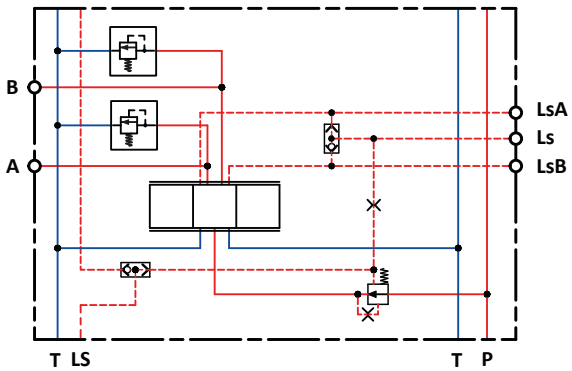




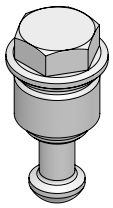
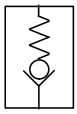
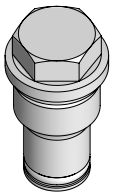
Range setting *(bar)*	Code numbers
20 ÷ 70	**PWA7M180N00**
71 ÷ 130	**PWA7M180B00**
131 ÷ 210	**PWA7M180G00**
211 ÷ 280	**PWA7M180V00**
281 ÷ 350	**PWA7M180W00**
351 ÷ 420	**PWA7M180R00**

PWB shock valve for A/B port. **Not adjustable**



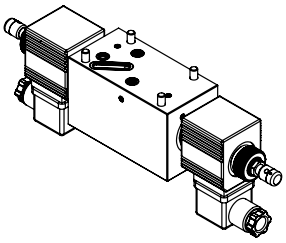


Setting pressure*(bar)*	Code numbers
50	**PWB7M180050**
70	**PWB7M180070**
90	**PWB7M180090**
110	**PWB7M180110**
130	**PWB7M180130**
150	**PWB7M180150**
180	**PWB7M180180**
200	**PWB7M180200**
230	**PWB7M180230**
260	**PWB7M180260**
290	**PWB7M180290**
320	**PWB7M180320**
350	**PWB7M180350**
380	**PWB7M180380**

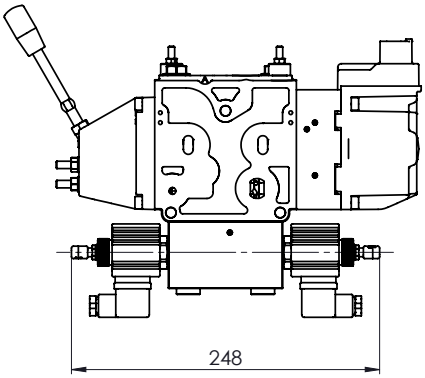
PWR suction valve for A/B port		
Product	Hydraulic diagram	Code numbers
		**PWR7M180000**
Plug for **PWS - PWA - PWB** and **PWR** cavity		
Product	Hydraulic diagram	Code numbers
		**PWP7M18000**

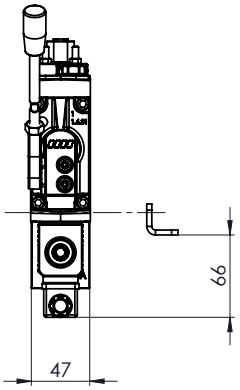
OMFB
HYDRAULIC POWER CONTROL

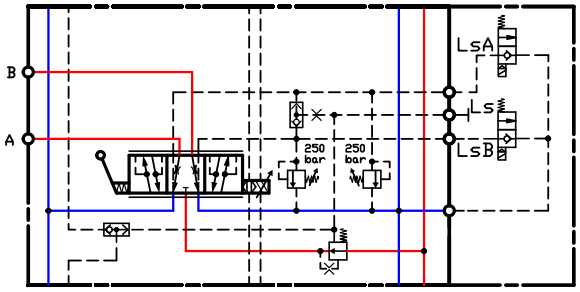
PDV315 Proportional Valve
PDL module - **Electrical LS$_{A/B}$ unloading**
ON-OFF actuation normally closed

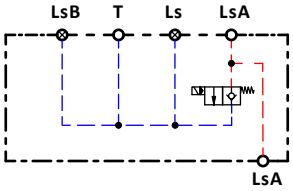
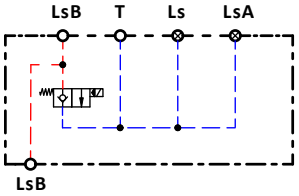
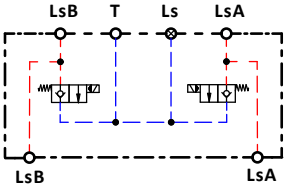
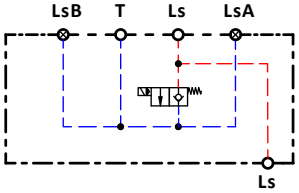


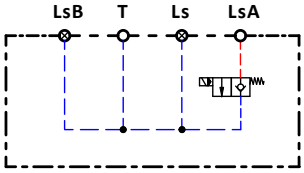
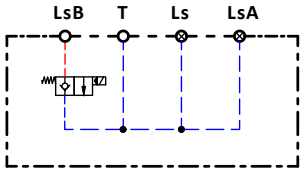
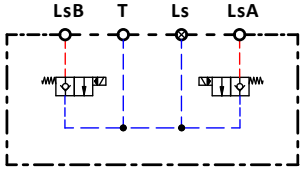
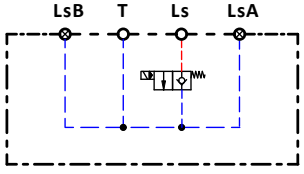
When PDL is energized, the piloting signal is lead to tank and in turn the work port oil flow will be cutted off.
PDL modules is always to be matched with PDW pressure compesated.





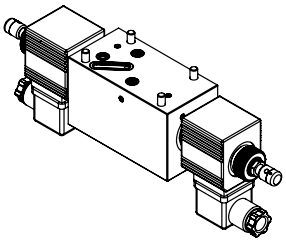


PDL code numbers			
Hydraulic diagram	**Connector type**	**12V dc**	**24V dc**
Active on LsA 	Deutsch Parallel	**PDL12C11200**	**PDL12C31200**
	Deutsch Perpendicular	**PDL12C12200**	**PDL12C32200**
	DIN	**PDL12C13200**	**PDL12C33200**
	JPT	**PDL12C14200**	**PDL12C34200**
Active on LsB 	Deutsch Parallel	**PDL13C11200**	**PDL13C31200**
	Deutsch Perpendicular	**PDL13C12200**	**PDL13C32200**
	DIN	**PDL13C13200**	**PDL13C33200**
	JPT	**PDL13C14200**	**PDL13C34200**
Active on LsA and LsB 	Deutsch Parallel	**PDL11C11200**	**PDL11C31200**
	Deutsch Perpendicular	**PDL11C12200**	**PDL11C32200**
	DIN	**PDL11C13200**	**PDL11C33200**
	JPT	**PDL11C14200**	**PDL11C34200**
Active on Ls 	Deutsch Parallel	**PDL14C11200**	**PDL14C31200**
	Deutsch Perpendicular	**PDL14C12200**	**PDL14C32200**
	DIN	**PDL14C13200**	**PDL14C33200**
	JPT	**PDL14C14200**	**PDL14C34200**

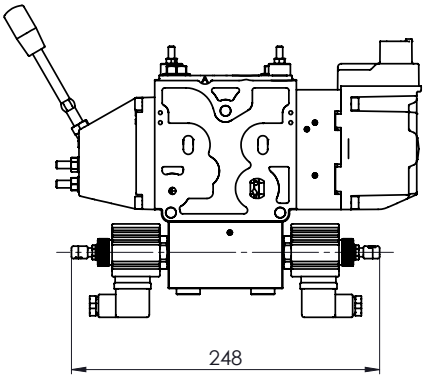
PDL code numbers			
Hydraulic diagram	**Connector type**	**12V dc**	**24V dc**
Active on LsA 	Deutsch Parallel	**PDL32C11200**	**PDL32C31200**
	Deutsch Perpendicular	**PDL32C12200**	**PDL32C32200**
	DIN	**PDL32C13200**	**PDL32C33200**
	JPT	**PDL32C14200**	**PDL32C34200**
Active on LsB 	Deutsch Parallel	**PDL33C11200**	**PDL33C31200**
	Deutsch Perpendicular	**PDL33C12200**	**PDL33C32200**
	DIN	**PDL33C13200**	**PDL33C33200**
	JPT	**PDL33C14200**	**PDL33C34200**
Active on LsA and LsB 	Deutsch Parallel	**PDL35C11200**	**PDL35C31200**
	Deutsch Perpendicular	**PDL35C12200**	**PDL35C32200**
	DIN	**PDL35C13200**	**PDL35C33200**
	JPT	**PDL35C14200**	**PDL35C34200**
Active on Ls 	Deutsch Parallel	**PDL34C11200**	**PDL34C31200**
	Deutsch Perpendicular	**PDL34C12200**	**PDL34C32200**
	DIN	**PDL34C13200**	**PDL34C33200**
	JPT	**PDL34C14200**	**PDL34C34200**

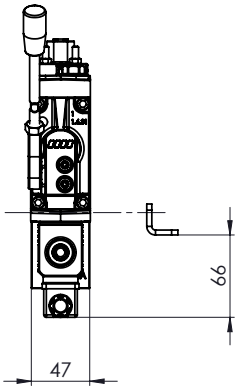
OMFB
HYDRAULIC POWER CONTROL

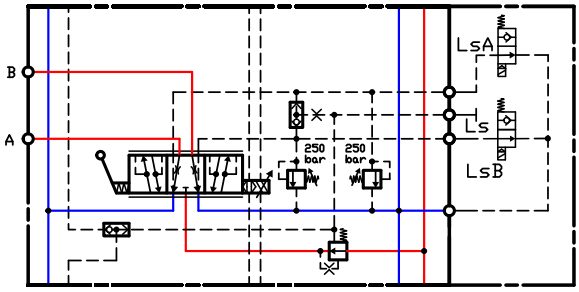
PDV315 Proportional Valve
PDL module - **Electrical LS$_{A/B}$ unloading**
ON-OFF actuation normally open

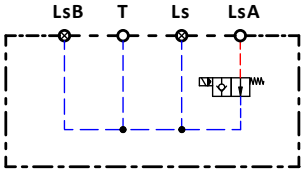
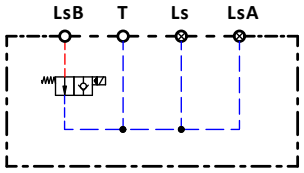
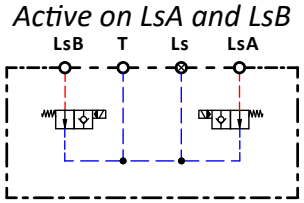
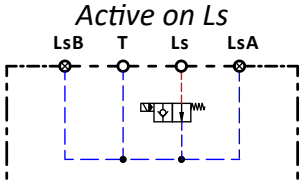


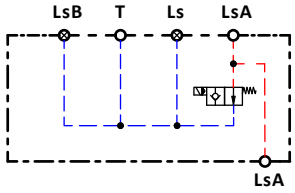
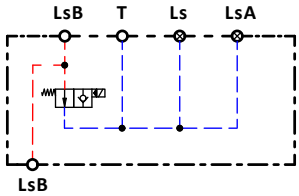
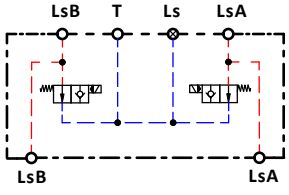
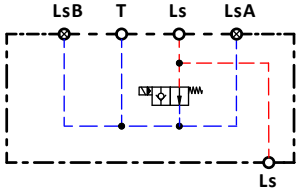
When PDL is deenergized, the piloting signal is lead to tank and in turn the work port oil flow will be cutted off.
PDL modules is always to be matched with PDW pressure compesated.





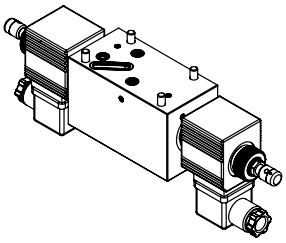


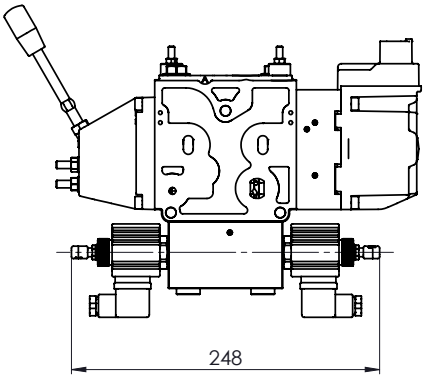
PDL code numbers			
Hydraulic diagram	**Connector type**	**12V dc**	**24V dc**
Active on LsA 	Deutsch Parallel	**PDL32A11100**	**PDL32A31100**
	Deutsch Perpendicular	**PDL32A12100**	**PDL32A32100**
	DIN	**PDL32A13100**	**PDL32A33100**
	JPT	**PDL32A14100**	**PDL32A34100**
Active on LsB 	Deutsch Parallel	**PDL33A11100**	**PDL33A31100**
	Deutsch Perpendicular	**PDL33A12100**	**PDL33A32100**
	DIN	**PDL33A13100**	**PDL33A33100**
	JPT	**PDL33A14100**	**PDL33A34100**
Active on LsA and LsB 	Deutsch Parallel	**PDL35A11100**	**PDL35A31100**
	Deutsch Perpendicular	**PDL35A12100**	**PDL35A32100**
	DIN	**PDL35A13100**	**PDL35A33100**
	JPT	**PDL35A14100**	**PDL35A34100**
Active on Ls 	Deutsch Parallel	**PDL34A11100**	**PDL34A31100**
	Deutsch Perpendicular	**PDL34A12100**	**PDL34A32100**
	DIN	**PDL34A13100**	**PDL34A33100**
	JPT	**PDL34A14100**	**PDL34A34100**

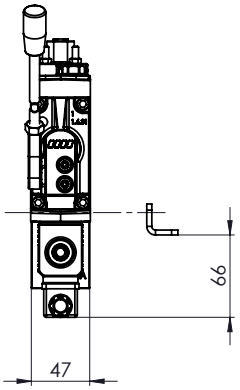
PDL code numbers			
Hydraulic diagram	**Connector type**	**12V dc**	**24V dc**
Active on LsA 	Deutsch Parallel	**PDL12A11100**	**PDL12A31100**
	Deutsch Perpendicular	**PDL12A12100**	**PDL12A32100**
	DIN	**PDL12A13100**	**PDL12A33100**
	JPT	**PDL12A14100**	**PDL12A34100**
Active on LsB 	Deutsch Parallel	**PDL13A11100**	**PDL13A31100**
	Deutsch Perpendicular	**PDL13A12100**	**PDL13A32100**
	DIN	**PDL13A13100**	**PDL13A33100**
	JPT	**PDL13A14100**	**PDL13A34100**
Active on LsA and LsB 	Deutsch Parallel	**PDL11A11100**	**PDL11A31100**
	Deutsch Perpendicular	**PDL11A12100**	**PDL11A32100**
	DIN	**PDL11A13100**	**PDL11A33100**
	JPT	**PDL11A14100**	**PDL11A34100**
Active on Ls 	Deutsch Parallel	**PDL14A11100**	**PDL14A31100**
	Deutsch Perpendicular	**PDL14A12100**	**PDL14A32100**
	DIN	**PDL14A13100**	**PDL14A33100**
	JPT	**PDL14A14100**	**PDL14A34100**

OMFB HYDRAULIC POWER CONTROL

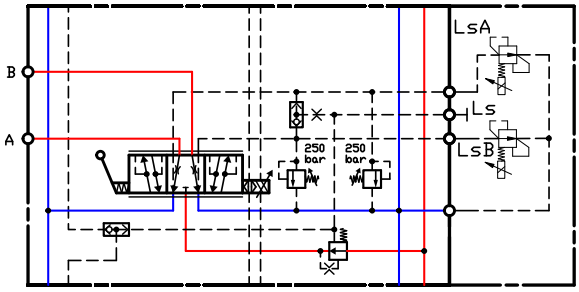
PDV315 Proportional Valve
PDLD module - **Electrical LS$_{A/B}$ unloading**
Proportional actuation normally open (current signal mA)

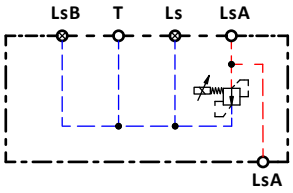
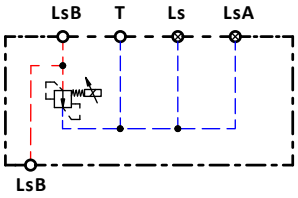
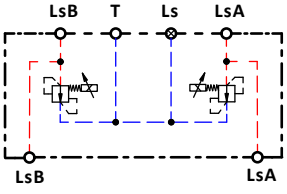
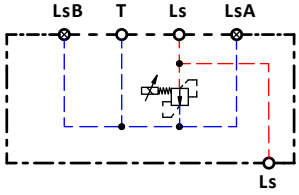




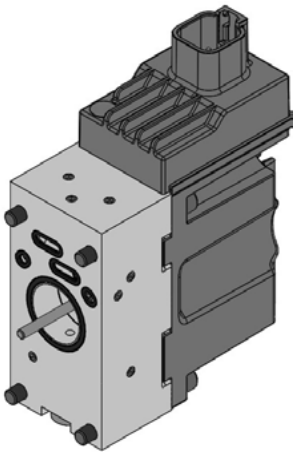


PDLD is an electro-hydraulic device that allows the A/B port working pressure to be remotely an proportionally operated according to a current signal (mA). When the working pressure exceed the setting pressure value, the A/B port oil flow will be cutted off.
When PDLD is not energized, PDW is almost pressureless, as well as the A-B oil flow is cutted off.



PDLD code numbers			
Hydraulic diagram	**Connector type**	**12V dc**	**24V dc**
Active on LsA 	Deutsch Parallel	**PDL12D11000**	**PDL12D31000**
Active on LsB 	Deutsch Parallel	**PDL13D11000**	**PDL13D31000**
Active on LsA and LsB 	Deutsch Parallel	**PDL11D11000**	**PDL11D31000**
Active on Ls 	Deutsch Parallel	**PDL14D11000**	**PDL14D31000**

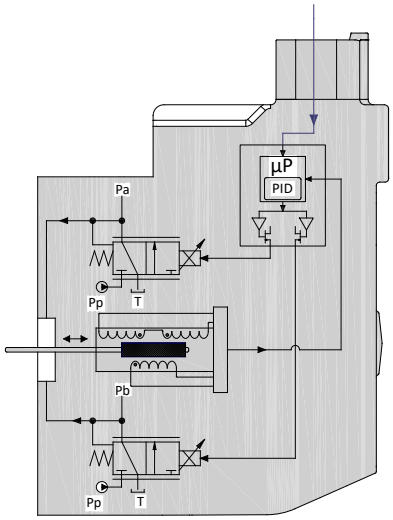
PDV315 - PEAC131 Electro-hydraulic proportional actuation
Closed loop spool control, high performance resolution
Input signal control 0,5 Udc



PEAC131 is a proportional high performance PDV spool actuation with integrated electronics and inductive transducer (LVDT) that operates safely and precisely the main spool movement according to an electrical signal coming from a remote control.
The input signal by means of the PCB and the two proportional pressure reducing valves, determines the level of the pilot pressure which moves the main spool.
The spool position is detected in the LVDT transducer which generates an electric feed-back signal registered by the electronics.
The variation between the input signal and the feed-back signal, actuates the solenoid valves accordingly, so that, the hydraulic pilot pressure will drive the main spool in the right position.

All PEAC131 modules comes with integrated fault monitoring system, available in two version:

Active version
Passive version



Active fault monitoring

When an error state is detected, the two proportional solenoid valves will be automatically deactivated, a red lamp will light-up and drive the spool in neutral position (if it's not seized up).
The system will only react to failures of more than 500 ms (in other words there is delay of half a second before anything happens). An alarm signal is sent out through the connector, and minus is opened.
This error state is memorized, and continues until the system is being reset by switching off the supply voltage.
Shortly, when the active fault monitoring system is connected and an error state is detected, the system ensures a fast and operator free reaction, that will put the complete hydraulic circuit into venting conditions, thus preventing uncontrollable machine movements.

Passive fault monitoring

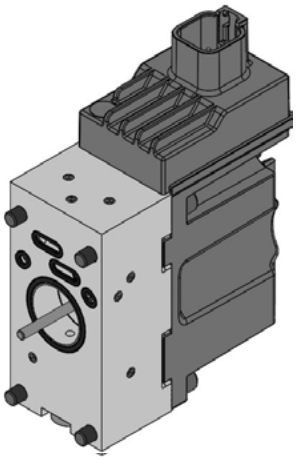
When an error state is detected, the two proportional solenoid valves will not be deactivated, a red lamp will light-up, but still control the main spool.
When a fault condition occurs, after a delay of 250 ms an alarm signal is sent out through a devoted pin
This state is not memorized, and when the faulty state disappears, the alarm signal will turn to passive again.
In order to prevent the electronic from going into an undefined state, any time the system is being triggered or reset, a general check of power supply and the internal clock frequency is made.

The use of PEAC131 module both passive or active version, allows the machines hydraulic system to be made with different level of safety degree that for the choice of which it is essential to know the exactly required functions.

When the PEAC131 module active version is connected with the pump unloading system, the level of safety degree protection for the complete hydraulic system becomes very high, operator free, and helps OEM to meet the PL (Performance Level) required to be comply with the safety demands of Machinery Directive 2006/42/EC.

OMFB HYDRAULIC POWER CONTROL

PDV315 - PEAC131 Electro-hydraulic proportional actuation
Closed loop spool control, high performance resolution
Input signal control 0,5 Udc

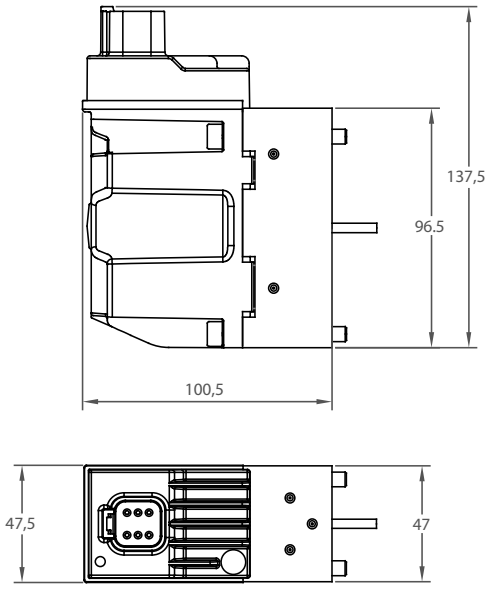


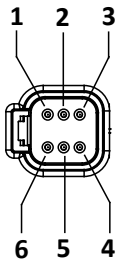
PEAC131 is defined by:

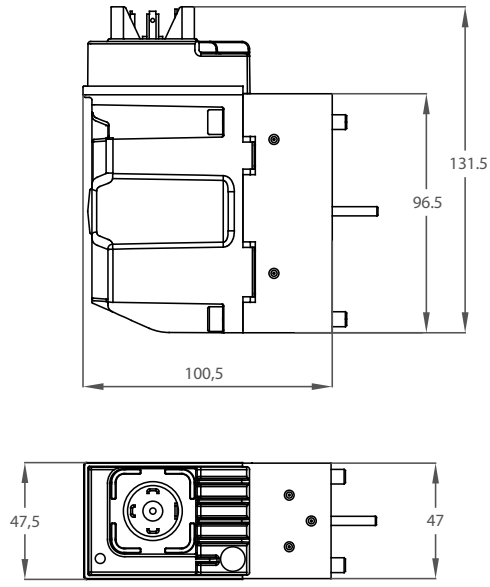
- Inductive transducer with resolution < 12 µm
- Integrated diagnosis and error memory
- Fault monitoring transistor output for signal source
- Higher spool control accuracy
- EMC performace according to Directive 2014/30/UE
- Low hysteresis
- Quicker reaction time
- Spool direction movement output
- Integrated PWM/Pulse Width Modulation
- Low electrical power

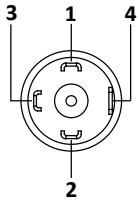
PEAC131 Technical data		
Rated supply voltage		**10 ÷ 30 Vdc**
Max ripple		**5%**
Signal control		**0,5 Udc**
Range control signal		**0,25 Udc to 0,75 Udc**
Neutral spool position		**0,5 Udc**
Max threshold signal, **A** port		**1 V**
Max threshold signal, **B** port		**1 V**
Max current signal @ rated voltage		**48 mA**
Input capacitor		**100 ηF**
Signal control impedance		**25 kΩ**
Power consumption		**8,7 W**
Heat insulation		**Class H (180°C)**
Duty cycle		**ED 100%**
Max current consumption		**650 mA**
Current consumption in neutral position		**80 mA**
Coil impedance @ 20°C		**8,9 Ω**
Dither frequency		**50-200 Hz**
Recommended frequency		**100 Hz**
Enclouser degree **(Electrical wiring excepted)**		**IP 66 - IP 67 - IP 69K**
Weight cast iron body		**1,8 kg**
Weight aluminium body		**1,3 kg**
Bootloader function, debugging parameters and set-up function available only with Deutsch connector AT04-6P (to be matched with AT06-6S)		
Fault monitoring system	Max current on safety output (pin 5)	**50 mA**
	Reaction time a fault	**500 ms**
Max current output signal for spool direction moviment		**50 mA**
Reaction time (constant voltage)	From neutral position to max spool travel	**110 - 140 ms**
	From max spool travel to neutral	**70 - 90 ms**
Reaction time (neutral switch)	From neutral position to max spool travel	**130 - 170 ms**
	From max spool travel to neutral	**70 - 90 ms**

PDV315 - PEAC131 Electro-hydraulic proportional actuation
Closed loop spool control, high performance resolution
Input signal 0,5 Udc - Electrical connectors



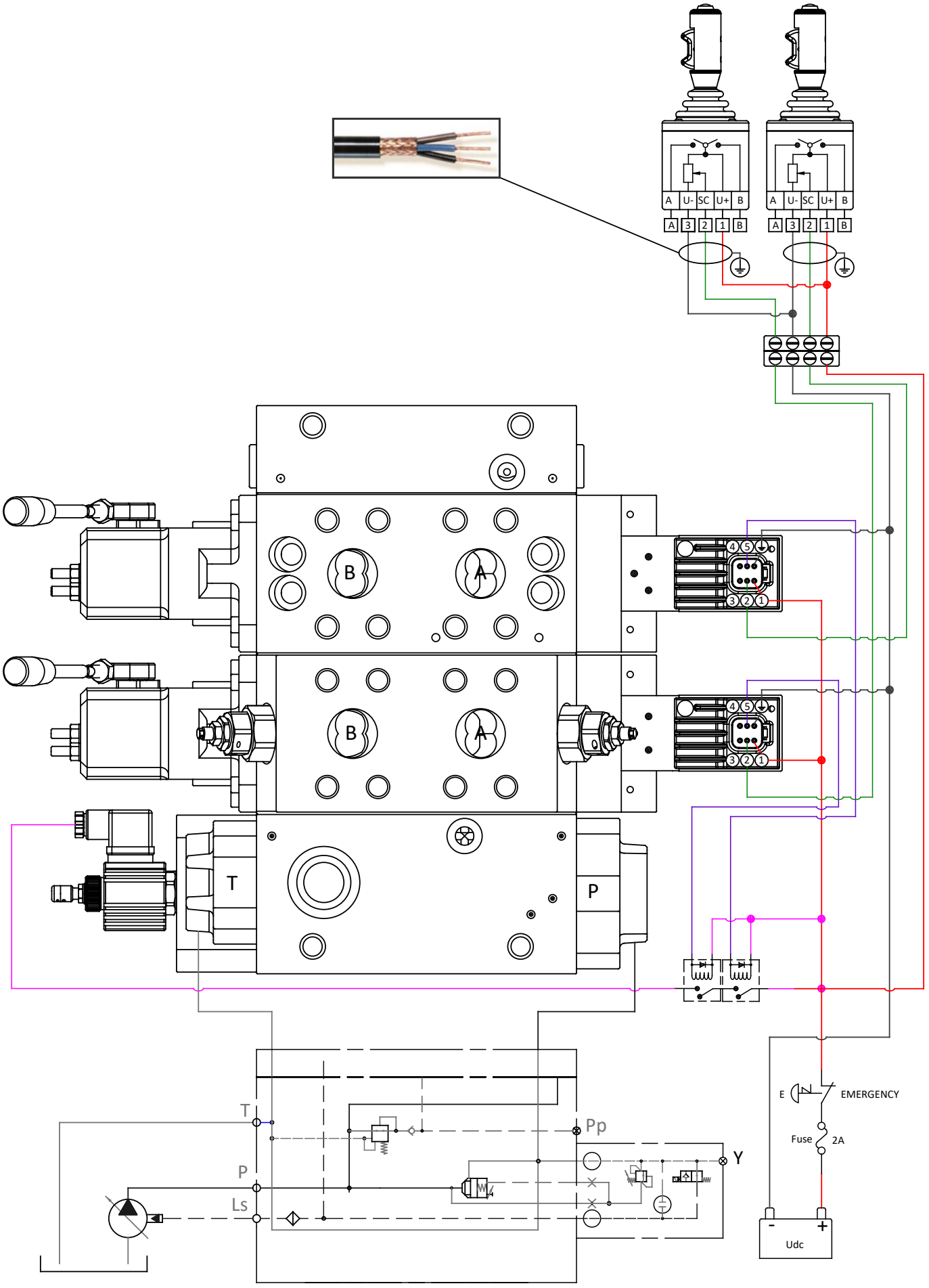
Deutsch connector AT04-6P Enclousure degree IP 69K PIN-assignment			
	**1**	Power supply	
	2	Input signal control	
	3	CAN-high	**A** port-spool movement signal
	4	CAN-low	**B** port-spool movement signal
	5	Fault monitoring signal	
	6	Ground	



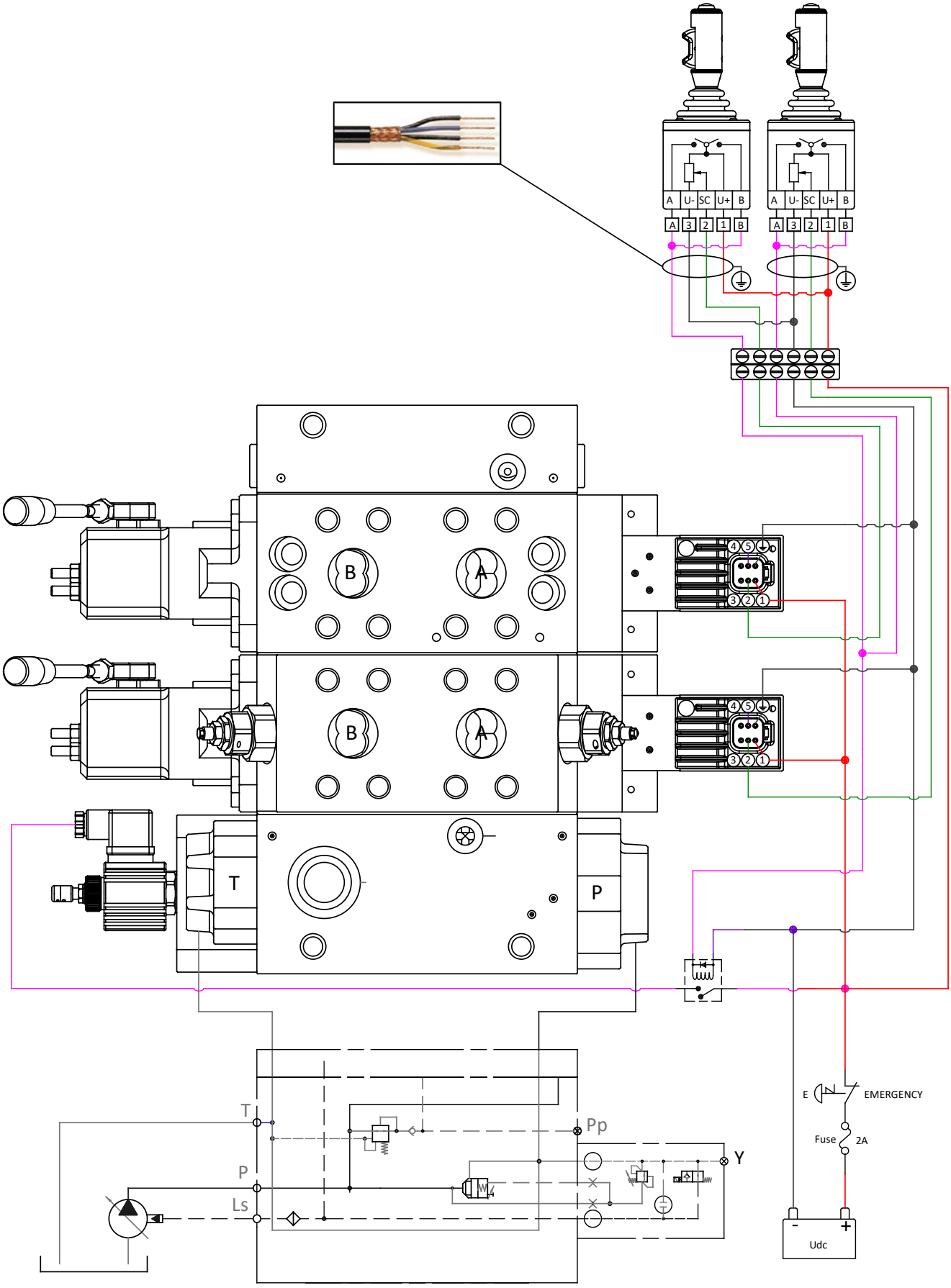
Hirschmann connector DIN 43650 Enclousure degree IP 65 PIN-assignment		
	**1**	Power supply
	2	Input signal control
	3	Fault monitoring signal
	4	Ground

Connector version	Code numbers			
	Active version		Passive version	
	Cast-iron body	Aluminium body	Cast-iron body	Aluminium body
Deutsch AT04-6P	**PEAC0181000**	**PEAC1181000**	**PEAC0171000**	**PEAC1171000**
DIN 43650	**PEAC0181200**	**PEAC1181200**	**PEAC0171200**	**PEAC1171200**

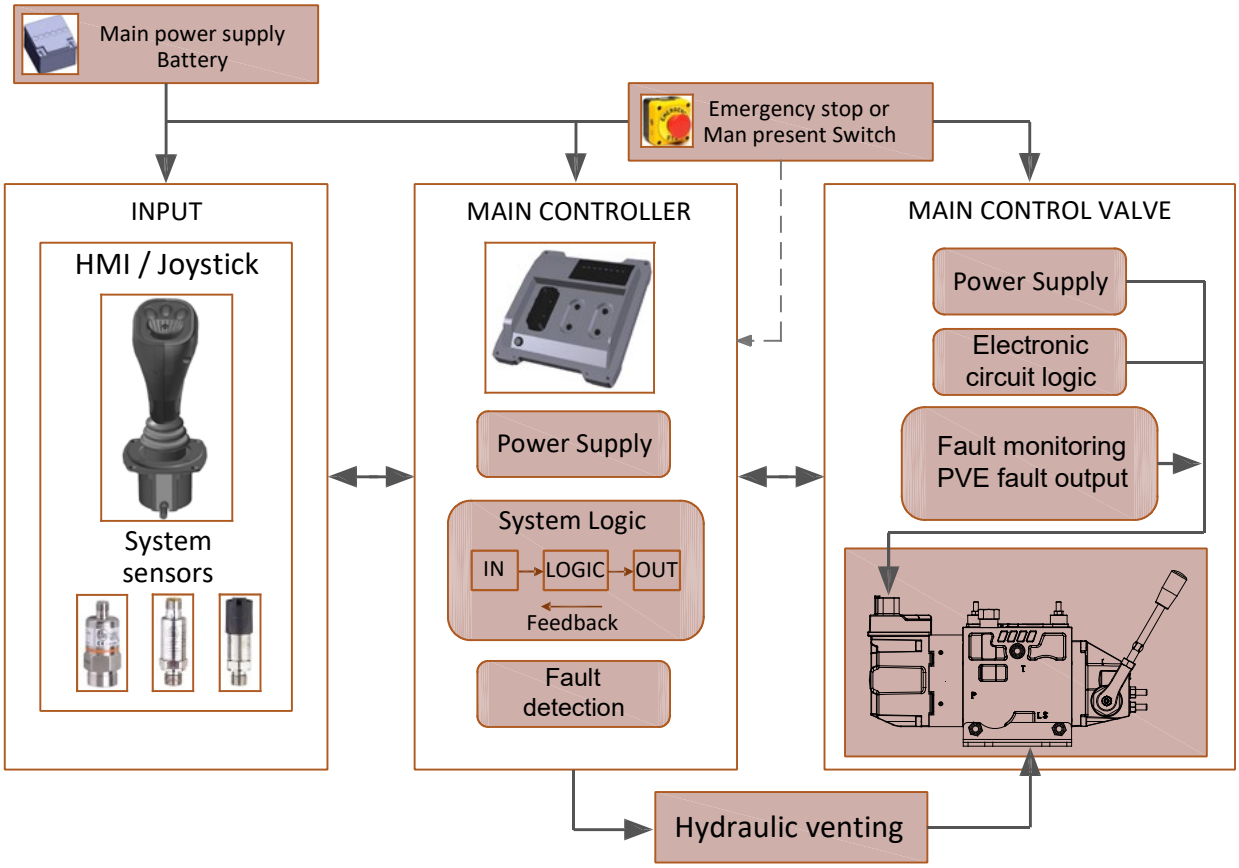
PDV315 - PEAC131 Electro-hydraulic proportional actuation
Closed loop spool control, high performance resolution
Input signal control 0,5 Udc



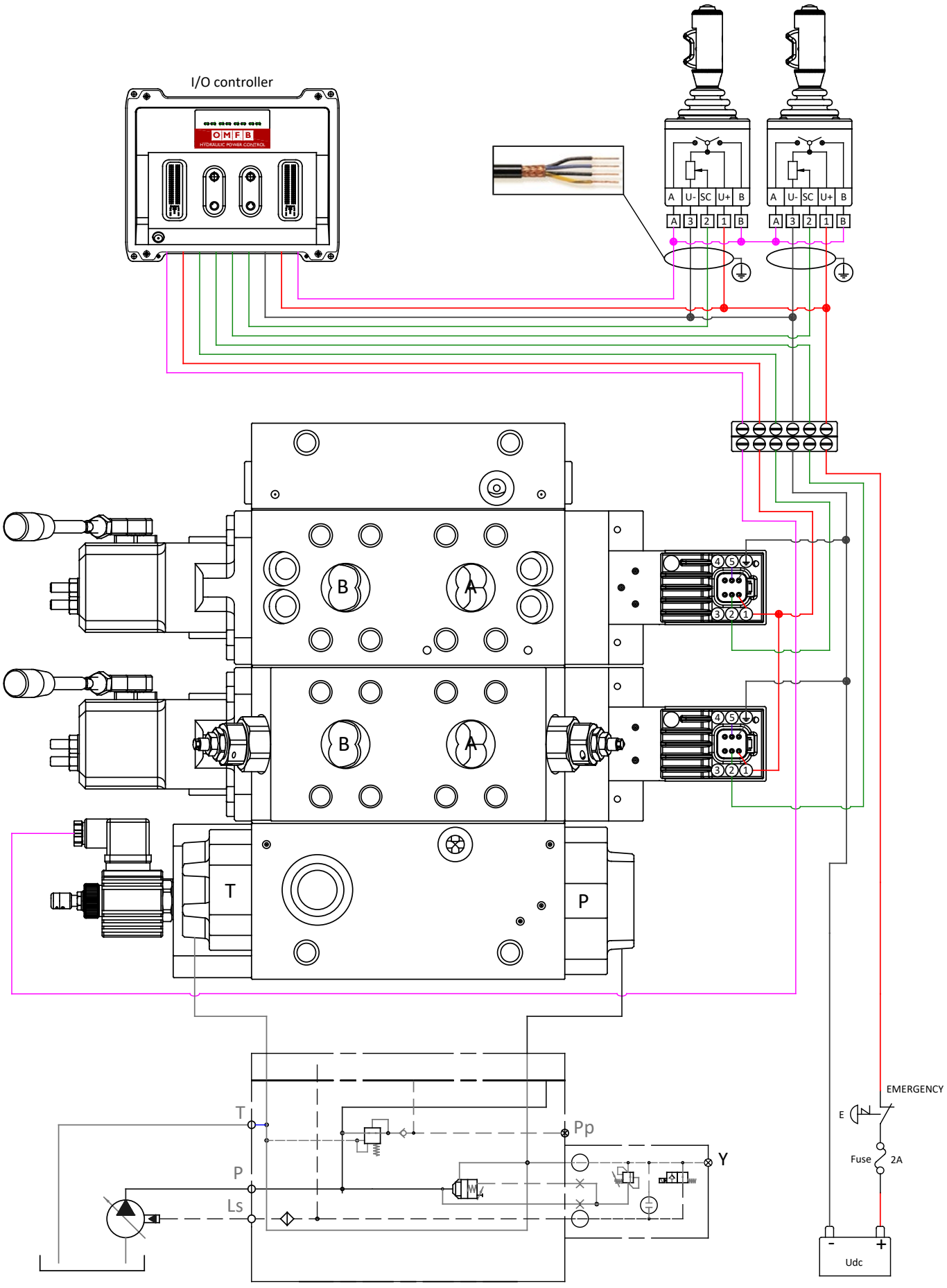
PDV315 - PEAC131 Electro-hydraulic proportional actuation
Closed loop spool control, high performance resolution
Input signal control 0,5 Udc



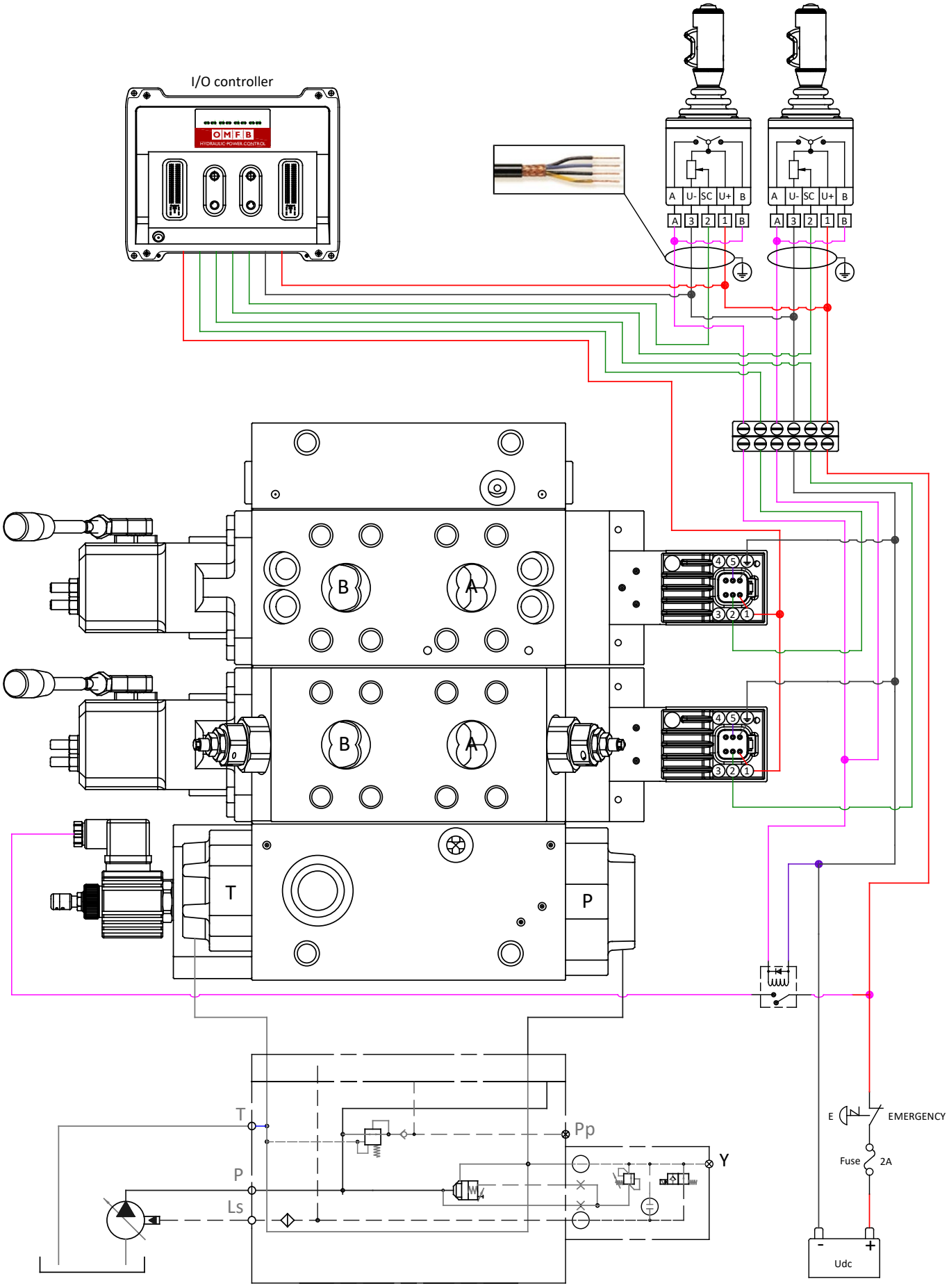
PDV315 - PEAC131 Electro-hydraulic proportional actuation
Closed loop spool control, high performance resolution
Electrical block diagram for intelligent ring machine control



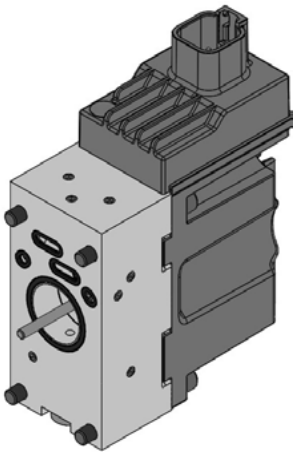
PDV315 - PEAC131 Electro-hydraulic proportional actuation
Electrical wiring diagram with OMFB I/O controller
Input signal 0,5 Udc



PDV315 - PEAC131 Electro-hydraulic proportional actuation
Electrical wiring diagram with OMFB I/O controller
Input signal 0,5 Udc



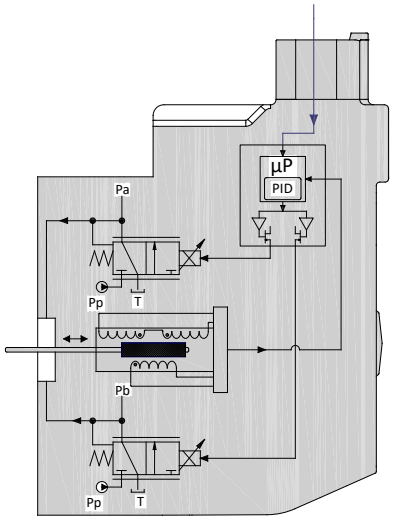
PDV315 - PEAC132 Electro-hydraulic proportional actuation
Closed loop spool control, high performance resolution
Input signal control 0 ÷ 10 V



PEAC132 is a proportional high performance PDV spool actuation with integrated electronics and inductive transducer (LVDT) that operates safely and precisely the main spool movement according to an electrical signal coming from a remote control.
The input signal by means of the PCB and the two proportional pressure reducing valves, determines the level of the pilot pressure which moves the main spool.
The spool position is detected in the LVDT transducer which generates an electric feed-back signal registered by the electronics.
The variation between the input signal and the feed-back signal, actuates the solenoid valves accordingly, so that, the hydraulic pilot pressure will drive the main spool in the right position.

All PEAC132 modules comes with integrated fault monitoring system, available in two version:

Active version
Passive version



Active fault monitoring

When an error state is detected, the two proportional solenoid valves will be automatically deactivated, a red lamp will light-up and drive the spool in neutral position (if it's not seized up).
The system will only react to failures of more than 500 ms (in other words there is delay of half a second before anything happens). An alarm signal is sent out through the connector, and minus is opened.
This error state is memorized, and continues until the system is being reset by switching off the supply voltage.
Shortly, when the active fault monitoring system is connected and an error state is detected, the system ensures a fast and operator free reaction, that will put the complete hydraulic circuit into venting conditions, thus preventing uncontrollable machine movements.

Passive fault monitoring

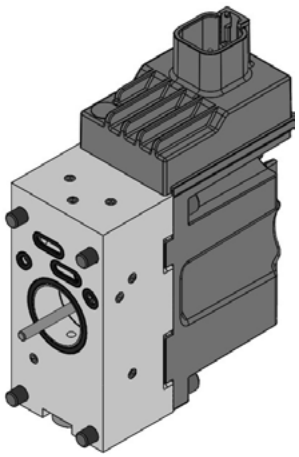
When an error state is detected, the two proportional solenoid valves will not be deactivated, a red lamp will light-up, but still control the main spool.
When a fault condition occurs, after a delay of 250 ms an alarm signal is sent out through a devoted pin
This state is not memorized, and when the faulty state disappears, the alarm signal will turn to passive again.
In order to prevent the electronic from going into an undefined state, any time the system is being triggered or reset, a general check of power supply and the internal clock frequency is made.

The use of PEAC132 module both passive or active version, allows the machines hydraulic system to be made with different level of safety degree that for the choice of which it is essential to know the exactly required functions.

When the PEAC132 module active version is connected with the pump unloading system, the level of safety degree protection for the complete hydraulic system becomes very high, operator free, and helps OEM to meet the PL (Performance Level) required to be comply with the safety demands of Machinery Directive 2006/42/EC.

OMFB HYDRAULIC POWER CONTROL

PDV315 - PEAC132 Electro-hydraulic proportional actuation
Closed loop spool control, high performance resolution
Input signal control 0 ÷ 10 V

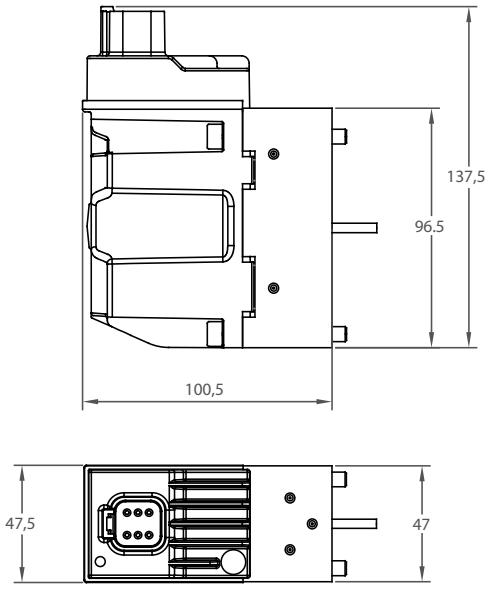


PEAC132 is defined by:

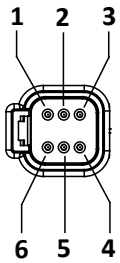
- Inductive transducer with resolution < 12 µm
- Integrated diagnosis and error memory
- Fault monitoring transistor output for signal source
- Higher spool control accuracy
- EMC performace to
- Low hysteresis
- Quicker reaction time
- Spool direction movement output
- Integrated PWM/Pulse Width Modulation
- Low electrical power

PEAC132 Technical data		
Rated supply voltage		**10-30 Vdc**
Max ripple		**5%**
Signal control		**0-10 V**
Range control signal		**2,5 V to 7,5 V**
Neutral spool position		**5 V**
Max threshold signal, **A** port		**1 V**
Max threshold signal, **B** port		**1 V**
Max current signal @ rated voltage		**48 mA**
Input capacitor		**100 ηF**
Signal control impedance		**25 kΩ**
Power consumption		**8,7 W**
Heat insulation		**Class H (180°C)**
Duty cycle		**ED 100%**
Max current consumption		**650 mA**
Current consumption in neutral position		**80 mA**
Coil impedance @ 20°C		**8,9 Ω**
Dither frequency		**50-200 Hz**
Recommended frequency		**100 Hz**
Enclouser degree **(Electrical wiring excepted)**		**IP 66 - IP 67 - IP 69K**
Weight cast iron body		**1,8 kg**
Weight aluminium body		**1,3 kg**
Bootloader function, debugging parameters and set-up function available only with Deutsch connector AT04-6P (to be matched with AT06-6S)		
Fault monitoring system	Max current on safety output (pin 5)	**50 mA**
	Reaction time a fault	**500 ms**
Max current output signal for spool direction moviment		**50 mA**
Reaction time (constant voltage)	From neutral position to max spool travel	**110 - 140 ms**
	From max spool travel to neutral	**70 - 90 ms**
Reaction time (neutral switch)	From neutral position to max spool travel	**130 - 170 ms**
	From max spool travel to neutral	**70 - 90 ms**

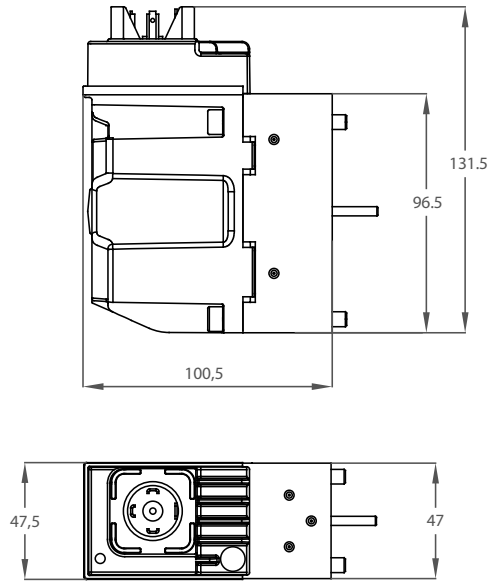
PDV315 - PEAC132 Electro-hydraulic proportional actuation
Closed loop spool control, high performance resolution
Input signal 0 ÷ 10 V - Electrical connectors



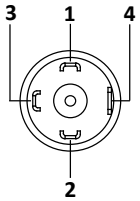
Deutsch connector AT04-6P
Enclousure degree IP 69K
PIN-assignment



1	Power supply	
2	Input signal control	
3	CAN-high	**A** port-spool movement signal
4	CAN-low	**B** port-spool movement signal
5	Fault monitoring signal	
6	Ground	



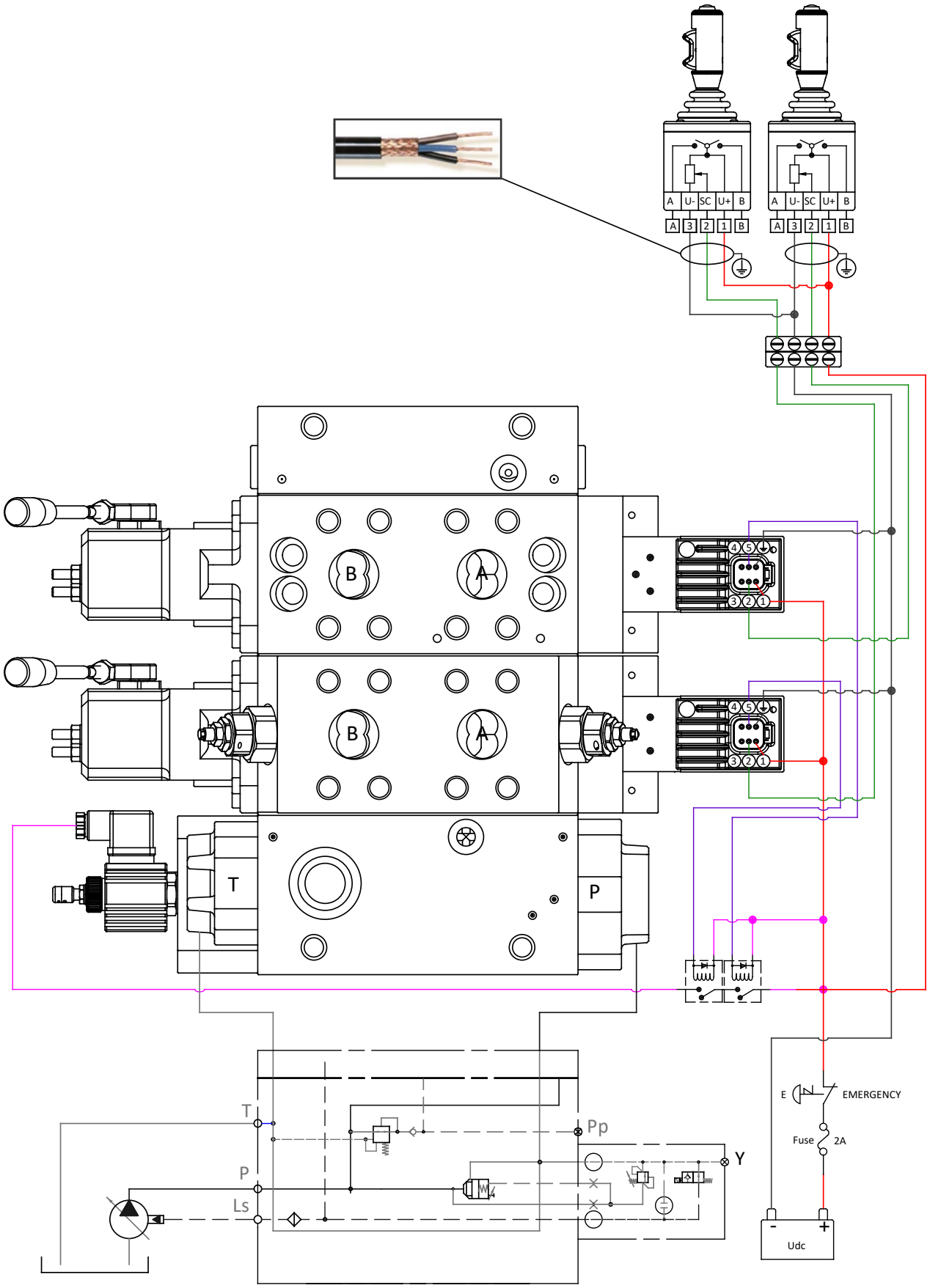
Hirschmann connector DIN 43650
Enclousure degree IP 65
PIN-assignment



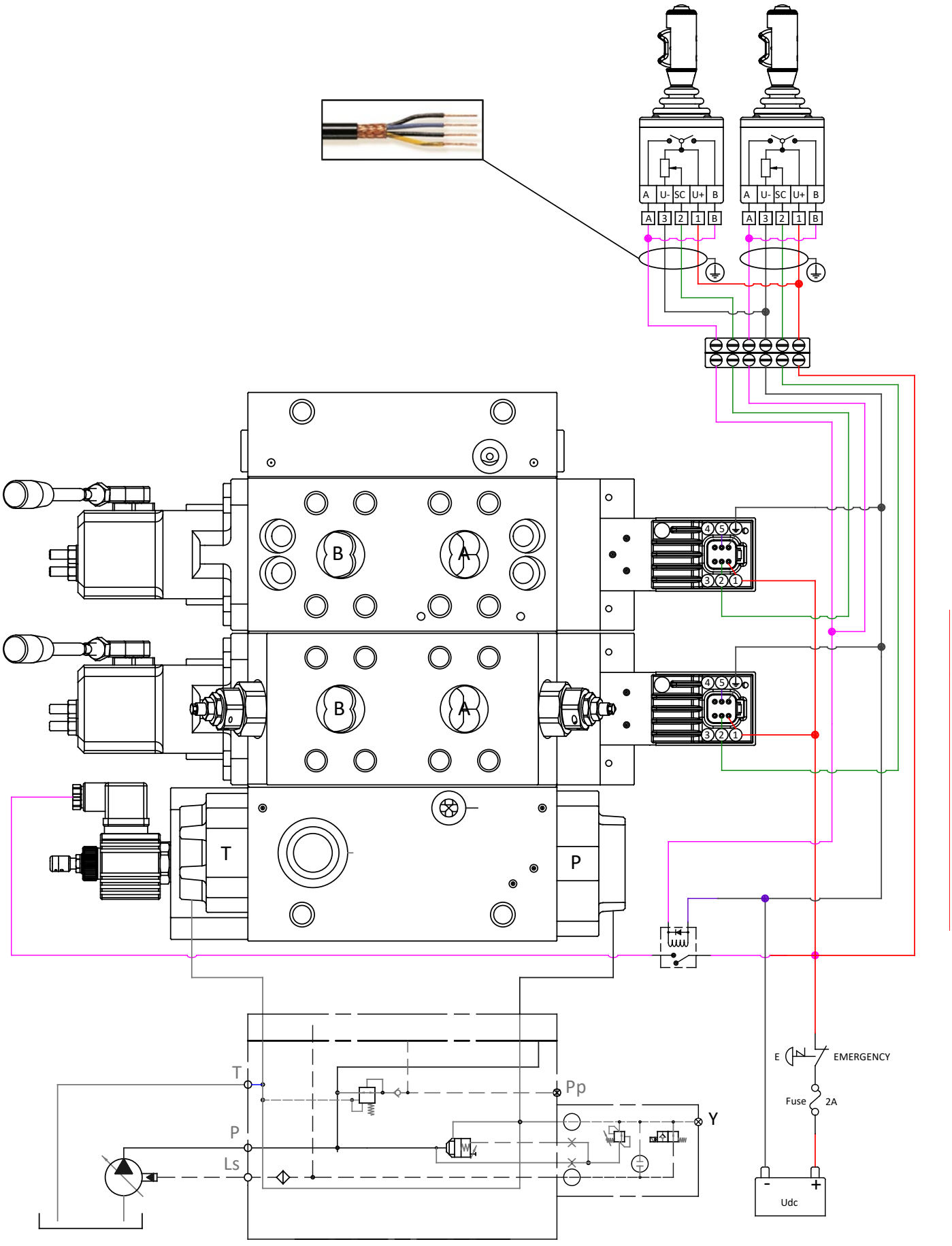
1	Power supply
2	Input signal control
3	Fault monitoring signal
4	Ground

Connector version	Code numbers			
	Active version		Passive version	
	Cast-iron body	Aluminium body	Cast-iron body	Aluminium body
Deutsch AT04-6P	**PEAC0182000**	**PEAC1182000**	**PEAC0172000**	**PEAC1172000**
DIN 43650	**PEAC0182200**	**PEAC1182200**	**PEAC0172200**	**PEAC1172200**

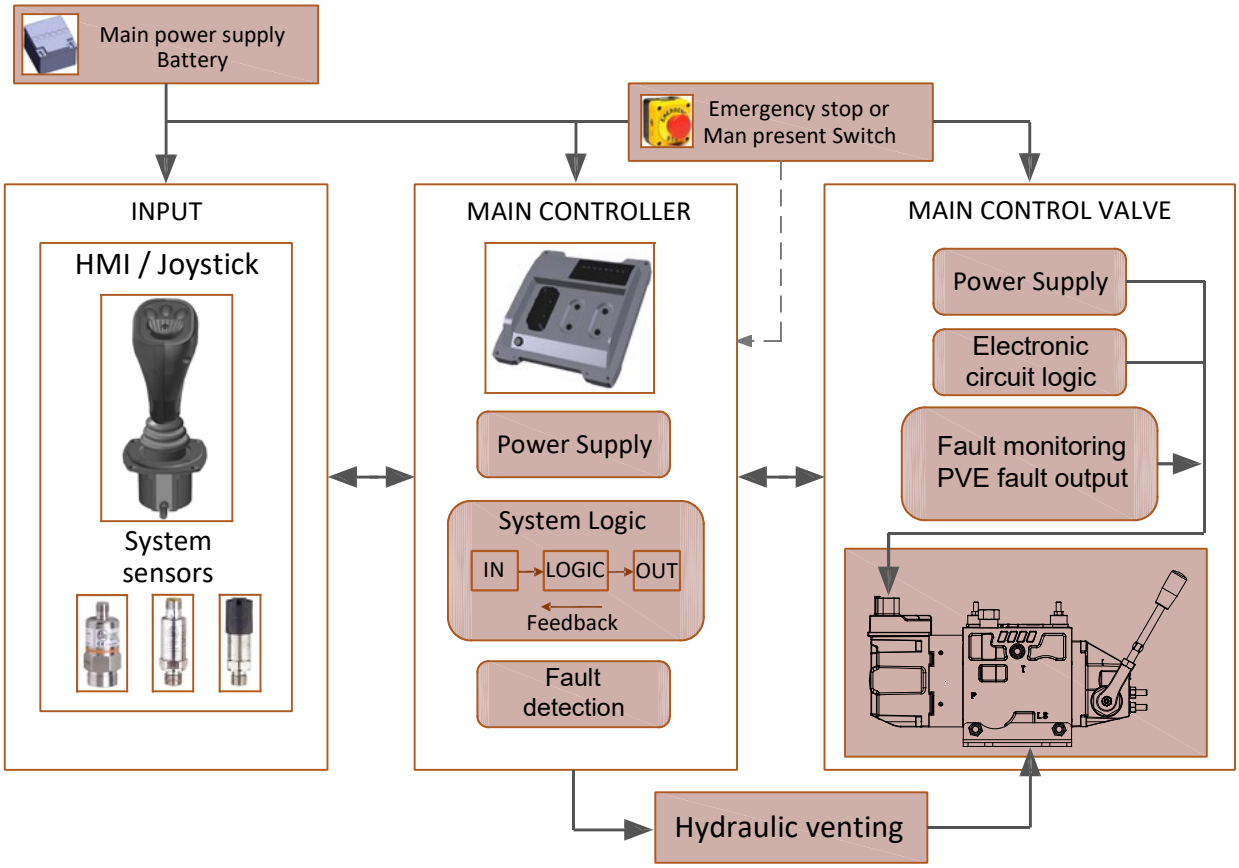
PDV315 - PEAC132 Electro-hydraulic proportional actuation
Closed loop spool control, high performance resolution
Input signal control 0 ÷ 10 V



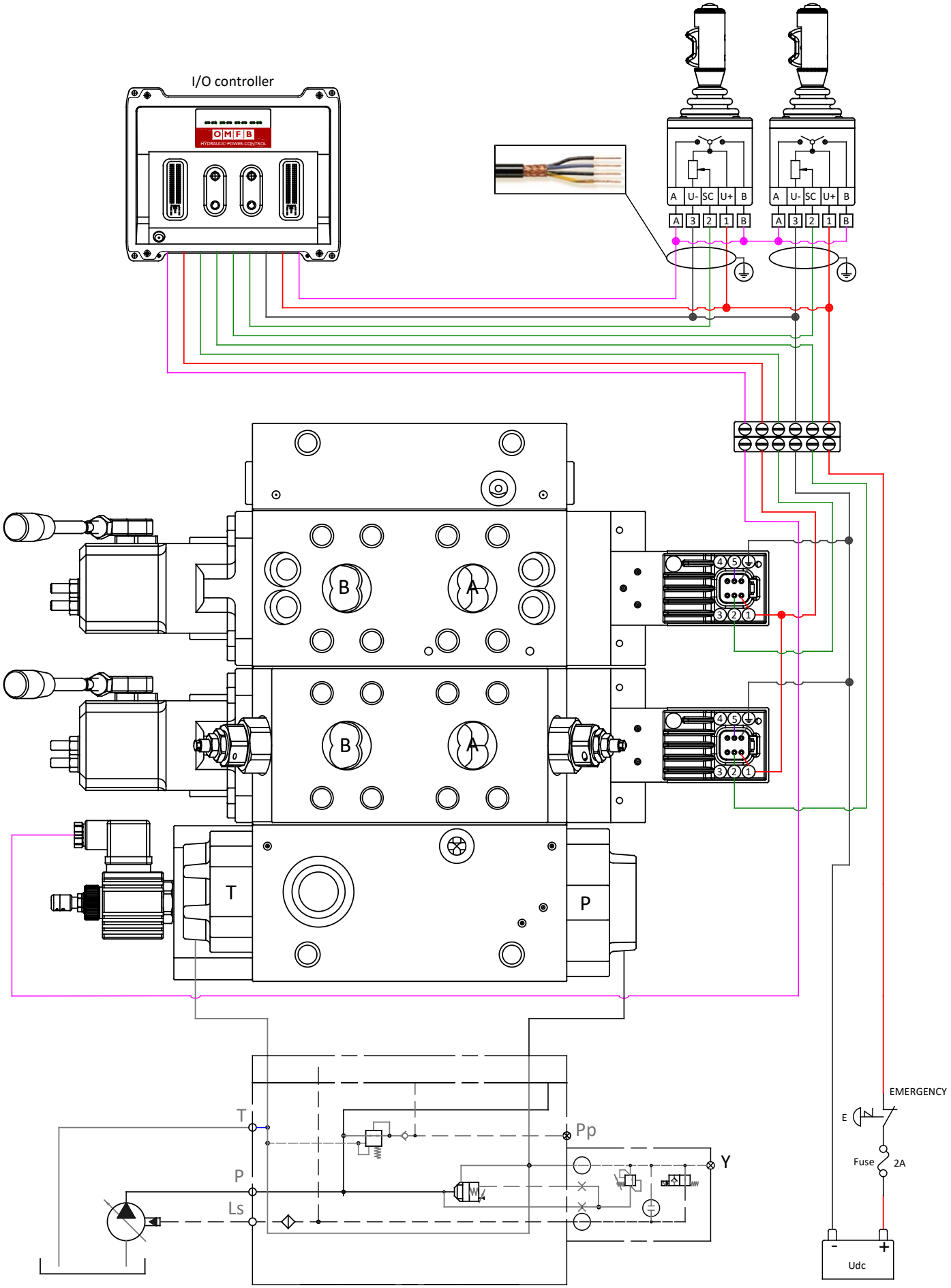
PDV315 - PEAC132 Electro-hydraulic proportional actuation.
Closed loop spool control, high performance resolution
Input signal control 0 ÷ 10 V



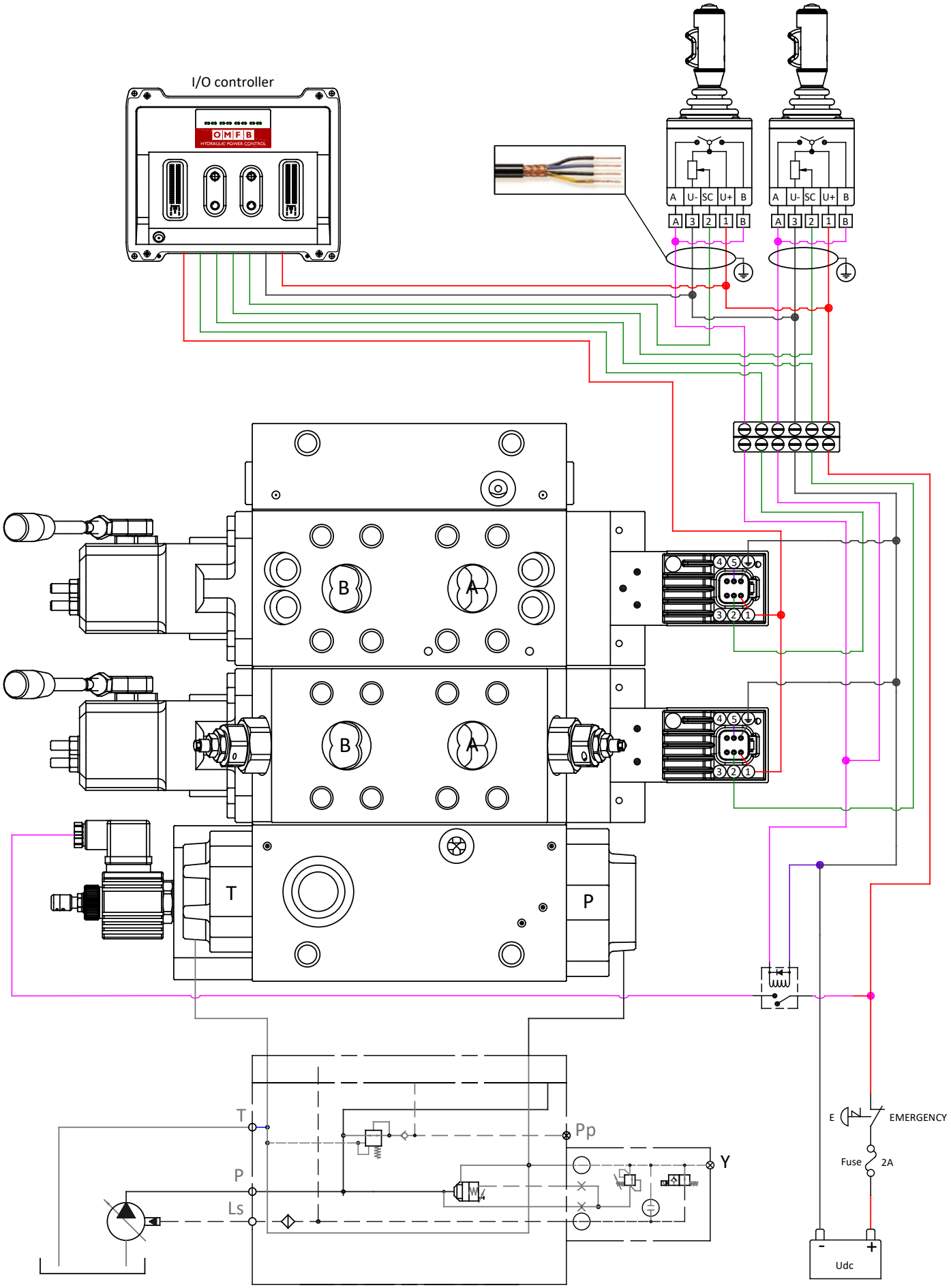
PDV315 - PEAC132 Electro-hydraulic proportional actuation.
Closed loop spool control, high performance resolution
Electrical block diagram for intelligent ring machine control



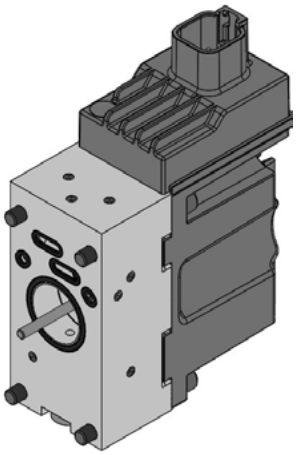
PDV315 - PEAC132 Electro-hydraulic proportional actuation
Electrical wiring diagram with OMFB I/O controller
Input signal 0 ÷ 10 V



PDV315 - PEAC132 Electro-hydraulic proportional actuation
Electrical wiring diagram with OMFB I/O controller
Input signal 0 ÷ 10 V



PDV315 - PEAC136 Electro-hydraulic proportional actuation
Closed loop spool control, high performance resolution
Input signal 4 ÷ 20 mA



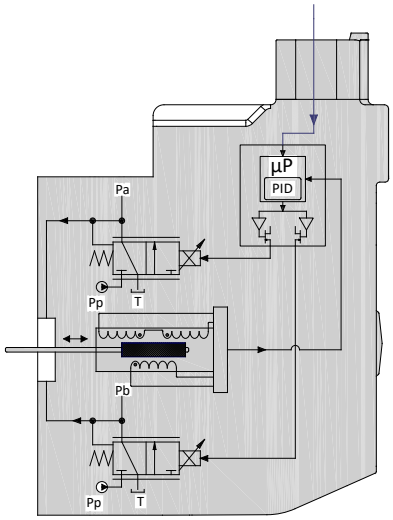
PEAC136 is a proportional high performance PDV spool actuation with integrated electronics and inductive transducer (LVDT) that operates safely and precisely the main spool movement according to an electrical signal coming from a remote control.
The input signal by means of the PCB and the two proportional pressure reducing valves, determines the level of the pilot pressure which moves the main spool.
The spool position is detected in the LVDT transducer which generates an electric feed-back signal registered by the electronics.
The variation between the input signal and the feed-back signal, actuates the solenoid valves accordingly, so that, the hydraulic pilot pressure will drive the main spool in the right position.

All PEAC136 modules comes with integrated fault monitoring system, available in two version:

Active version
Passive version

Active fault monitoring

When an error state is detected, the two proportional solenoid valves will be automatically deactivated, a red lamp will light-up and drive the spool in neutral position (if it's not seized up).
The system will only react to failures of more than 500 ms (in other words there is delay of half a second before anything happens). An alarm signal is sent out through the connector, and minus is opened.
This error state is memorized, and continues until the system is being reset by switching off the supply voltage.
Shortly, when the active fault monitoring system is connected and an error state is detected, the system ensures a fast and operator free reaction, that will put the complete hydraulic circuit into venting conditions, thus preventing uncontrollable machine movements.



Passive fault monitoring

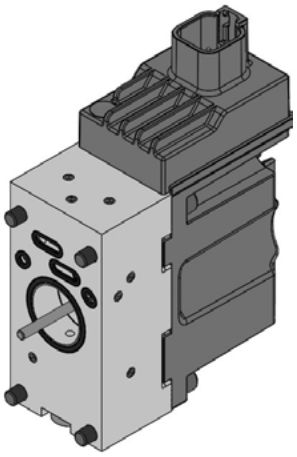
When an error state is detected, the two proportional solenoid valves will not be deactivated, a red lamp will light-up, but still control the main spool.
When a fault condition occurs, after a delay of 250 ms an alarm signal is sent out through a devoted pin
This state is not memorized, and when the faulty state disappears, the alarm signal will turn to passive again.
In order to prevent the electronic from going into an undefined state, any time the system is being triggered or reset, a general check of power supply and the internal clock frequency is made.

The use of PEAC136 module both passive or active version, allows the machines hydraulic system to be made with different level of safety degree that for the choice of which it is essential to know the exactly required functions.

When the PEAC136 module active version is connected with the pump unloading system, the level of safety degree protection for the complete hydraulic system becomes very high, operator free, and helps OEM to meet the PL (Performance Level) required to be comply with the safety demands of Machinery Directive 2006/42/EC.

OMFB HYDRAULIC POWER CONTROL

PDV315 - PEAC136 Electro-hydraulic proportional actuation
Closed loop spool control, high performance resolution
Input signal control 4 ÷ 20 mA

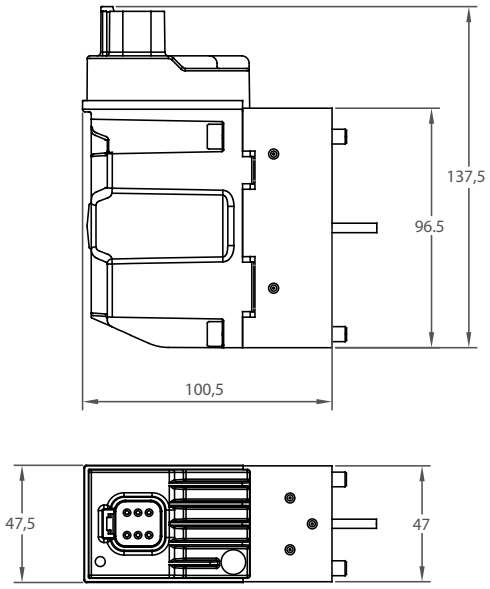


PEAC136 is defined by:

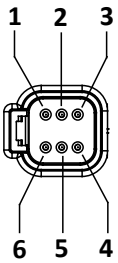
- Inductive transducer with resolution < 12 µm
- Integrated diagnosis and error memory
- Fault monitoring transistor output for signal source
- Higher spool control accuracy
- EMC performace according to Directive 2014/30/UE
- Low hysteresis
- Quicker reaction time
- Spool direction movement output
- Integrated PWM/Pulse Width Modulation
- Low electrical power
- Robust and reliable design

PEAC136 Technical data		
Rated supply voltage		**10 ÷ 30 Vdc**
Max ripple		**5%**
Signal control		**4 ÷ 20 mA**
Range control signal		**4 mA to 20 mA**
Neutral spool position		**12 mA**
Max threshold signal, **A** port		**1,5 mA**
Max threshold signal, **B** port		**1,5 mA**
Max current signal @ rated voltage		**48 mA**
Input capacitor		**100 ηF**
Signal control impedance		**220 Ω**
Power consumption		**8,7 W**
Heat insulation		**Class H (180°C)**
Duty cycle		**ED 100%**
Max current consumption		**650 mA**
Current consumption in neutral position		**80 mA**
Coil impedance @ 20°C		**8,9 Ω**
Dither frequency		**50 ÷ 200 Hz**
Recommended frequency		**100 Hz**
Enclouser degree **(Electrical wiring excepted)**		**IP65 - IP66 - IP69K**
Weight cast iron body		**1,8 kg**
Weight aluminium body		**1,3 kg**
Bootloader function, debugging parameters and set-up function available with Deutsch connector AT04-6P, only (to be matched with AT06-6S)		
Fault monitoring system	Max current on safety output (pin 5)	**50 mA**
	Reaction time a fault	**500 ms**
Max current output signal for spool direction moviment		**50 mA**
Reaction time (constant voltage)	From neutral position to max spool travel	**110 ÷ 140 ms**
	From max spool travel to neutral	**70 ÷ 90 ms**
Reaction time (neutral switch)	From neutral position to max spool travel	**130 ÷ 170 ms**
	From max spool travel to neutral	**70 ÷ 90 ms**

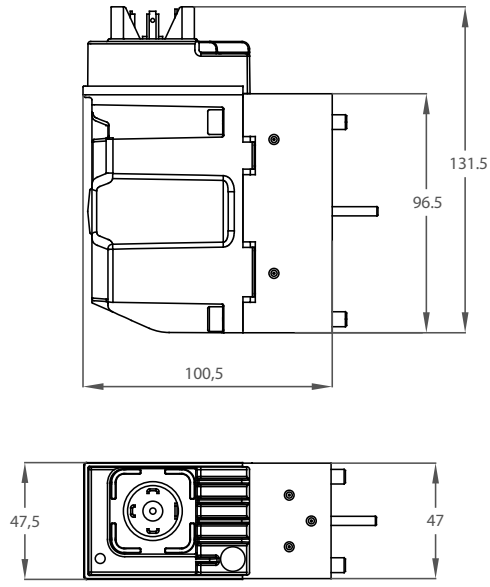
PDV315 - PEAC136 Electro-hydraulic proportional actuation
Closed loop spool control, high performance resolution
Input signal control 4 ÷ 20 mA - Electrical connectors



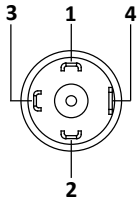
Deutsch connector AT04-6P
Enclousure degree IP 69K
PIN-assignment



1	Power supply	
2	Input signal control	
3	CAN-high	**A** port-spool movement signal
4	CAN-low	**B** port-spool movement signal
5	Fault monitoring signal	
6	Ground	



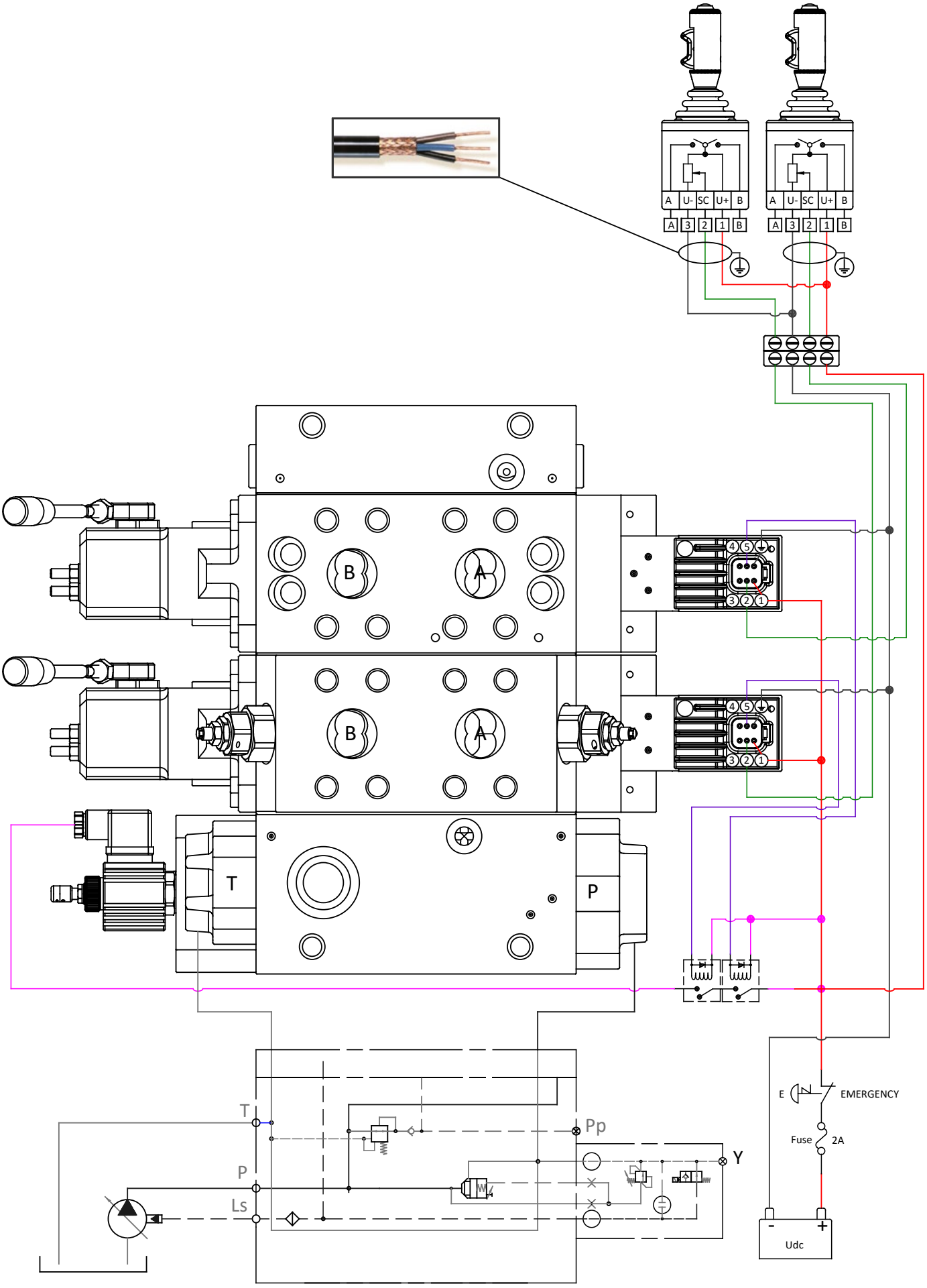
Hirschmann connector DIN 43650
Enclousure degree IP 65
PIN-assignment



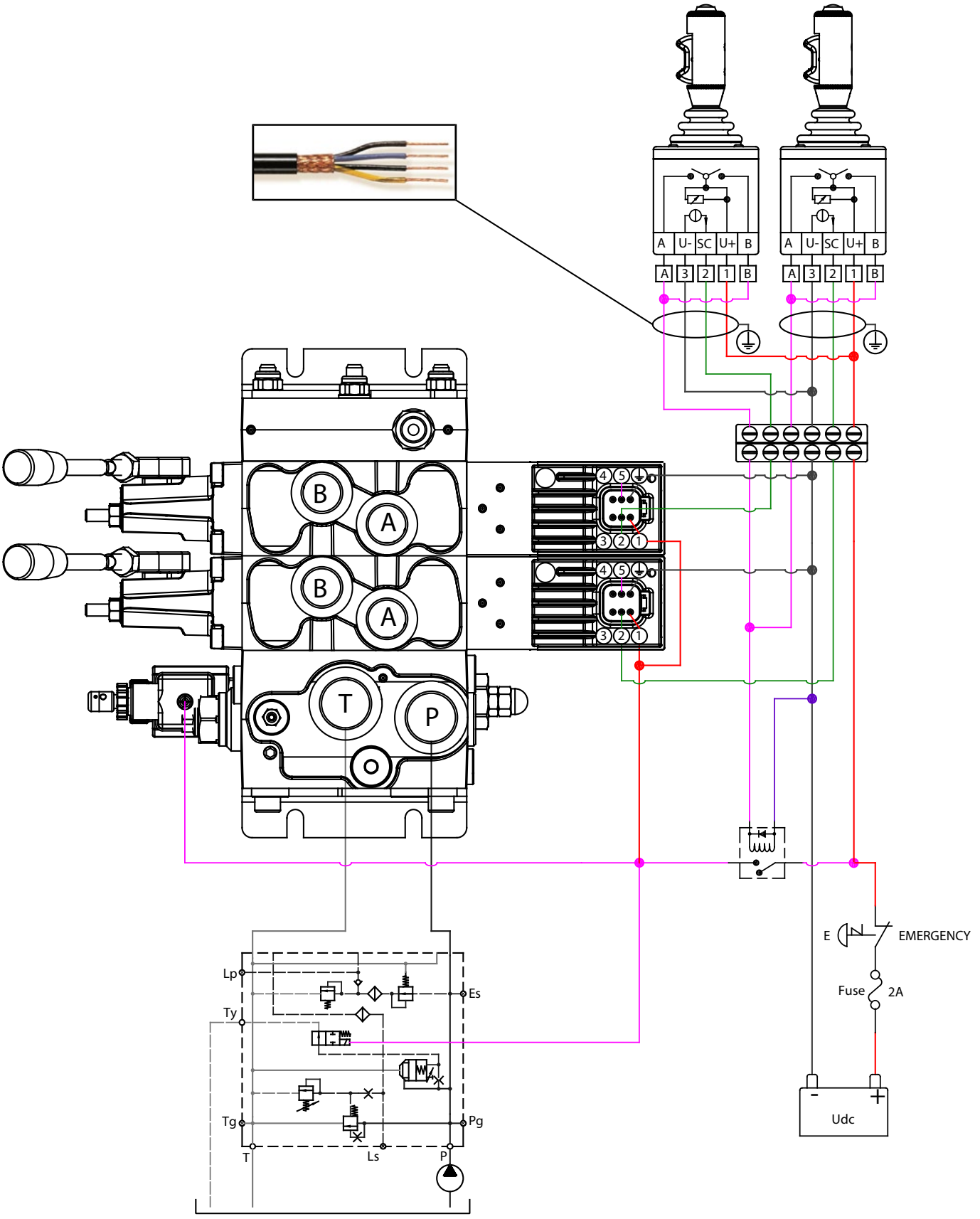
1	Power supply
2	Input signal control
3	Fault monitoring signal
4	Ground

Connector version	Code numbers			
	Active version		Passive version	
	Cast-iron body	Aluminium body	Cast-iron body	Aluminium body
Deutsch AT04-6P	**PEAC0186000**	**PEAC1186000**	**PEAC0176000**	**PEAC1176000**
DIN 43650	**PEAC0186200**	**PEAC1186200**	**PEAC0176200**	**PEAC1176200**

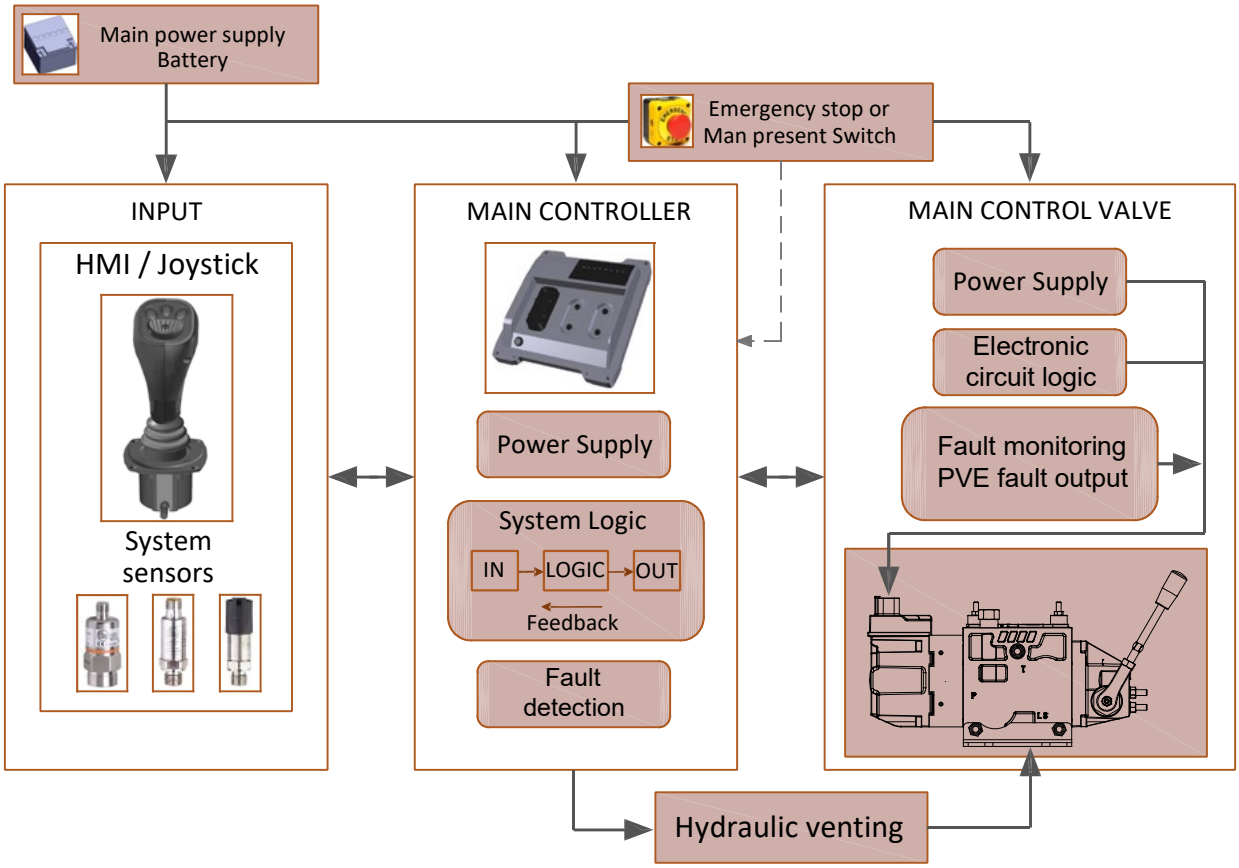
PDV315 - PEAC136 Electro-hydraulic proportional actuation
Closed loop spool control, high performance resolution
Input signal 4 ÷ 20 mA



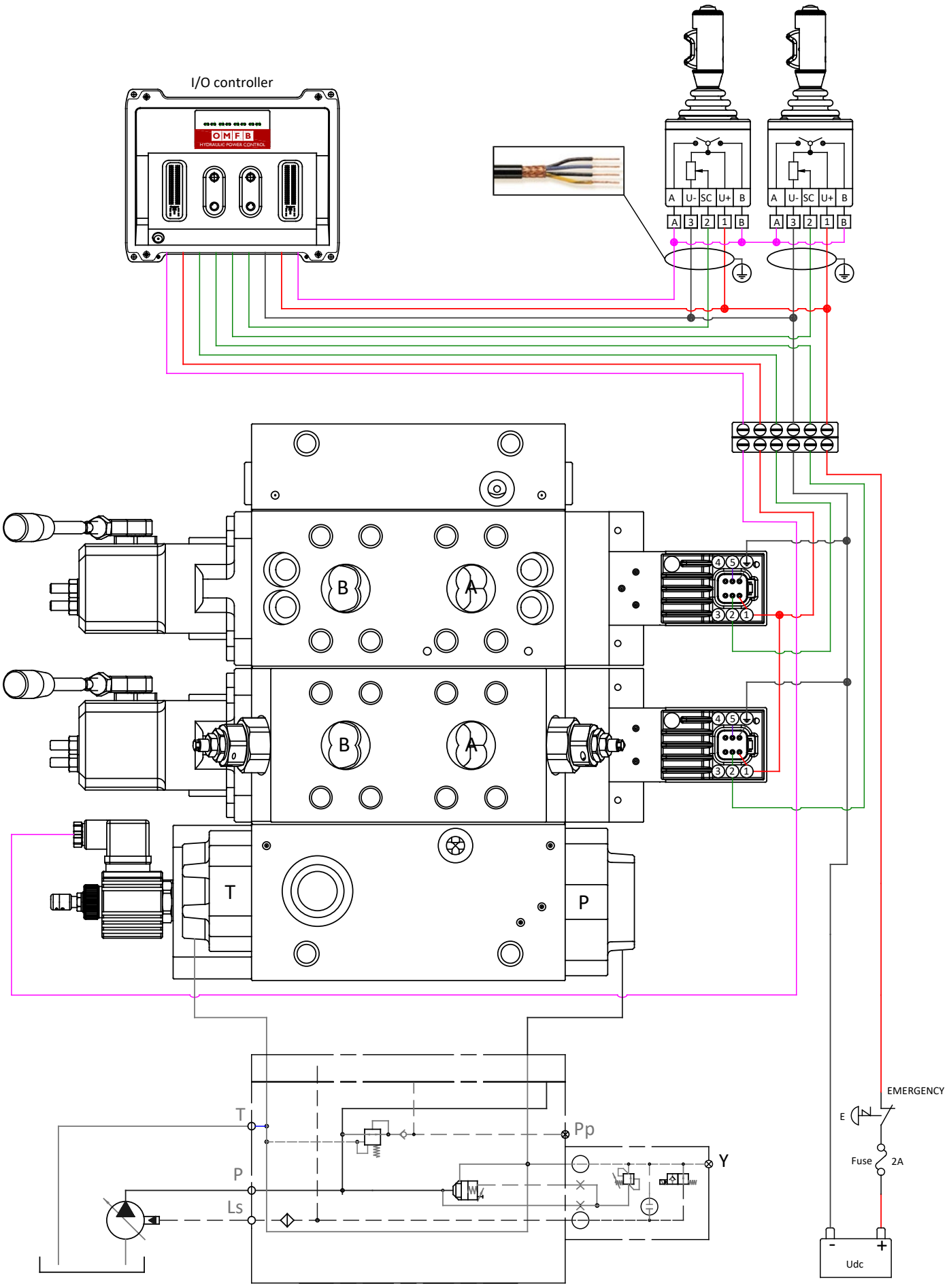
PDV315 - PEAC136 Electro-hydraulic proportional actuation
Closed loop spool control, high performance resolution
Input signal control 4 ÷ 20 mA



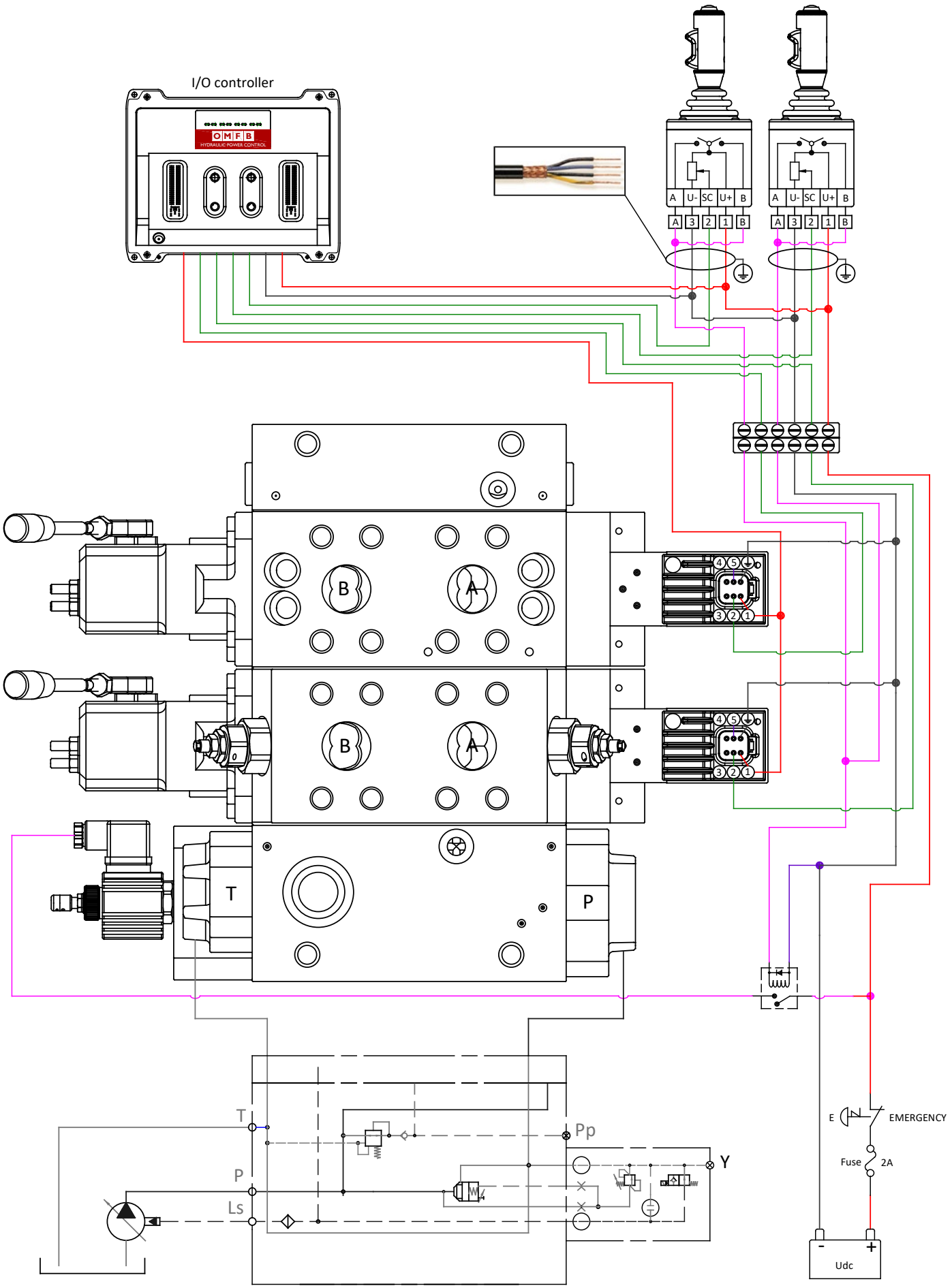
PDV315 - PEAC136 Electro-hydraulic proportional actuation
Closed loop spool control, high performance resolution
Electrical block diagram for intelligent ring machine control



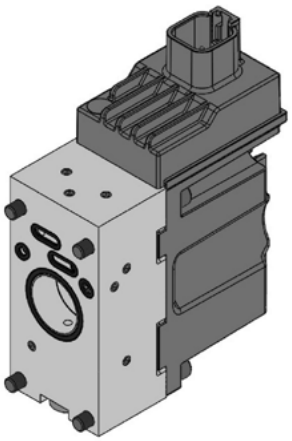
PDV315 - PEAC136 Electro-hydraulic proportional actuation.
Electrical wiring with OMFB I/O controller
Input signal 4 ÷ 20 mA



PDV315 - PEAC136 Electro-hydraulic proportional actuation
Electrical wiring diagram with OMFB I/O controller
Input signal 4 ÷ 20 mA



PDV315 - PEAC031 Electro-hydraulic proportional actuation
Open loop spool control, high performance resolution
Input signal control 0,5 Udc

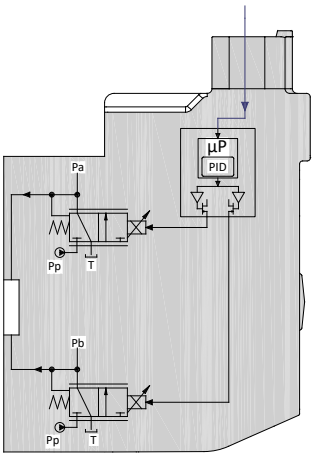


PEAC031 is a proportional open loop spool actuation with integrated electronics that operates the main spool movement according to an electrical signal coming from a remote control.

The input signal by means of the PCB and the two proportional pressure reducing valves, determines the level of the pilot pressure which moves the main spool.

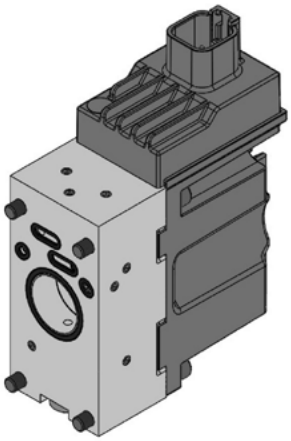
PEAC031 does not have neither the transducer spool position control nor fault monitoring system, this means that any forces which override the pilot pressure spool forces, may chenge the spool position with no error signal, and the safety of the whole system is left to the operator's visual control, only.

PEAC031 is recommended where a simple proportional control is required, and where hysteresis and reaction time are not so critical.



OMFB HYDRAULIC POWER CONTROL

PDV315 - PEAC031 Electro-hydraulic proportional actuation
Open loop spool control, high performance resolution
Input signal control 0,5 Udc

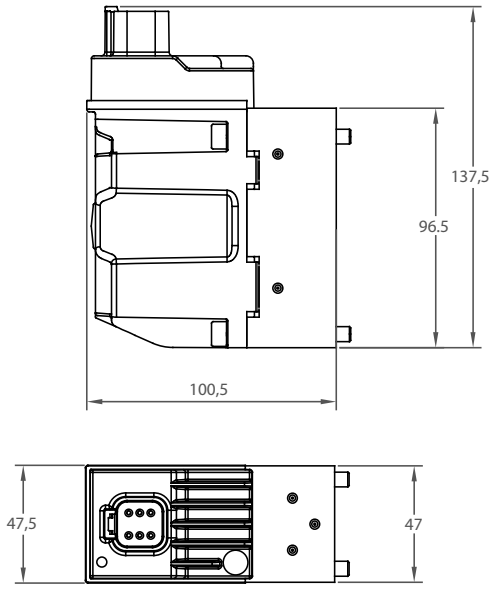


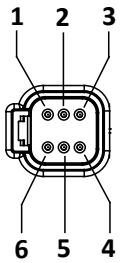
PEAC031 is defined by:

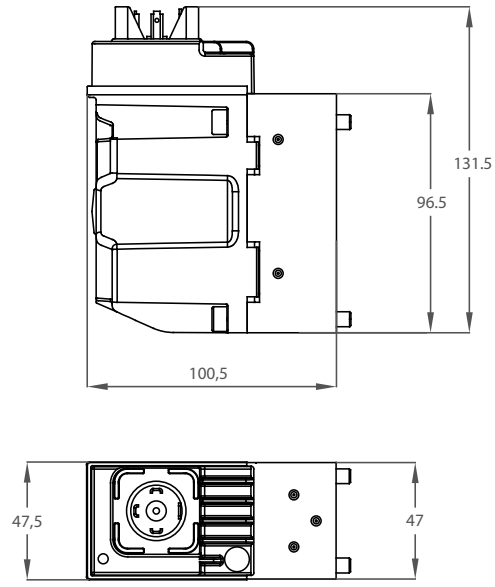
- High spool control accuracy
- EMC performace according to Directive 2014/30/UE
- Quick reaction time
- Integrated PWM/Pulse Width Modulation
- Low electrical power
- Robust and reliable design

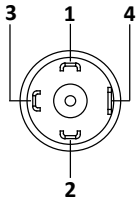
PEAC031 Technical data		
Rated supply voltage		**10-30 Vdc**
Max ripple		**5%**
Signal control		**0,5 Udc**
Range control signal		**0,25 Udc to 0,75 Udc**
Neutral spool position		**0,5 Udc**
Max threshold signal, **A** port		**1 V**
Max threshold signal, **B** port		**1 V**
Max current signal @ rated voltage		**48 mA**
Input capacitor		**100 ηF**
Signal control impedance		**25 kΩ**
Power consumption		**8,7 W**
Heat insulation		**Class H (180°C)**
Duty cycle		**ED 100%**
Max current consumption		**650 mA**
Current consumption in neutral position		**80 mA**
Coil impedance @ 20°C		**8,9 Ω**
Dither frequency		**50-200 Hz**
Recommended frequency		**100 Hz**
Enclouser degree **(Electrical wiring excepted)**		**IP 66 - IP 67 - IP 69K**
Weight cast iron body		**1,8 kg**
Weight aluminium body		**1,3 kg**
Bootloader function, debugging parameters and set-up function available only with Deutsch connector AT04-6P (to be matched with AT06-6S)		
Reaction time (constant voltage)	From neutral position to max spool travel	**110 - 140 ms**
	From max spool travel to neutral	**70 - 90 ms**
Reaction time (neutral switch)	From neutral position to max spool travel	**130 - 170 ms**
	From max spool travel to neutral	**70 - 90 ms**

PDV315 - PEAC031 Electro-hydraulic proportional actuation
Open loop spool control, high performance resolution
Input signal 0,5 Udc - Electrical connectors



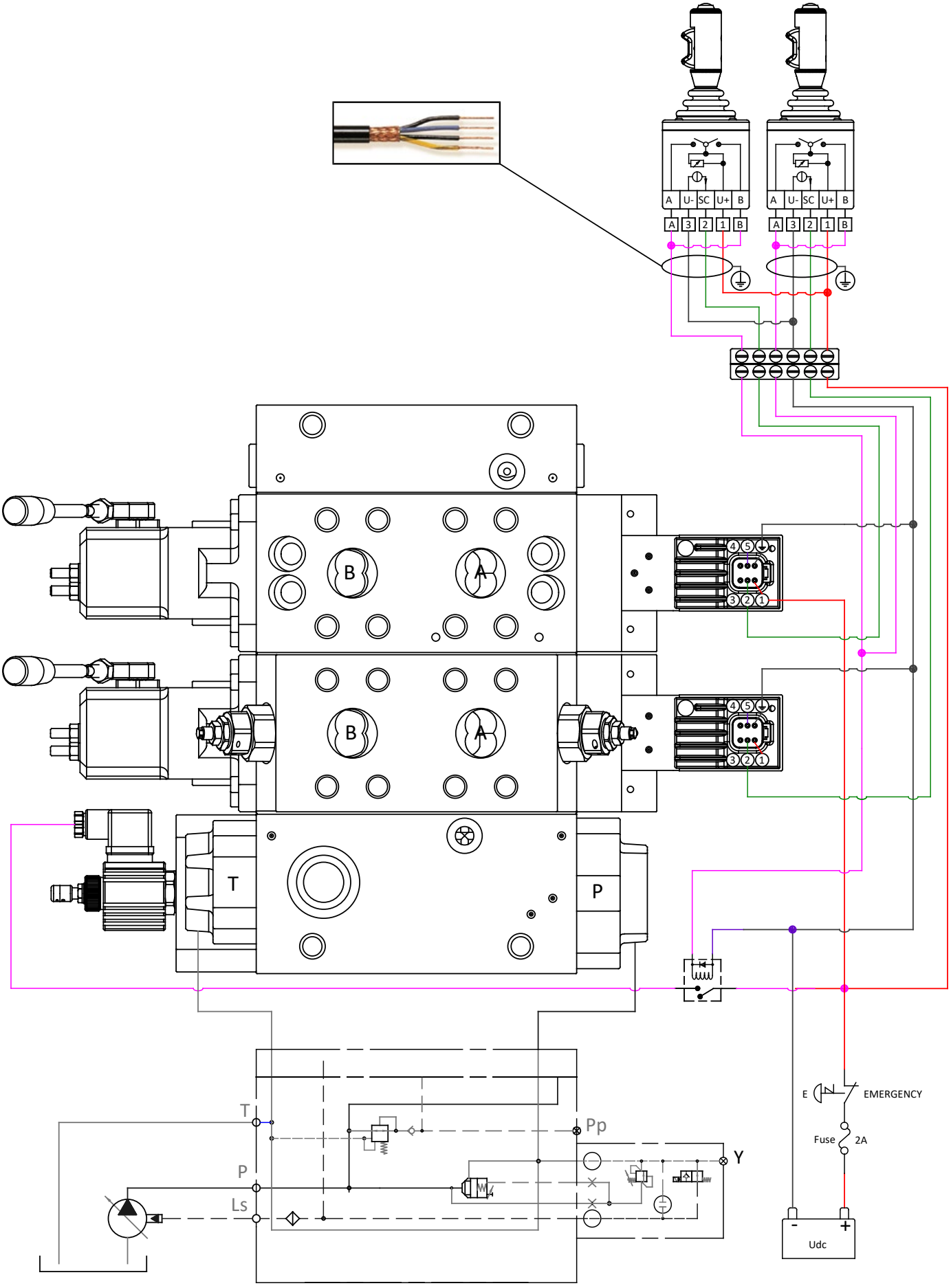
Deutsch connector AT04-6P Enclousure degree IP 69K PIN-assignment		
	**1**	Power supply
	2	Input signal control
	3	CAN-high
	4	CAN-low
	5	Free
	6	Ground



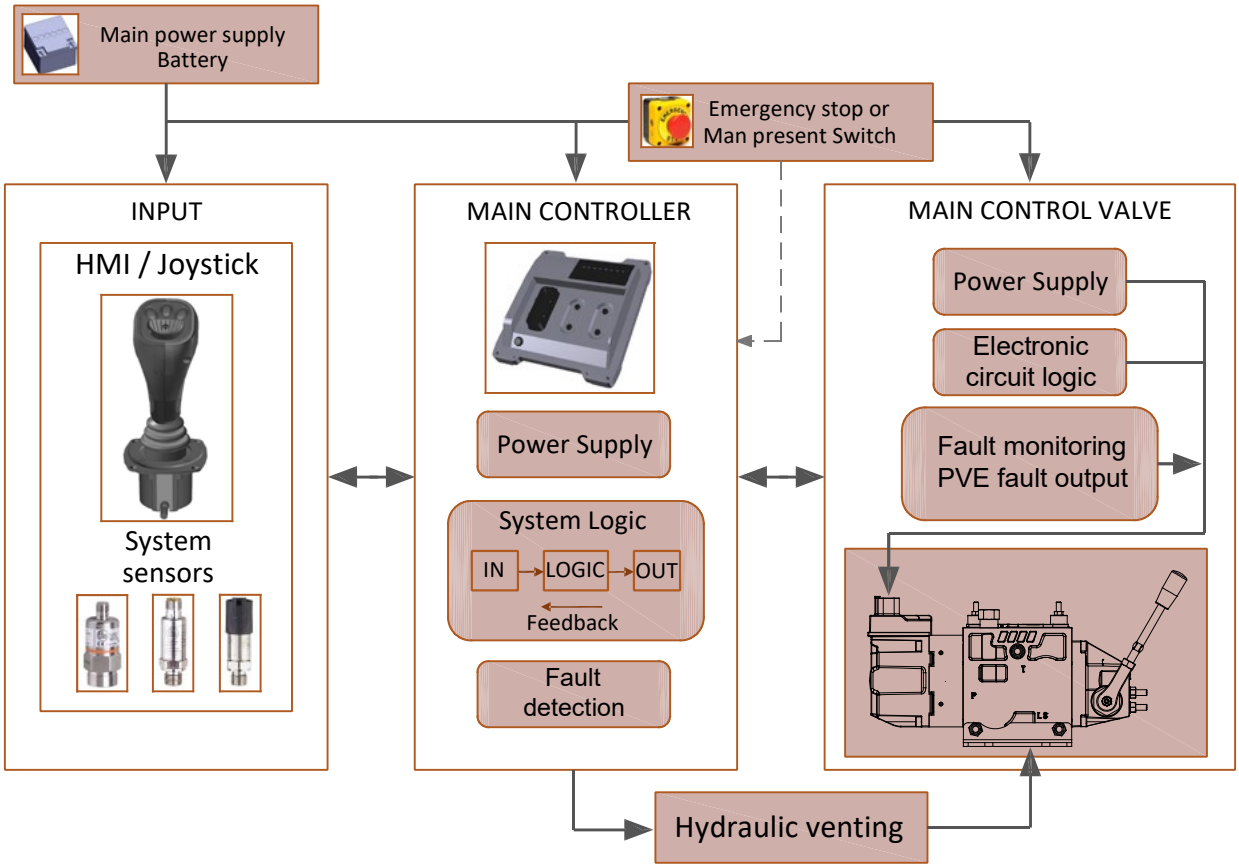
Hirschmann connector DIN 43650 Enclousure degree IP 65 PIN-assignment		
	**1**	Power supply
	2	Input signal control
	3	Free
	4	Ground

Connector version	Code numbers			
	Active version		Passive version	
	Cast-iron body	Aluminium body	Cast-iron body	Aluminium body
Deutsch AT04-6P	**PEAC0081000**	**PEAC1081000**	**PEAC0071000**	**PEAC1071000**
DIN 43650	**PEAC0081200**	**PEAC1081200**	**PEAC0071200**	**PEAC1071200**

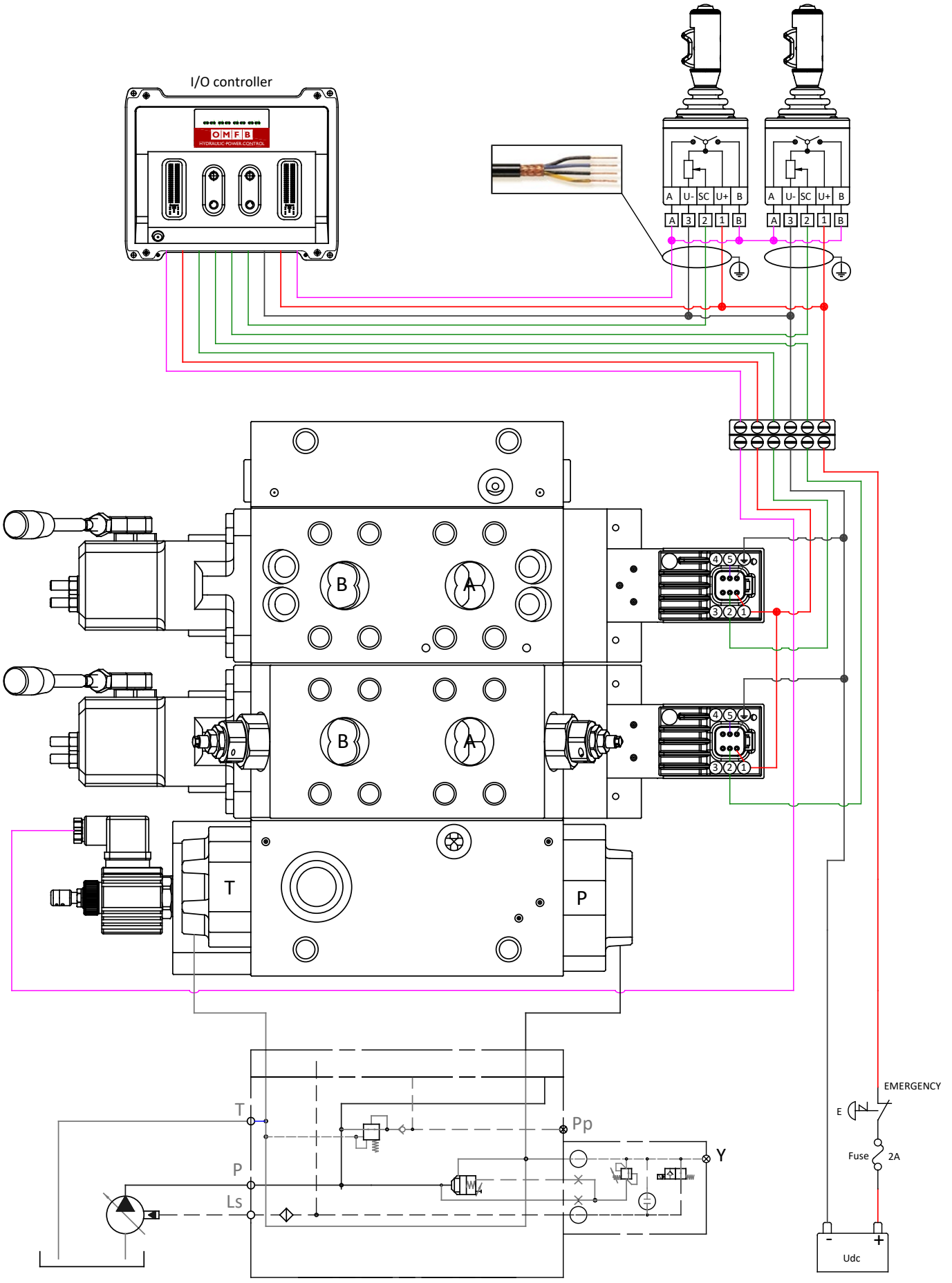
PDV315 - PEAC031 Electro-hydraulic proportional actuation
Open loop spool control, high performance resolution
Input signal control 0,5 Udc



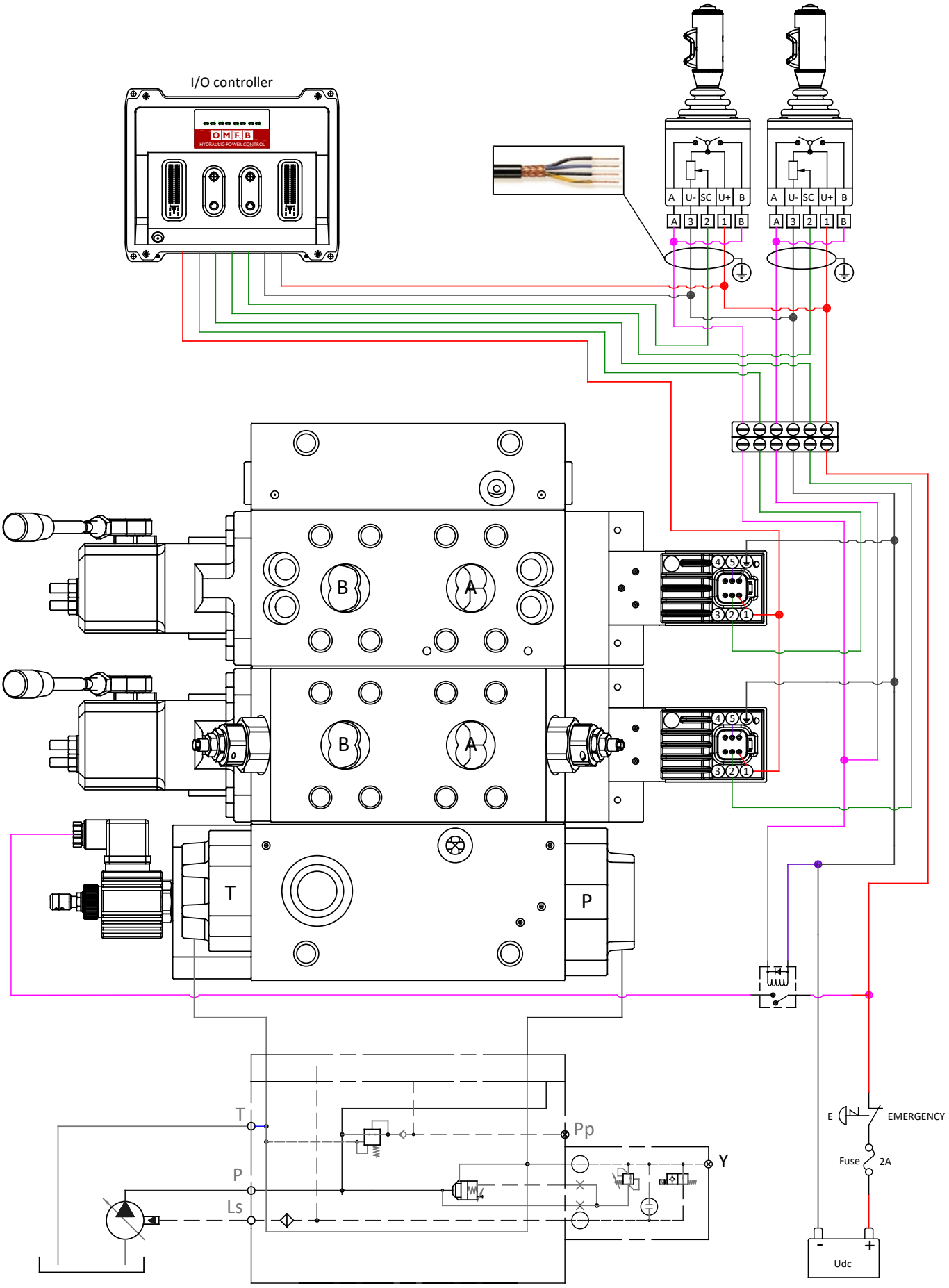
PDV315 - PEAC031 Electro-hydraulic proportional actuation
Open loop spool control, high performance resolution
Electrical block diagram for intelligent ring machine control



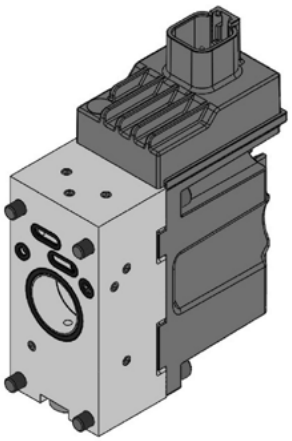
PDV315 - PEAC031 Electro-hydraulic proportional actuation
Electrical wiring diagram with OMFB I/O controller
Input signal 0,5 Udc



PDV315 - PEAC031 Electro-hydraulic proportional actuation
Electrical wiring diagram with OMFB I/O controller
Input signal 0,5 Udc



PDV315 - PEAC032 Electro-hydraulic proportional actuation
Open loop spool control, high performance resolution
Input signal control 0 ÷ 10 V

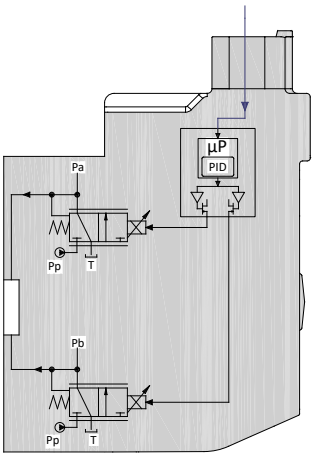


PEAC032 is a proportional open loop spool actuation with integrated electronics that operates the main spool movement according to an electrical signal coming from a remote control.

The input signal by means of the PCB and the two proportional pressure reducing valves, determines the level of the pilot pressure which moves the main spool.

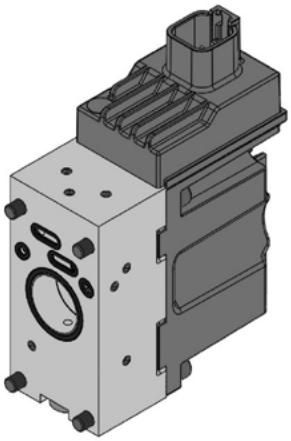
PEAC032 does not have neither the transducer spool position control nor fault monitoring system, this means that any forces which override the pilot pressure spool forces, may chenge the spool position with no error signal, and the safety of the whole system is left to the operator's visual control, only.

PEAC032 is recommended where a simple proportional control is required, and where hysteresis and reaction time are not so critical.



OMFB HYDRAULIC POWER CONTROL

PDV315 - PEAC032 Electro-hydraulic proportional actuation
Open loop spool control, high performance resolution
Input signal control 0 ÷ 10 V

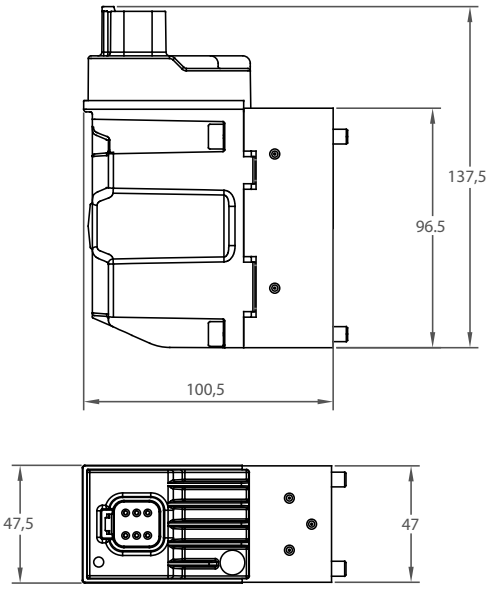


PEAC032 is defined by:

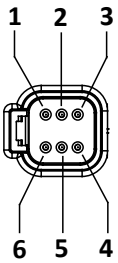
- High spool control accuracy
- EMC performace according to Directive 2014/30/UE
- Quick reaction time
- Integrated PWM/Pulse Width Modulation
- Low electrical power
- Robust and reliable design

PEAC032 Technical data		
Rated supply voltage		**10-30 Vdc**
Max ripple		**5%**
Signal control		**0-10 V**
Range control signal		**2,5 V to 7,5 V**
Neutral spool position		**5 V**
Max threshold signal, **A** port		**1 V**
Max threshold signal, **B** port		**1 V**
Max current signal @ rated voltage		**48 mA**
Input capacitor		**100 ηF**
Signal control impedance		**25 kΩ**
Power consumption		**8,7 W**
Heat insulation		**Class H (180°C)**
Duty cycle		**ED 100%**
Max current consumption		**650 mA**
Current consumption in neutral position		**80 mA**
Coil impedance @ 20°C		**8,9 Ω**
Dither frequency		**50-200 Hz**
Recommended frequency		**100 Hz**
Enclouser degree **(Electrical wiring excepted)**		**IP 66 - IP 67 - IP 69K**
Weight cast iron body		**1,8 kg**
Weight aluminium body		**1,3 kg**
Bootloader function, debugging parameters and set-up function available only with Deutsch connector AT04-6P (to be matched with AT06-6S)		
Reaction time (constant voltage)	From neutral position to max spool travel	**110 - 140 ms**
	From max spool travel to neutral	**70 - 90 ms**
Reaction time (neutral switch)	From neutral position to max spool travel	**130 - 170 ms**
	From max spool travel to neutral	**70 - 90 ms**

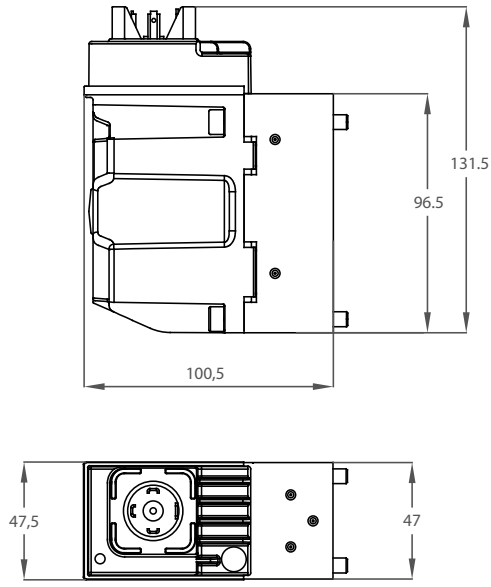
PDV315 - PEAC032 Electro-hydraulic proportional actuation
Open loop spool control, high performance resolution
Input signal 0 ÷ 10 V - Electrical connectors



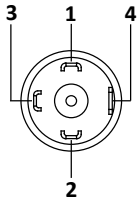
Deutsch connector AT04-6P
Enclousure degree IP 69K
PIN-assignment



1	Power supply
2	Input signal control
3	CAN-high
4	CAN-low
5	Free
6	Ground



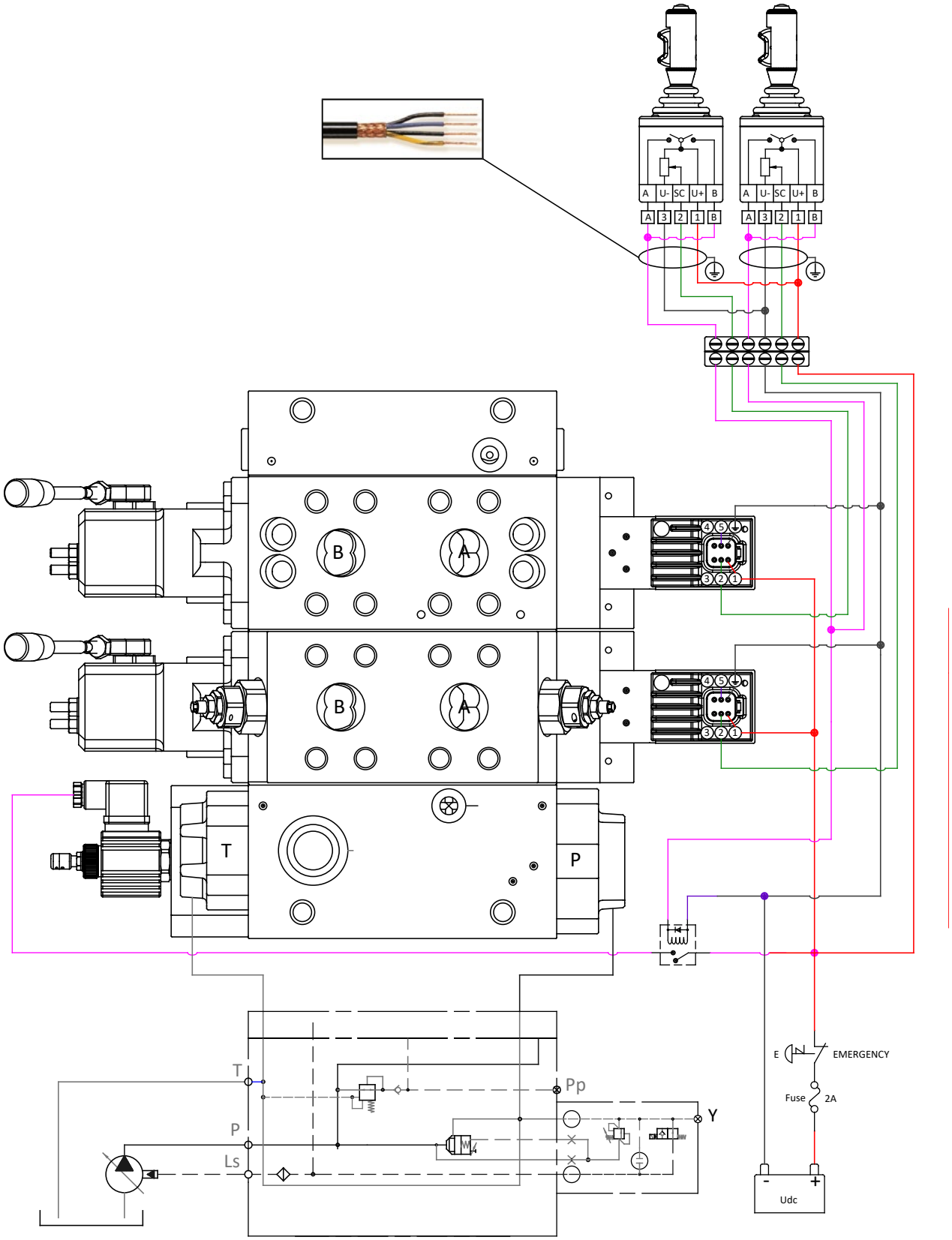
Hirschmann connector DIN 43650
Enclousure degree IP 65
PIN-assignment



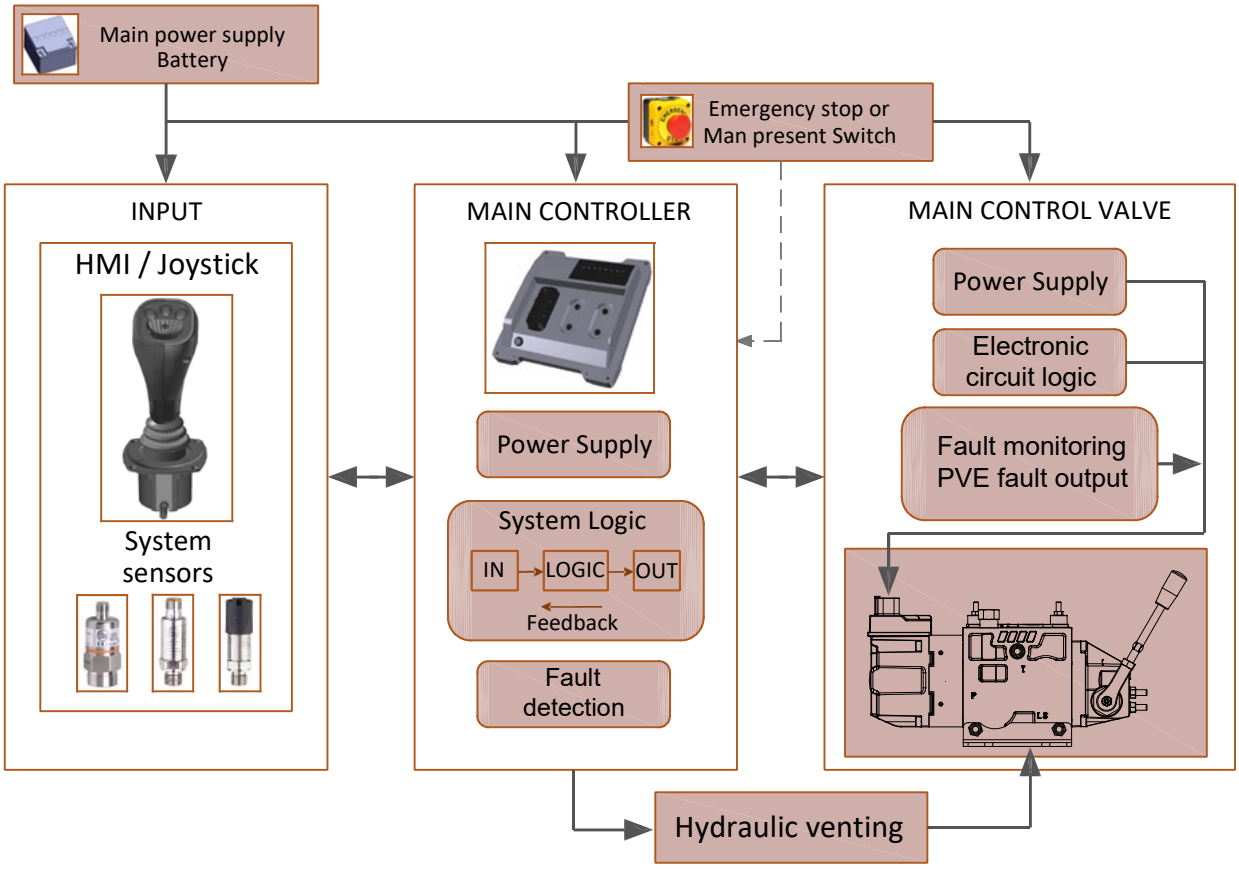
1	Power supply
2	Input signal control
3	Free
4	Ground

Connector version	Code numbers			
	Active version		Passive version	
	Cast-iron body	Aluminium body	Cast-iron body	Aluminium body
Deutsch AT04-6P	**PEAC0082000**	**PEAC1082000**	**PEAC0072000**	**PEAC1072000**
DIN 43650	**PEAC0082200**	**PEAC1082200**	**PEAC0072200**	**PEAC1072200**

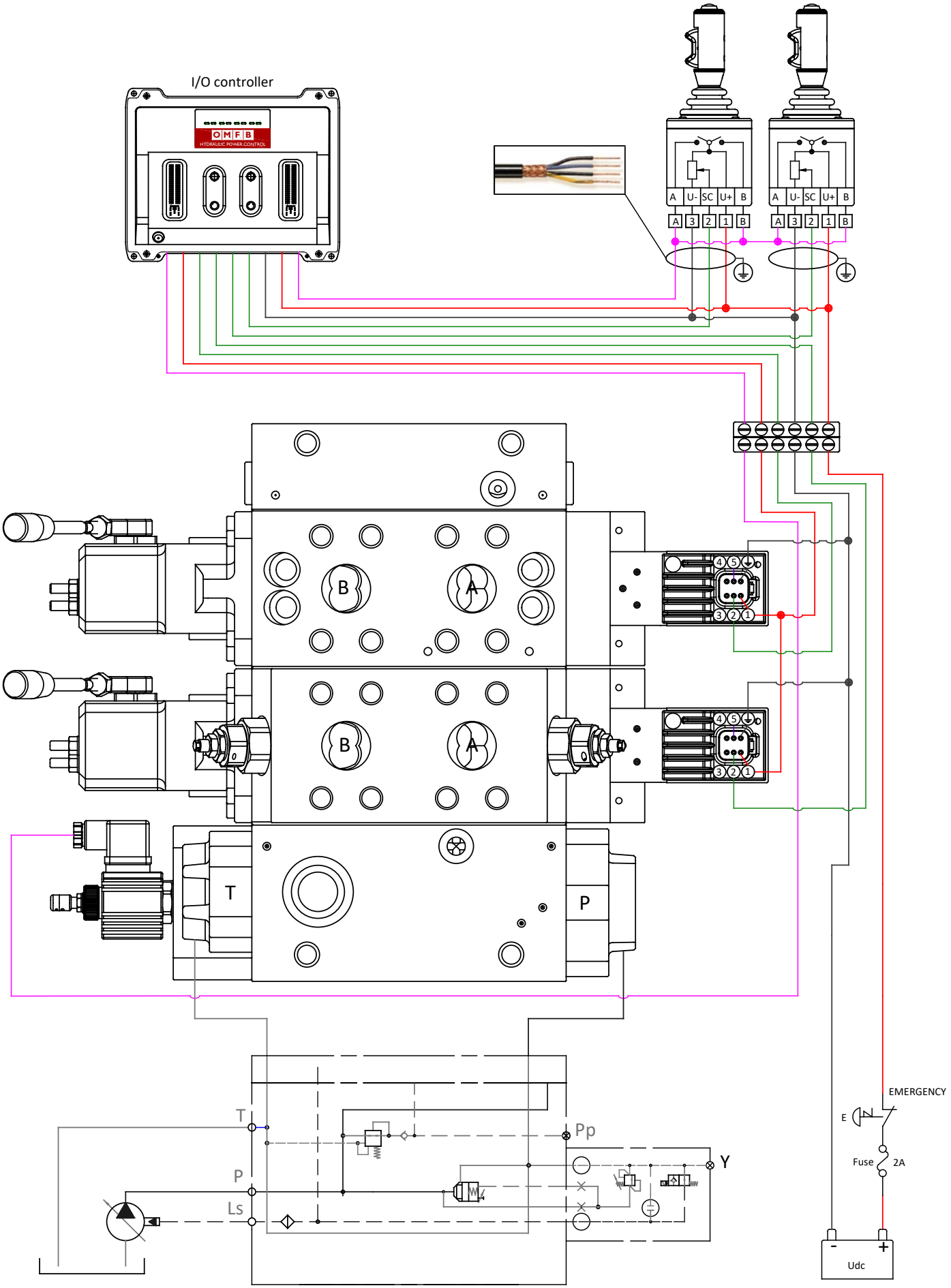
PDV315 - PEAC032 Electro-hydraulic proportional actuation.
Open loop spool control, high performance resolution
Input signal control 0 ÷ 10 V



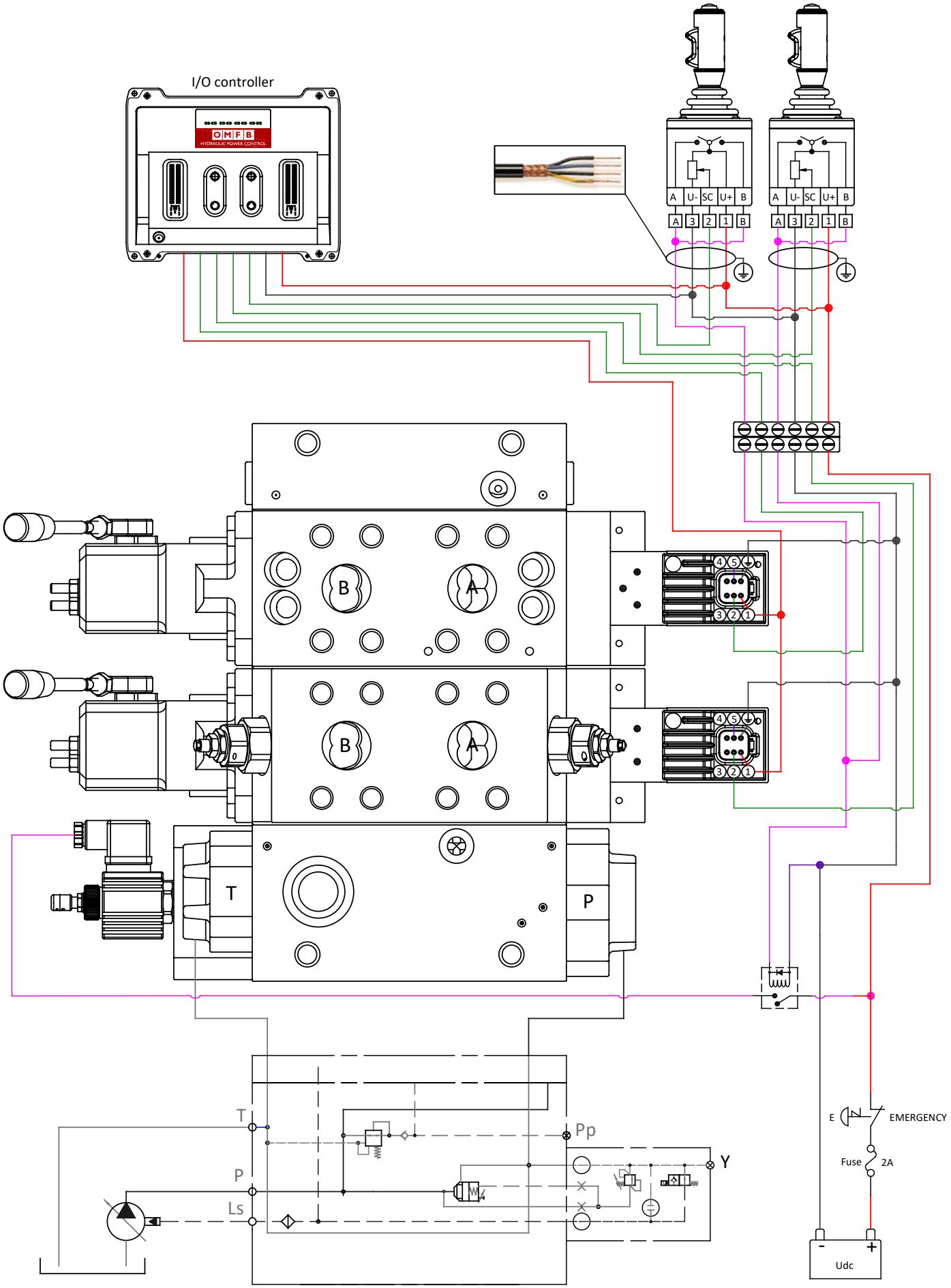
PDV315 - PEAC032 Electro-hydraulic proportional actuation.
Open loop spool control, high performance resolution
Electrical block diagram for intelligent ring machine control



PDV315 - PEAC032 Electro-hydraulic proportional actuation
Electrical wiring diagram with OMFB I/O controller
Input signal 0 ÷ 10 V

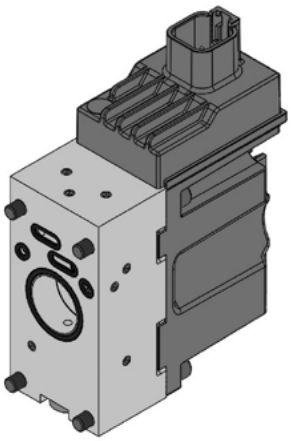


PDV315 - PEAC032 Electro-hydraulic proportional actuation
Electrical wiring diagram with OMFB I/O controller
Input signal 0 ÷ 10 V



OMFB HYDRAULIC POWER CONTROL

PDV315 - PEAC036 Electro-hydraulic proportional actuation
Open loop spool control
Input signal 4 ÷ 20 mA

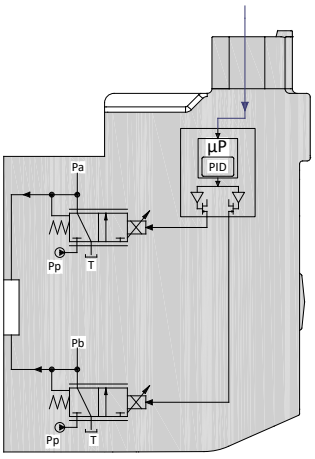


PEAC036 is a proportional open loop spool actuation with integrated electronics that operates the main spool movement according to an electrical signal coming from a remote control.

The input signal by means of the PCB and the two proportional pressure reducing valves, determines the level of the pilot pressure which moves the main spool.

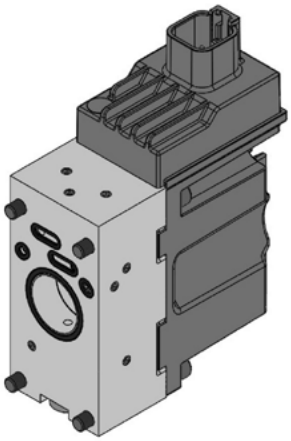
PEAC036 does not have neither the transducer spool position control nor fault monitoring system, this means that any forces which override the pilot pressure spool forces, may chenge the spool position with no error signal, and the safety of the whole system is left to the operator's visual control, only.

PEAC036 is recommended where a simple proportional control is required, and where hysteresis and reaction time are not so critical.



OMFB HYDRAULIC POWER CONTROL

PDV315 - PEAC036 Electro-hydraulic proportional actuation
Open loop spool control
Input signal 4 ÷ 20 mA

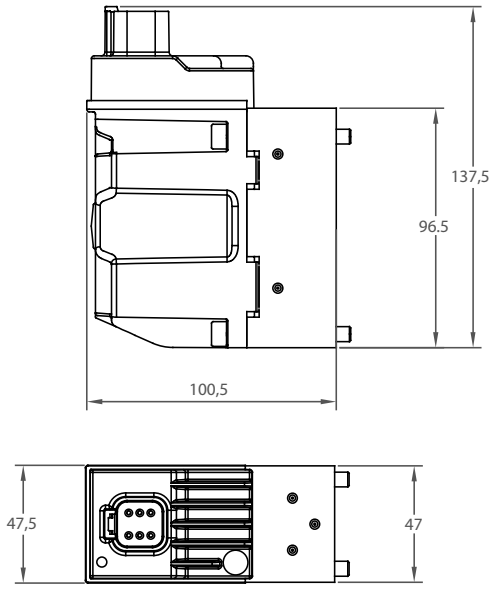


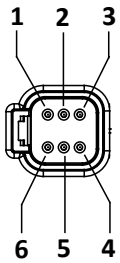
PEAC036 is defined by:

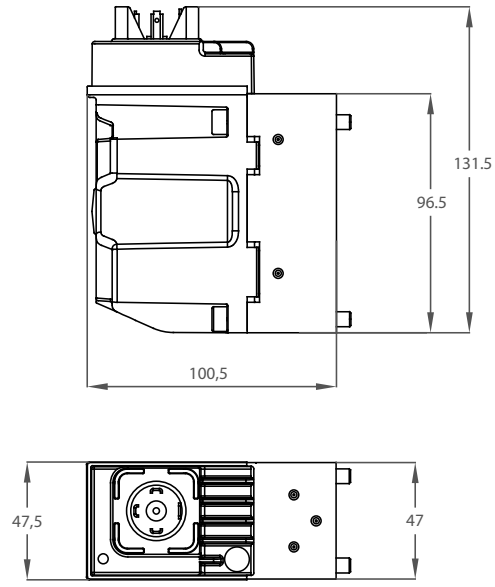
- High spool control accuracy
- EMC performace according to Directive 2014/30/UE
- Quick reaction time
- Integrated PWM/Pulse Width Modulation
- Low electrical power
- Robust and reliable design

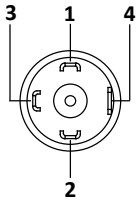
PEAC036 Technical data		
Rated supply voltage		**10-30 Vdc**
Max ripple		**5%**
Signal control		**4-20 mA**
Range control signal		**4 mA to 20 mA**
Neutral spool position		**12 mA**
Max threshold signal, **A** port		**1,5 mA**
Max threshold signal, **B** port		**1,5 mA**
Input capacitor		**100 ηF**
Input impedance		**220 Ω**
Power consumption		**8,7 W**
Heat insulation		**Class H (180°C)**
Duty cycle		**ED 100%**
Max current consumption		**650 mA**
Current consumption in neutral position		**80 mA**
Max current start spool travel		**140 mA**
Max current end spool travel		**450 mA**
Coil impedance @ 20°C		**8,9 Ω**
Signal control impedance		**50 KΩ**
Dither frequency		**50-200 Hz**
Recommended frequency		**100 Hz**
Enclouser degree **(Electrical wiring excepted)**		**IP65 - IP66 - IP69K**
Bootloader function, debugging parameters and set-up function available with Deutsch connector AT04-6P, only (to be matched with AT06-6S)		
Reaction time (constant voltage)	From neutral position to max spool travel	**110 - 140 ms**
	From max spool travel to neutral	**70 - 90 ms**
Reaction time (neutral switch)	From neutral position to max spool travel	**130 - 170 ms**
	From max spool travel to neutral	**70 - 90 ms**

PDV315 - PEAC036 Electro-hydraulic proportional actuation.
Input signal control 4 ÷ 20 mA
Electrical connectors



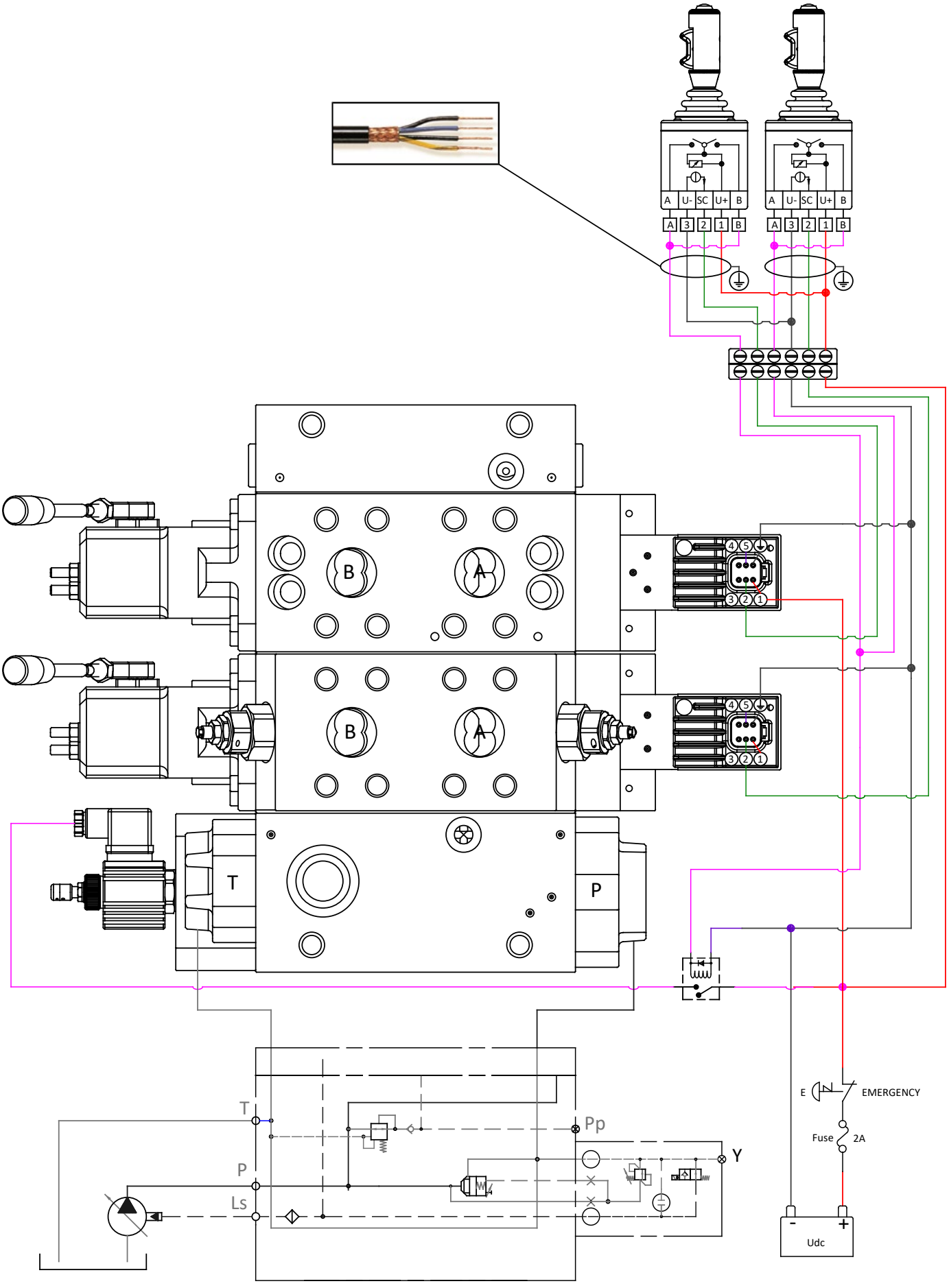
Deutsch connector AT04-6P Enclousure degree IP 69K PIN-assignment		
	**1**	Power supply
	2	Input signal control
	3	CAN-high
	4	CAN-low
	5	Free
	6	Ground



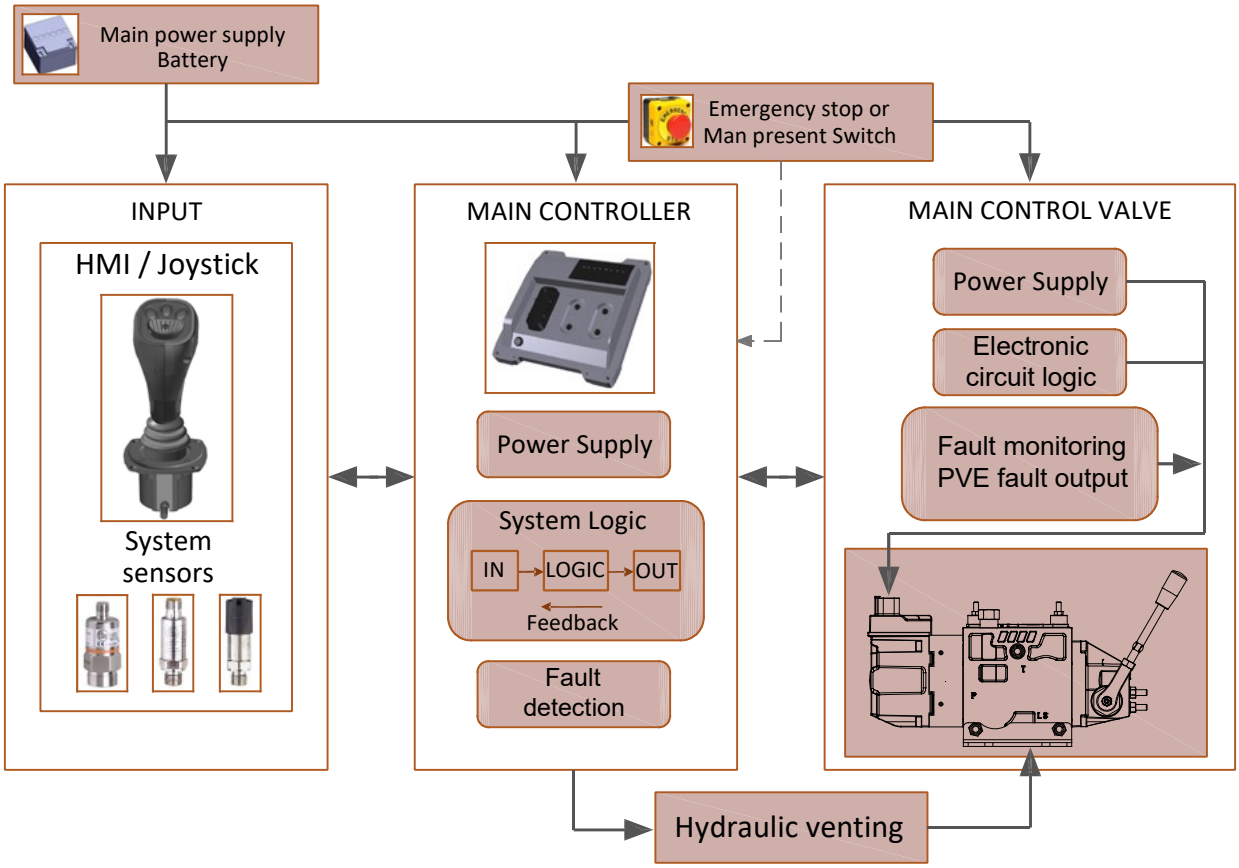
Hirschmann connector DIN 43650 Enclousure degree IP 65 PIN-assignment		
	**1**	Power supply
	2	Input signal control
	3	Free
	4	Ground

Connector version	Code numbers			
	Active version		Passive version	
	Cast-iron body	Aluminium body	Cast-iron body	Aluminium body
Deutsch AT04-6P	**PEAC0086000**	**PEAC1086000**	**PEAC0076000**	**PEAC1076000**
DIN 43650	**PEAC0086200**	**PEAC1086200**	**PEAC0076200**	**PEAC1076200**

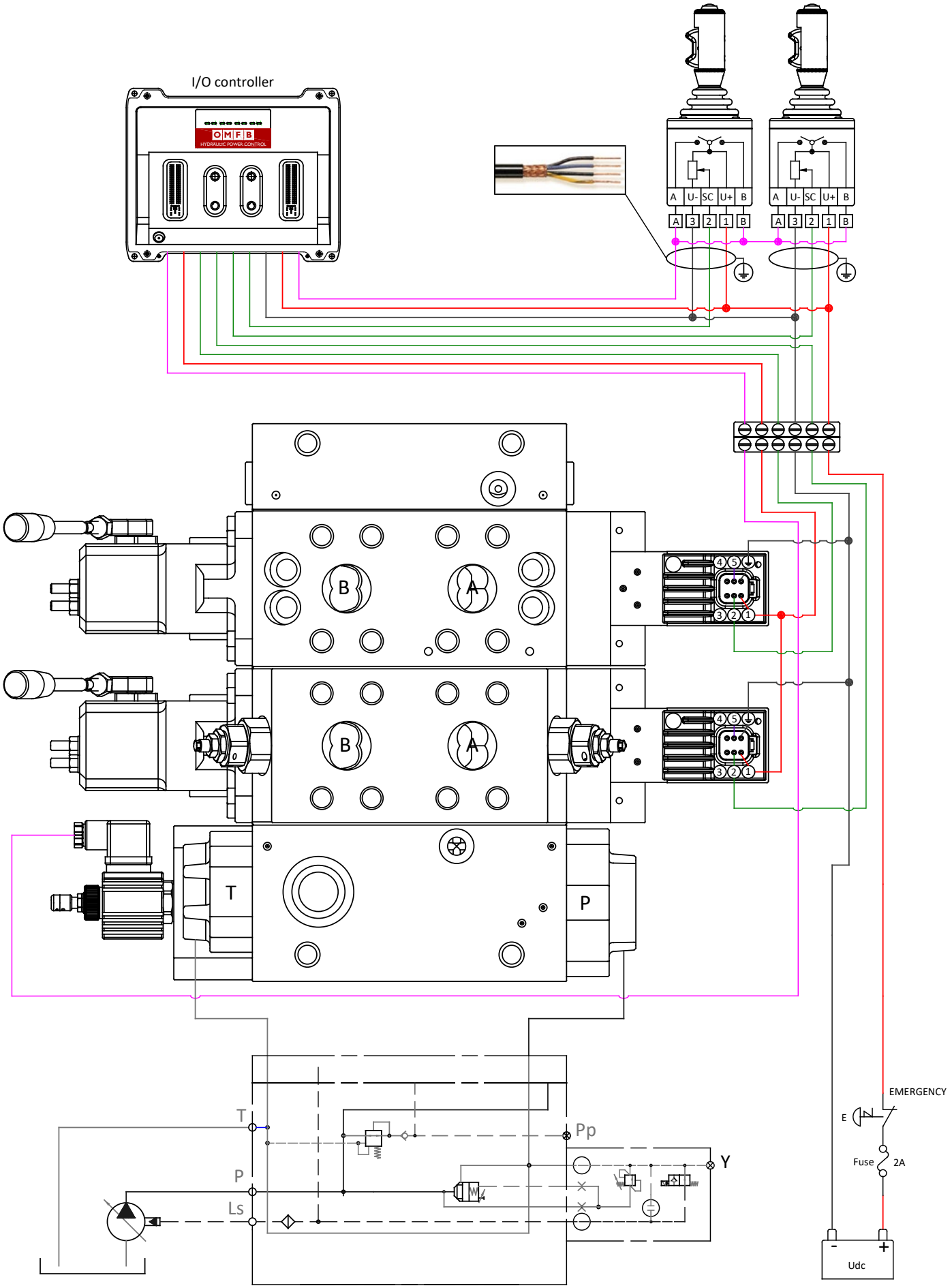
PDV315 - PEAC036 Electro-hydraulic proportional actuation.
Input signal control 4-20 mA
Electrical wiring



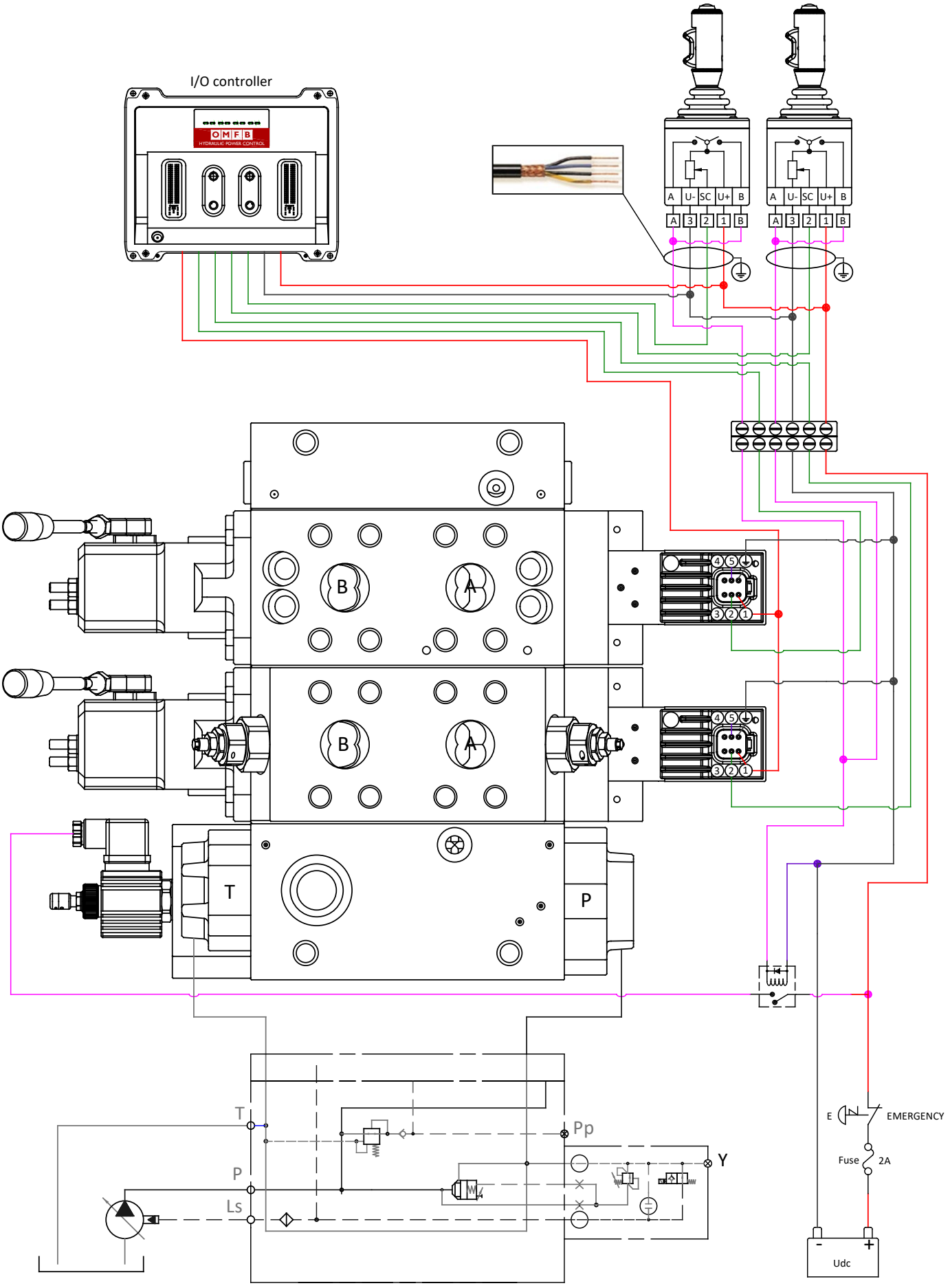
PDV315 - PEAC036 Electro-hydraulic proportional actuation
Open loop spool control
Current input signal 4-20 mA



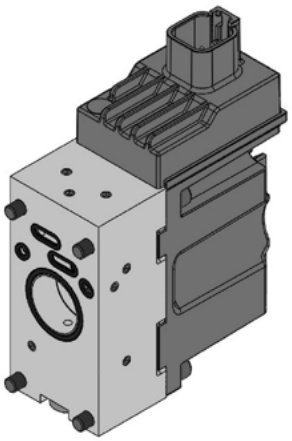
PDV315 - PEAC036 Electro-hydraulic proportional actuation.
Electrical wiring with OMFB I/O controller
Current input signal 4 ÷ 20 mA



PDV315 - PEAC036 Electro-hydraulic proportional actuation.
Electrical wiring with OMFB I/O controller
Current input signal 4 ÷ 20 mA



PDV315 - PEAD3 Electro-hydraulic proportional actuation
Open loop spool control - Current input signal for PWM or supply voltage for ON/OFF control

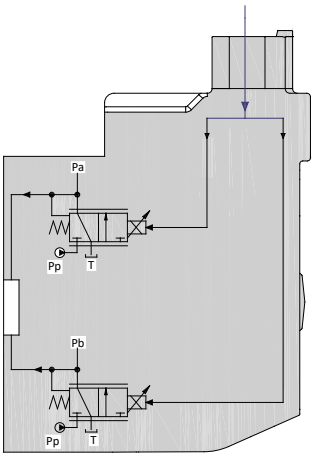


PEAD3 is a proportional open loop spool actuation without integrated electronics that operates the main spool movement according to an electrical signal coming from a remote control.

The input signal by means of the two proportional pressure reducing valves, determines the level of the pilot pressure which moves the main spool.

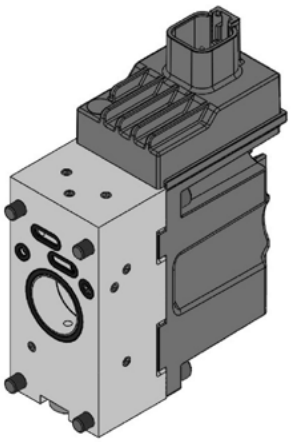
PEAD3 does not have neither the transducer spool position control nor fault monitoring system, this means that any forces which override the pilot pressure spool forces, may chenge the spool position with no error signal, and the safety of the whole system is left to the operator's visual control, only.

PEAD3 is recommended where a simple proportional control is required, and where hysteresis and reaction time are not so critical.



OMFB HYDRAULIC POWER CONTROL

PDV315 - PEAD3 Electro-hydraulic proportional actuation
Open loop spool control - Current input signal for PWM or supply voltage for ON/OFF control

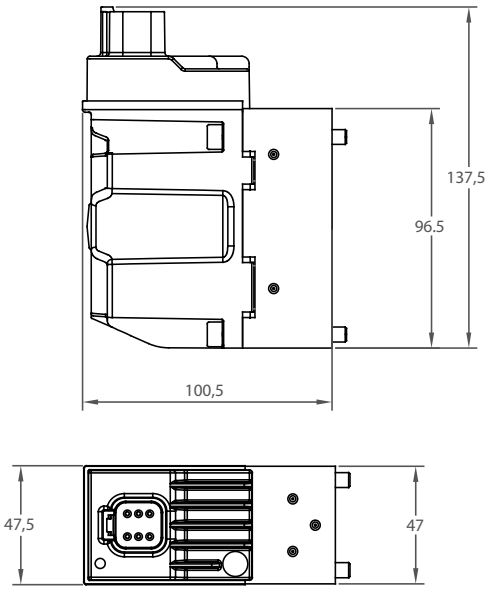


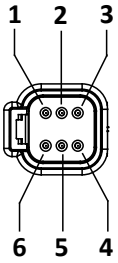
PEAD3 is defined by:

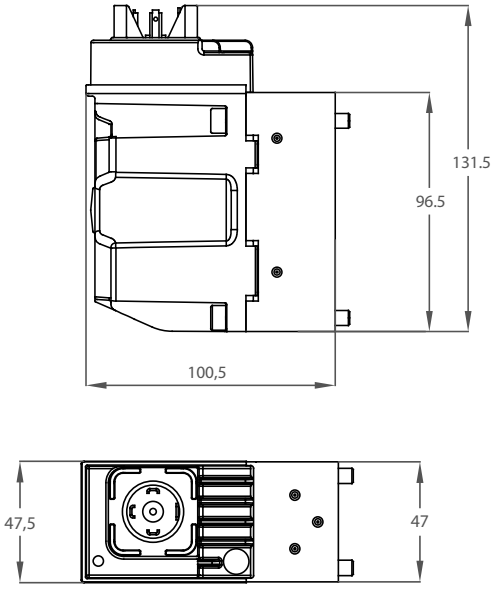
- High spool control accuracy
- EMC performace according to Directive 2014/30/UE
- Quick reaction time
- Integrated PWM/Pulse Width Modulation
- Low electrical power
- Robust and reliable design

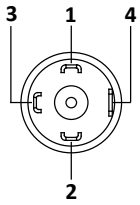
PEAD3 Technical data			
Supply voltage		12 Vdc	24 Vdc
Voltage range		10-16 V	20-30 V
Max ripple		5%	5%
Current consuption at rated voltage		750 mA @ 12 Vdc	400 mA @ 24 Vdc
Power consumption		9 W	9,6 W
R @ 20°C		8,9 Ω	35 Ω
Start spool travel		220 mA	140 mA
End spool travel flow control		650 mA	350 mA
Max spool flow in pre-floating position		650 mA	350 mA
Spool floating position		750 mA	400 mA
Heat insulation		Class H (180°C)	
Oil temperature	(Recommended)	20 ÷ 60 °C	
Oil temperature	(Min)	-30 °C	
Oil temperature	(Max)	80 °C	
Ambient temperature		-30 ÷ 60 °C	
PWM frequency		50 ÷ 200 Hz	
Best frequency		100 Hz	
Duty cycle		100% ED	
Plug connector		6 pins Deutsch or 4 pins DIN	
Enclouser degree	(Electrical wiring excepted)	IP69K	
Weight cast iron body		1, 8 kg	
Weight Aluminium body		1,3 kg	
Max current output signal for spool direction moviment		50 mA	
Reaction time (constant voltage)	From neutral position to max spool travel	110 - 140 ms	
	From max spool travel to neutral	70 - 90 ms	
Reaction time (neutral switch)	From neutral position to max spool travel	130 - 170 ms	
	From max spool travel to neutral	70 - 90 ms	

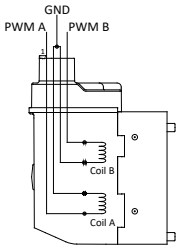
PDV315 - PEAD3 Electro-hydraulic proportional actuation
Open loop spool control - Current input signal for PWM or supply voltage for ON/OFF control - Electrical connectors



Deutsch connector AT04-6P Enclousure degree IP 69K PIN-assignment		
	**1**	**A** port +
	2	Free
	3	**A** port -
	4	**B** port +
	5	Free
	6	**B** port -

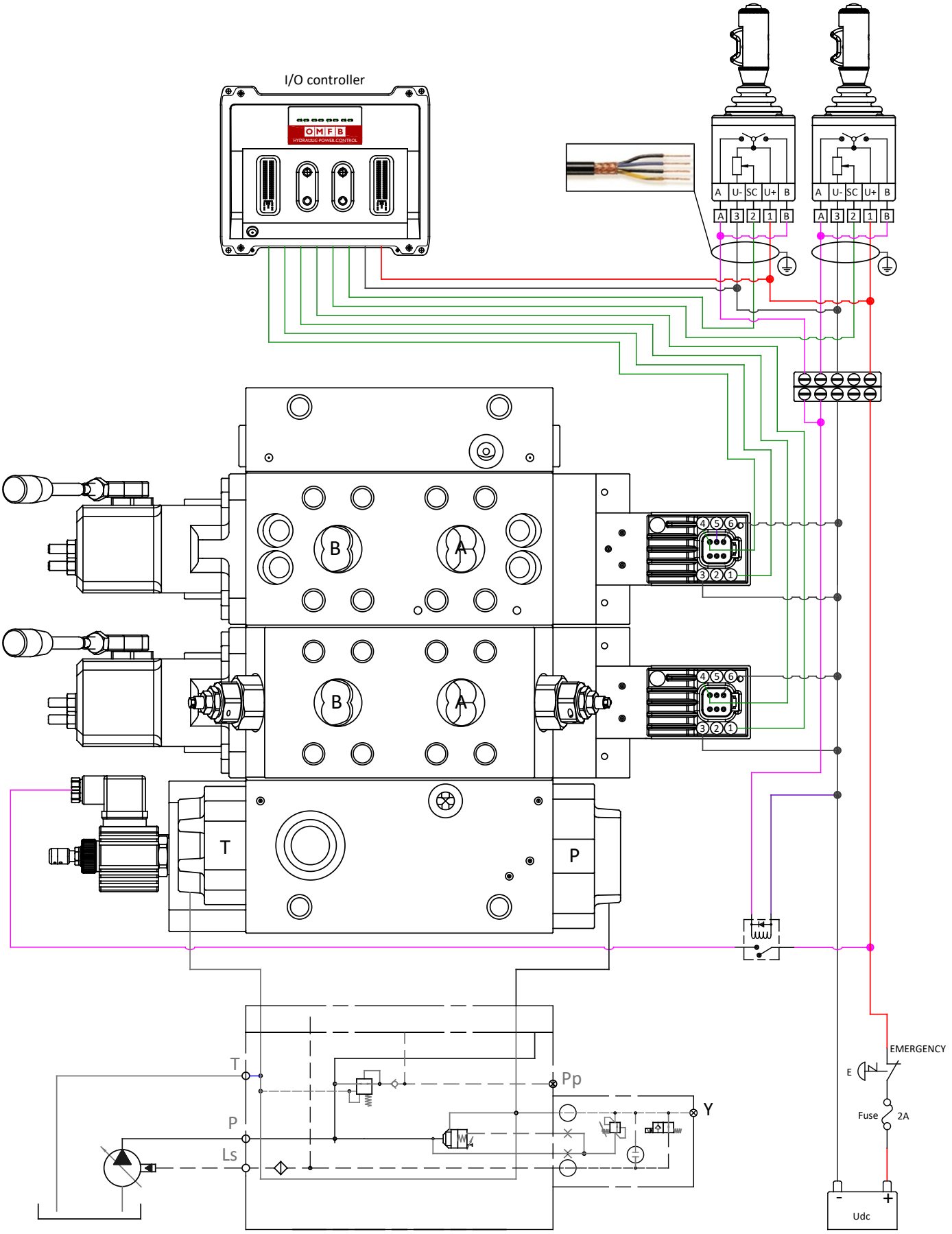


Hirschmann connector DIN 43650 Enclousure degree IP 65 PIN-assignment		
	**1**	**A** port +
	2	**B** port +
	3	Free
	4	Ground

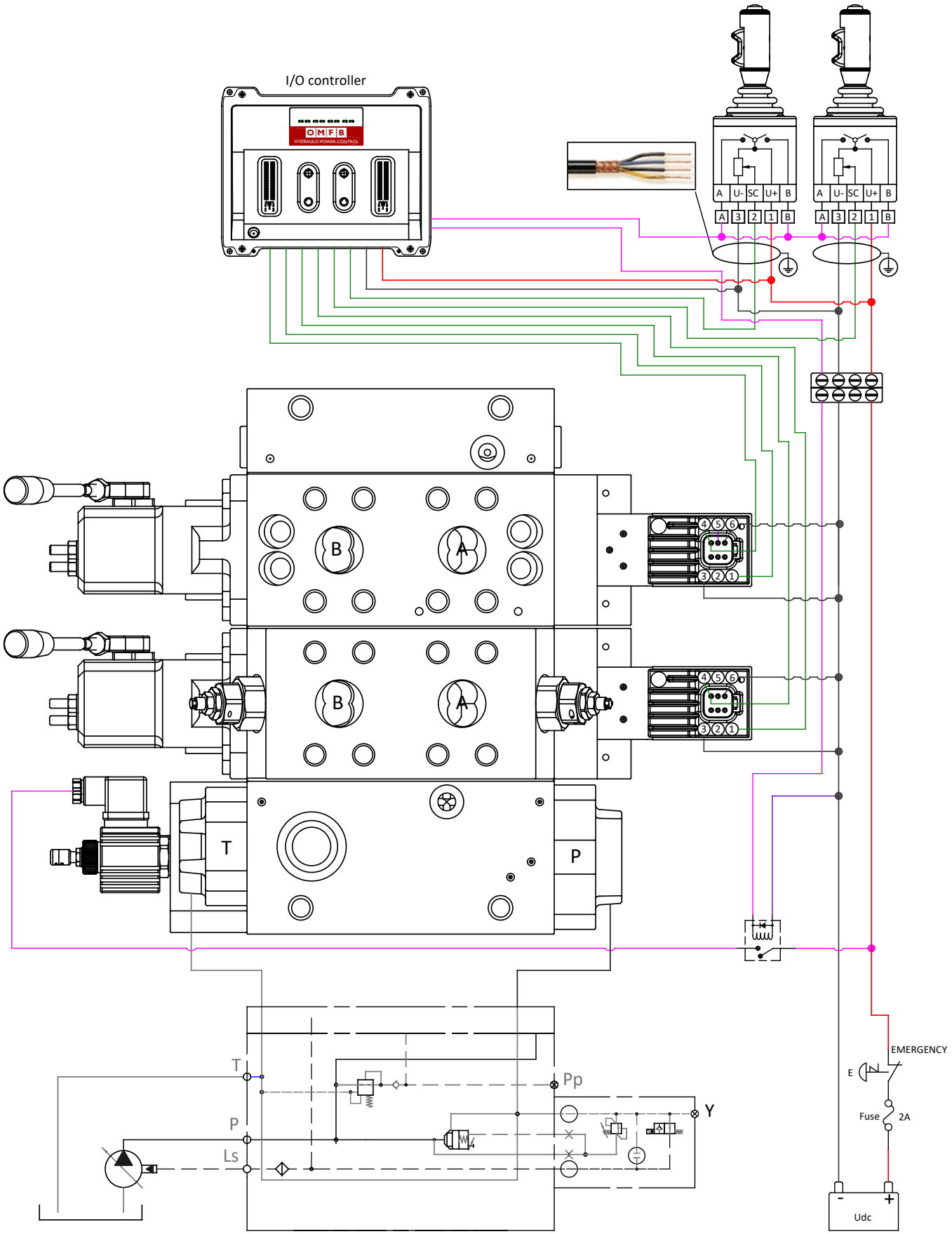


Connector version	Code numbers			
	12 V		24 V	
	Cast-iron body	Aluminium body	Cast-iron body	Aluminium body
Deutsch AT04-6P	**PEAD0100002**	**PEAD1100002**	**PEAD0200002**	**PEAD1200002**
DIN 43650	**PEAD0120002**	**PEAD1120002**	**PEAD0220002**	**PEAD1220002**

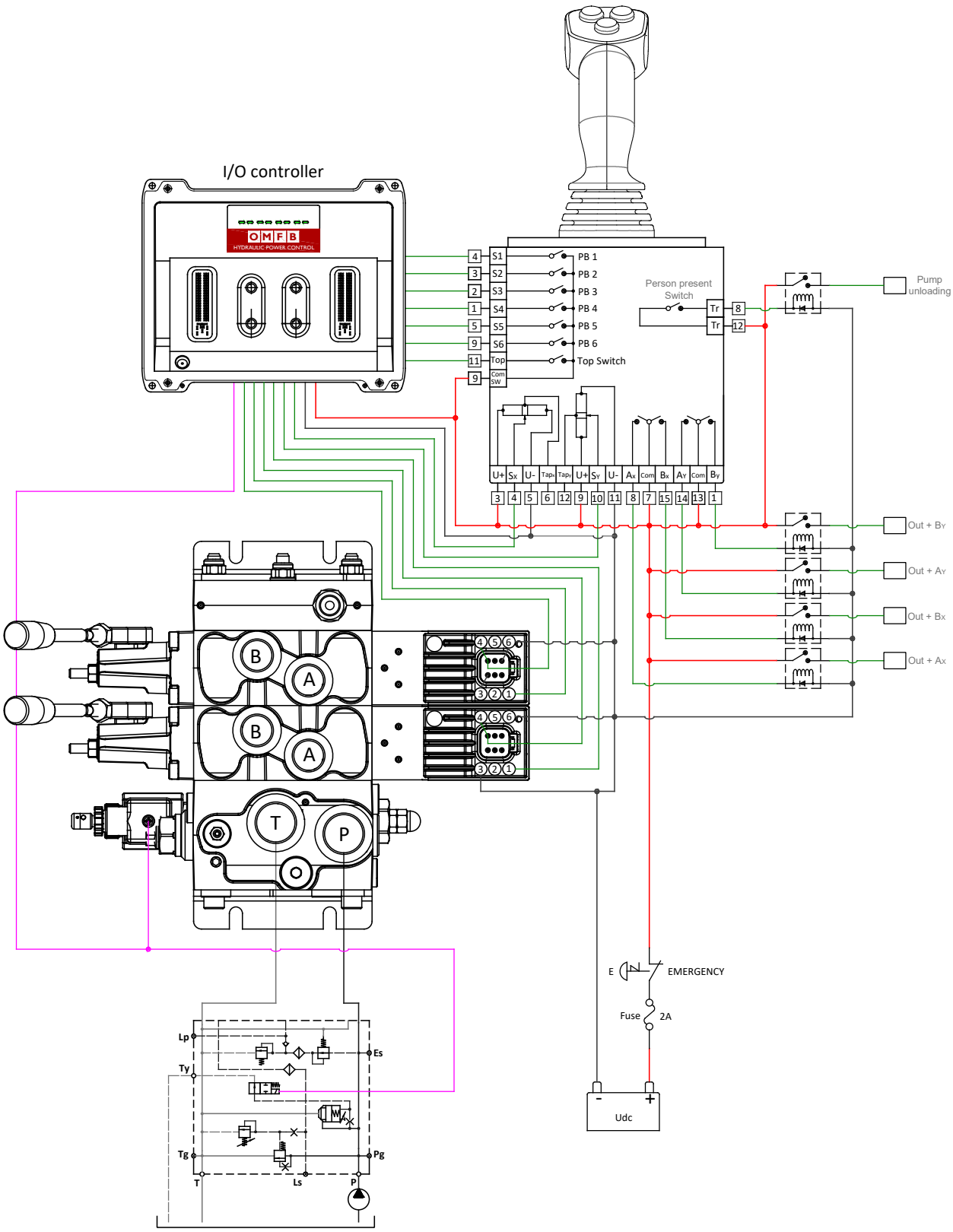
PDV315 - PEAD3 Electro-hydraulic proportional actuation.
Electrical wiring with OMFB I/O controller - Current input signal for PWM or supply voltage for ON/OFF control



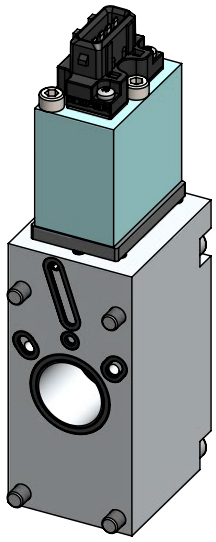
PDV315 - PEAD3 Electro-hydraulic proportional actuation.
Electrical wiring with OMFB I/O controller - Current input signal for PWM or supply voltage for ON/OFF control



PDV315 - PEAD3 Electro-hydraulic proportional actuation.
Electrical wiring with OMFB I/O controller - Current input signal for PWM or supply voltage for ON/OFF control



PDV315 - PEAP3 Electro-hydraulic proportional actuation
Open loop spool control - Current input signal for PWM or supply voltage for ON/OFF control

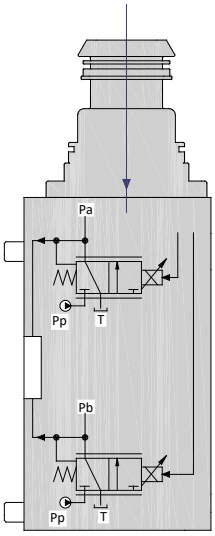


PEAP3 is a proportional open loop spool actuation without integrated electronics that operates the main spool movement according to an electrical signal coming from a remote control.

The input signal by means of the two proportional pressure reducing valves, determines the level of the pilot pressure which moves the main spool.

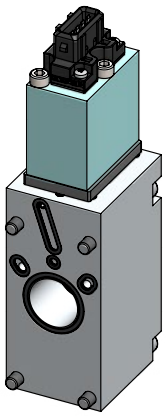
PEAP3 does not have neither the transducer spool position control nor fault monitoring system, this means that any forces which override the pilot pressure spool forces, may chenge the spool position with no error signal, and the safety of the whole system is left to the operator's visual control, only.

PEAP3 is recommended where a simple proportional control is required, and where hysteresis and reaction time are not so critical.



OMFB HYDRAULIC POWER CONTROL

PDV315 - PEAP3 Electro-hydraulic proportional actuation
Open loop spool control - Current input signal for PWM or supply voltage for ON/OFF control

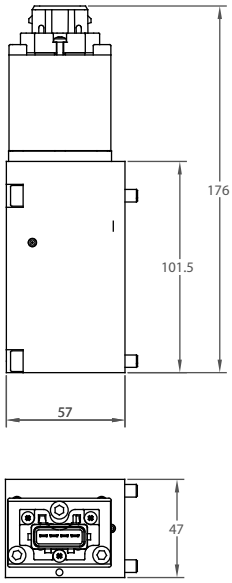


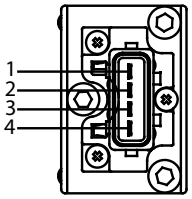
PEAP3 is defined by:

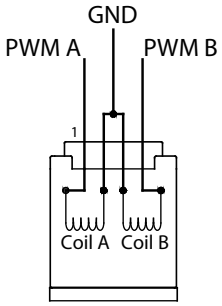
- High spool control accuracy
- EMC performace according to Directive 2014/30/UE
- Quick reaction time
- Integrated PWM/Pulse Width Modulation
- Low electrical power
- Robust and reliable design

PEAP3 Technical data			
Supply voltage		12 Vdc	24 Vdc
Voltage range		10-16 V	20-30 V
Max ripple		5%	5%
Current consuption at rated voltage		1330 mA @ 12 Vdc	630 mA @ 24 Vdc
Power consumption		23 W	21 W
R @ 20°C		6,3 Ω	27 Ω
Start spool travel		220 mA	140 mA
End spool travel flow control		650 mA	350 mA
Max spool flow in pre-floating position		650 mA	350 mA
Spool floating position		750 mA	400 mA
Heat insulation		Class H (180°C)	
Oil temperature	(Recommended)	-20 ÷ 60 °C	
Oil temperature	(Min)	-30 °C	
Oil temperature	(Max)	80 °C	
Ambient temperature		-30 ÷ 60 °C	
PWM frequency		50 ÷ 200 Hz	
Best frequency		100 Hz	
Duty cycle		100% ED	
Plug connector		Amp Junior Power Timer 4 pins	
Enclouser degree	(Electrical wiring excepted)	IP69K	
Max current output signal for spool direction moviment		50 mA	
Reaction time (constant voltage)	From neutral position to max spool travel	110 - 140 ms	
	From max spool travel to neutral	70 - 90 ms	
Reaction time (neutral switch)	From neutral position to max spool travel	130 - 170 ms	
	From max spool travel to neutral	70 - 90 ms	

PDV315 - PEAP3 Electro-hydraulic proportional actuation
Input signal control PWM - Current input signal for PWM or supply voltage for ON/OFF control - Electrical connector

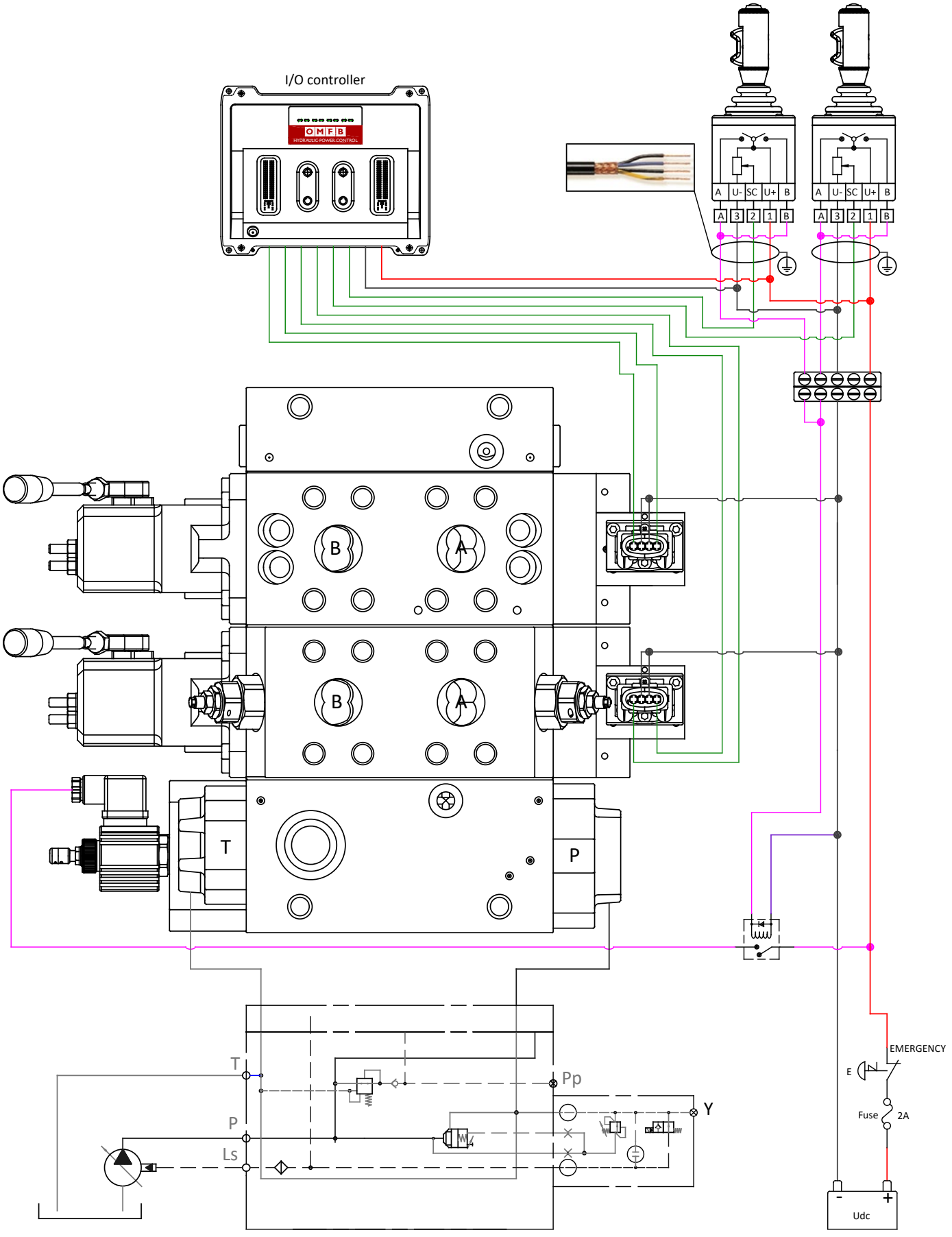


Amp Junior Power Timer 4 pin connector Enclousure degree IP 65 PIN-assignment		
	**1**	**A** port +
	2	**A** port -
	3	**B** port -
	4	**B** port +

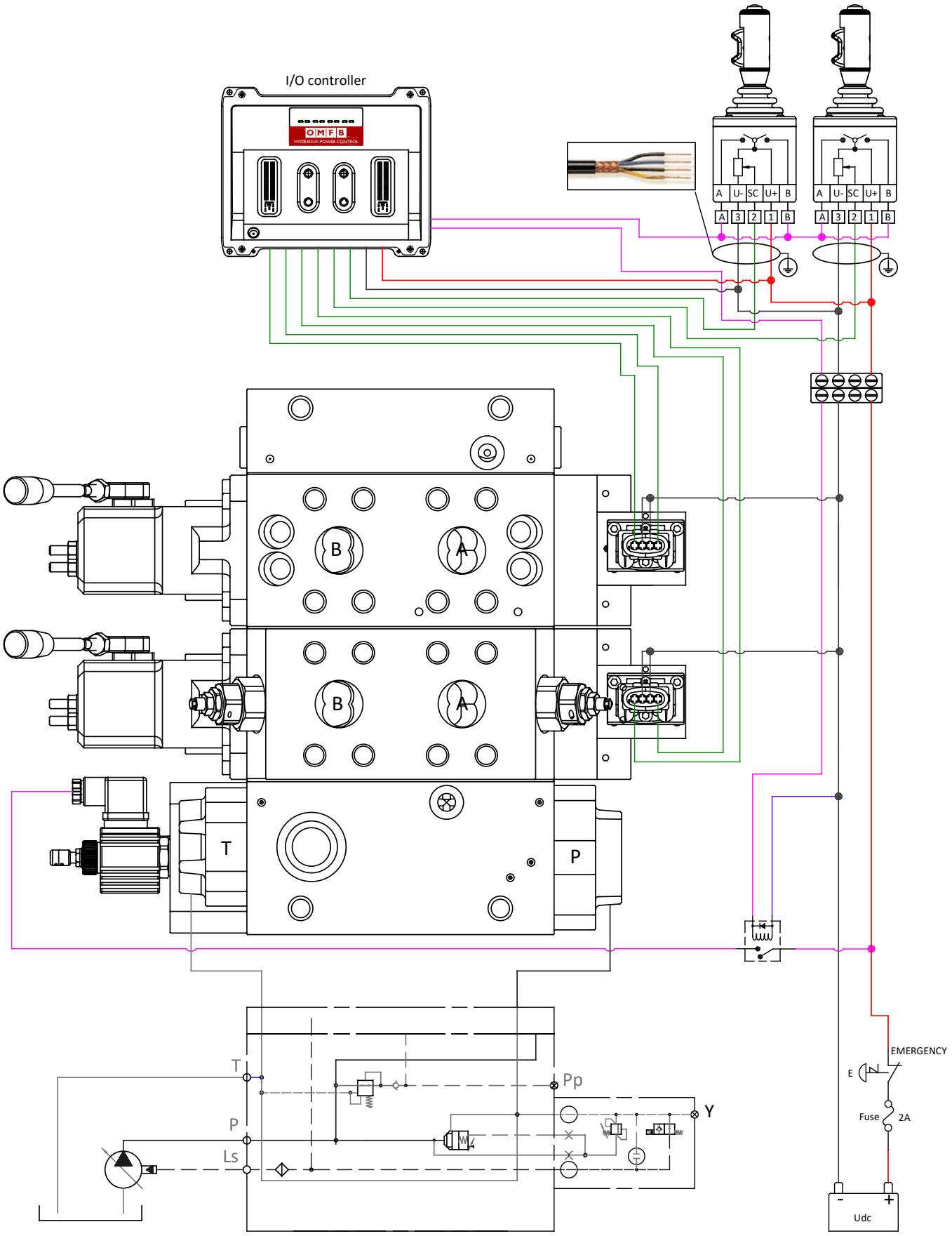


Connector version	Code numbers			
	12 V		24 V	
	Cast-iron body	Aluminium body	Cast-iron body	Aluminium body
AMP Junior timer 4 Pin	**PEAP0110002**	**PEAP1110002**	**PEAP0210002**	**PEAP1210002**

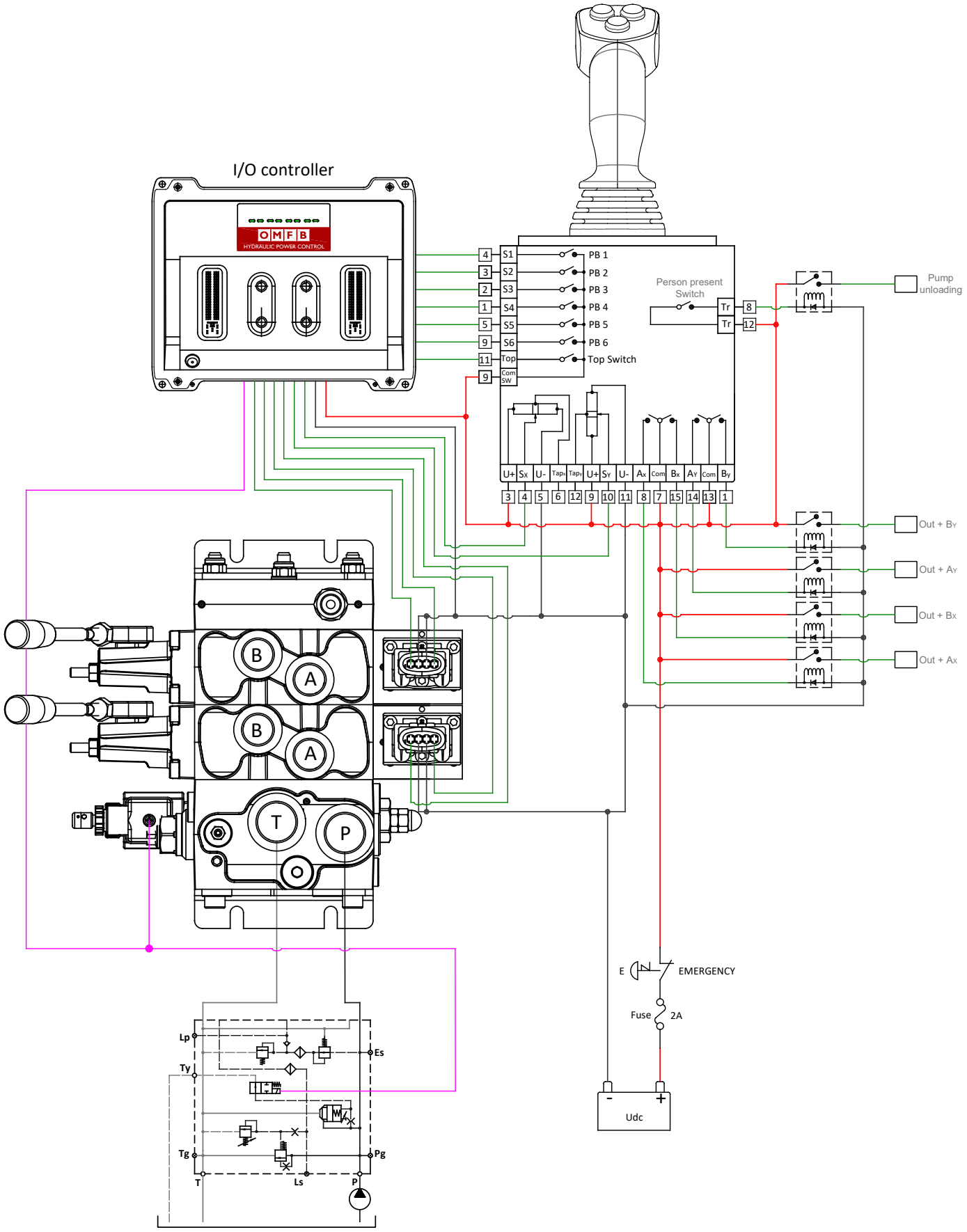
PDV315 - PEAP3 Electro-hydraulic proportional actuation
Electrical wiring with OMFB I/O controller - Current input signal for PWM or supply voltage for ON/OFF control



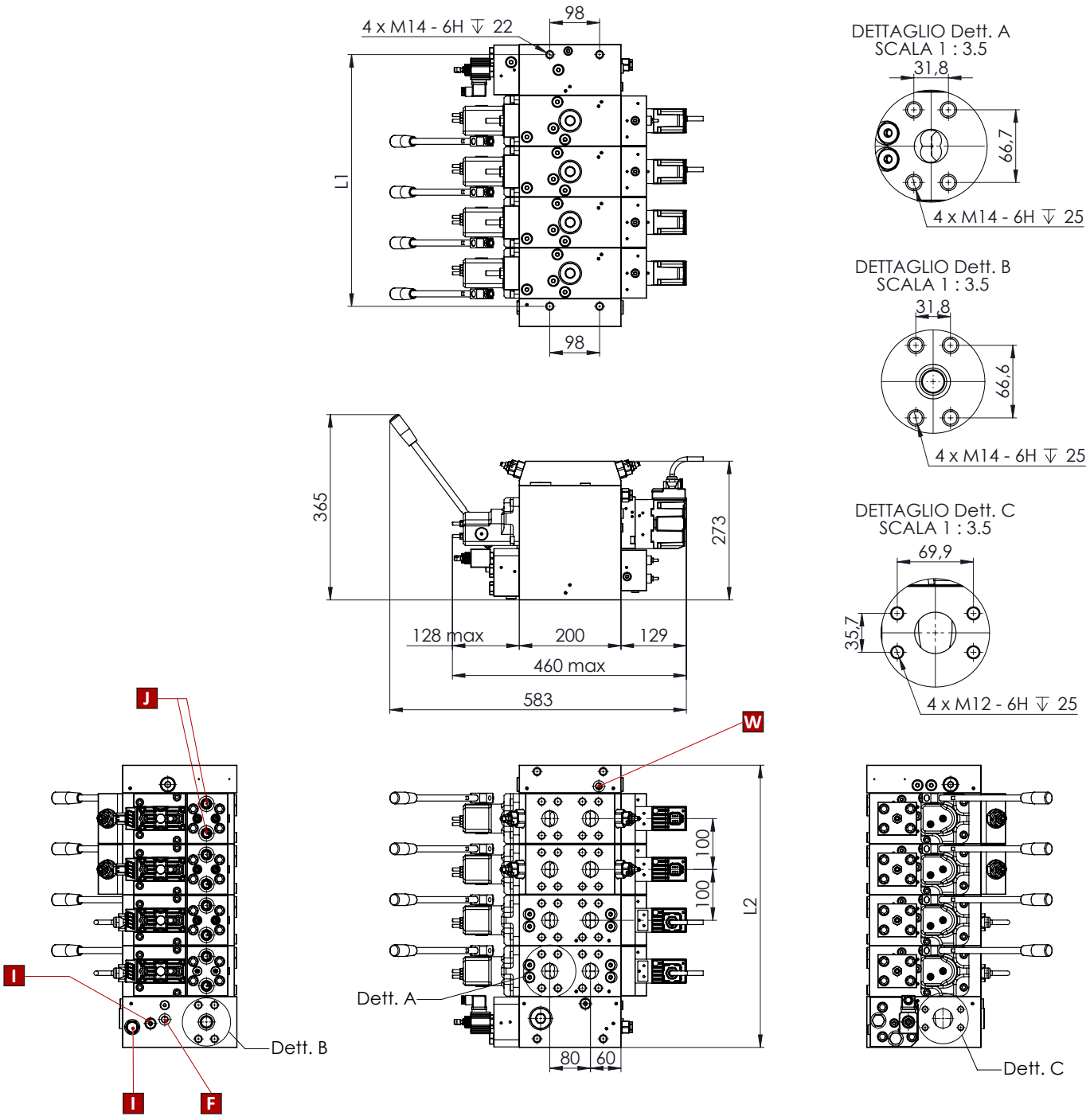
PDV315 - PEAP3 Electro-hydraulic proportional actuation
Electrical wiring with OMFB I/O controller - Current input signal for PWM or supply voltage for ON/OFF control



PDV315 - PEAP3 Electro-hydraulic proportional actuation
Electrical wiring with OMFB I/O controller - Current input signal for PWM or supply voltage for ON/OFF control



PDV315 Proportional valve
Overall dimensions drawing with standard inlet section
Right assembly version

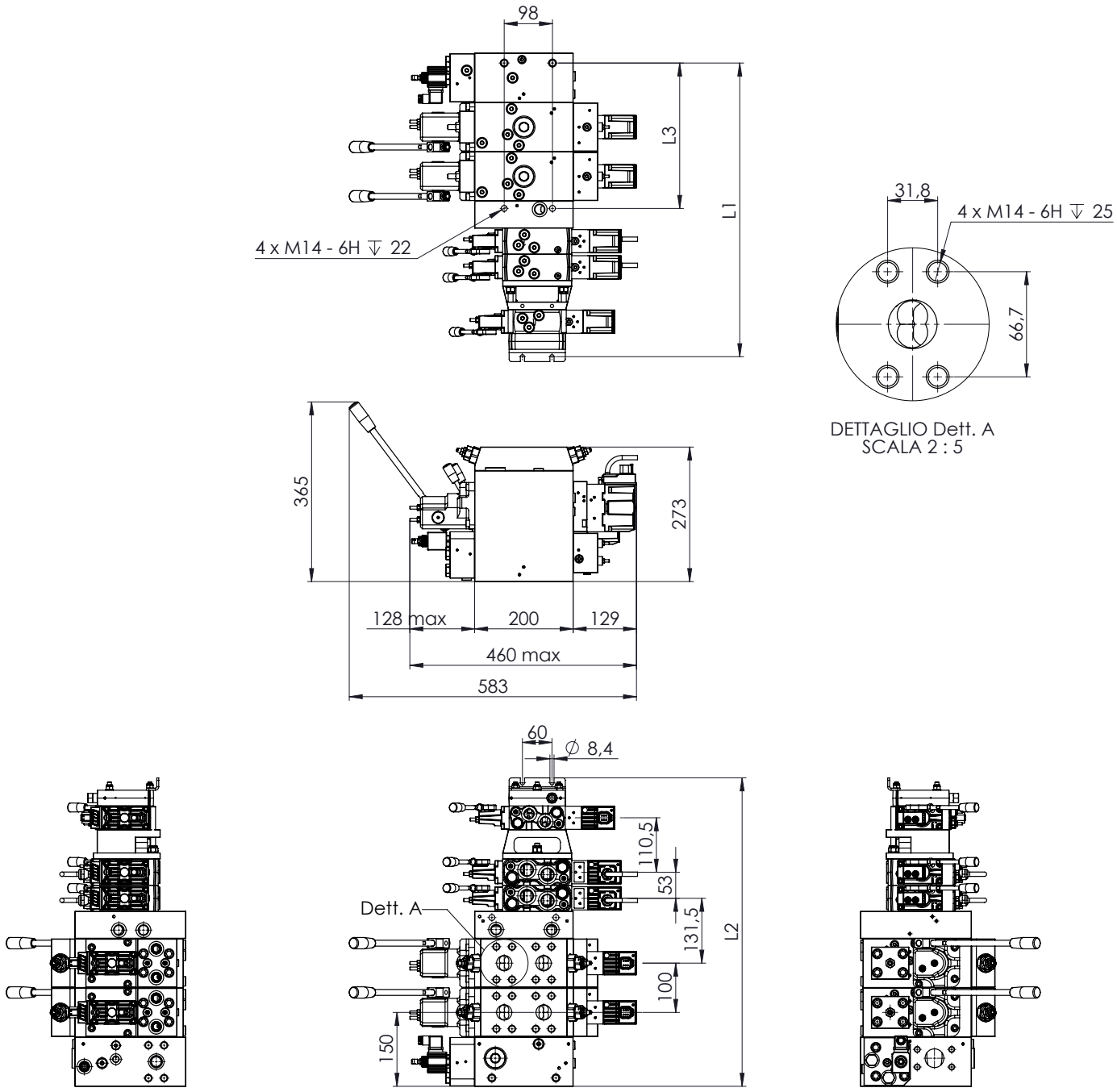


PDW		1	2	3	4	5	6	7	8	9	10	11	12
L1	mm	180	228	276	324	372	420	468	516	564	612	660	708
	in	7,09	8,98	10,87	12,76	14,65	16,54	18,43	20,31	22,20	24,09	25,98	27,87
L2	mm	200	248	296	344	392	440	488	536	584	632	680	728
	in	7,87	9,76	11,65	13,54	15,43	17,32	19,21	21,10	22,99	24,88	26,77	28,66

PDV315 Proportional valve
Overall dimensions drawing with standard inlet section
Right assembly version

A = Pump side port - 3/4" BSPP - 17 mm deep [1 1⁄16 in 12 UN-2B - 0,67 in deep]
B = T port - 3/4" BSPP - 17 mm deep [1 1⁄16 in 12 UN - 2B - 0,67 in deep]
C = Main pressure relief valve
D = Main pressure reducing valve
E = Pump pressure gauge connection - 1/4" BSPP - 12 mm deep [7⁄16 in-20 UNF-2B - 0,47 in deep]
F = LS connection 1/4" BSPP - 12 mm deep [7⁄16 in-20 UNF-2B - 0,47 in deep]
G = External pilot pressure supply connection 1/4" BSPP - 12 mm deep [7⁄16 in-20 UNF-2B - 0,47 in deep]
H = External feeding main pressure reducing valve 1/4" BSPP - 12 mm deep [7⁄16 in-20 UNF-2B - 0,47 in deep]
I = Tank pressure gauge connection 1/4" BSPP - 12 mm deep [7⁄16 in-20 UNF-2B - 0,47 in deep]
J = Electrical LS/pump unloading function
K = Pump unloading drain port, 1/4" BSPP - 12 mm deep [7⁄16 in-20 UNF - 2B - 0,47 in deep]
L = Pump unloading mechanical override
M = A-B port mechanical flow adjustment
N = LSA
O = LSB
P = LS
} remote pilot pressure connection 1/4" BSPP - 12 mm deep [7⁄16 in-20 UNF - 2B - 0,47 in deep]
Q = Port A
R = Port B
} 1/2" BSPP - 17 mm deep [7⁄8 in-14 UNF-2B - 0,67 in deep]
S = Ls_B
T = Ls_A
} pilot pressure relief valve
U = Shock/suction valve B port
V = Shock/suction valve A port
W = External drain connection electric actuations - 1/4" BSPP - 12 mm deep [7⁄16 in-20 UNF-2B - 0,47 in deep]

PDV315 Proportional valve
Overall dimensions drawing with double inlet and MID end section



PDW		2	3	4	5	6	7	8	9	10	11	12
L1	mm	331	379	427	475	523	571	619	667	715	763	811
	in	13,03	14,92	16,81	18,70	20,59	22,48	24,37	26,26	28,15	30,04	31,93
L2	mm	351	399	447	495	543	591	639	687	735	783	831
	in	13,82	15,71	17,60	19,49	21,38	23,27	25,16	27,05	28,94	30,83	32,72

PDV315 Proportional valve
Overall dimensions drawing with double inlet and MID end section

A = Pump side port - 3/4" BSPP - 17 mm deep [1 1⁄16 in 12 UN-2B - 0,67 in deep]
B = T port - 3/4" BSPP - 17 mm deep [1 1⁄16 in 12 UN - 2B - 0,67 in deep]
C = Main pressure relief valve
D = Main pressure reducing valve
E = Pump pressure gauge connection - 1/4" BSPP - 12 mm deep [7⁄16 in-20 UNF-2B - 0,47 in deep]
F = LS connection 1/4" BSPP - 12 mm deep [7⁄16 in-20 UNF-2B - 0,47 in deep]
G = External pilot pressure supply connection 1/4" BSPP - 12 mm deep [7⁄16 in-20 UNF-2B - 0,47 in deep]
H = External feeding main pressure reducing valve 1/4" BSPP - 12 mm deep [7⁄16 in-20 UNF-2B - 0,47 in deep]
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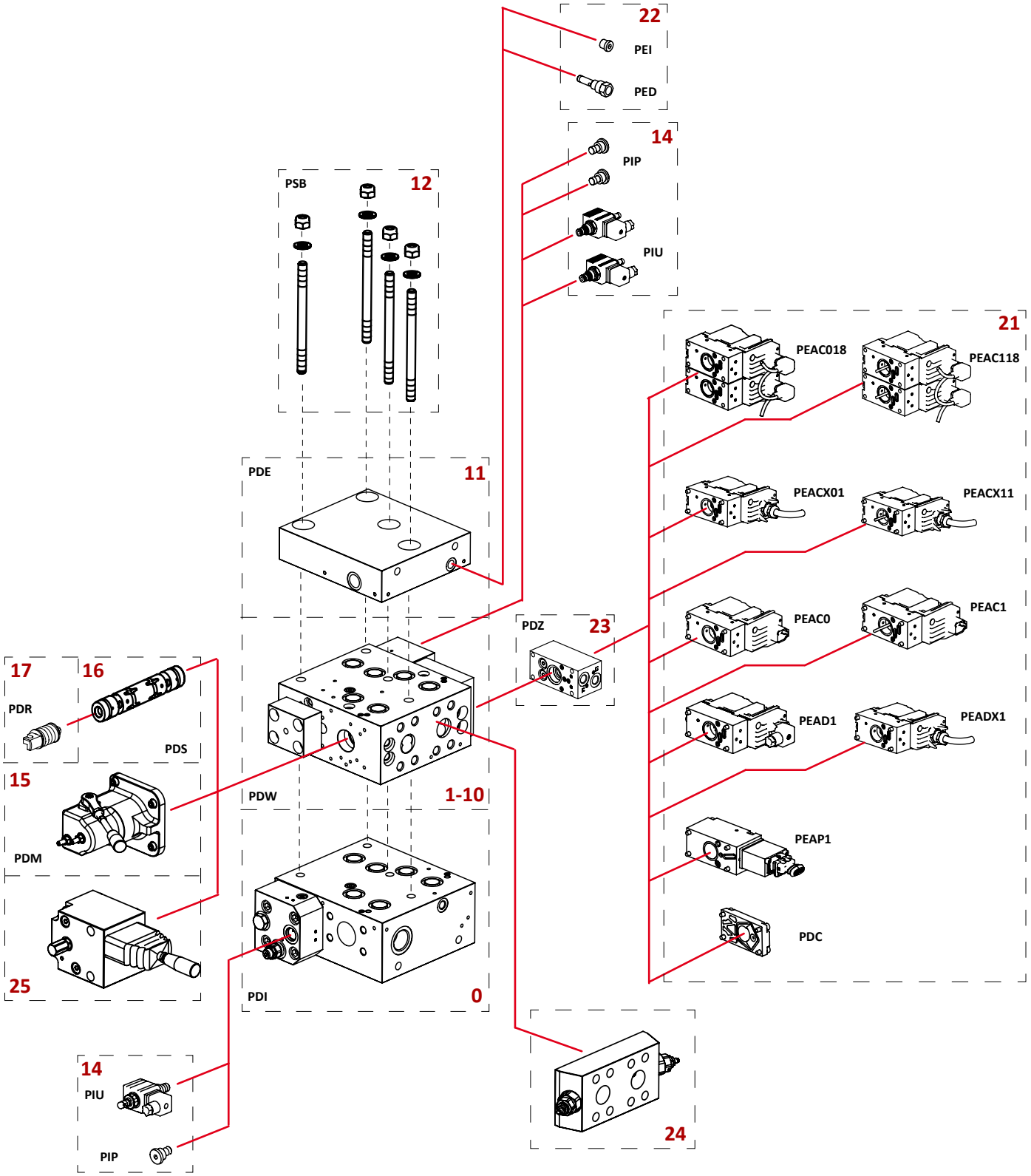
J = Electrical LS/pump unloading function
K = Pump unloading drain port, 1/4" BSPP - 12 mm deep [7⁄16 in-20 UNF - 2B - 0,47 in deep]
L = Pump unloading mechanical override
M = A-B port mechanical flow adjustment
N = LSA
O = LSB
P = LS
} remote pilot pressure connection 1/4" BSPP - 12 mm deep [7⁄16 in-20 UNF - 2B - 0,47 in deep]
Q = Port A
R = Port B
} 1/2" BSPP - 17 mm deep [7⁄8 in-14 UNF-2B - 0,67 in deep]
S = Ls_B
T = Ls_A
} pilot pressure relief valve
U = Shock/suction valve B port
V = Shock/suction valve A port
W = External drain connection electric actuations - 1/4" BSPP - 12 mm deep [7⁄16 in-20 UNF-2B - 0,47 in deep]


22
PEI
PED
14
PIP
PIU
PSB
12
21
PEAC018
PEAC118
PDE
11
PEACX01
PEACX11
PEAC0
PEAC1
PDZ
23
17
16
PDR
PDS
PEAD1
PEADX1
15
PDM
PDW
1-10
PEAP1
PDC
25
PDI
0
14
PIU
PIP
24

PDV315 Proportional valve, Product selection chart

Reference field	Description			Code numbers see pag
0	Inlet sections	Open centre	**PDI**	
		Closed centre		
1-10	Working sections	with pressure compensator	**PDW**	
		without pressure compensator		
11	End sections		**PDE**	
12	Stay bolt set		**PSB**	
14	Solenoid Ls unloading		**PIU**	
	Plug for LS unloading cavity		**PIP**	
15	Mechanical actuation		**PDM**	
16	Spool		**PDS**	
17	Spool centered set		**PDR**	
21	Proportional electro-hydraulic actuations	Open loop spool control current signal for PWM and ON-OFF control	**PEAD1**	
		Open loop spool control high resolution	**PEAC0**	
		Closed loop spool control high performance resolution	**PEAC1**	
		Open loop spool control high resolution CAN-Bus	**PEAC018**	
		Closed loop spool control high performance resolution CAN-Bus	**PEAC118**	
		Open loop spool control high resolution ATEX	**PEACX01**	
		Closed loop spool control high performance resolution ATEX version	**PEACX11**	
		Open loop spool control current signal for PWM and ON-OFF control ATEX version	**PEADX1**	
		Open loop spool control current input signal for PWM and ON-OFF control - AMP JPT 4 pin	**PEAP1**	
	Rear cover for	Hydraulic control	**PDH**	
		Detent	**PDD**	
		Friction detent	**PDF**	
		Mechanical actuation	**PDC**	
22	End sections	External drain line cartridge	**PED**	
		Internal plug	**PEI**	
23	Dual function control body		**PDZ**	
24	Antishock body			

OMFB
HYDRAULIC POWER CONTROL

OMFB HYDRAULIC POWER CONTROL			Code:	**PDV315**		Customer:		
			Date:	__/__/____		Customer ref:		
			Review index:	-		Issued by:		
			Review date:	-		OMFB sales ref:		
I	Valve type:	PDV 315	V	Working sections Up:	8	IX	Rated voltage [V]:	12
II	Type of threads:	BSPP	VI	Working sections Down:		X	Certifications:	None
III	Type of inlet:	standard	VII	Inlet section side:	Right version	XI		
IV	Pump type:	Open Center	VIII	2nd pump type:		XII	Pump flow [l/min]:	

0	Notes		**B** Port		**0**	bar			**13**		**A** Port		Notes	
					23				**14**					
			Actuation side								**Handle side**			
1		**21**		**1**	bar			bar	**16**		**15**			
		17		**20**					**20**					
				19					**19**					
				18					**23**					
2		**21**		**2**	bar			bar	**16**		**15**			
		17		**20**					**20**					
				19					**19**					
				18					**23**					
3		**21**		**3**	bar			bar	**16**		**15**			
		17		**20**					**20**					
				19					**19**					
				18					**23**					
4		**21**		**4**	bar			bar	**16**		**15**			
		17		**20**					**20**					
				19					**19**					
				18					**23**					
5		**21**		**5**	bar			bar	**16**		**15**			
		17		**20**					**20**					
				19					**19**					
				18					**23**					
6		**21**		**6**	bar			bar	**16**		**15**			
		17		**20**					**20**					
				19					**19**					
				18					**23**					
7		**21**		**7**	bar			bar	**16**		**15**			
		17		**20**					**20**					
				19					**19**					
				18					**23**					
8		**21**		**8**	bar			bar	**16**		**15**			
		17		**20**					**20**					
				19					**19**					
				18					**23**					
9		**21**		**9**	bar			bar	**16**		**15**			
		17		**20**					**20**					
				19					**19**					
				18					**23**					
10		**21**		**10**	bar			bar	**16**		**15**			
		17		**20**					**20**					
				19					**19**					
				18					**23**					
11				**11**					**12**					
				22										