



# Electronic components & PHC systems

TECHNICAL CATALOG



**Additional information**

This catalogue shows the product in the most standard configurations.  
Please contact our Sales Dpt. for more detailed information or special requests.

**WARNING!**

All specifications of this catalogue refer to the standard product at this date.  
Walvoil, oriented to a continuous improvement, reserves the right to  
discontinue, modify or revise the specifications, without notice.

**WALVOIL IS NOT RESPONSIBLE FOR ANY DAMAGE CAUSED BY AN  
INCORRECT USE OF THE PRODUCT.**

3<sup>rd</sup> edition October 2017

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# Electronic components

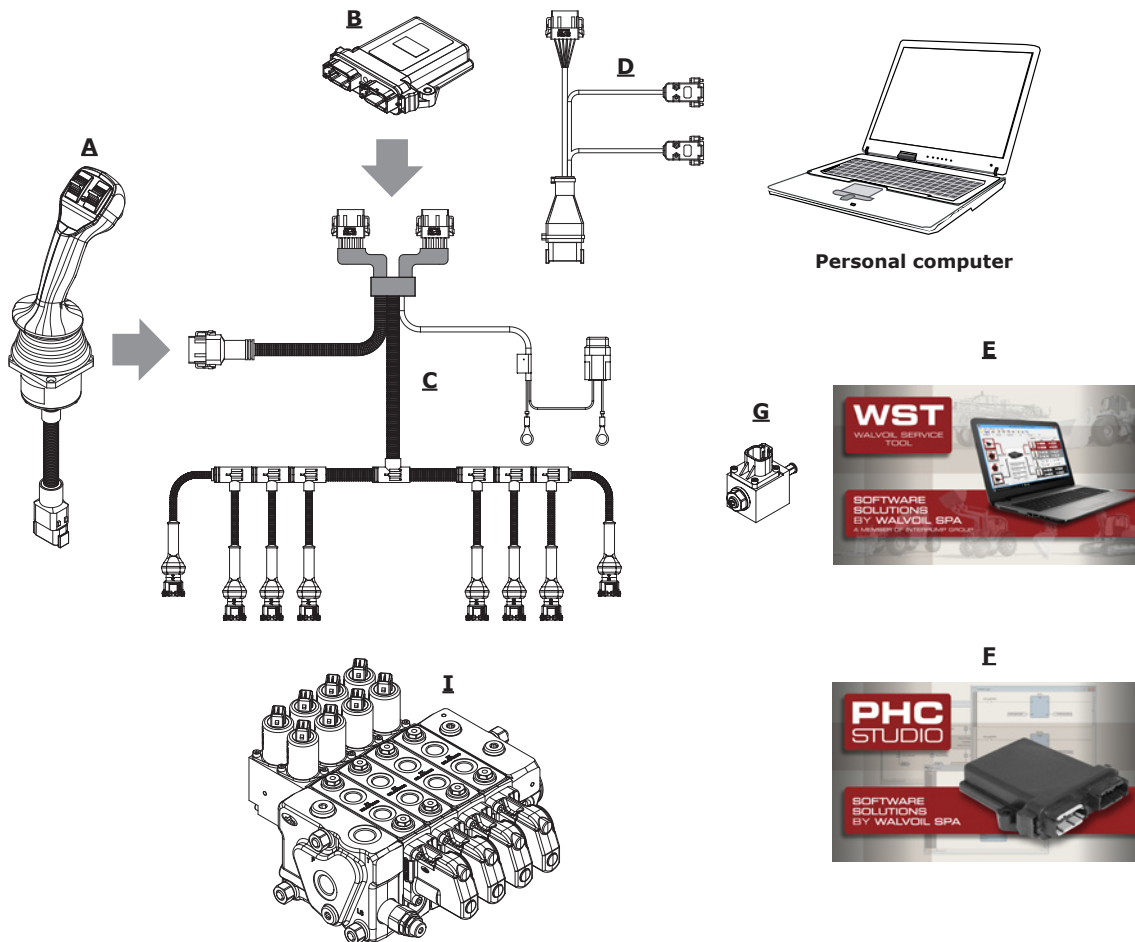
## Introduction

Walvoil offers a wide range of electronic devices developed for control systems dedicated to earth moving, agricultural and industrial machines.

Our production includes: proportional joysticks, analog and CAN bus versions, control units and spool position sensors to control the proportional directional valves, with electro-hydraulic or mechatronic controls.

These components allow to implement the machine logic functionality and the system operational safety requested by the application.

Complete control systems are available as well. They were born thanks to the experience shared with important OEMs in their sector.



### A - Proportional Joysticks

The AJW-CJW are proportional contactless joysticks for Walvoil handles.

The contactless technology guarantees long life and precise comfortable control.

The robust mechanical design is specifically tailored to off-highway operating machines.

Different output options are available for easy interfacing to the machine ECU (e.g. analog, CAN,...). Redundant options for safety applications are available.

The MDN joysticks are compact, low profile control devices that provide precise fingertip control in one.

Compact dimensions make them suitable for installation with reduced operation space like armrests and remote control chest packs.

In applications where operation safety, long life and maintenance absence are decisive features, they provide reliability and operating simplicity.

### B - CED Electronic Control Units and PVD Proportional Valve Driver

These control units are dedicated to PHC standard systems.

The relation between the unit inputs and outputs and the system logic functionality can be predefined (standard application) or modifiable by the user with PHC studio (only CED400W).

The application working parameters can be modified to optimize the electro-hydraulic system installation on the machine.

This customization is made through a WST software tool.

The control units are protected against the battery overvoltage and reverse polarity, and input/output short-circuits to battery/ground. Outputs current are compensated and stabilized.

Description specification: **CED 4 0 0 W**



### **PVD 2 0 0**



### C - Harnesses

These are the connection harnesses for the predefined PHC standard systems.

The KCDs (Kit Connection Devices) provide the connections between the devices included into these systems, the electronic joystick, the electronic control unit and the main hydraulic valve.

They are made with single wires, mechanically protected by corrugated tube.

The power line connection to the system battery is fuse protected.

The connections to the devices are realized with DEUTSCH DTM and/or AMP JPT connectors.

The harnesses are suitable for a static or fixed installation, for agricultural, industrial and off highway applications.

Description specification: **KCD 04**



### D - Accessories

A wide range of accessories is available to enable the interface among the electronic devices on this catalogue.

They are useful to let the user build the harness connection requested for and to allow the electronic components to work together.

The connectors are already preassembled with standard multipolar cables: just a simple electrical connection between wires is requested to implement the correct electrical diagram.

The programming cables and software are available to dialog with the control units, for the optimal application parameters settings, and diagnostic purposes.

### E - WST control unit configuration software



The CED electronic control units are programmed in the Company with default operating parameters, suitable for most applications. For special applications, the WST (Walvoil Service Tool) software can be used together with a personal computer to optimize the control parameters for the electrohydraulic modules. For example, minimum and maximum output current values can be set for linear curves.

### F - PHC Studio



PHC Studio is an Integrated Development Environment (IDE) to develop and download into the CED400W electronic control unit the custom application functionality and the working parameters.

PHC Studio allow to have the complete control of the application, either hydraulic that electronic.

It is compliance with all the 5 programming languages of the IEC 61131-3 PLC Standard.

### G - Spool position sensors

The hall effect spool position sensor allow to converts the spool movements into an electrical digital signal (SPSD) or into a voltage linear signal (SPSL).

## Introduction

### H - PHC electronic systems

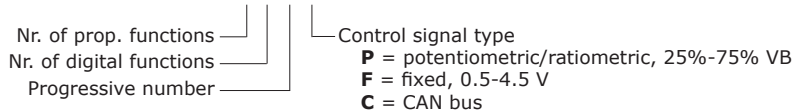
The PHCs (Power Hydraulic Control) are complete electronic systems, made of one or more joysticks, one or more control units, and their connection harness.

They can be used to control almost all Walvoil directional valves; they are designed to exploit the full potential, in terms of performances and safety, of the different system components.

For both the command devices (e.g. joysticks) and the control devices (e.g. control units), the redundancies on the input and output lines are managed by improving the robustness level of the application.

Thanks to a dedicated diagnostic tool, the WST software, the operator can set-up to the optimal configuration for the system, or make diagnostic on it.

Description specification: **PHC 4 0 0 F**



### I - Directional control valve

Walvoil offers a wide range of directional control valves, monoblock, sectional, open center, Load Sensing, Flow Sharing, which can be configured with proportional electro-hydraulic and mechatronic controls.

Please contact our Sales Department to request for the documentation.



## AJW analog joystick

- Hall effect contactless double axis joysticks
- The contactless technology guarantees long life and precise comfortable control
- Robust mechanical design; specifically tailored to off-highway operating machines
- Handles with additional proportional axis

### Working conditions

#### Electrical specifications

#### AJW

Supply voltage		from 8 to 32 V or regulated 5±0.1V
Current consumption	without grip	max. 20 mA at 32 V
Output signal	full range	from 0.5 to 4.5 V - 2.5 V in neutral
	tolerance (in neutral and full stroke)	±0.15 V both sides per axis
	redundancy signal (crossed)	from 4.5 to 0.5 V - 2.5 V in neutral
	max. load	< 1 mA

#### Mechanical specifications

Lever angle	operation	± 20° both axis
	tolerance	±1
Lever force (X,Y axis)	stroke end	6±1N (fully actuated 190 mm - 7.48 in above flange)
Operating life	on each axis (full stroke cycles)	>10 <sup>6</sup>
Weight	without grip	0.50 Kg (1.10 lb)

#### Environmental specifications

Working temperature		from -40° C to +85° C (from -40° F to 185° F)
Storage temperature		from -40° C to +85° C (from -40° F to 185° F)
Weather protection	above fixing plan	AJW: IP65 / AJW-IP: IP67 - IPX9K
EMC compatibility		100 V/m - ISO13766, ISO14982

#### "Dead man" switch features

Contact type		NA
Current rating (24 VDC)		200 mA resistive load
Mechanical life (nr. of operations)		10 <sup>6</sup>
Electric life (nr. of operations)		3x10 <sup>4</sup>
Operating force		3.4 N
Weather protection		IP67

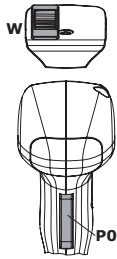
#### Test specifications

Mechanical vibration	random	from 5 to 500 Hz, 5,4x10 <sup>4</sup> to 0,56 g <sup>2</sup> /Hz, 100 h each axis
	sinusoidal	40 m/s <sup>2</sup> from 10 to 2000 Hz
	bumps	100 applications - 400 m/s <sup>2</sup> x 6 ms
Humidity	96%	240 h
Thermal shock		100 cycles, from -40° C to 85° C and back, 50° C/min (100 cycles, from -40° F to 212° F and back, 122° F/min)
Salt spray	exposure	100 h

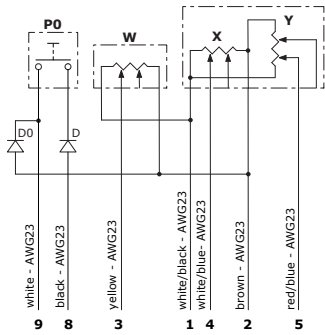
# Control components

## AJW analog joystick

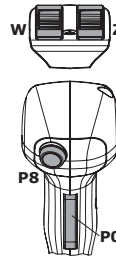
### Configurations



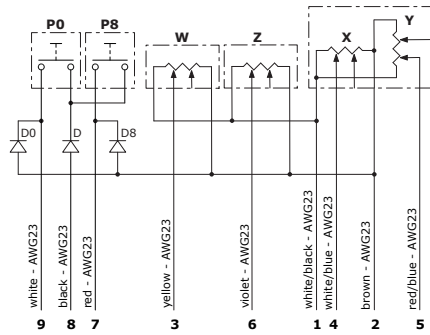
Code	<b>183540027</b>
Description	AJW2000A-PZA0100DQ-ORD-WN140/(D2F12035)-(TC-PROT)
Plate	1 ARW* type proportional roller (W)
Front zone	"dead man" switch (P0)



Pin	Function
1	VJ+
2	VJ-
3	W axis
4	X axis
5	Y axis
6	plugged
7	plugged
8	VJ+
9	P0 dead man
10	plugged
11	plugged
12	plugged



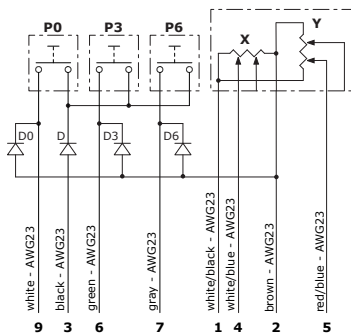
Code	<b>183540028</b>
Description	AJW2000A-PZTM0200BQ-ORD-8R2D-WN140-ZN140/(D2F12035)-(TC-PROT)
Plate	2 ARW* type proportional rollers (W-Z)
Front zone	1 T* type push-button with spring return (P8), "dead man" switch (P0)



Pin	Function
1	VJ+
2	VJ-
3	W axis
4	X axis
5	Y axis
6	Z axis
7	P8 push-button
8	VJ+
9	P0 dead man
10	plugged
11	plugged
12	plugged



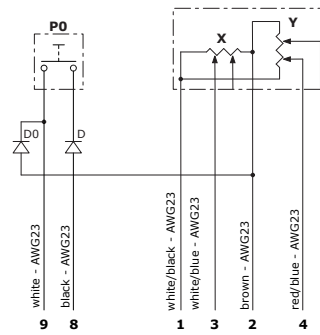
Code	<b>183540029</b>
Description	AJW2000A-PTA2000CQ-ORD-3R2D-6R2D/(D2F12035)-(TC-PROT)
Plate	2 T* type push-buttons with spring return (P3-P6)
Front zone	"dead man" switch (P0)



Pin	Function
1	VJ+
2	VJ-
3	P3 push-button
4	X axis
5	Y axis
6	P6 push-button
7	plugged
8	VJ+
9	P0 dead man
10	plugged
11	plugged
12	plugged



Code	<b>183540006</b>
Description	AJW2000A-PA0000AQ-ORD/D2F12035-(TC-PROT)
Plate	-
Front zone	"dead man" switch (P0)

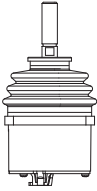


Pin	Function
1	VJ+
2	VJ-
3	X axis
4	Y axis
5	plugged
6	plugged
7	plugged
8	VJ+
9	P0 dead man
10	plugged
11	plugged
12	plugged

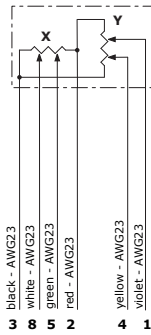
NOTE (\*): for component features see page 12



### Configuration



	AJW-IP
Code	<b>183540058</b>
Description	AJW-IP2027A-S(5V)/D2F08050



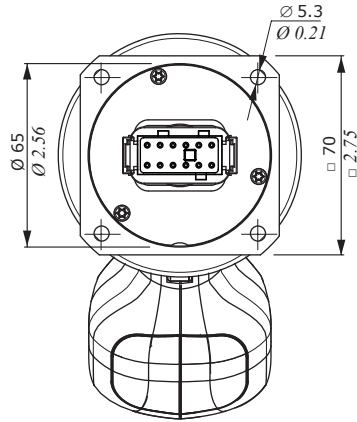
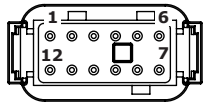
Pin	Function
1	Yr
2	Vcc (5V)
3	VJ-
4	Y axis
5	Xr
6	plugged
7	plugged
8	X axis

NOTE (\*): for component features see page 12

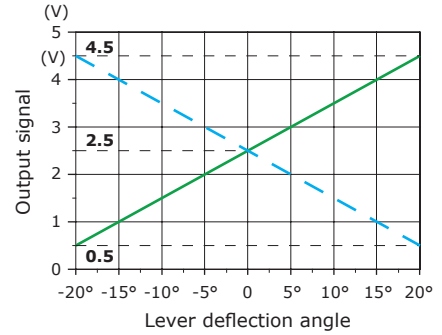
## AJW analog joystick

### Dimensions and features

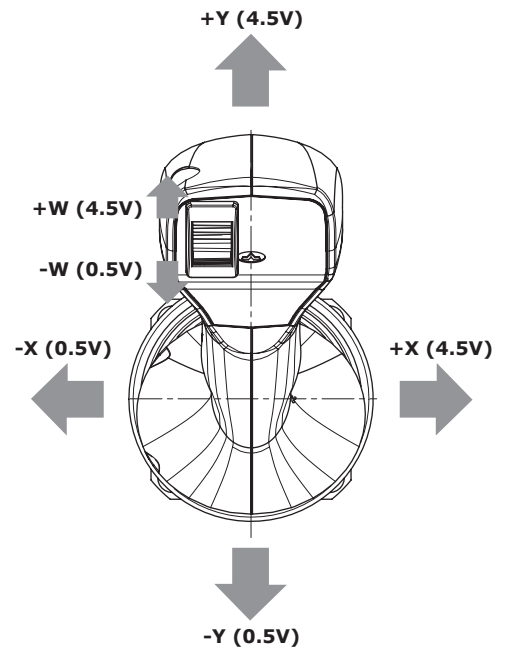
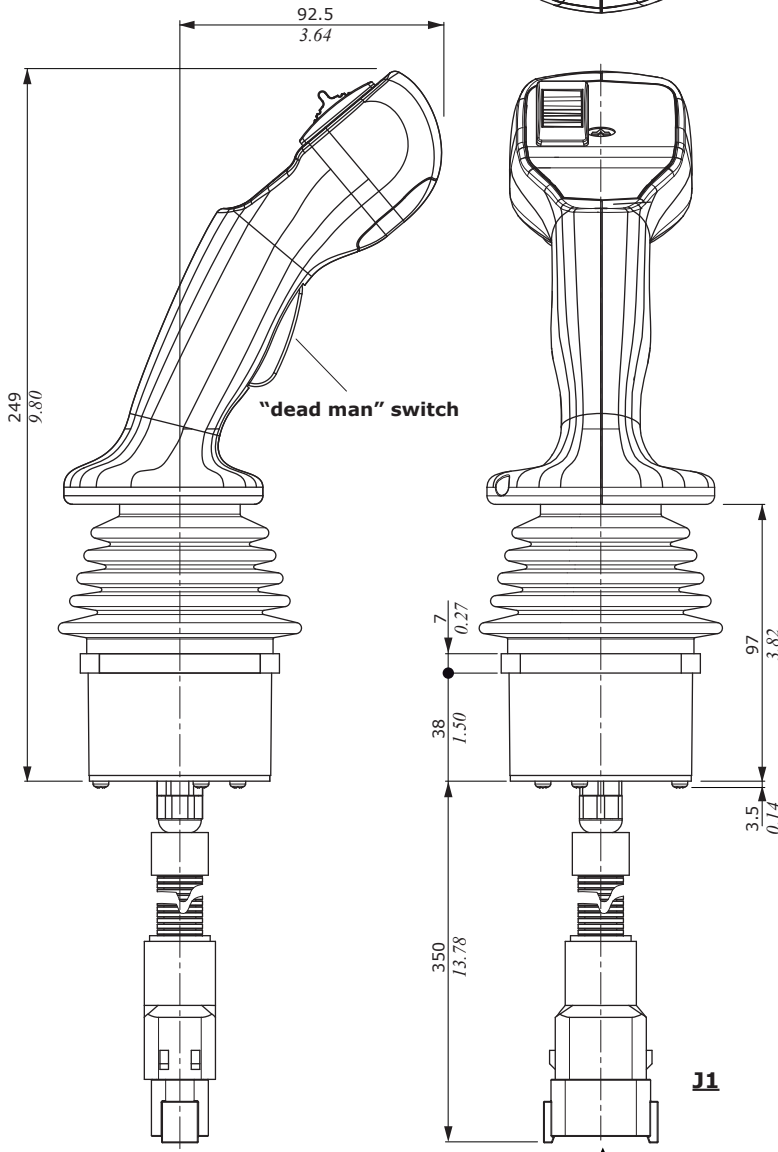
**DTM04-12PA**  
Deutsch connector



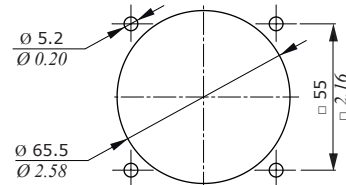
**Joystick output signal**



— Output A signal  
- - - Output B redundant optional signal



**Panel cut out**



**J1**

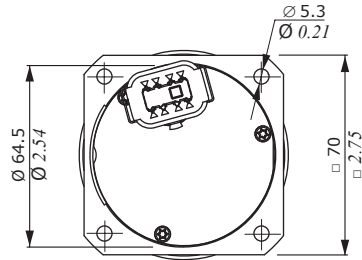
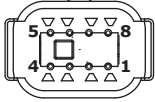
**JM1**

**Mating connector**

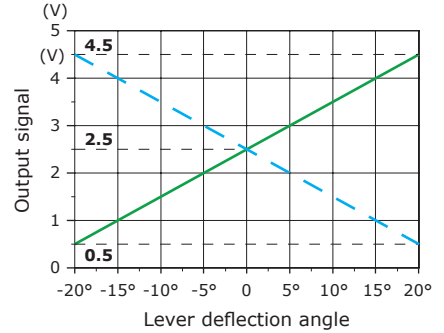
Name	Type
<b>JM1</b>	DTM06-12SA Deutsch

### Dimensions and features

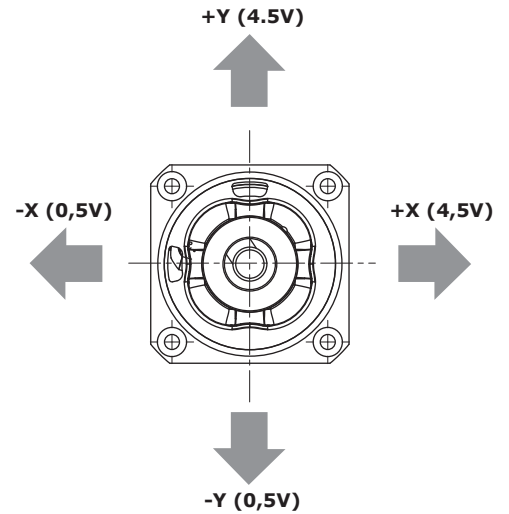
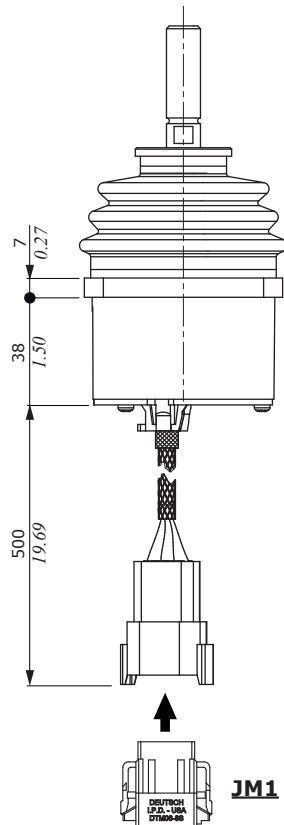
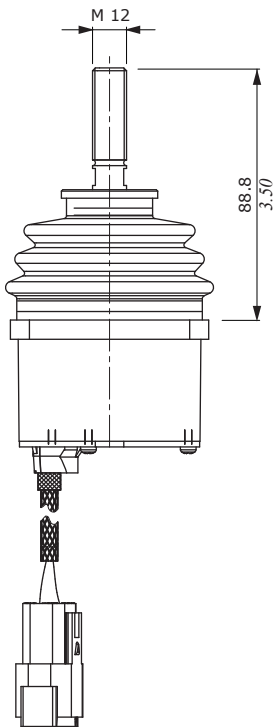
**DTM04-8P**  
Deutsch connector



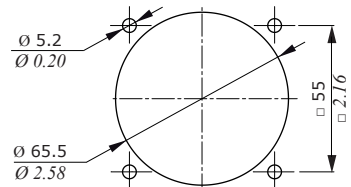
**Joystick output signal**



— Output A signal  
- - - Output B redundant optional signal



**Panel cut out**



**Mating connector**

Name	Type
<b>JM1</b>	DTM06-8S Deutsch

NOTE (\*): Weather protection IP67-IPX9K above the panel, IP57-IPX9K below the panel

## AJW and AJW-IP analog joystick

### Electric device features

#### ARW type proportional roller

Supply voltage	from 8 to 32 VDC
Max. current consumption	< 24 mA
Max. output current	1 mA
Output signal (range)	0,5 - 4,5 V
Output signal (central position)	2,5V
Signal tolerance (central position and stroke end)	±100 mV
Minimum load	10 KΩ
Actuator deflection angle	± 35° (±1°)
Mechanical life (nr. of operations)	10 <sup>6</sup>
Operating force	2 N
Mechanical vibration	IEC 68-2
	EN 60068-2-29
Mechanical shock	(pulse 400m/s <sup>2</sup> x 6 ms, 100 times)
Weather protection	IP67-IPX9K
EMC compatibility	ISO 13766 ISO 14982

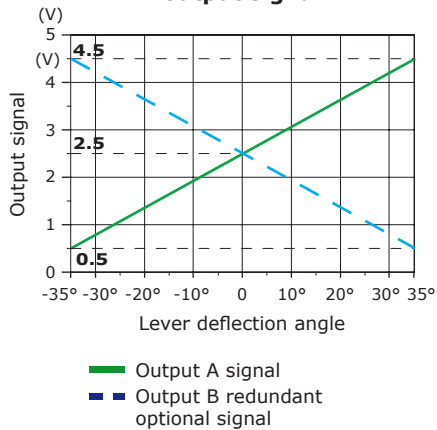


#### T type ON/OFF push-button

Execution	spring return
Contact type	normally open
Current rating	200 mA resistive load @ 12 VDC
Mechanical life (nr. of operations)	10 <sup>6</sup>
Electric life (nr. of operations)	20x10 <sup>4</sup>
Weather protection	IP67 with handle mounting



**Proportional roller  
output signal**





## CJW CAN bus joystick

- Contactless single or double axis joysticks
- CAN bus models
- The contactless technology guarantees long life and precise comfortable control
- Robust mechanical design; specifically tailored to off-highway operating machines
- Handles with additional proportional axis

### Working conditions

#### Electrical specifications

#### CJW

Supply voltage		from 8 to 32 V
Current consumption	without grip	max. 100 mA @ 32 V
Output CAN protocols		CANopen Safety, SAE J1939, CANopen, CAN 2.0A and 2.0B, ISOBUS (AUX-N compliant)

#### Mechanical specifications

Lever angle	operation	$\pm 20^\circ$ both axis
	tolerance	$\pm 1$
Lever force (X,Y axis)	stroke end	6 $\pm$ 1N (fully actuated 190 mm - 7.48 in above flange)
	Operating life	on each axis (full stroke cycles)
Weight	without grip	>10 <sup>6</sup>
		0.50 Kg (1.10 lb)

#### Environmental specifications

Working temperature		from -40° C to +85° C (from -40° F to 185° F)
Storage temperature		from -40° C to +85° C (from -40° F to 185° F)
Weather protection	above fixing plan	IP65
EMC compatibility		100 V/m - ISO13766, ISO14982

#### "Dead man" switch features

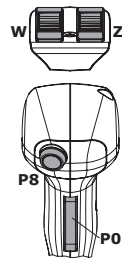
Contact type		NA
Current rating (24 VDC)		200 mA resistive load
Mechanical life (nr. of operations)		10 <sup>6</sup>
Electric life (nr. of operations)		3x10 <sup>4</sup>
Operating force		3.4 N
Weather protection		IP67

#### Test specifications

Mechanical vibration	random	from 5 to 500 Hz, 5,4x10 <sup>4</sup> to 0,56 g <sup>2</sup> /Hz, 100 h each axis
	sinusoidal	40 m/s <sup>2</sup> from 10 to 2000 Hz
	bumps	100 applications - 400 m/s <sup>2</sup> x 6 ms
Humidity	96%	240 h
Thermal shock		100 cycles, from -40° C to 85° C and back, 50° C/min (100 cycles, from -40° F to 212° F and back, 122° F/min)
Salt spray	exposure	100 h

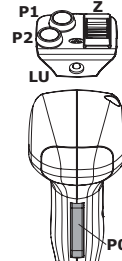
## CJW CAN bus joystick

### Configurations



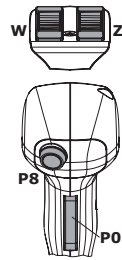
Code	<b>183530011</b>
Protocol	CANopen
Description	CJW2010A-PZTM0200BQ-0R-8R2-WN140-ZN140/A8F12
Plate	2 ARW* type proportional rollers (W-Z)
Front zone	"dead man" switch (P0), 1 push-button with spring return (P8)

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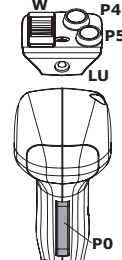
Code	<b>183530012</b>
Protocol	CANopen
Description	CJW2010A-PZTA2101BQ-0R-1R2-2R2-URL-ZN140/A8F12-<JOYSTICK SX>
Plate	1 ARW* type proportional roller (Z), 2 T* type push-buttons with spring return (P1-P2), 1 LED (LU); left configuration
Front zone	"dead man" switch (P0)

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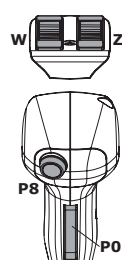
Code	<b>183530057</b>
Protocol	SAE J1939
Description	CJW2010A-PZTM0200BQ-0R-8R2-WN140-ZN140/A8F12
Plate	2 ARW* type proportional rollers (W-Z)
Front zone	"dead man" switch (P0), 1 push-button with spring return (P8)

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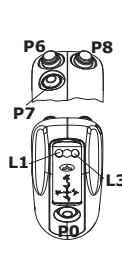
Code	<b>183530013</b>
Protocol	CANopen
Description	CJW2010A-PZTA2101CQ-0R-4R2-5R2-URL-WN140/A8F12-<JOYSTICK DX>
Plate	1 ARW* type proportional roller (W), 2 T* type push-buttons with spring return (P1-P2), 1 LED (LU); right configuration
Front zone	"dead man" switch (P0)

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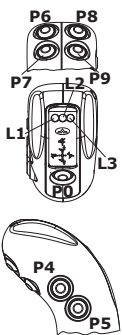
Code	<b>183530058</b>
Protocol	CANopen Safety
Description	CJW2010A-PZTM0200BQ-0R-8R2-WN140-ZN140/A8F12
Plate	2 ARW* type proportional rollers (W-Z)
Front zone	"dead man" switch (P0), 1 push-button with spring return (P8)

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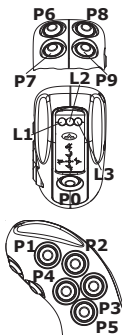
Code	<b>183530045</b>
Protocol	SAE J1939
Description	CJW2034A-AMHQ0402AQ-0R3(A)-6N5(K)-7RB(A)-8N5(K)-ALV-CLR/D2F08035(TC)
Plate	2 LED (L1-L3) 1M type push-button with detent (P0)
Front zone	2M type push-button (P6-P8), 1K type push-button with spring return (P9)

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Code	<b>183530044</b>
Protocol	SAE J1939
Description	CJW2034A-AMHQ0703AQ-0R3(A)-4RB(A)-5RB(A)-6RB(A)-7RB(A)-8RB(A)-9RB(A)-ALV-BLY-CLR/F1F05150(TC)
Plate	3 LED (L1-L2-L3), 1M type pushbutton with detent (P0)
Front zone	4M type pushbutton with spring return (P6-P7-P8-P9)
Lateral zone	2M type pushbutton with spring return (P4-P5)

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Code	<b>183530043</b>
Protocol	ISOBUS
Description	CJW2044A-AMHM1003AQ-0R3(A)-1RB(A)-2RB(A)-3RB(A)-4RB(A)-5RB(A)-6RB(A)-7RB(A)-8RB(A)-9RB(A)-ALV-BLY-CLR/A3M09030(TC)
Plate	3 LED (L1-L2-L3), 1M type push-button with detent (P0)
Front zone	4M type push-button with spring return (P6-P7-P8-P9)
Lateral zone	5M type push-button with spring return (P1-P2-P3-P4-P5)

See page 18

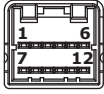


NOTE (\*): for component features see page 19

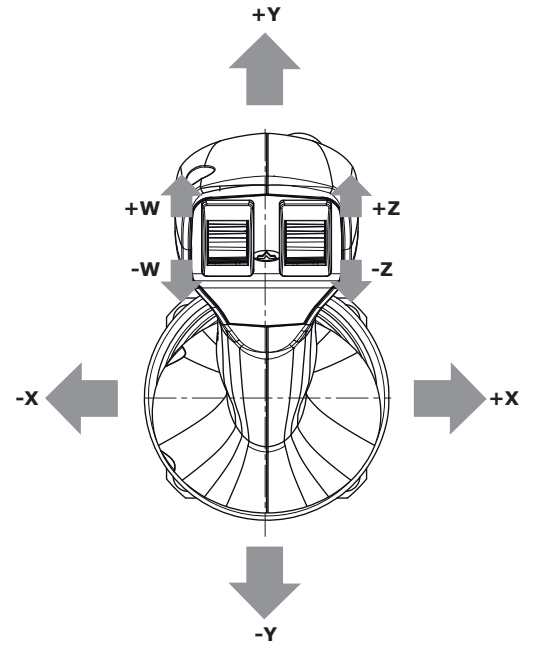
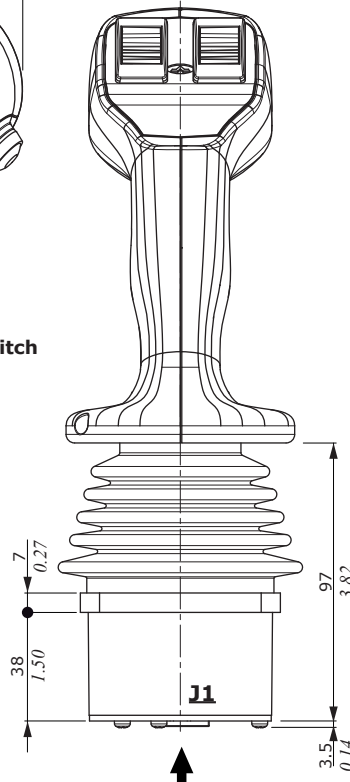
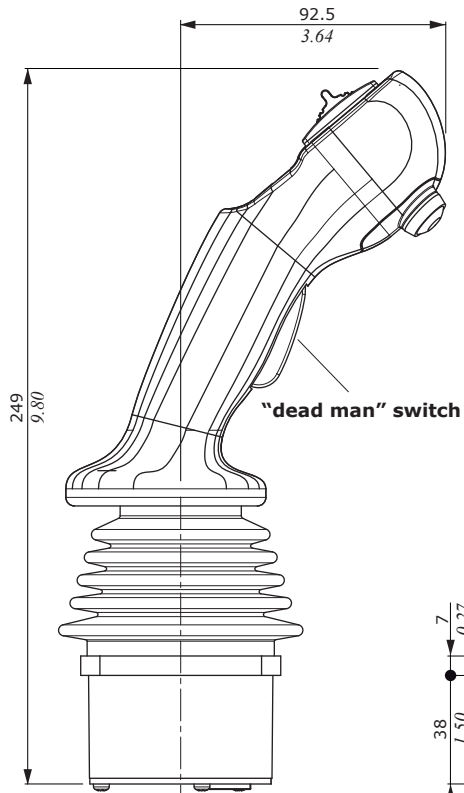
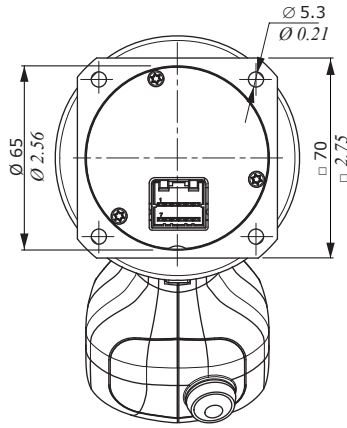
### Dimensions and features

For configuration see page 14.

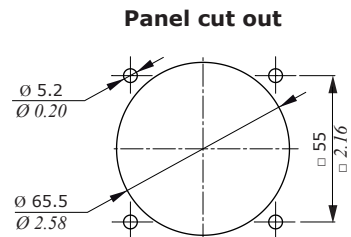
#### Multi-lock 040 series Tyco connector (tin plated contacts)



1	not conn.	7	not conn.
2	not conn.	8	not conn.
3	CAN_L	9	not conn.
4	CAN_H	10	not conn.
5	VJ-	11	VJ+
6	not conn.	12	not conn.



Mating connector	
Name	Type
JM1	Multilock series 040 Tyco

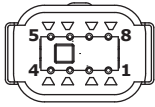


## CJW CAN bus joystick

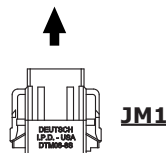
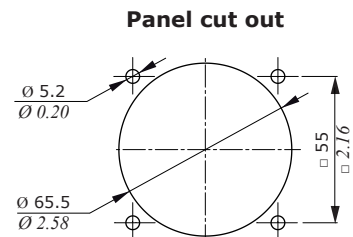
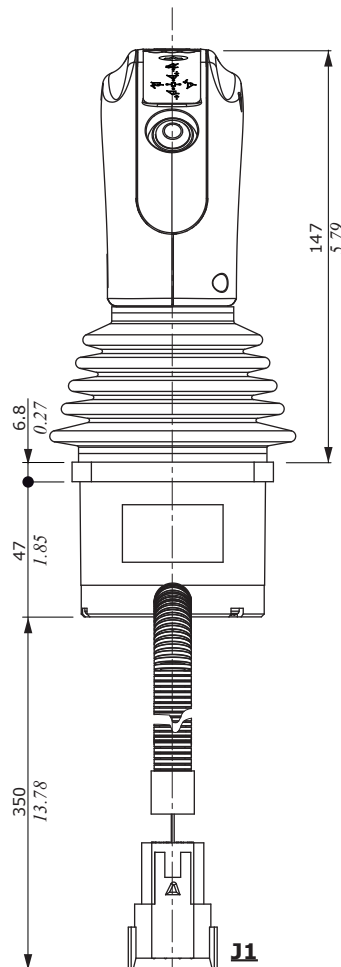
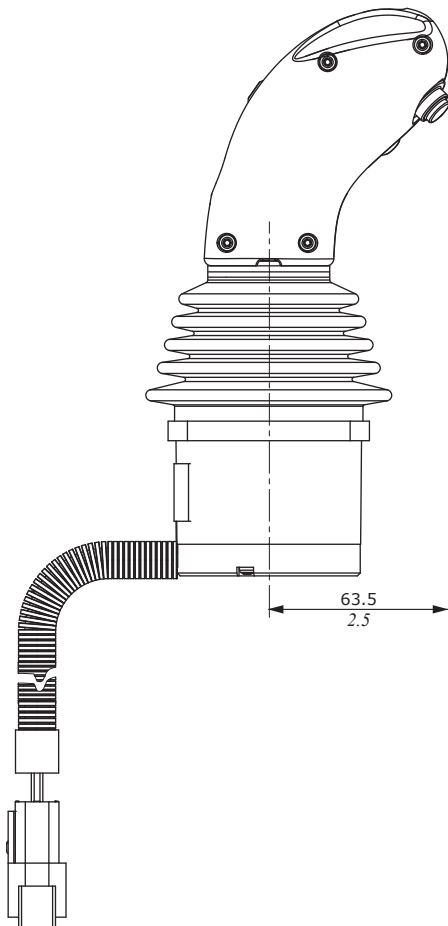
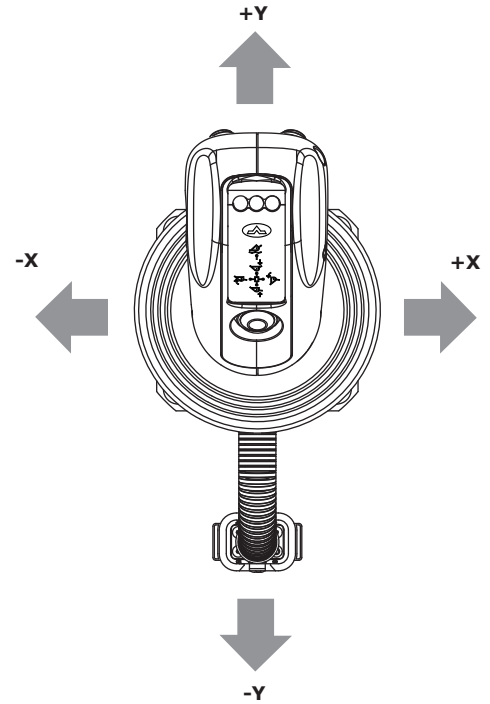
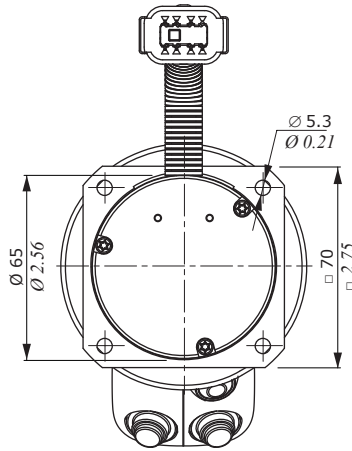
### Dimensions and features

For configuration see page 14.

**DTM04-8P**  
**Deutsch connector**  
 (nichel plated contacts)



1	VJ+	5	Push-button P8
2	CAN_L	6	Push-button P6
3	CAN_H	7	VJ+
4	VJ-	8	plugged



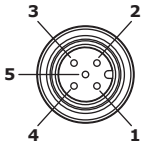
Mating connector	
Name	Type
JM1	DTM06-8S Deutsch



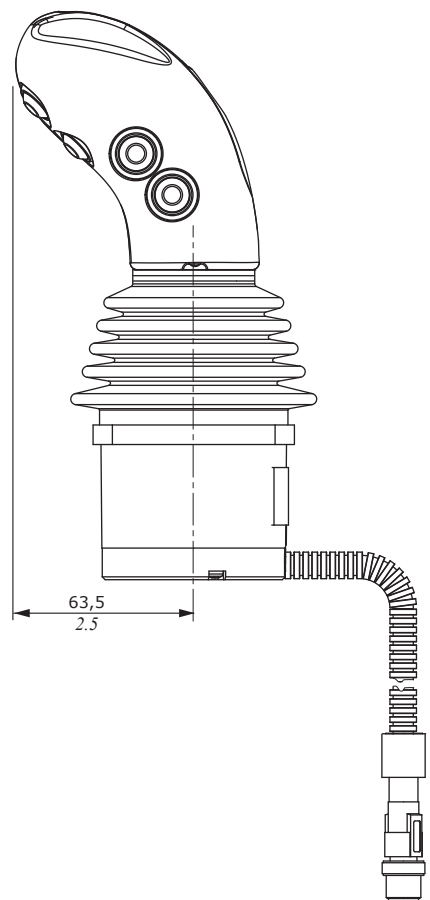
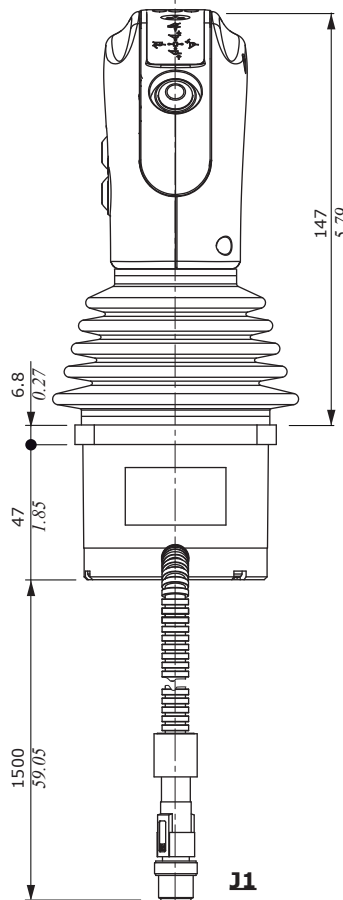
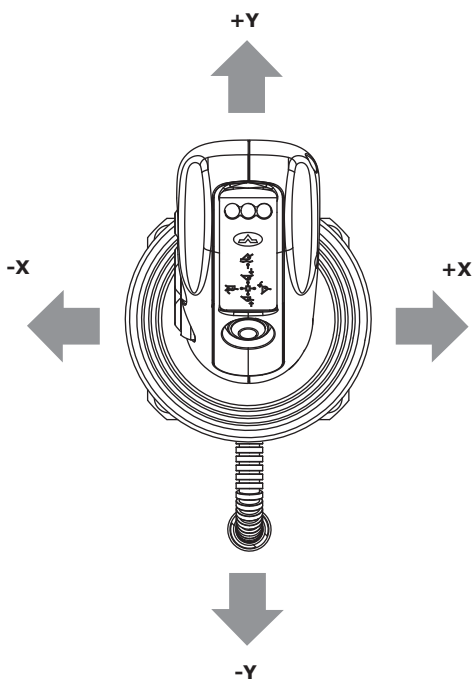
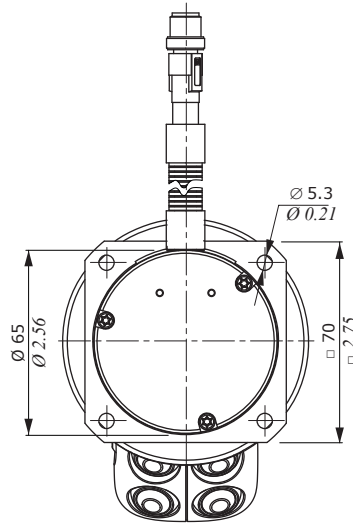
### Dimensions and features

For configuration see page 14.

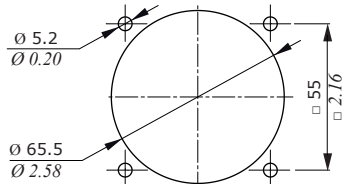
#### M12-5P male connector



1	CAN_H
2	CAN_L
3	VJ+
4	VJ-
5	VK+



#### Panel cut out



J1

JM1

#### Mating connector

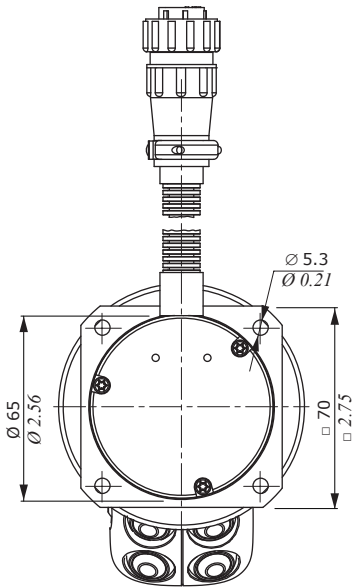
Name	Type
JM1	5 poles - M12 female

# Control components

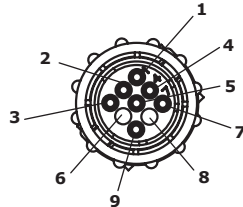
## CJW CAN bus joystick

### Dimensions and features

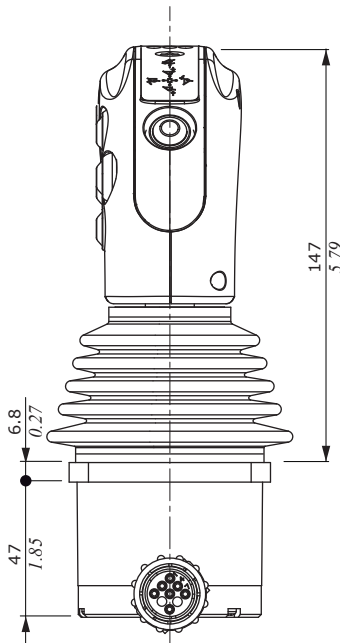
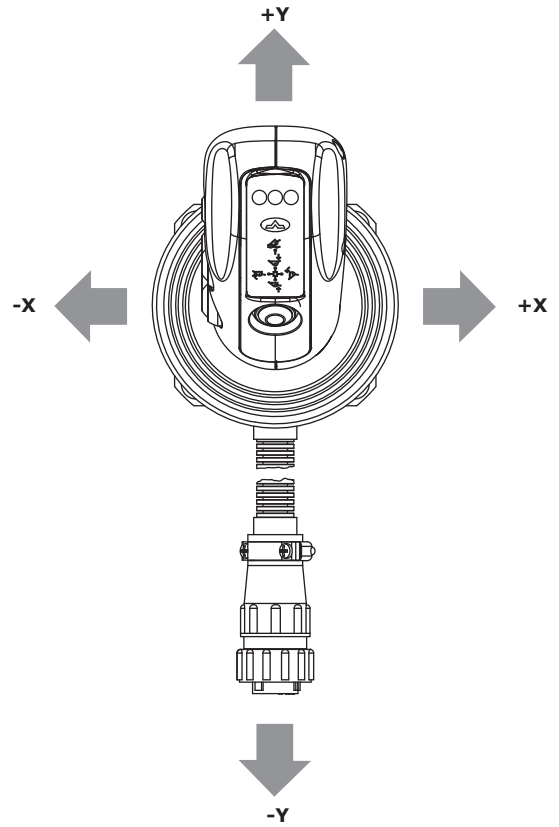
For configuration see page 14.



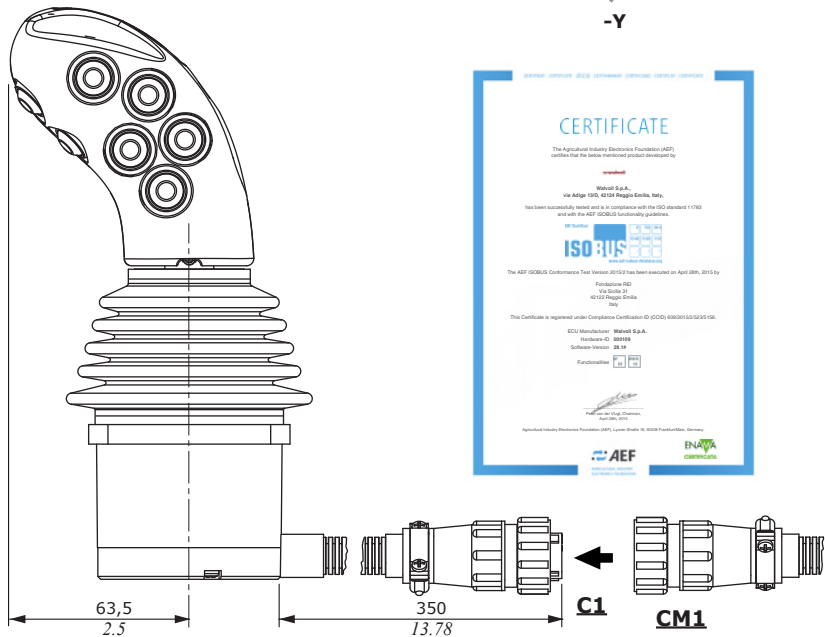
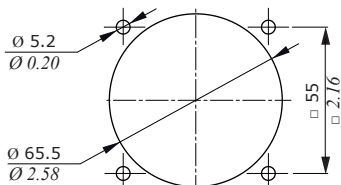
**CPC-9P  
AMP MPF connector**  
(selective gold plated contacts)



1	VJ+	6	not conn.
2	CAN_L	7	VJ+
3	CAN_L	8	not conn.
4	CAN_H	9	VJ-
5	CAN_H		



Panel cut out



Mating connector	
Name	Type
CM1	AMP CPC - 9 FPM

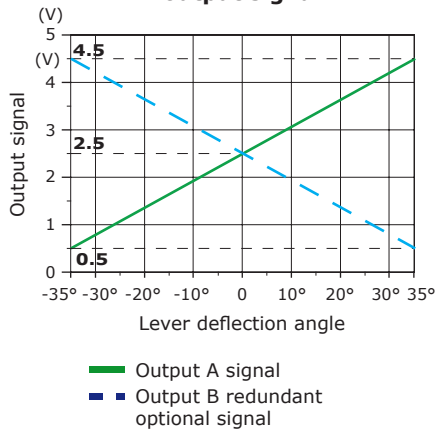
### Electric device features

#### ARW type proportional roller

Supply voltage	from 8 to 32 VDC
Max. current consumption	< 24 mA
Max. output current	1 mA
Output signal (range)	0,5 - 4,5 V
Output signal (central position)	2,5V
Signal tolerance (central position and stroke end)	±100 mV
Minimum load	10 KΩ
Actuator deflection angle	± 35° (±1°)
Mechanical life (nr. of operations)	10 <sup>6</sup>
Operating force	2 N
Mechanical vibration	IEC 68-2
	EN 60068-2-29
Mechanical shock	(pulse 400m/s <sup>2</sup> x 6 ms, 100 times)
Weather protection	IP67-IPX9K
EMC compatibility	ISO 13766 ISO 14982



**Proportional roller output signal**



#### T type ON/OFF push-button

Execution	spring return
Contact type	normally open
Current rating	200 mA resistive load @ 12 VDC
Mechanical life (nr. of operations)	10 <sup>6</sup>
Electric life (nr. of operations)	20x10 <sup>4</sup>
Weather protection	IP67 with handle mounting



#### M type ON/OFF push-button

Execution	spring return, with detent
Contact type	normally open
Current rating	200 mA @ 12 VDC resistive load
Mechanical life (nr. of operations)	10 <sup>6</sup>
Electric life (nr. of operations)	5x10 <sup>5</sup>
Mechanical life (nr. of operations)	IP67 with handle mounting
Electric life (nr. of operations)	10 mA



#### K type ON/OFF push-button

Execution	spring return
Contact type	normally open
Current rating	5 A resistive load @ 12 VDC
Mechanical life (nr. of operations)	10 <sup>5</sup>
Electric life (nr. of operations)	25x10 <sup>3</sup>
Weather protection	IP64







## Potentiometric joysticks

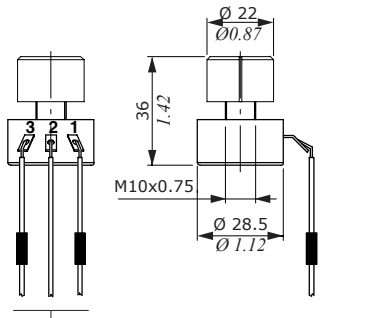
- Potentiometric/ratiometric signal
- Analog proportional signal
- On/off redundant, or neutral, signal
- Robust construction

<b>Working conditions</b>		
<b>General features</b>	<b>PTM104</b>	<b>MDN142</b>
Type	rotative potentiometer	single axis joystick
Max. supply voltage (V <sub>in</sub> )	35VDC	35VDC
Power absorption	0.4 W @ 40°C (104°F)	0.25W @ 25°C (77°F)
Connector	flying leads	Dupont Dubox
Lever deflection - Working angle	300° ± 5°	±30°
Average lifetime (nr. of operations)	10 <sup>4</sup>	>5x10 <sup>6</sup>
Working temperature	from -40° C to +70° C (from -40° F to 158° F)	from -25° C to +70° C (from -13° F to 158° F)
Weather protection (on the fixing plan)	nd	IP66
<b>Analog track</b>		
Total resistance	5KΩ ±20%	5KΩ ±20%
Output signal range (V <sub>out</sub> /V <sub>in</sub> %)	from 50% to 75%	from 25% to 75%
Central position signal (V <sub>out</sub> /V <sub>in</sub> %)	50% ACKW	50%
<b>Directional and center switch off</b>		
Switch center gap	/	2.5° either directions
Max. load current	nd	2mA

# Control components

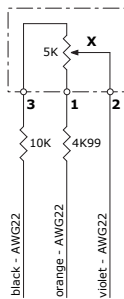
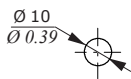
## PTM104 rotative potentiometer

### Dimensions and features



n.3 x AWG22, length 400 mm - 15.7 in

#### Panel cut out

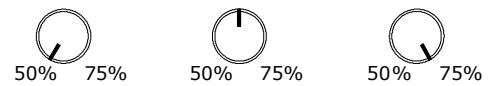
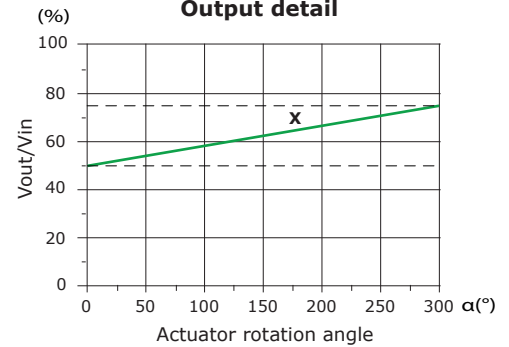


Pin	Wire	Description
1	orange	Supply + (VJ+)
2	violet	Proportional signal (X)
3	black	Supply - (VJ-)

#### Ordering codes

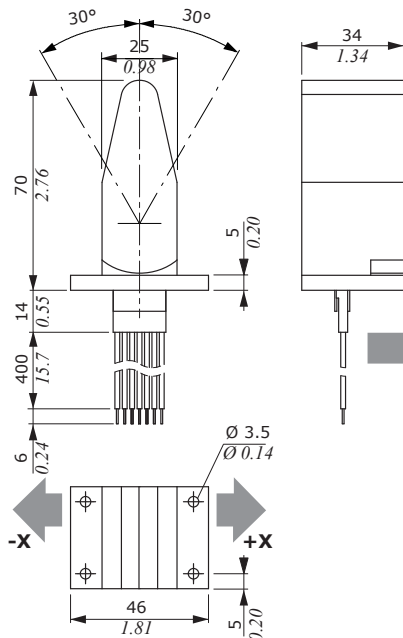
Description	Code
PTM104 potentiometer	5POT100005

#### Output detail

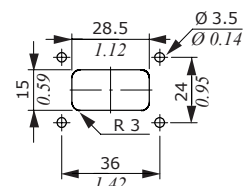


## MDN142 potentiometric joystick

### Dimensions and features

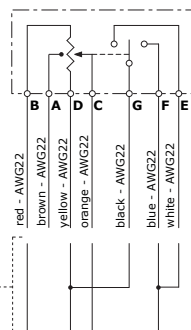
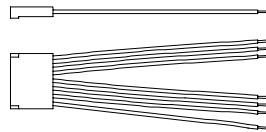


#### Panel cut out



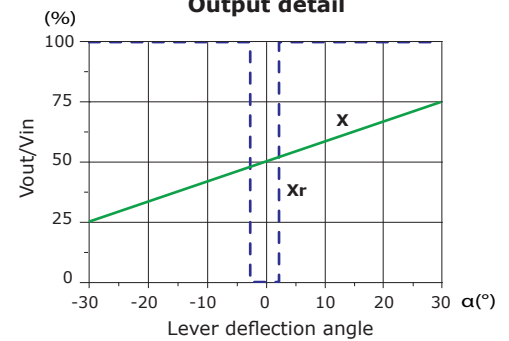
#### Connecting cable

7 poles cable included in the joystick, with Dubox Housing 65240-007 type female connector and AWG22 wires with tin-plate terminals.



Interface: to use the joystick redundancy option, this wiring is required

#### Output detail



— Output X signal  
 ■ Output Xr redundant signal

#### Ordering codes

Description	Code
MDN142 complete joystick	VJOY200001
7 poles cable, as spare part	W0450003

#### Pin Wire Description

Pin	Wire	Description
A	brown	Center proportional signal
B	red	Supply - (VJ-)
C	orange	Proportional signal (X)
D	yellow	Supply + (VJ+)
E	white	Signal redundancy - (Xr)
F	blue	Signal redundancy + (Xr)
G	black	Common redundancy

## CED400W electronic control units



- Programmable according to IEC 61131-3 standard through PHC Studio
- 12/24 VDC applications
- 3 Hardware configurations with "ready-to-use" application software
- Designed for PHC electronic systems

The CED400W is a microprocessor-based PWM driver designed to control 8 proportional solenoid valves (4+4). In the controllers is always loaded the standard application software that is "ready-to-use" (e.g. for analog joysticks, CAN bus joysticks of fan drive) and the control parameters can be easily adjusted through the WST STUDIO software.

It is possible to develop and download a custom application software with the PHC Studio tool. In this case access to IEC61131-3 programming language is built-in.

Also available is the PHC STUDIO Starter Kit (p/n 182400021), that contains an ECU, sample actuators, a wire harness, tutorial programs and the complete documentation.

Other features:

- Solenoid currents measurement (to compensate changes in coil resistance, temperature and supply voltage)
- Programmable Dither frequency (to reduce spool sticking)
- Protected power supply (against reversed polarity and load dump)
- Protected inputs (against short circuits to GND and to power supply)
- Protected outputs (against short circuits, reversed polarity, over-current and over-temperature)

### Technical data

#### General

Supply voltage VK	da 8 a 32 V
Current consumption	<100 mA
Max. current output	6 A - 12 VDC
Interface	RS232, 19200, 8, n, 1
EMC compatibility	ISO13766, ISO14982
Environmental compatibility	IEC60068-2-6/27/29
Working temperature	from -40°C to +85°C
Protection degree	IP67 with mating connector attached
Weight	0.3 Kg (0.66 lb)

#### Analog inputs

Number	up to 4
Signal type	0/VK or from 0 to 5 V

#### Digital inputs

Number	up to 6
Signal type	0/VK, from 0 to 50 KHz

#### Proportional outputs

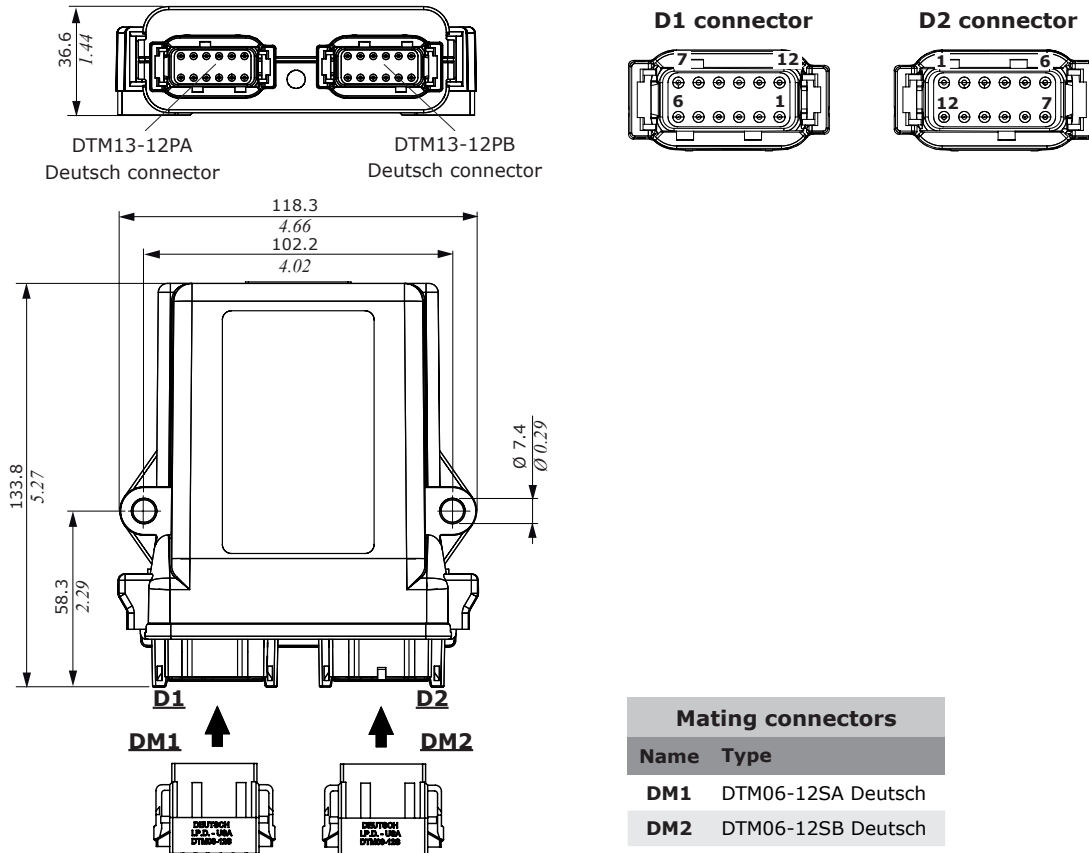
Number	12
Type	8HSD* + 4LSD*
Max. load	2 A

NOTE (\*): HSD - High Side Driver  
LSD - Low Side Driver

# Electronic control units

## CED400W electronic control units

### Dimensions and pin-out



CED Control unit			CAN		Analog input			Digital input	Frequency input	Digital output		Sensor output
Application type	CED pn	WST pn	Port	120R (0.5-4.5V)	0-VK (ratio)	Temp.	0/VK	0/VK	HSD	LSD	5V	
ANALOG	183337025	DCDSW0230005	0	0	4*	4*	0	4**	2**	8	4	0
CANBUS FANDRIVE	183337033	DCDSW0230012	1	0	0	0	4	6**	2**	4	2	1
CANBUS	183337037	DCDSW0230013	1	0	4*	4*	0	2**	2**	8	4	0

NOTE (\*): 0-VK analog inputs are multiplexed with the 0.5-4.5V

(\*\*): The frequency inputs are multiplexed with the digital inputs DI\_1 and DI\_2

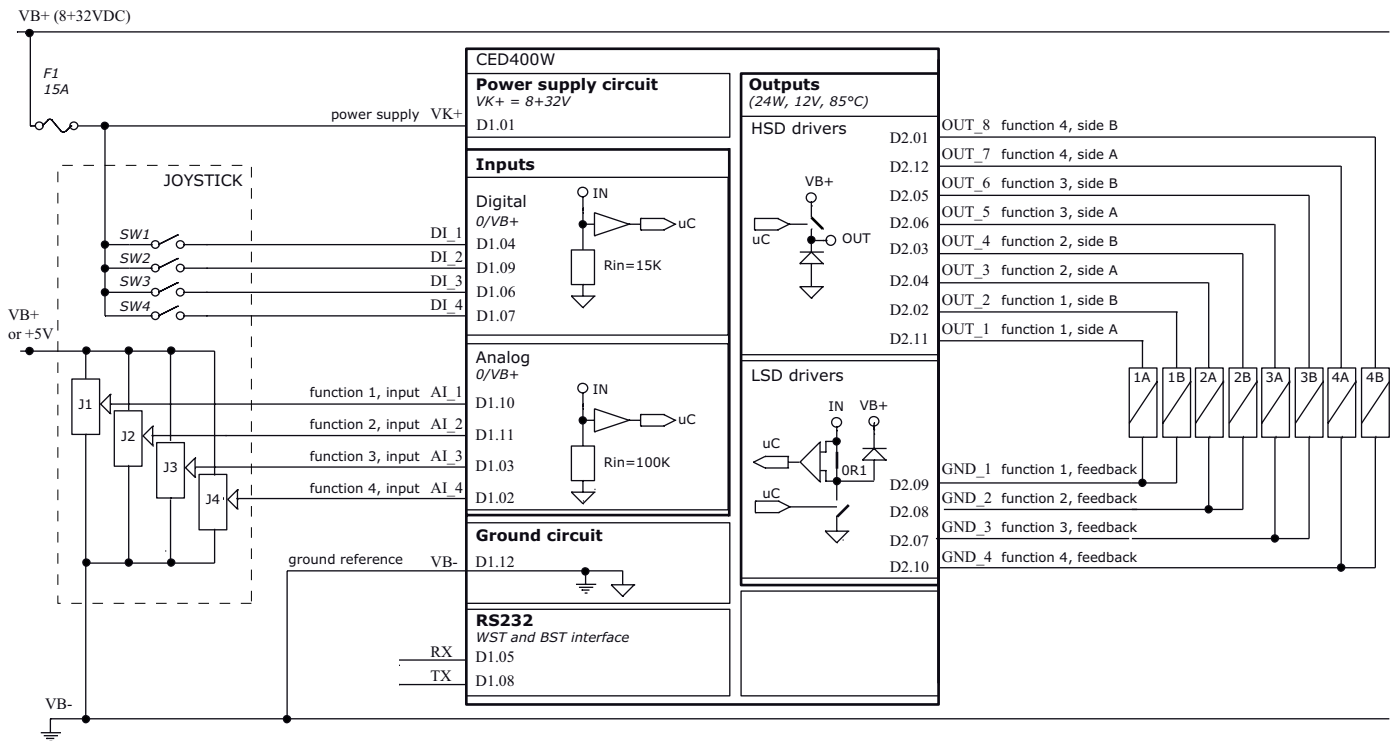
CED400W part numbers	
Description	Code
Programming cable	VCAV600018
PHC studio starter kit	182400021
USB/RS232 adapter USB 2.0 EADA70156	W0420001
USB/CANBUS adapter USB-CAN PEAK - IPEH-002021	W0420003
PHC400F standard harness	183480118
PHC400C standard harness	183480168
Connection cable	YCON140041
	YCON140067
PHC400 load harness	183480203
PHC400 load extension cable (2 m)	183490049
Battery supply cable (4 m Fuse 15A)	W0410005

NOTE : See details in the dedicated chapters



### System diagram

#### Analog circuit configuration for 183337025



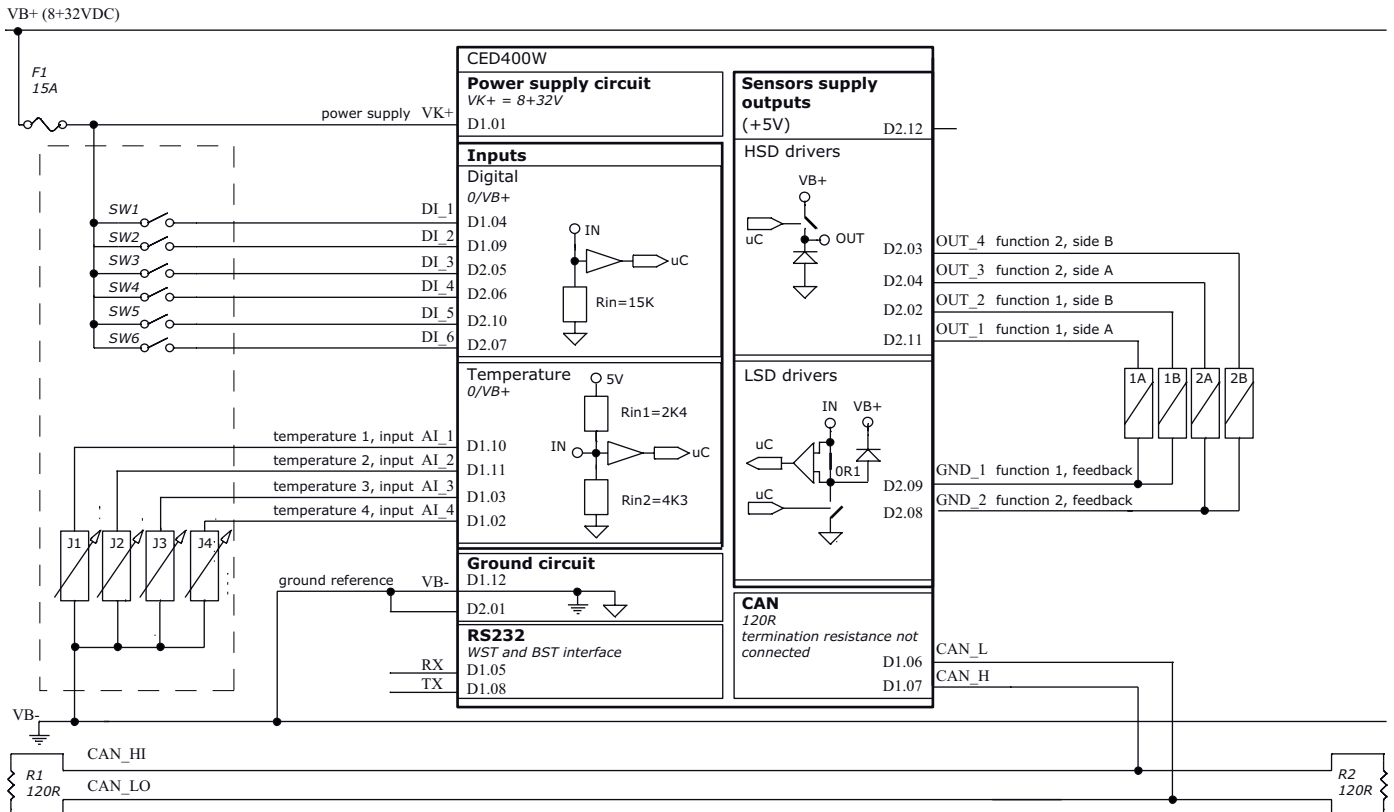
#### Connector PIN-OUT

Pin	function	
	D1 connector	D2 connector
1	VK+	OUT_8
2	AI_4	OUT_2
3	AI_3	OUT_4
4	DI_1	OUT_3
5	RX	OUT_6
6	DI_3	OUT_5
7	DI_4	GND_3
8	TX	GND_2
9	DI_2	GND_1
10	AI_1	GND_4
11	AI_2	OUT_1
12	VB-	OUT_7

## CED400W electronic control units

### System diagram

#### CANbus / Fan Drive circuit configuration for 183337033

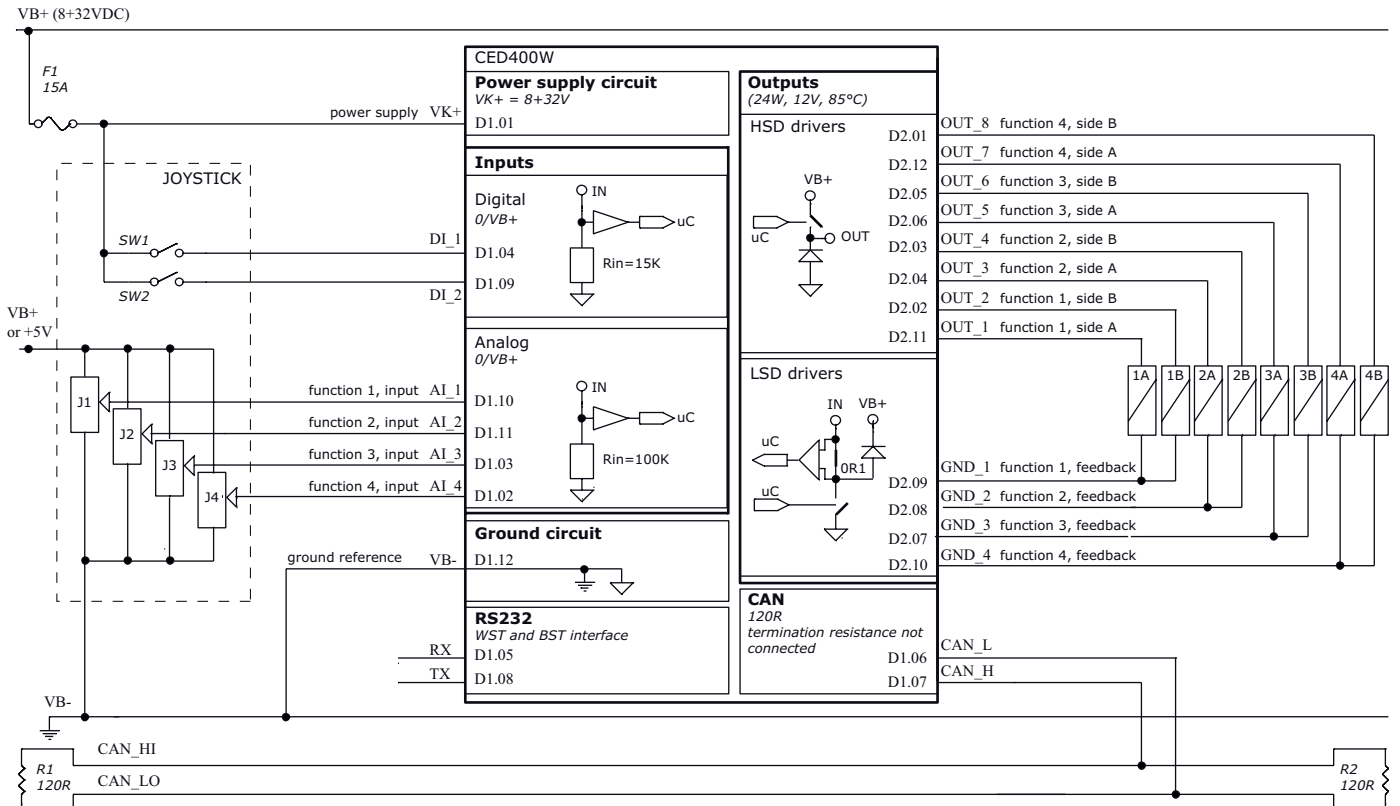


#### Connector PIN-OUT

Pin	function	
	D1 connector	D2 connector
1	VK+	VB-
2	AI_4	OUT_2
3	AI_3	OUT_4
4	DI_1	OUT_3
5	RX	DI_3
6	CAN_L	DI_4
7	CAN_H	DI_6
8	TX	GND_2
9	DI_2	GND_1
10	AI_1	DI_5
11	AI_2	OUT_1
12	VB-	VJ+

### System diagram

#### CANbus circuit configuration for 183337037



#### Connector PIN-OUT

Pin	function	
	D1 connector	D2 connector
1	VK+	OUT_8
2	AI_4	OUT_2
3	AI_3	OUT_4
4	DI_1	OUT_3
5	RX	OUT_6
6	CAN_L	OUT_5
7	CAN_H	GND_3
8	TX	GND_2
9	DI_2	GND_1
10	AI_1	GND_4
11	AI_2	OUT_1
12	VB-	OUT_7



## CED040 electronic control unit



- 12VDC applications
- Designed for PHC electronic systems
- Four digital outputs control (by 4 relays)

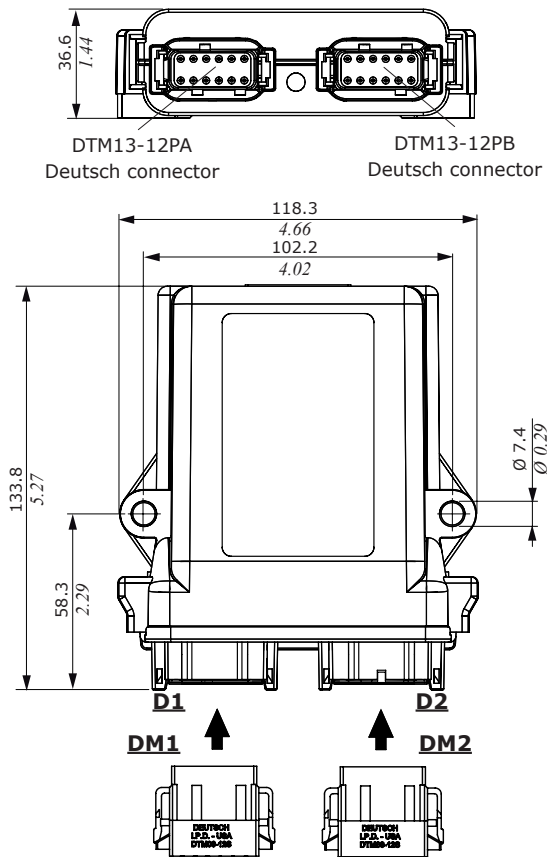
### Working conditions

General features	CED040
Supply voltage	from 9 to 16 V
Current consumption	50 mA (no-load current) 15A (max. supply)
Max current output	15 A (2 output)
Interface	CAN 2.0 A - B
EMC compatibility	150 V/m - ISO13766, ISO14982
Environmental compatibility	IEC60068-2-6/27/29
Working temperature	from -40 to +85°C ( <i>from -40°F to 185°F</i> )
Protection degree	IP67 with mating connector attached
Weight	0.3 Kg ( <i>0.66 lb</i> )
Analog inputs	
Number	3
Signal type	from 0.5 to 4.5 V
Digital inputs	
Number	6
Signal type	0/VB
ON/OFF outputs	
Number	4
Type	relay (HSD*)
Max. load	7.5 A

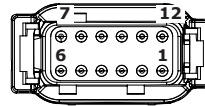
NOTE (\*): HSD - High Side Driver

## CED040 electronic control unit

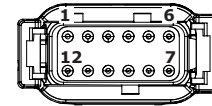
### Dimensions and pin-out



D1 connector



D2 connector



#### Connectors PIN-OUT

Pin	Function	
	D1 connector	D2 connector
1	OUT_1	OUT_L
2	VB-	DI_5
3	CAN_H	DI_1
4	CAN_L	VJ-
5	AI_4	AI_3
6	AI_5	AI_2
7	VK+	AI_1
8	VK+	VJ+
9	OUT_2	DI_2
10	OUT_3	DI_3
11	OUT_4	DI_4
12	OUT_1	DI_6

#### Mating connectors

Name	Type
DM1	DTM06-12SA Deutsch
DM2	DTM06-12SB Deutsch

#### CED040 control unit code

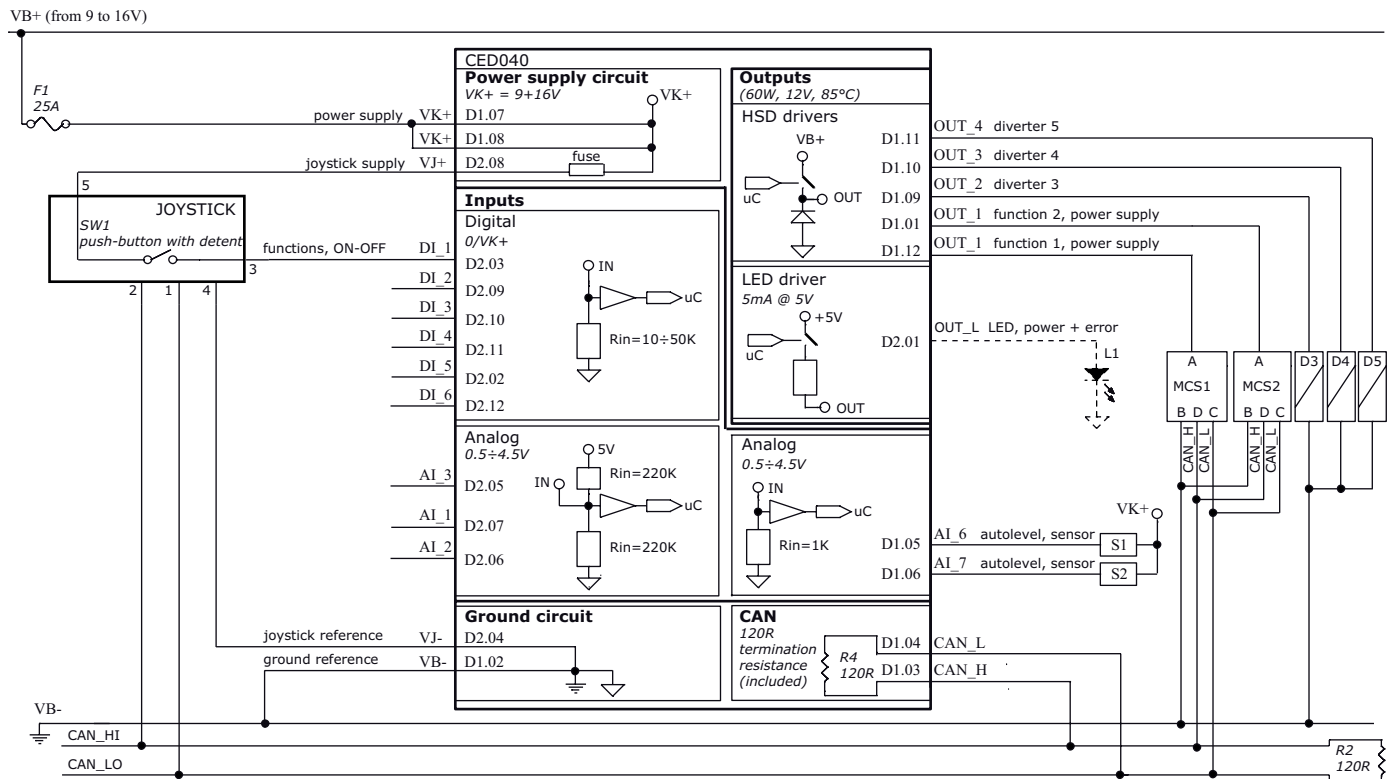
Code	183360010
Description	CED040/PHC250C-12V/v6.00
Notes	Supply voltage 12V, 3 ON-OFF outputs (5A)

### System diagram

#### CED040/PHC250C configuration

The CED040 control unit is dedicated configuration for front loader application, for SDM122/DLM22 series with mechatronic control.

For information, please contact our Sales Department.









## CED160 electronic control unit

- 12VDC applications
- One proportional function control (1 input / 2 outputs)
- Six digital outputs control (through six relays)
- Designed for PHC electronic systems

### Working conditions

#### General features

#### CED160

Supply voltage	from 9 to 16 V
Current consumption	50 mA (no-load current) 15A (max. supply)
Max. current output	7.5 A
Interface	CAN 2.0 A - B, 125-250 Kbit/sec
EMC compatibility	150 V/m - ISO13766, ISO14982
Environmental compatibility	IEC60068-2-6/27/29
Working temperature	from -40 to +85°C (from -40°F to 185°F)
Protection degree	IP67 with mating connector attached
Weight	0.3 Kg (0.66 lb)

#### Analog inputs

Number	3
Signal type	from 0.5 to 4.5 V

#### Digital inputs

Number	6
Signal type	0/VB

#### Proportional outputs

Number	1 couple
Type	HSD*
Signal	PWM
Frequency	from 50 to 300 Hz
Max. load	2 A

#### ON/OFF outputs

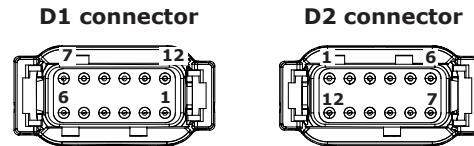
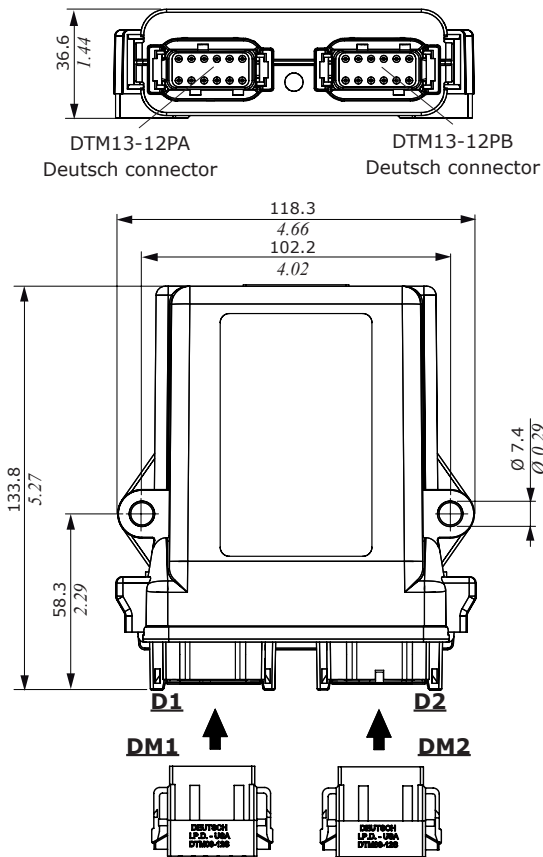
Number	6
Signal type	relay (HSD*)
Max. load	7.5 A

NOTE (\*): HSD - High Side Driver  
LSD - Low Side Driver

# Electronic control units

## CED160 electronic control unit

### Dimensions and pin-out



Connector PIN-OUT		
Pin	Function	
	D1 connector	D2 connector
1	OUT_1	DI_5
2	VB-	DI_6
3	CAN_H	DI_1
4	CAN_L	GND_P
5	OUT_5	AI_3
6	OUT_6	AI_2
7	VK+	AI_1
8	VK+	OUT_B
9	OUT_2	DI_2
10	OUT_3	DI_3
11	OUT_4	DI_4
12	OUT_1	OUT_A

Mating connectors	
Name	Type
DM1	DTM06-12SA Deutsch
DM2	DTM06-12SB Deutsch

#### CED160 control unit code

**Code** 183360008

**Description** CED160/PHC160F-12V/v4.00

**Notes** Supply voltage 12V, 1 prop. function (2 outputs - 2A), 3 ON-OFF functions (6 outputs - 5A)

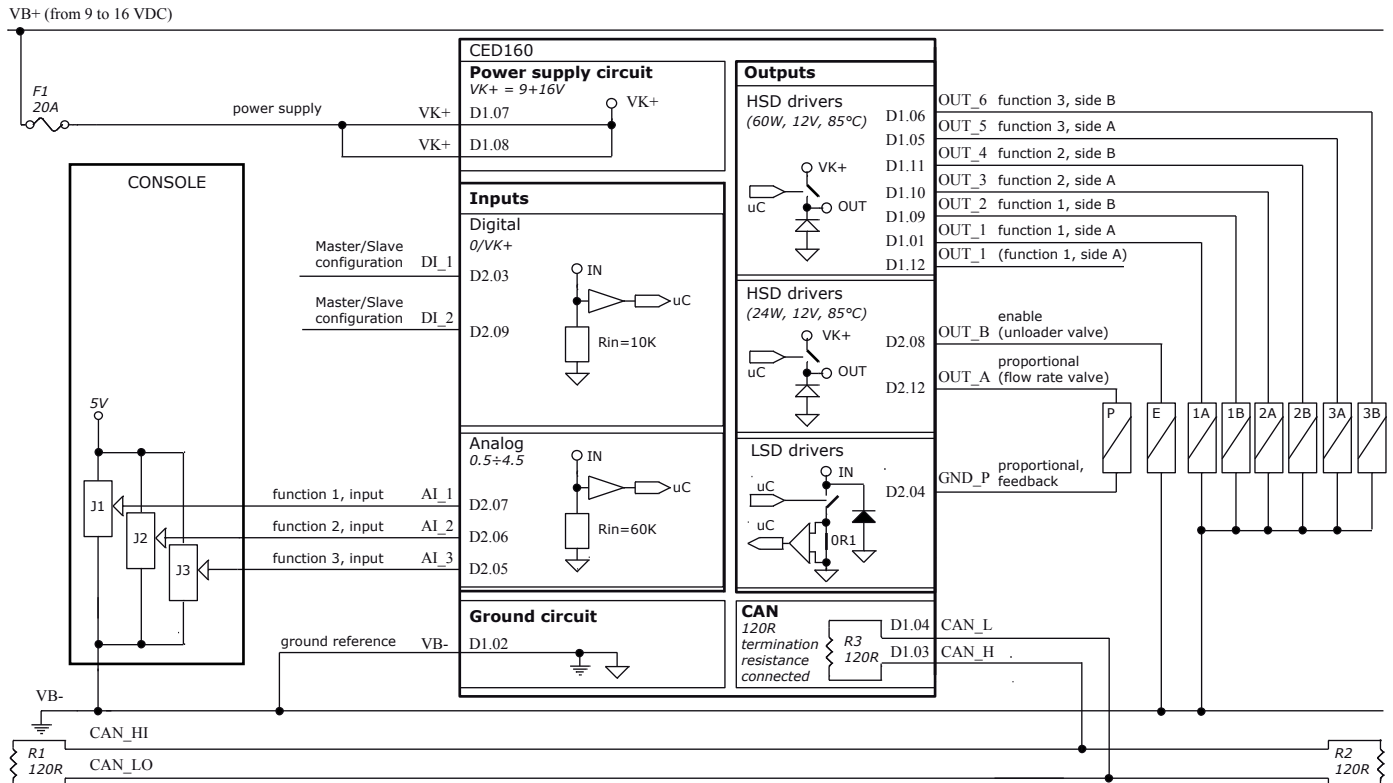
### System diagram

#### Specific circuit configuration

The CED160 control unit is available in dedicated configuration for the SDE series with direct acting solenoid control.

It is possible to configure the system with a maximum of 1 Master controller (1 proportional, 1 unloader and 6 on/off coils) and 3 Slave controllers (6 on/off coils for every controller).

For information, please contact our Sales Department.



**CED configuration**

DI_1	DI_2	CED
GND	GND	CEDA (Master)
VB+	GND	CEDB (Slave1)
GND	VB+	CEDC (Slave2)
VB+	VB+	CEDD (Slave3)





## CED252 electronic control unit

- 12VDC applications
- "Dead man" switch management
- Float function management
- Two proportional function controls (3 inputs / 4 outputs)
- Five digital outputs controls
- Designed for front-end loader applications
- Available with ISOBUS (ISO-11783) standard

### Working conditions

#### General features

#### CED252

Supply voltage	from 9 to 16 V
Current consumption	> 100 mA
Max. current output	21 A - 12 VDC
Interface	RS232, 9600, 8, n, 1 - CAN 2.0 A - B, 125-250 Kbit/sec
EMC compatibility	200 V/m - ISO13766, ISO14982, 2000/2/EC, CE
Environmental compatibility	IEC60068-2-6/27/29
Working temperature	from -40 to +85°C (from -40°F to 185°F)
Protection degree	IP67
Weight	0.8 Kg (1.8 lb)

#### Analog inputs

Number	up to 11
Signal type	up to 6, from 0 to 30 VDC - up to 5, from 0 to 5 VDC

#### Digital inputs

Number	1
Signal type	from 0 to 30 VDC

#### Proportional outputs

Number	5 x HSD
Signal type	PWM - (HSD*)
Frequency	100-150-220 Hz
Max. load	5 x 2A

#### ON/OFF outputs

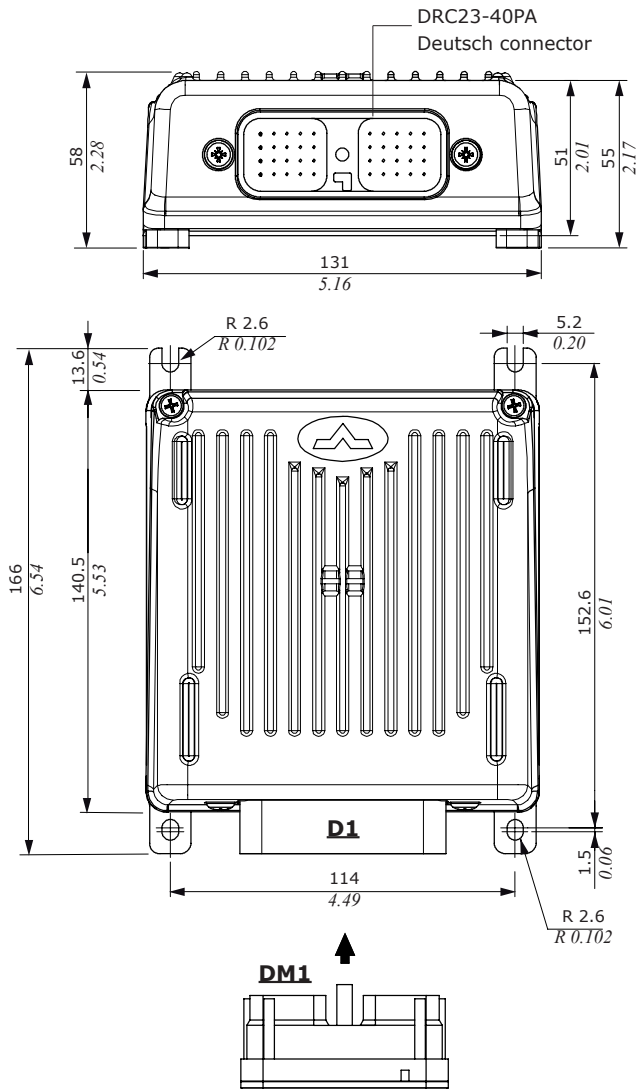
Number	5 x HSD*
Signal type	0/VB
Max. load	5 A

NOTE (\*): HSD - High Side Driver

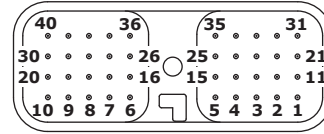
# Electronic control units

## CED252 electronic control unit

### Dimensions and pin-out



### D1 connector



### D connector PIN-OUT

Pin	function	Pin	function	Pin	function	Pin	function
1	OUT_8	11	OUT_7	21	OUT_10	31	OUT_6
2	OUT_9	12	OUT_1	22	OUT_2	32	OUT_3
3	VK+	13	GND_1	23	OUT_5	33	OUT_4
4	VK+	14	VK+	24	GND_2	34	VJ+
5	GND_3	15	VB+	25	VEM+	35	VS+
6	VB-	16	VJ-	26	AI_11	36	AI_1
7	AI_3	17	AI_2	27	AI_8	37	AI_5
8	AI_6	18	AI_7	28	AI_4	38	AI_9
9	AI_10	19	GND	29	RX	39	TX
10	VS-	20	CAN_SH	30	CAN_H	40	CAN_L

### Mating connectors

Name	Type
DM1	DRC26-40SA Deutsch

### CED252 control unit code

Code	183350025
Protocol	SAE J1939
Description	CED252/PHC251C/v4015
Notes	Supply voltage 12V, 2 prop. function (4 outputs - 2A), 3 ON-OFF outputs (5A)

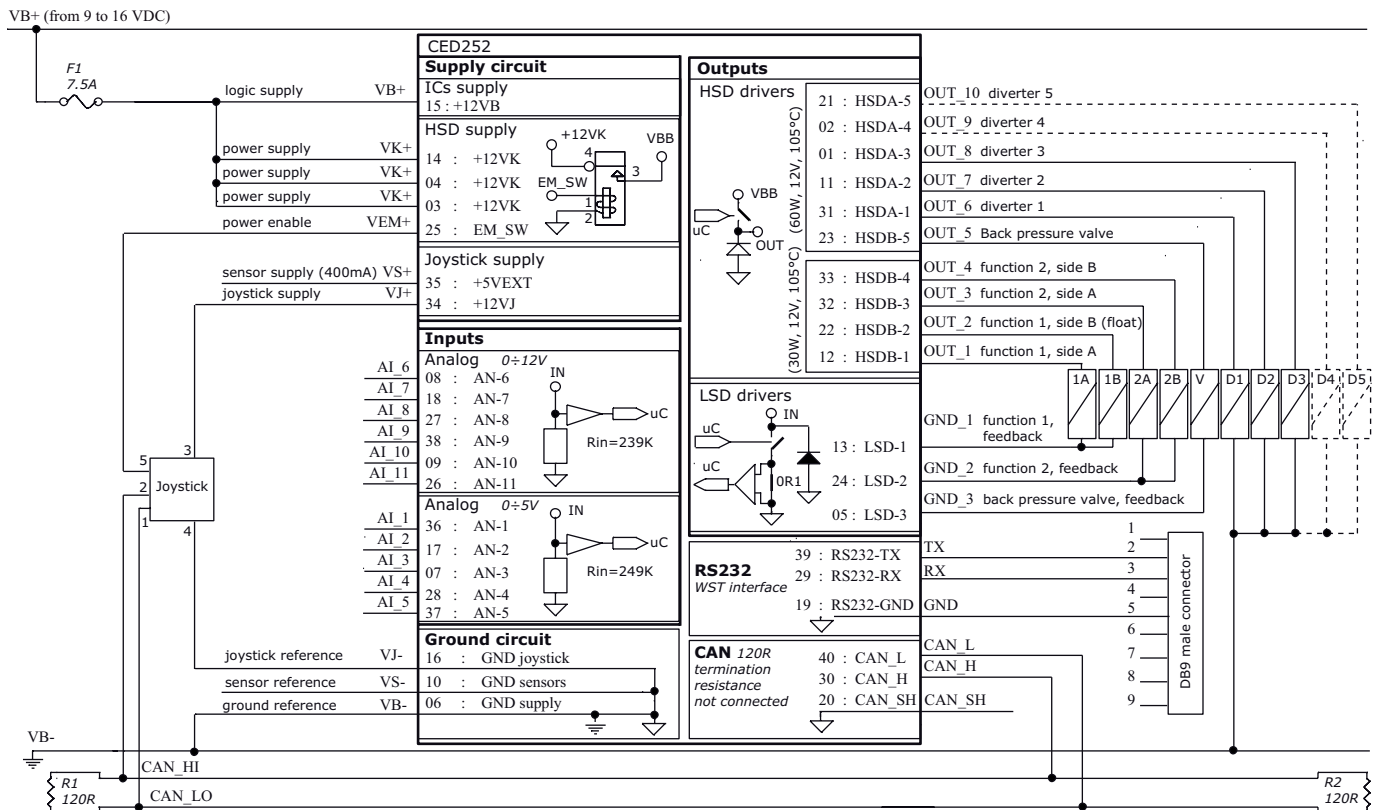
### CED252 control unit code, ISOBUS certification

Code	183350030
Protocol	ISOBUS
Description	CED252/ISOBUS/LOADER/v4033.02
Notes	Supply voltage from 9 to 16V, 5 x HSD* proportional outputs (2A), 5 x HSD* ON-OFF outputs (5A)

NOTE (\*): HSD - High Side Driver

### System diagram

Standard circuit configuration for 183350025.



# Electronic control units

## CED252 electronic control unit

### System diagram

#### ISOBUS circuit configuration for 183350030

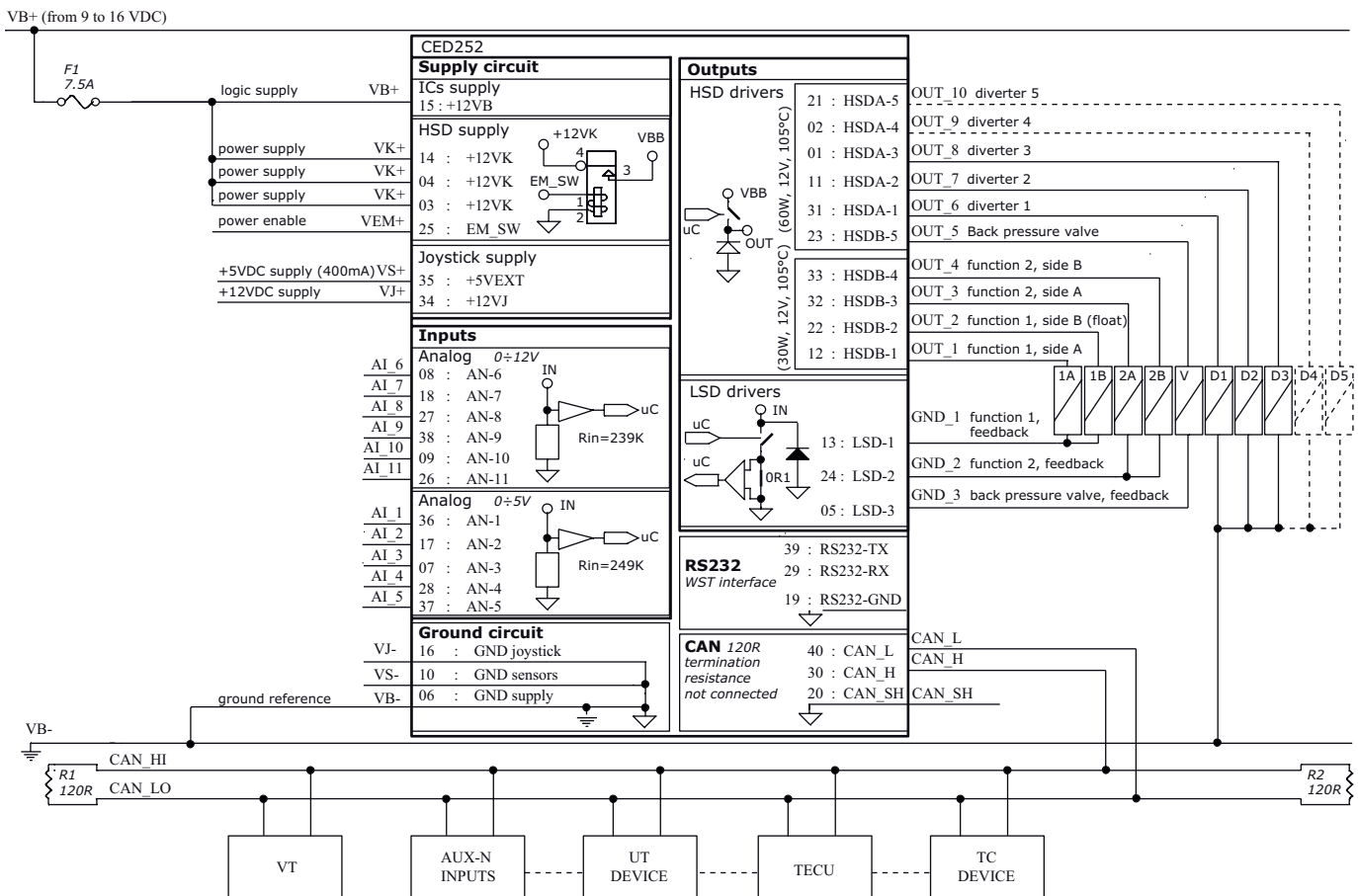
The CED252 electronic control unit is compatible with the Universal Terminal UT (release 2.0) and it is already available on the AEF Database (Agricultural Industry Electronics Foundation).

The CED252 electronic control unit is configured for:

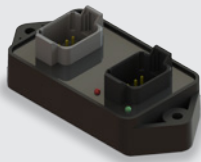
- 3 proportional inputs, Type 3, Analog – return to 50%, Negative/Positive
- 10 on/off inputs Type 2, Non Latching (momentary), Increase value
- 3 pairs proportional outputs, PWM control, with current compensation,
- 6 power 60W outputs, ON/OFF control.

This high number of inputs and outputs makes this unit the ideal controller of any professional Front Loader, implementing the most common and automatic functionalities requested by the application. Thanks to its construction, the unit can be mounted outside of the tractor cabine, directly on the Front Loader attachment.

Being ISOBUS compatible makes it easy to interface the control of the complete loader to the joystick already available inside the tractor cabine, and, eventually, adapt the human-machine interface to the preferences and the characteristics of the operator, reducing his physical and cognitive fatigue. The CED252 electronic control unit can be interfaced to the CJW ISOBUS joystick (see page 14 and 18).







## PVD200 Proportional Valve Driver

- For 12/24V applications
- Designed for PHC electronic systems

The PVD200 is a microprocessor-based PWM driver designed to control 4 proportional solenoid valves (2+2). Delivered in a potted enclosure, the PVD200 provides a flexible I/O configuration in a compact package, specifically designed to resist water, temperature, humidity and high vibrations typical of harsh environments.

The PVD200 can manage input signals coming from switches, rollers, potentiometer and PLC's, both analog and CAN bus. The working parameters (minimum and maximum currents, ramp times, dither) can be easily programmed with a PC and the WST interface.

Other features:

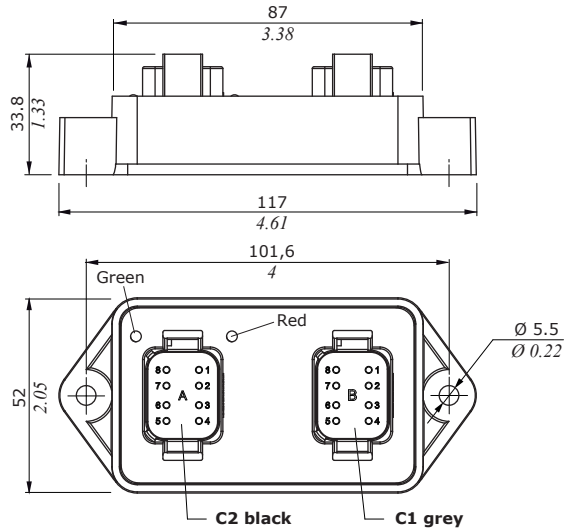
- Solenoid currents measurement (to compensate changes in coil resistance, temperature and supply voltage)
- Programmable Dither frequency (to reduce spool sticking)
- Protected power supply (against reversed polarity and load dump)
- Protected inputs (against short circuits to GND and to power supply)
- Protected outputs (against short circuits to GND and to power supply)

Technical data	
<b>General features</b>	
	<b>PVD200</b>
Supply voltage	from 8 to 32 V
Current consumption (without external load)	<50 mA
Max. current output	4 A - 12 VDC
EMC Compatibility	ISO13766, ISO14982
Working temperature	from -40 to +85°C
Protection degree	IP67-IP69K with mating connector fitted
Output connector	Deutsch DT0408PA - Amphenol AT0408PA
Input connector	Deutsch DT0408PB - Amphenol AT0408PB
<b>Analog inputs</b>	
Number	up to 4
Signal type	2 types F: 0.5-4.5 V / 2 types P: 25%-75% V <sub>bb</sub>
<b>Communication port</b>	
CAN bus 2.0B port	
<b>Proportional outputs</b>	
Number	4 (2 pairs)
Type	4HSD + 2LSD*
Signal	PWM on HSD*
Dither frequency	From 50Hz to 300Hz
Max. load per channel	2A
<b>Other outputs</b>	
2 led for status indication	
1 output	5V@50mA max.

NOTE (\*): HSD - High Side Driver / LSD - Low Side Driver

## PVD200 proportional valve driver

### Dimensions and features



#### Mating connectors

Name	Type
<b>C1</b>	DT06-08SA Deutsch or AT06-08SA Amphenol
<b>C2</b>	DT06-08SB Deutsch or AT06-08SB Amphenol

#### LED diagnostic

	ON	OFF	Blink
<b>Green</b>	controller on	controller off	-
<b>Red</b>	-	Normal working	Error state (see WST)

PVD Valve driver			CAN		Analog input			Digital input		Frequency input	Digital output		Sensor output
Application type	Controller pn	WST pn	Port	120R (0.5-4.5V)	0-VK (ratio)	Temp.	0/5V	0/VK	0/VK	HSD	LSD	5V	
ANALOG	183380008	DCDSW0240007	1	0	4*	2**	0	2*	2**	0	4	2	1

NOTES (\*): 0.5-4.5V analog inputs with neutral reference and multiplexed with the 0/5V digital inputs.

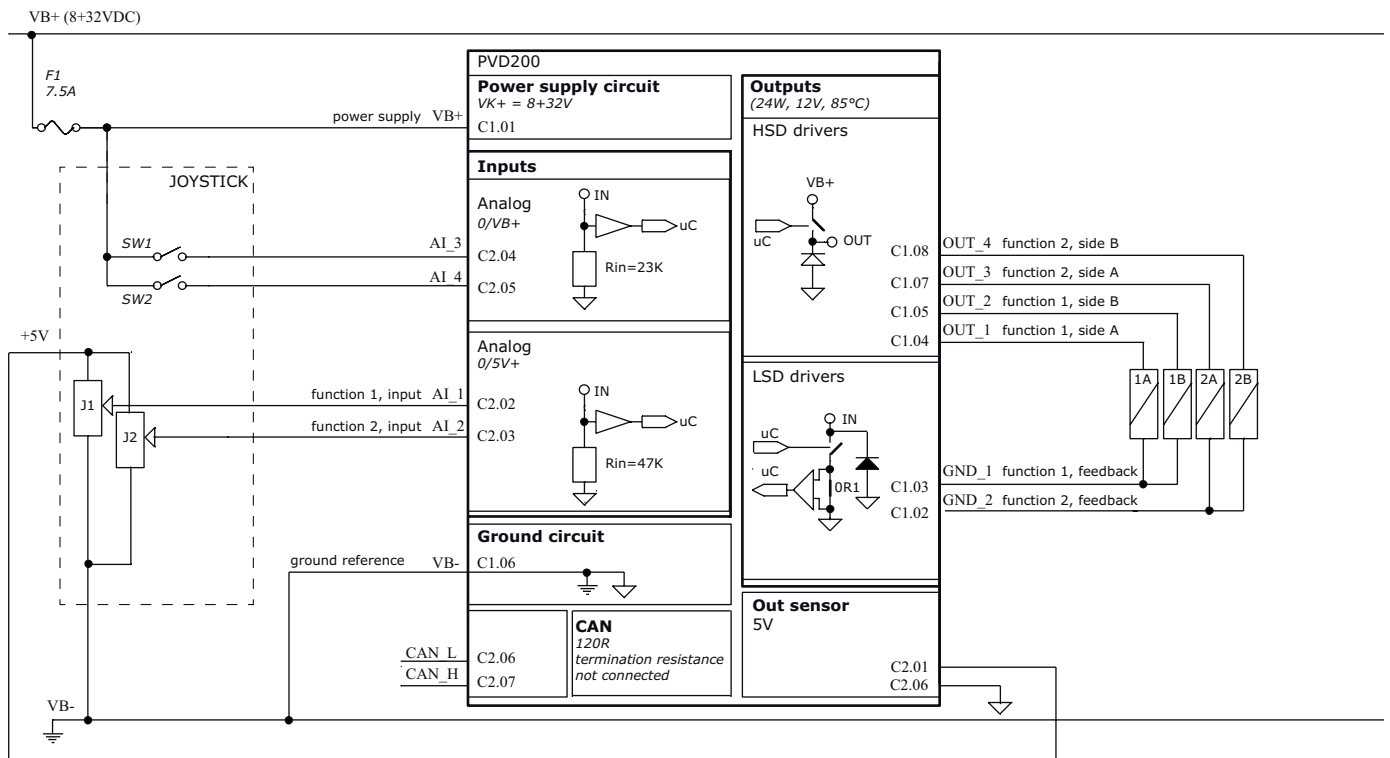
(\*\*): 0-VK analog inputs are multiplexed with the 0/VK digital inputs.

#### PVD200 part numbers

Description	Code
Programming cable	VCAV600024
Connection cable	YCON140081
	YCON140082
USB/CANBUS adapter USB-CAN PEAK - IPEH-002021	W0420003
Battery supply cable (4 m Fuse 15A)	W0410005

NOTE : See details in the dedicated chapters

### System diagram



### Connector PIN-OUT

Pin	function	
	C1 connector	C2 connector
1	VB+	Vcc (+5V) sensor supply
2	GND_2	AI-1 (0-5V analog input/digital input)
3	GND_1	AI-2 (0-5V analog input/digital input)
4	OUT_1	AI-3 (0-Vbb analog input/digital input)
5	OUT_2	AI-4 (0-Vbb analog input/digital input)
6	VB-	CAN_L
7	OUT_3	CAN_H
8	OUT_4	GND sensor supply





## Software & tools

- Standard application
- Custom application

### **Standard application**

The Standard Application Logic made by Walvoil is loaded as default in the controller. The customer can calibrate and configure the application parameters with the Walvoil Service Tools (WST).

### **Custom application**

The Customer can create his own application logic with the PHC Studio tool. It is also possible to use the Walvoil Service Tool (WST) to calibrate and configure the application parameters.

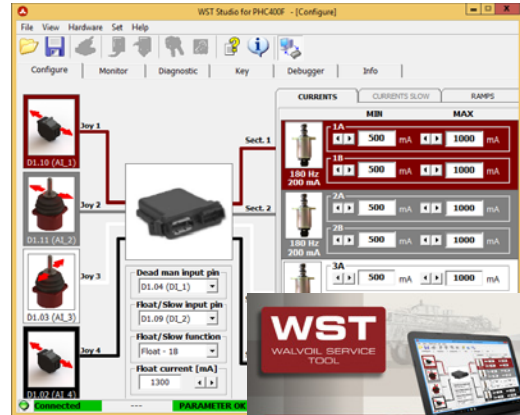
## Software & tools

### WST Walvoil Service Tools for standard application



With the WST Studio is possible:

- Configure the inputs of the system
  - Input type
  - Input logic
  - Pinout
- Customize the Working Parameters
  - Output current for every section
  - Output dither
  - Operator presence
  - Slow function
  - Float function
  - Ramp function
- Real Time I/O signals monitoring
- In-field system diagnostic
- Lock/unlock the control unit



### PHC Studio



#### Integrated Development Environment (IDE)

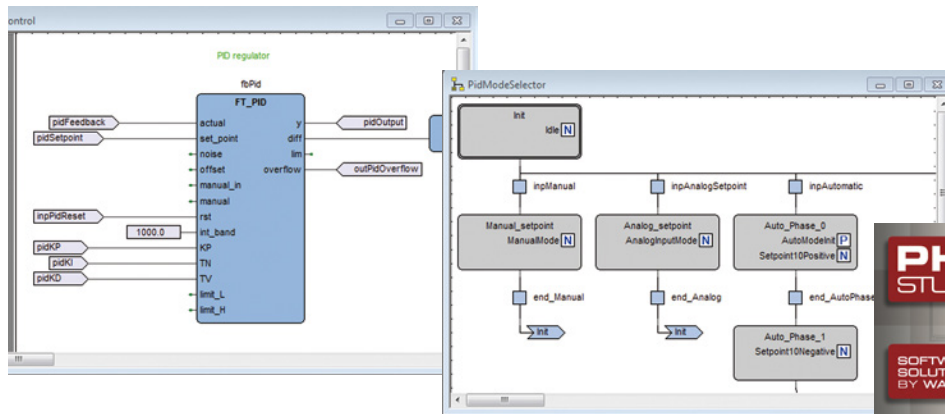
PHC Studio is an Integrated Development Environment (IDE) to develop and download into the CED400W electronic control unit the:

- Custom application logics
- Working parameters

PHC Studio allow to have the complete control of the application, either hydraulic that electronic.

#### Standard programming languages

- Compliance with all the 5 programming languages of the IEC 61131-3 PLC Standard



### Starter Kit

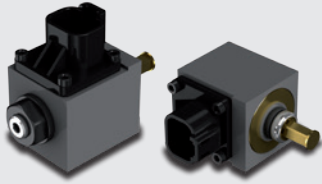
To start to work with PHC STUDIO Development Tool is available a Starter Kit with the following part number:

- USB card with documentation and tutorial
- ECU CED400W/PHC STUDIO/PHC400C (p.n. 183337037)
- RS232 to USB serial converter (p.n. W0420001)
- Wiring harness
- Roller ARW
- Push button
- Green LED



Starter Kit	
Code	Description
182400021	Starter Kit x CED400W CAN

## Hall effect spool position sensors



- SPSD type
- SPSL type

### Spool position sensors

Accuracy, reliability and repeatability are the main features of Walvoil position sensors.

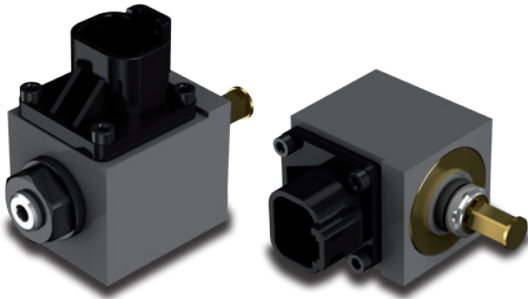
Converts the spool movements into an electric digital signal or into a voltage linear signal.

Working conditions	SPSD	SPSD-S	SPSL	SPSL-S
Voltage supply	from 9 to 32 VDC		from 9 to 32 VDC or 5 VDC	
Current absorption	< 10 mA (no load)		< 10 mA (no load)	
Mechanical life	3x10 <sup>6</sup>		3x10 <sup>6</sup>	
Connector type	DT04-4P Deutsch		DT04-4P Deutsch	
Weather protection	IP67 / IPX9K		IP67 / IPX9K	
Working temperature	from -40°C to 105°C ( <i>from -40°F to 221°F</i> )		from -40°C to 105°C ( <i>from -40°F to 221°F</i> )	
Working pressure	350 bar ( <i>5100 psi</i> )		350 bar ( <i>5100 psi</i> )	
Max. electrical stroke	±10 mm ( <i>±0.39 in</i> )	±5.5 mm ( <i>±0.22 in</i> )	±10 mm ( <i>±0.39 in</i> )	±5.5 mm ( <i>±0.22 in</i> )
Max. mechanical stroke	±10 mm ( <i>±0.39 in</i> )	±5.5 mm ( <i>±0.22 in</i> )	±10 mm ( <i>±0.39 in</i> )	±5.5 mm ( <i>±0.22 in</i> )
EMC compatibility	ISO 13766 / ISO 14982		ISO 13766 / ISO 14982	
Mechanical vibrations, shock, bumps	IEC 68-2-6,-27,-29		IEC 68-2-6,-27,-29	
Output signal	PNP		/	
type	PNP		/	
max. current	6 mA		/	
range	/		from 0.5 to 4.5 V	
linearity	/		± 5%	
spool in neutral	/		2.5 ± 0.2 V	
max. current	/		1 mA	

# Spool position sensors

## Hall effect spool position sensors

### SPSD type



The SPSPD position sensor converts the spool movements into an electric digital signal.

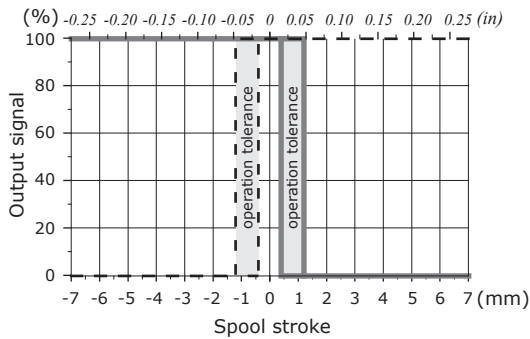
Main features are:

- contactless technology guarantees a long mechanical life;
- available for the complete range of valves.

Typical applications:

- cranes
- telehandlers
- aerial platforms
- front-end loaders (mid-mount)

Output signal (SPSD example) vs. spool stroke



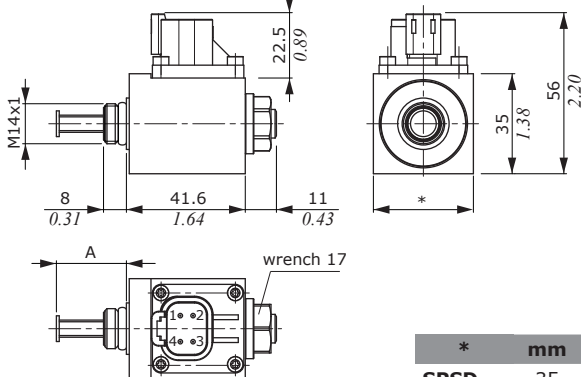
— out A  
- - - out B

### SPSL ordering codes

Code	Description	Electrical stroke	Mechanical stroke	Supply
5SE210021D01	SPSD/M1021/PNP/D4P/v1.0	±10 mm (±0.39 in)	±10 mm (±0.39 in)	from 8 to 32 V
5SE310021D01	SPSD-S/M1021/PNP/D4P/V1.0	±10 mm (±0.39 in)	±10 mm (±0.39 in)	from 8 to 32 V

### Mating connector

Code	Type
5CON140072	DT06-4S Deutsch



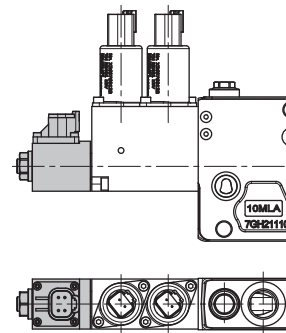
A = feeler neutral position.  
As for the sensor model, the dimension can be 16 or 21.5 mm (0.63 or 0.85 in)

	* mm	in
SPSD	35	1.38
SPSD-S	31	1.22

### Connector PIN-OUT

Pin	Functions
1	Out A
2	GND
3	VB+
4	Out B

### Example of sensor in 8EZ control with DPX100 working section

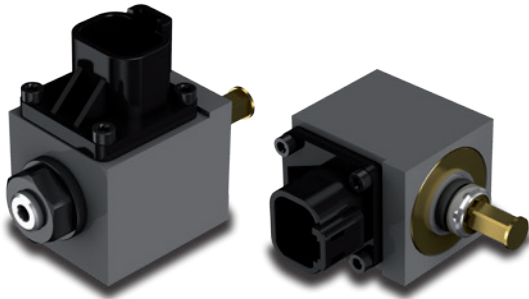


**IMPORTANT:** It is suggested to order the sensors through the controls assembled on the monoblock and sectional valves.

These controls, in different configurations, are available on the full range of Walvoil directional valves.



### SPSL type



The SPSL position sensor converts the spool movements into a linear voltage signal.

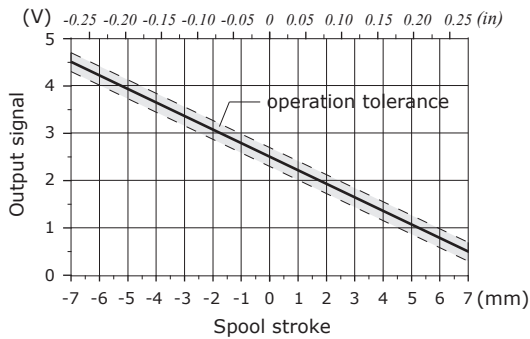
Main features are:

- contactless technology guarantees a long mechanical life;
- available for the complete range of valves.

Typical applications:

- cranes
- telehandlers
- aerial platforms
- front-end loaders (mid-mount)

**Output signal (SPSL example) vs. spool stroke**

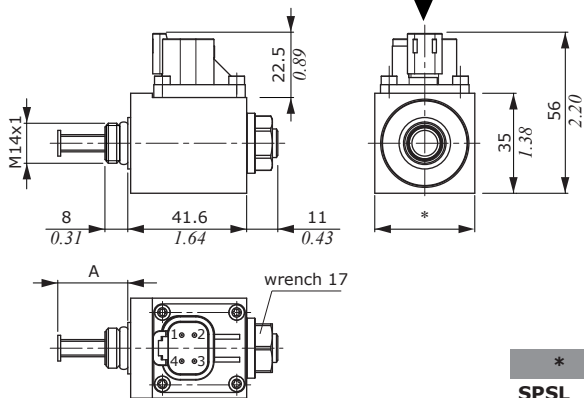
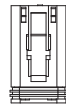


### SPSL ordering codes

Code	Description	Electrical stroke	Mechanical stroke	Supply
5SE221021D01	SPSL/0.5(OUT)-4.5(IN)-CR10	±10 mm (±0.39 in)	±10 mm (±0.39 in)	5 V
5SE225516D01	SPSL/0.5(OUT)-4.5(IN)-CR5.5	±5.5 mm (±0.22 in)	±10 mm (±0.39 in)	5 V
5SE226516D01	SPSL/0.5(OUT)-4.5(IN)-CR6.5	±6.5 mm (±0.26 in)	±6.5 mm (±0.26 in)	5 V
5SE227021D01	SPSL/0.5(OUT)-4.5(IN)-CR7	±7 mm (±0.27 in)	±10 mm (±0.39 in)	5 V
5SE228021D01	SPSL/0.5(OUT)-4.5(IN)-CR8	±8 mm (±0.31 in)	±10 mm (±0.39 in)	5 V
5SE236521D01	SPSL/8-32V/0.5(OUT)-4.5(IN)	±6.5 mm (±0.26 in)	±10 mm (±0.39 in)	from 8 to 32 V
5SE325521D01	SPSL-S/0.5(OUT)-4.5(IN)-CR5.5	±5.5 mm (±0.22 in)	±10 mm (±0.39 in)	5 V

### Mating connector

Code	Type
5CON140072	DT06-4S Deutsch



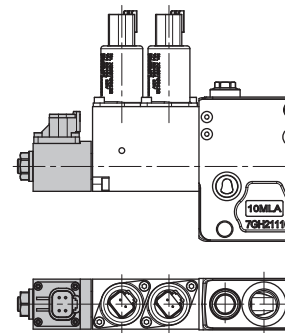
A = feeler neutral position.  
As for the sensor model, the dimension can be 16 or 21.5 mm (0.63 or 0.85 in)

*	mm	in
SPSL	35	1.38
SPSL-S	31	1.22

### Connector PIN-OUT

Pin	Functions	
	5V supply	8-32V supply
1	+ 5V	signal OUT
2	not connected	GND
3	GND	VB+
4	signal OUT	not connected

### Example of sensor in 8EZ control with DPX100 working section



**IMPORTANT:** It is suggested to order the sensors through the controls assembled on the monoblock and sectional valves.

These controls, in different configurations, are available on the full range of Walvoil directional valves.



## Mechanical spool position switches



- wide output current range (10 mA to 5A);
- heavy duty construction, corrosion resistant;
- long mechanical life ( $10^6$  cycles).

Precision ball switch for spool direction and neutral position detection, with NO and NC circuits in single and redundant configuration.

This switch is available on wide ranges of valves.

Working conditions		8MG
Voltage rating		from 5 to 24 VDC
Current rating		from 10 mA to 5A
Electrical life		$5 \times 10^5$
Mechanical life		$10^6$
Connector type	integrated	Packard Weather-Pack
	with flying leads	Packard Weather-Pack Deutsch DT series - AMP Superseal
Weather protection		IP67
Working temperature		from $-40^{\circ}\text{C}$ to $120^{\circ}\text{C}$ (from $-40^{\circ}\text{F}$ to $248^{\circ}\text{F}$ )

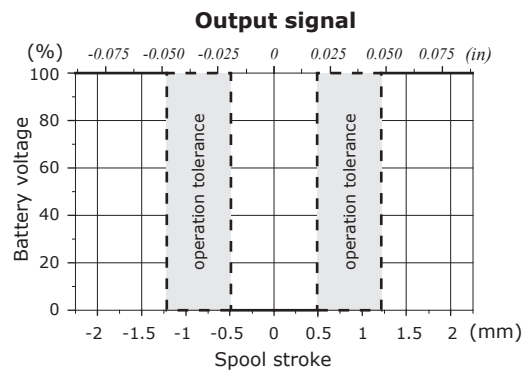
# Spool position sensors

## Mechanical spool position switches

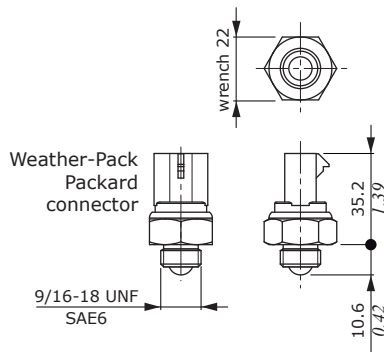
### 8MG type



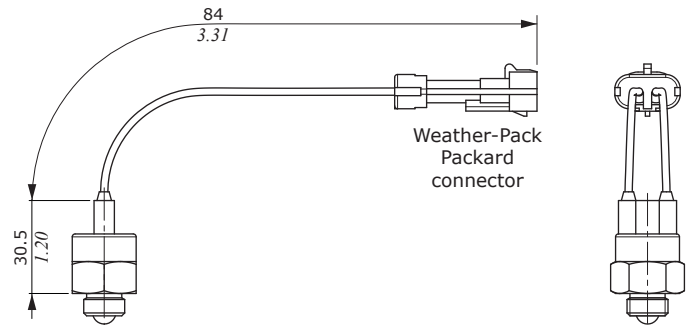
**IMPORTANT:** It is suggested to order the sensors through the controls assembled on the monoblock and sectional valves. These controls, in different configurations, are available on the full range of Walvoil directional valves.



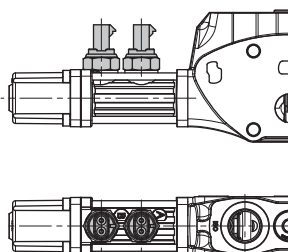
#### Sensor with integrated connector



#### Sensor with connector and flying leads



#### Example of sensor in 8MG control with SD8 working section





## Harnesses

- Dedicated to predefined PHC systems
- Power-line connection with fuse protection
- Suitable for static or fixed installation

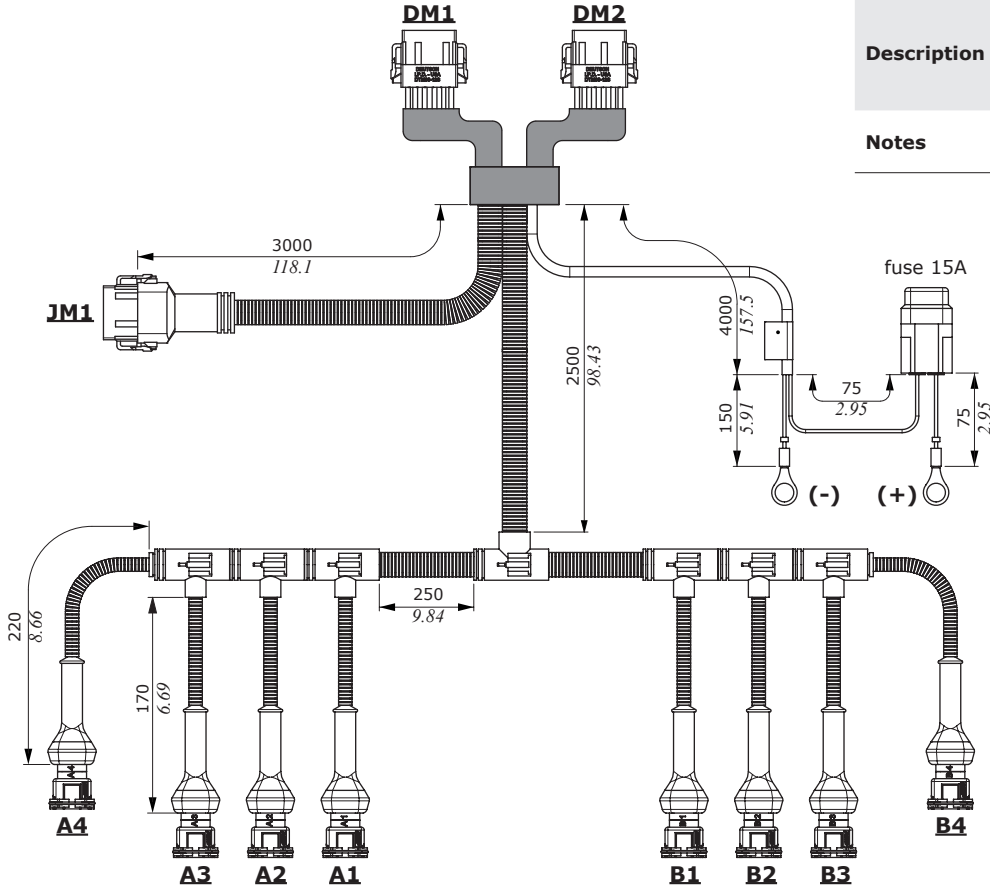
### Working conditions

#### General features

Working temperature		from -30°C to 105°C ( <i>from -22°F to 221°F</i> )
Working features		fixed laying, motor, agricultural and civil environment
Electrical insulation	rule	CEI 20-11, R3 type
	directive	2000/53/CE
Conductor section		DIN 72551-6, A and B type
Max. load current (continuative)	AWG22	up to 1 A
	AWG20	up to 2.5 A
	AWG17	up to 5 A
	AWG15	up to 10 A
	AWG13	up to 20 A

## KCD04-PHC400F

### Dimensions and wiring



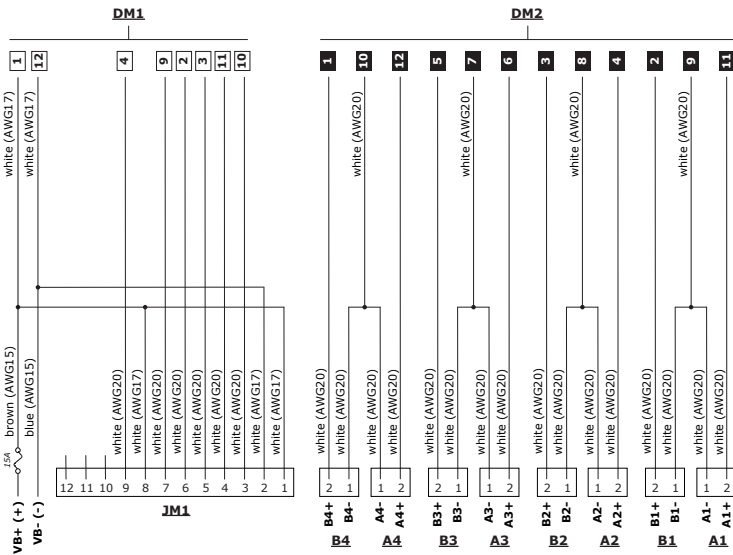
#### KCD04-PHC400F harness

**Code** 183480118

**Description** KCD04/(D2M12-D2M12)-01D2M12300(TC)-02(4)T1F02300(TC)-03(4)T102300(TC)-AU1F15400(TC)

**Notes** AJW and CED400W connection, for 4 proportional functions

#### Electrical wiring



#### Connector types

ID	Connection to	Type
DM1	CED	DTM06-12SA Deutsch
DM2	CED	DTM06-12SB Deutsch
JM1	Joystick	DTM06-12SA Deutsch
A1 to B4	proportional solenoid valves	AMP JPT, 2 poles

#### Connector PIN-OUT

Pin	DM1 connector		DM2 connector		JM1 conn. Function
	Name	Function	Name	Function	
1	VB+	VB+	OUT_8	B4+	VJ+
2	AI_4	joystick 4	OUT_2	B1+	VJ-
3	AI_3	joystick 3	OUT_4	B2+	joystick 1
4	DI_1	dead man	OUT_3	A2+	joystick 2
5	plugged	plugged	OUT_6	B3+	joystick 3
6	plugged	plugged	OUT_5	A3+	joystick 4
7	plugged	plugged	GND_3	A3- / B3-	float
8	plugged	plugged	GND_2	A2- / B2-	VJ+
9	DI_2	float	GND_1	A1- / B1-	dead man
10	AI_1	joystick 1	GND_4	A4- / B4-	plugged
11	AI_2	joystick 2	OUT_1	A1+	plugged
12	VB-	VB-	OUT_7	A4+	plugged

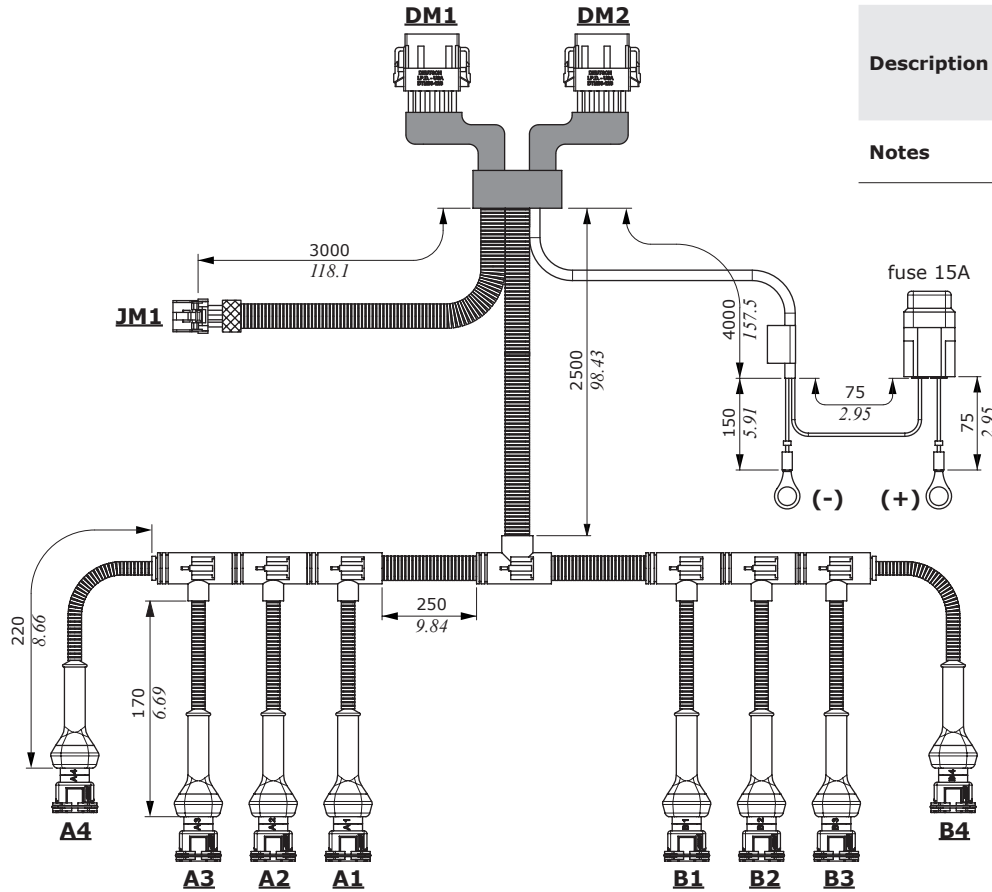
### Dimensions and wiring

#### KCD04-PHC400C harness

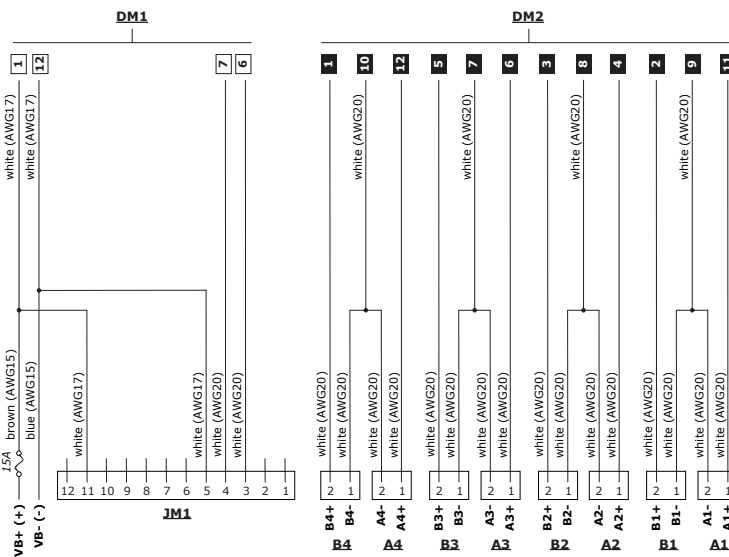
**Code** 183480168

**Description** KCD04/(D2M12-D2M12)-01A8M12300(TC)-02(4)T1F02300(TC)-03(4)T102300(TC)-AU1F15400(TC)

**Notes** CJW and CED400W connection, for 4 proportional functions



#### Electrical wiring



#### Connector types

ID	Connection to	Type
DM1	CED	DTM06-12SA Deutsch
DM2	CED	DTM06-12SB Deutsch
JM1	Joystick	Multilock Series 040 Tyco, 12 poles
A1 - B4	Proportional solenoid valves	JPT AMP, 2 poles

#### Connector PIN-OUT

Pin	DM1 connector		DM2 connector		JM1 con.
	Name	Function	Name	Function	Function
1	VB+	VB+	OUT_8	B4+	not conn.
2	plugged	plugged	OUT_2	B1+	not conn.
3	plugged	plugged	OUT_4	B2+	CAN_L
4	plugged	plugged	OUT_3	A2+	CAN_H
5	plugged	plugged	OUT_6	B3+	VJ-
6	CAN_L	CAN_L	OUT_5	A3+	not conn.
7	CAN_H	CAN_H	GND_3	A3- / B3-	not conn.
8	plugged	plugged	GND_2	A2- / B2-	not conn.
9	plugged	plugged	GND_1	A1- / B1-	not conn.
10	plugged	plugged	GND_4	A4- / B4-	not conn.
11	plugged	plugged	OUT_1	A1+	VJ+
12	VB-	VB-	OUT_7	A4+	not conn.

## KCD02-PHC400

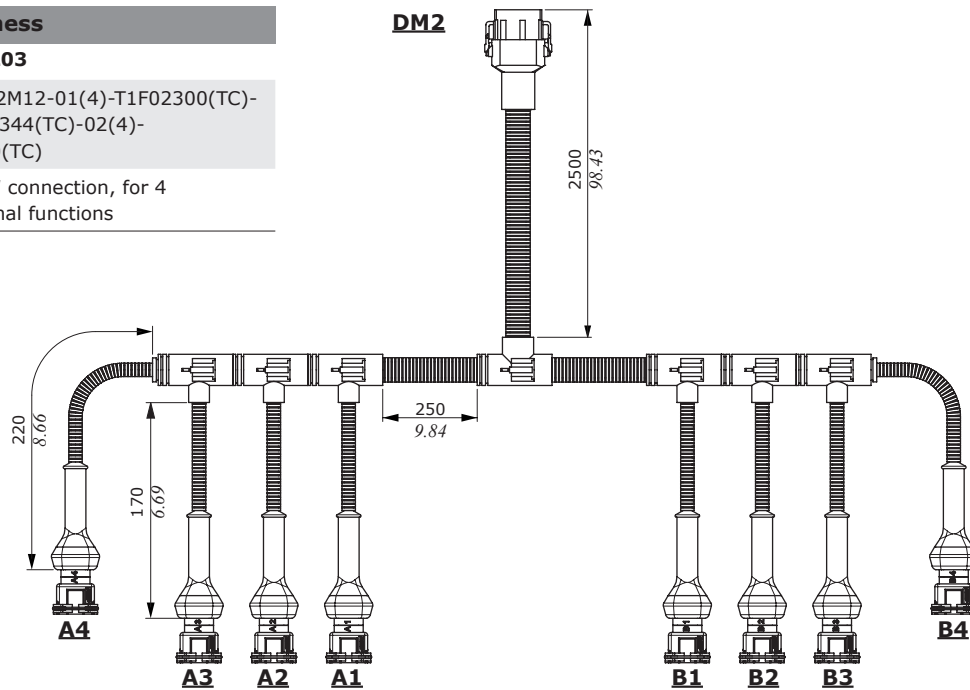
### Dimensions and wiring

#### KCD02-PHC400 harness

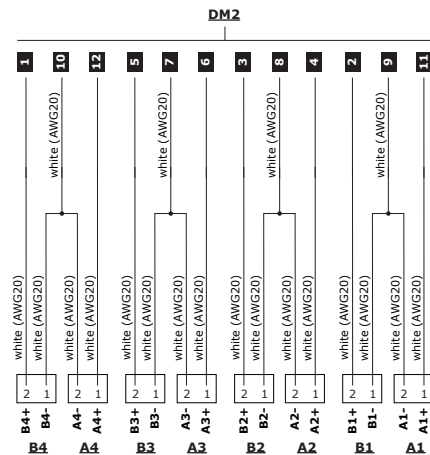
**Code** 183480203

**Description** KCD02/D2M12-01(4)-T1F02300(TC)-03M2M04344(TC)-02(4)-T1F02300(TC)

**Notes** CED400W connection, for 4 proportional functions



### Electrical wiring

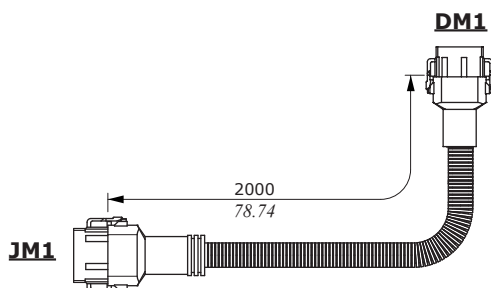


Connectors		
Name	Connection to	Type
DM2	CED	DTM06-12SB Deutsch
A1 - B4	Proportional solenoid valves	AMP JPT, 2 poles

PIN-OUT connectors		
Pin	Connector DM2	
	Nome	Function
1	OUT_8	B4+
2	OUT_2	B1+
3	OUT_4	B2+
4	OUT_3	A2+
5	OUT_6	B3+
6	OUT_5	A3+
7	GND_3	A3- / B3-
8	GND_2	A2- / B2-
9	GND_1	A1- / B1-
10	GND_4	A4- / B4-
11	OUT_1	A1+
12	OUT_7	A4+

## PHC400 load extension cable

### Dimensions and features



Connectors		
Name	Connection to	Type
DM1	CED	DTM06-12SB Deutsch
JM1	joystick	DTM06-12SB Deutsch

#### Load extension cable harnesses

**Code** 183490049

**Description** D2F12-D2M12 L=2000

**Notes** CED400W connection



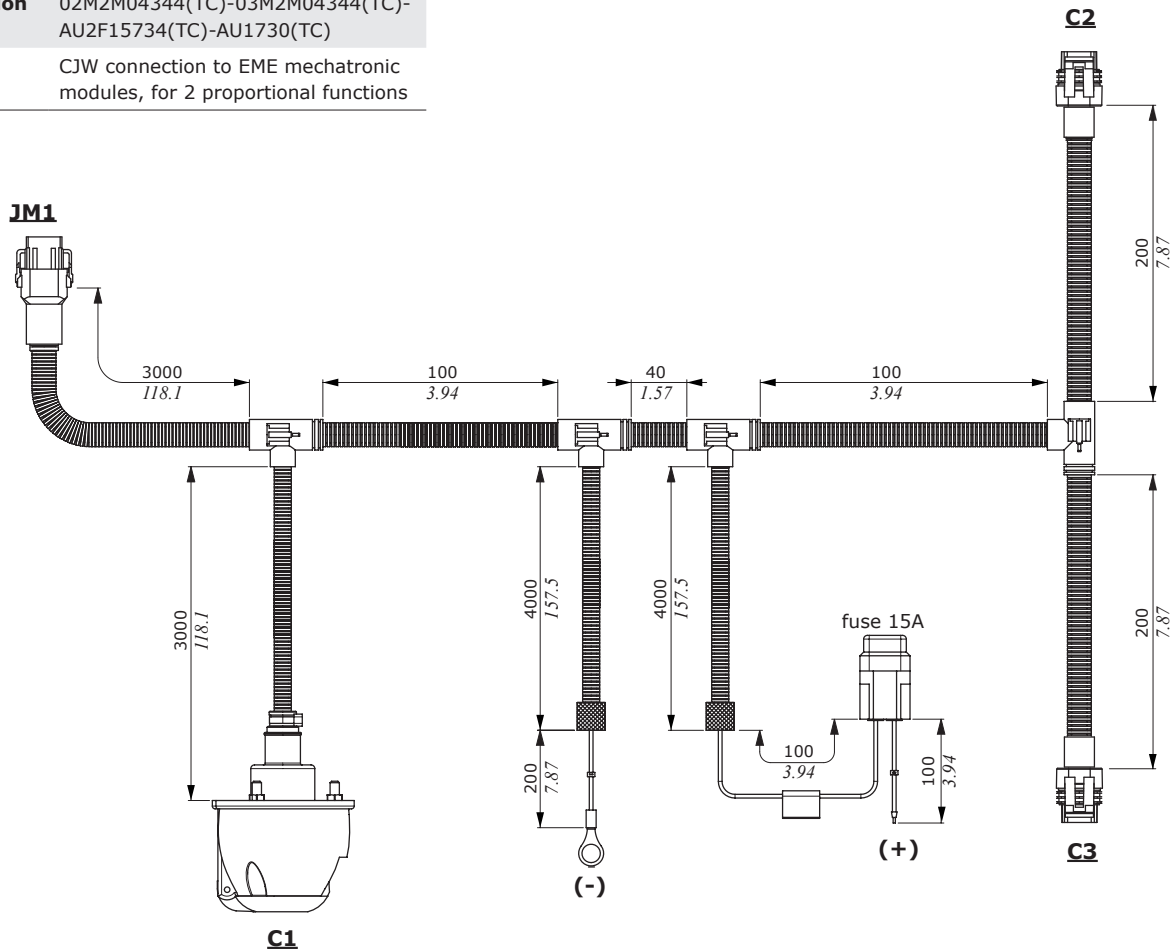
### Dimensions and wiring

#### KCD05-PHC220C harness

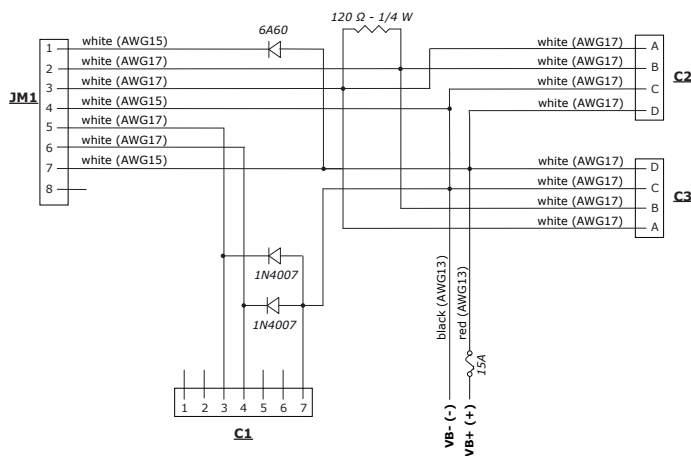
**Code** 183480165

**Description** KCD05/D2M06-01CCF07600(TC)-  
02M2M04344(TC)-03M2M04344(TC)-  
AU2F15734(TC)-AU1730(TC)

**Notes** CJW connection to EME mechatronic  
modules, for 2 proportional functions



#### Electrical wiring



#### Connector types

ID	Connection to	Type
C1	ON/OFF valves	8JB001941002 Hella
JM1	Joystick	DTM06-8S Deutsch
C2+C3	Mechatronic modules	M-PACK150_2 Packard, 4 poles

#### Connectors PIN-OUT

Pin	Functions		
	C1 conn.	JM1 conn.	C2+C3 conn.
1	not connected	VJ+	CAN_H
2	not connected	CAN_L	CAN_L
3	ON-OFF 3	CAN_H	VB-
4	ON-OFF 4	VB-	VB+
5	plugged	ON-OFF 3	/
6	plugged	ON-OFF 4	/
7	VB-	VJ+	/
8	/	plugged	/

## KCD05-PHC250C

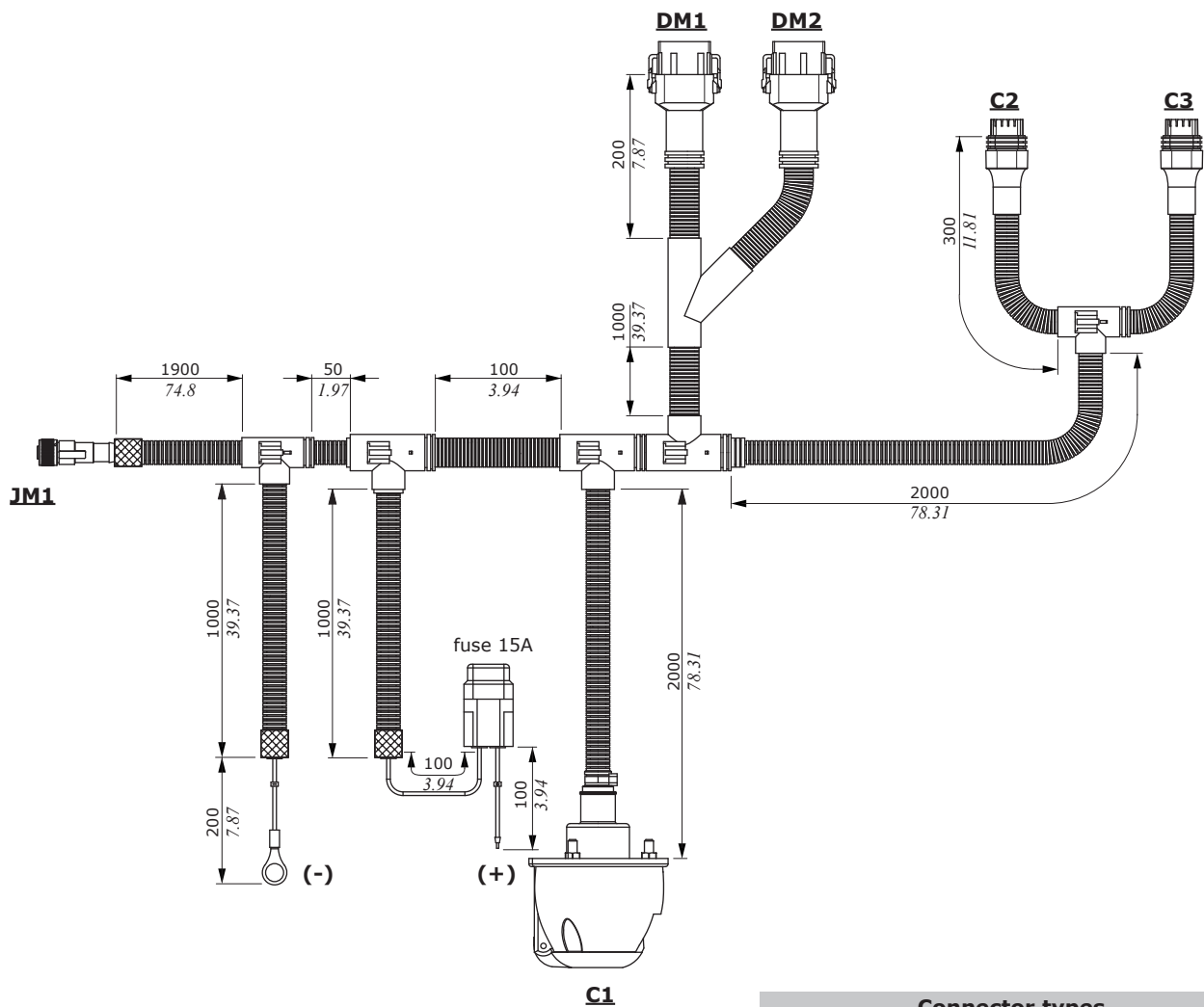
### Dimensions and wiring

#### KCD05-PHC250C harness

**Code** 183480166

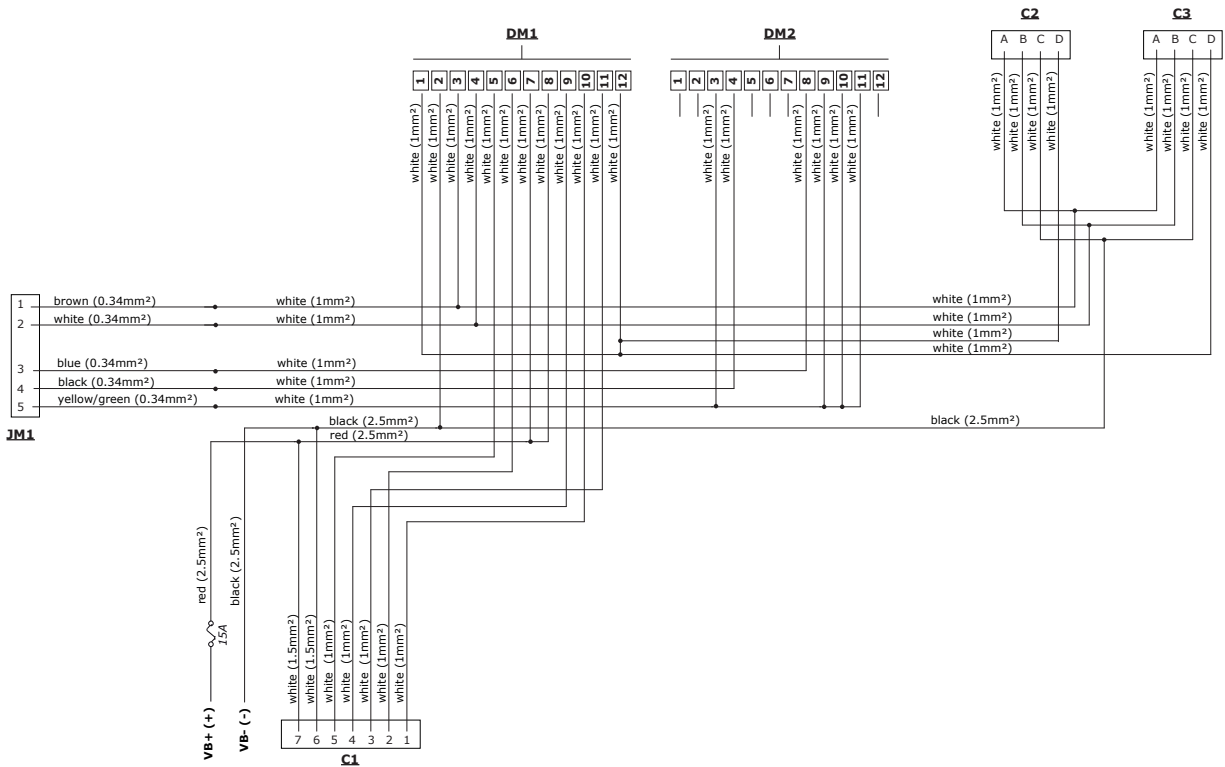
**Description** KCD06/(D2M12-D2M12)-01F1F05330(TC)-02CCF07320(TC)-03M2M04350(TC)-04M2M04350(TC)-AU2F15250(TC)-AU1250(TC)

**Note** CJW, CED040 and EME mechatronic modules connection, for 2 proportional functions



Connector types		
ID	Connection to	Type
DM1	CED	DTM06-12SA Deutsch
DM2	CED	DTM06-12SB Deutsch
JM1	Joystick	5 poles M12 - female
C1	ON/OFF valves	8JB001941002 Hella
C2+C3	Mechatronic modules	M-PACK150_2 Packard, 4 poles

### Dimensions and wiring



**Connectors PIN-OUT**

Pin	DM1 connector		DM2 connector		JM1 conn.	C1 conn.	C2+C3 con.
	Name	Function	Name	Function	Function	Function	Function
1	OUT_1	VEME+	OUT_L	plugged	CAN_H	ON-OFF 3	CAN_H
2	VB-	VB-	DI_5	plugged	CAN_L	sensor 2	CAN_L
3	CAN_H	CAN_H	DI_1	VK+	VJ+	ON-OFF 1	VB-
4	CAN_L	CAN_L	VJ-	VJ-	VJ-	ON-OFF 2	VEME+
5	AI_6	sensor 1	AI_3	plugged	VK+	sensor 1	/
6	AI_7	sensor 2	AI_2	plugged	/	VB-	/
7	VK+	VB+	AI_1	plugged	/	VB+	/
8	VK+	VB+	VJ+	VJ+	/	/	/
9	OUT_2	ON-OFF 2	DI_2	VK+	/	/	/
10	OUT_3	ON-OFF 3	DI_3	VK+	/	/	/
11	OUT_4	ON-OFF 1	DI_4	VK+	/	/	/
12	OUT_1	VEME+	DI_6	plugged	/	/	/

## KCD10-PHC251C

### Dimensions and wiring

#### KCD10-PHC251C harness

**Code** 183480137

**Description**

KCD10/CD3F40-01T1F02025-02T1F02025-03T1F02025-04T1F02025-05T1F02025(TAP)-06CCF07090(TC)-07F105050(TC)-08A1M03025(TAP)-AU2F15300(TC)-AU1300(TC)

**Note**

CJW and CED252 connection, for 2 proportional functions

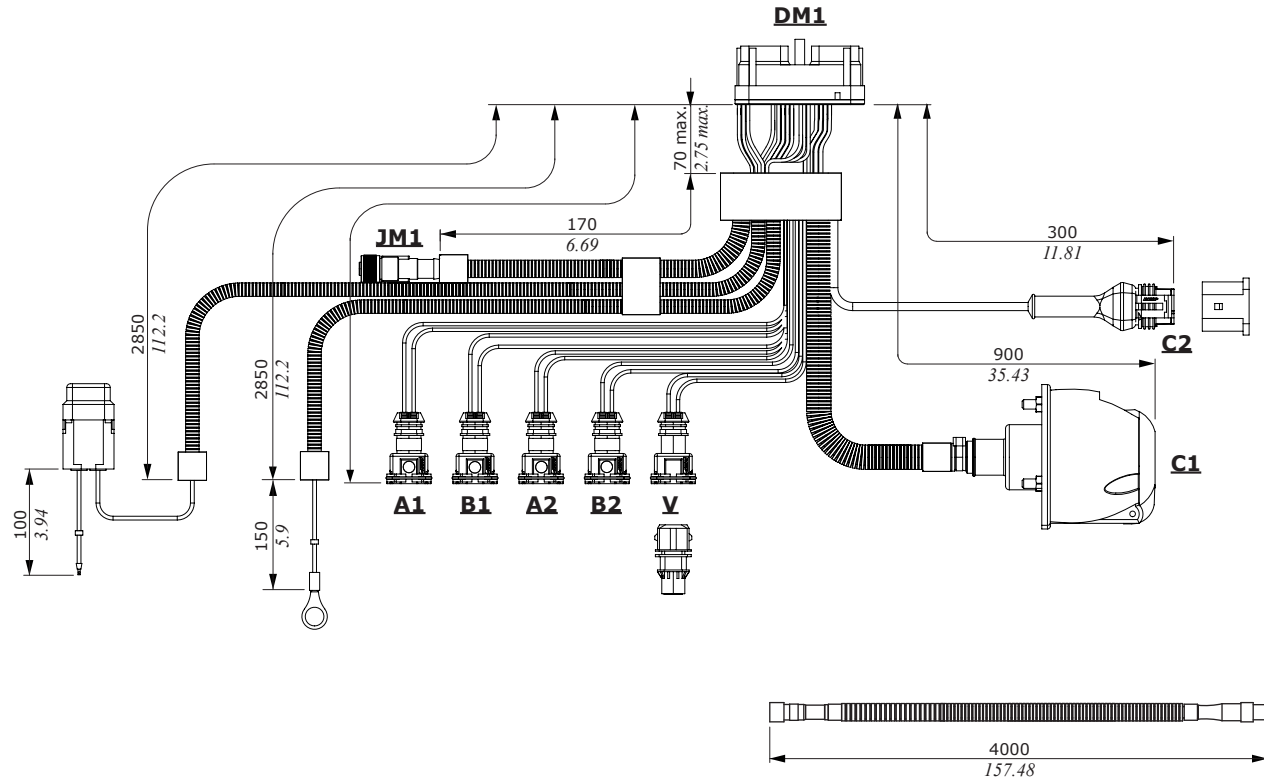
**Code** 183490001

**Description**

F1M05-F1F05(TC) L=4m (157.48 in)

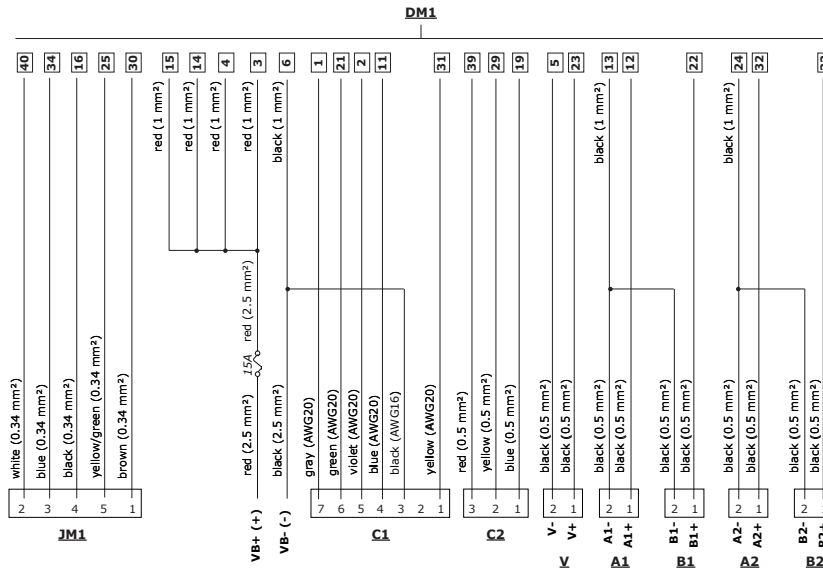
**Note**

extension for CJW connection



Connector types		
ID	Connection to	Type
DM1	CED	DRC26-40SA Deutsch
JM1	Joystick	5 poles M12 - female
C1	ON/OFF valves	8JB001941002 Hella
C2	programming	Superseal AMP, 3 poles, male
A1-B1	proportional solenoid valves	JPT AMP, 2 poles
A2-B2		
V		

### Dimensions and wiring



Connectors PIN-OUT			
Pin	JM1 conn. Function	C1 conn. Function	C2 conn. Function
1	CAN_H	diverter 2	RS232-GND
2	CAN_L	/	RS232-Tx
3	VJ+	power GND	RS232-Rx
4	VJ-	diverter 1	/
5	EM-SW	diverter 3	/
6	/	diverter 4	/
7	/	diverter 5	/

DM1 connector PIN-OUT											
Pin	Name	Function	Pin	Name	Function	Pin	Name	Function	Pin	Name	Function
1	OUT_8	diverter 5	11	OUT_7	diverter 1	21	OUT_10	diverter 4	31	OUT_6	diverter 2
2	OUT_9	diverter 3	12	OUT_1	A1+	22	OUT_2	B1+	32	OUT_3	A2+
3	VK+	VK+	13	GND_1	A1- / B1-	23	OUT_5	V+	33	OUT_4	B2+
4	VK+	VK+	14	VK+	VK+	24	GND_2	A2- / B2-	34	VJ+	VJ+
5	GND_3	V-	15	VB+	VB+	25	VEM+	EM-SW	35	VS+	not conn.
6	VB-	GND	16	VJ-	VJ-	26	AI_11	not conn.	36	AI_1	not conn.
7	AI_3	not conn.	17	AI_2	not conn.	27	AI_8	not conn.	37	AI_5	not conn.
8	AI_6	not conn.	18	AI_7	not conn.	28	AI_4	not conn.	38	AI_9	not conn.
9	AI_10	not conn.	19	GND	RS232-GND	29	RX	RS232-Rx	39	TX	RS232-Tx
10	VS-	not conn.	20	CAN_SH	not conn.	30	CAN_H	CAN_H	40	CAN_L	CAN_L

## KCD03+KCD03-PHC640C

### Dimensions and wiring

#### KCD03+KCD03-PHC640C harness

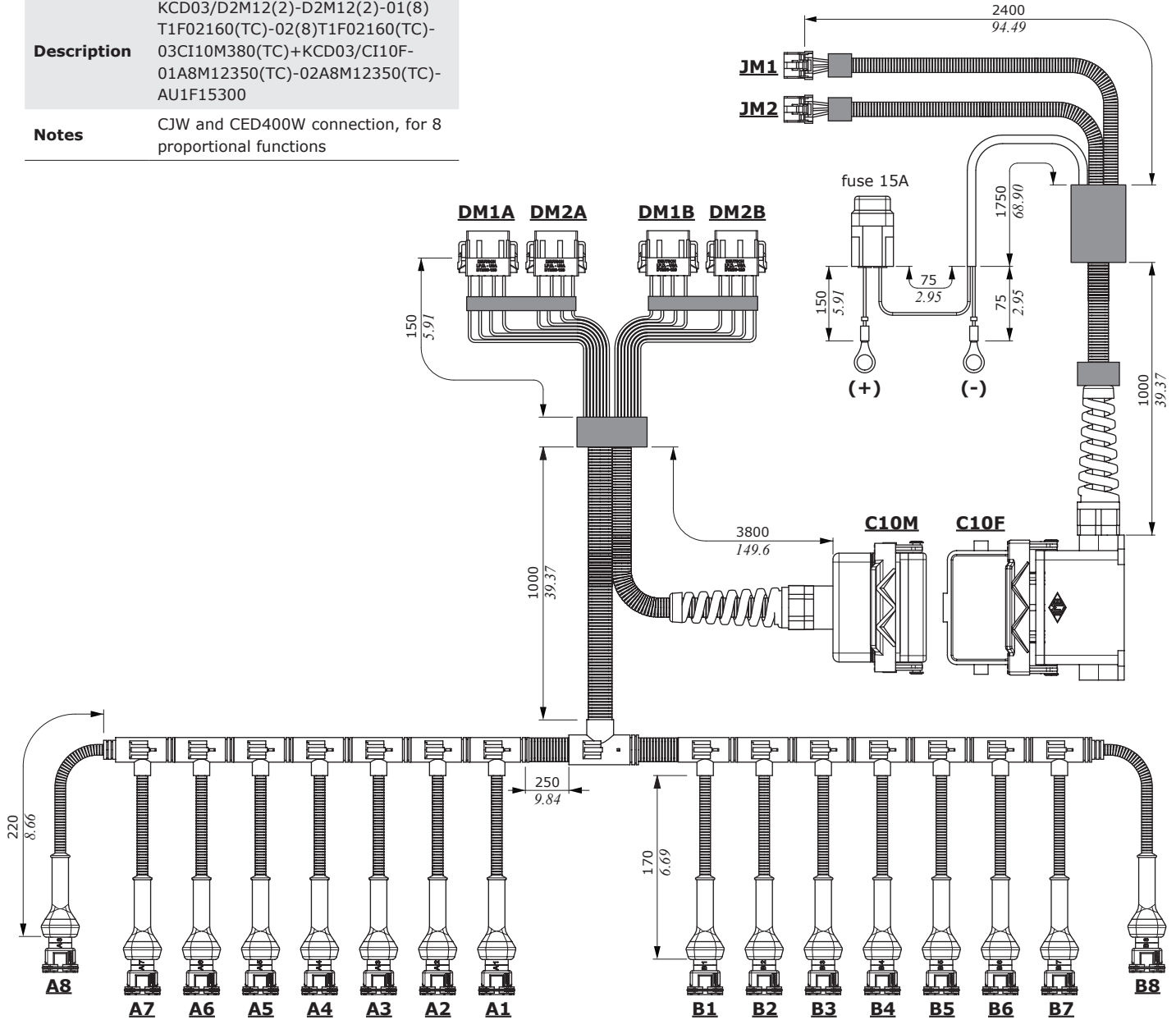
**Code** 183480169

**Description**

KCD03/D2M12(2)-D2M12(2)-01(8)  
T1F02160(TC)-02(8)T1F02160(TC)-  
03CI10M380(TC)+KCD03/CI10F-  
01A8M12350(TC)-02A8M12350(TC)-  
AU1F15300

**Notes**

CJW and CED400W connection, for 8  
proportional functions



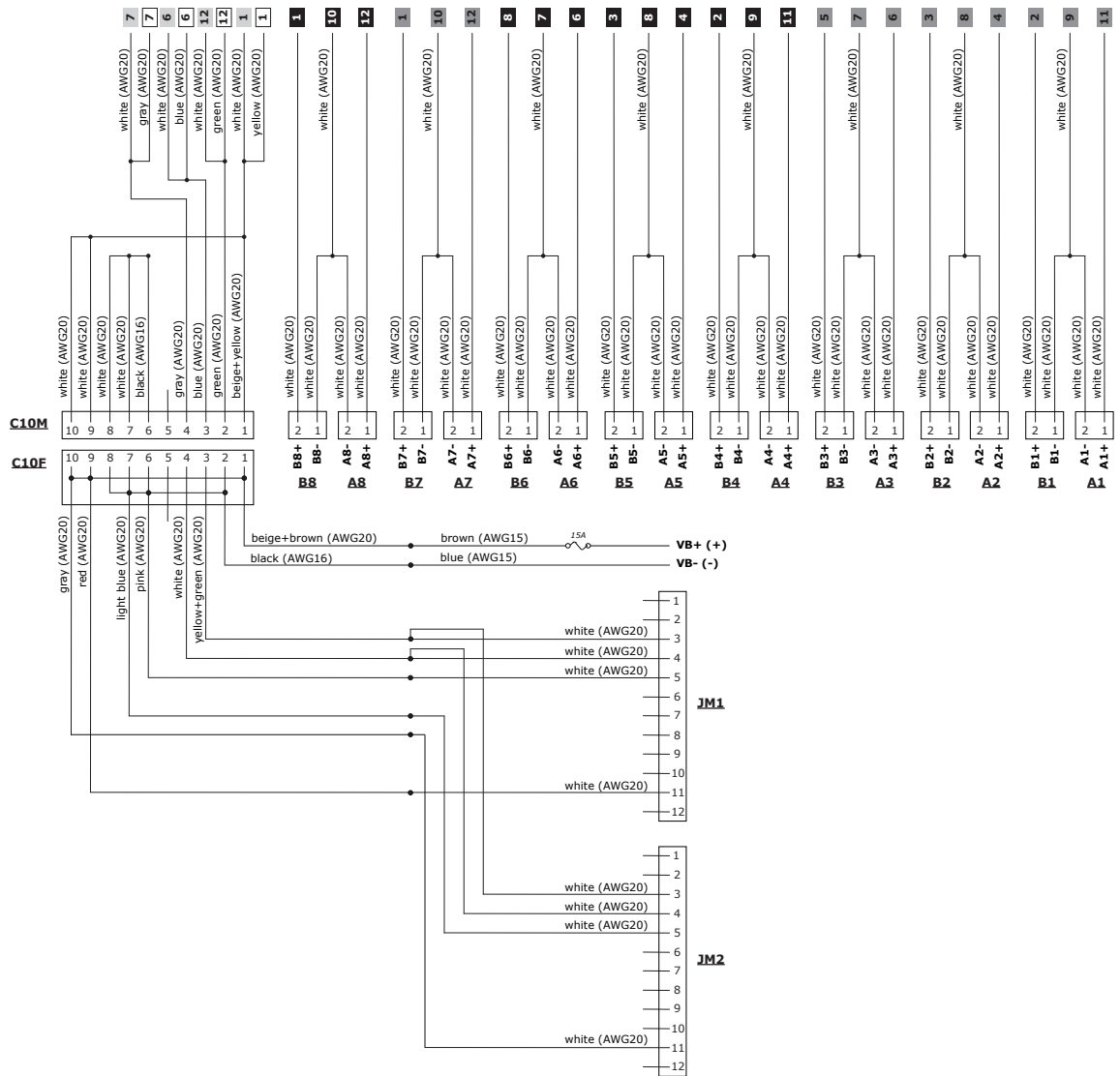
#### Connector types

ID	Connection to	Type
<b>DM1A+DM1B</b>	CED	DTM06-12SA Deutsch
<b>DM2A+DM2B</b>	CED	DTM06-12SB Deutsch
<b>C10M</b>	cable extension	CNM10+CHV10L+CHC10LG Ilme
<b>C10F</b>	cable extension	CNF10+CHP10LS Ilme
<b>JM1+JM2</b>	joystick	Multilock 040 series Tyco, 12 poles
<b>A1 to B8</b>	proportional solenoid valves	JPT AMP, 2 poles

### Dimensions and wiring

- 1** DM1A connector
- 1** DM2A connector
- 1** DM1B connector
- 1** DM2B connector

### Electrical wiring



### Connector PIN-OUT

Pin	DM1A connector		DM2A connector		DM1B connector		DM2B connector		JM1+JM2 con.	C10M+C10F con.
	Name	Function	Name	Function	Name	Function	Name	Function		
1	VB+	VB+	OUT_8	B7+	VB+	VB+	OUT_8	B8+	not connected	VB+
2	plugged	plugged	OUT_2	B1+	plugged	plugged	OUT_2	B4+	not connected	VB-
3	plugged	plugged	OUT_4	B2+	plugged	plugged	OUT_4	B5+	CAN_L	CAN_L
4	plugged	plugged	OUT_3	A2+	plugged	plugged	OUT_3	A5+	CAN_H	CAN_H
5	plugged	plugged	OUT_6	B3+	plugged	plugged	OUT_6	B6+	VJ-	not connected
6	CAN_L	CAN_L	OUT_5	A3- / B3-	CAN_L	CAN_L	OUT_5	A6+	not connected	VB-
7	CAN_H	CAN_H	GND_3	A3- / B3-	CAN_H	CAN_H	GND_3	A6- / B6-	not connected	VB-
8	plugged	plugged	GND_2	A2- / B2-	plugged	plugged	GND_2	A5- / B5-	not connected	VB-
9	plugged	plugged	GND_1	A1- / B1-	plugged	plugged	GND_1	A4- / B4-	not connected	VJ+
10	plugged	plugged	GND_4	A7- / B7-	plugged	plugged	GND_4	A8- / B8-	not connected	VJ+
11	plugged	plugged	OUT_1	A1+	plugged	plugged	OUT_1	A4+	VJ+	/
12	VB-	VB-	OUT_7	A7+	VB-	VB-	OUT_7	A8+	VJ-	/







## Accessories

- Preassembled connector kits for the control unit interface
- Preassembled connector kits for the joystick interface
- Preassembled connector kits for the solenoid valve interface
- Control unit programming cables

### Programming cables

These cables are used to connect a personal computer running our WST software to the electronic control unit for the directional control valve.

The programming cable is installed between the electronic control unit (D1 connector) and the harness (D1A connector), as shown in the picture.

### Cable kit

In addition to the pre-configured cables of the KCD series, Walvoil offers the opportunity to assemble custom cables.

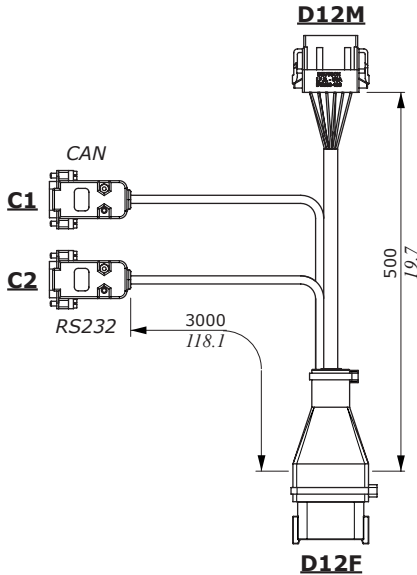
Using the suitable pre-assembled connector kit, you can meet the needs of connecting electronic components and electro-proportional controls on Walvoil directional valves.

## Programming cables

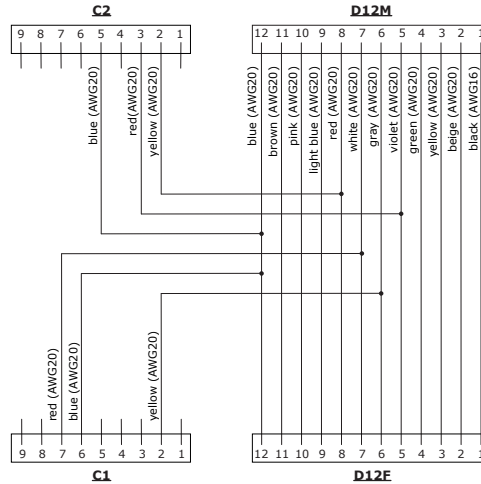
### For CED400W control units

<b>Code</b>	VCAV600018
<b>Description</b>	CED400W programming cable
<b>Notes</b>	RS232 and CAN bus programming

Connector types		
ID	Type	Connection to
<b>D12M</b>	DTM06-12SA Deutch	CED400W control units
<b>D12F</b>	DTM04-12PA Deutch	Harness
<b>C1+C2</b>	SUB-D 9 poles, female	Personal computer



### Electrical wiring



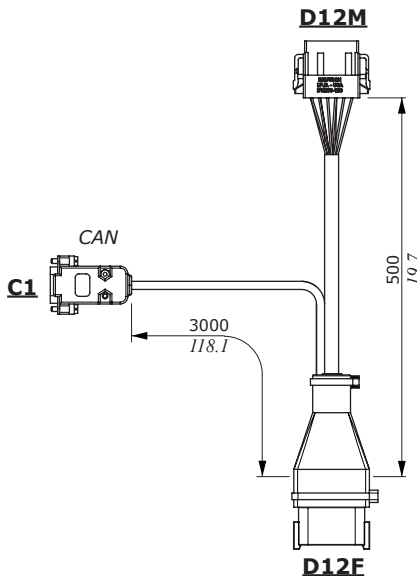
### Connector PIN-OUT

Pin	Functions	
	C1 conn.	C2 conn.
1	not connected	not connected
2	CAN_L	Tx
3	not connected	Rx
4	not connected	not connected
5	not connected	GND
6	GND	not connected
7	CAN_H	not connected
8	not connected	not connected
9	not connected	not connected

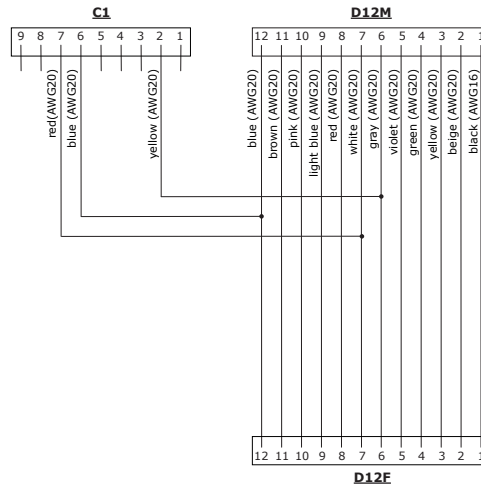
### For CED040-CED160 control unit

<b>Code</b>	VCAV600021
<b>Description</b>	CED040-CED160 programming cable
<b>Notes</b>	CAN bus programming

Connector types		
ID	Type	Connection to
<b>D12M</b>	DTM06-12SA Deutch	CED040-CED160 control units
<b>D12F</b>	DTM04-12PA Deutch	Harness
<b>C1</b>	SUB-D 9 poles, female	Personal computer



### Electrical wiring

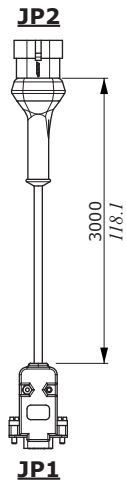


### C1 connector PIN-OUT

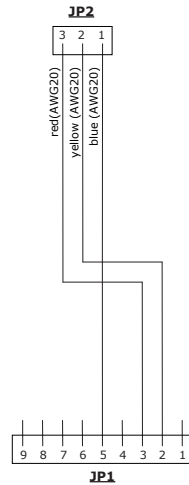
Pin	Functions	
	C1 conn.	C2 conn.
1	not connected	not connected
2	CAN_L	
3	not connected	
4	not connected	
5	not connected	
6	GND	
7	CAN_H	
8	not connected	
9	not connected	

### For CED252 control unit

<b>Code</b>	VCAV600014
<b>Description</b>	CED252 programming cable
<b>Notes</b>	RS232 programming



#### Electrical wiring



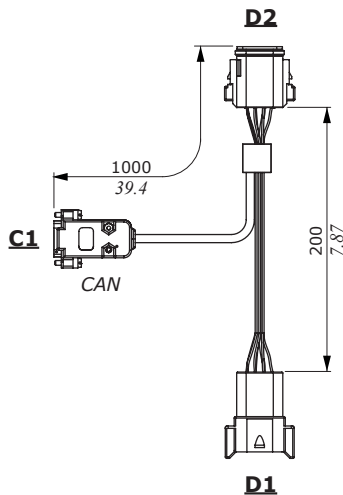
Connector PIN-OUT		
Pin	Functions	
	JP1 conn.	JP2 conn.
1	not connected	GND
2	Tx	Tx
3	Rx	Rx
4	not connected	/
5	GND	/
6	not connected	/
7	not connected	/
8	not connected	/
9	not connected	/

Connector types		
ID	Type	Connection to
JP1	SUB-D 9 poles, female	Personal computer
JP2	AMP Supereal, 3 poles	CED252 control unit

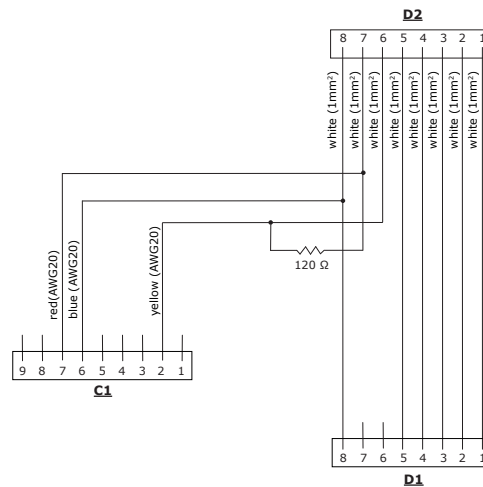
### For PVD200 proportional valve driver

<b>Code</b>	VCAV600024
<b>Description</b>	PVD200 programming cable
<b>Notes</b>	CAN bus programming

Connector types		
ID	Type	Connection to
D1	DT04-8PB Deutsch	Harness
D2	DT06-8SB Deutsch	PVD200 prop. valve driver
C1	SUB-D 9 poles, female	Personal computer 1mm <sup>2</sup>

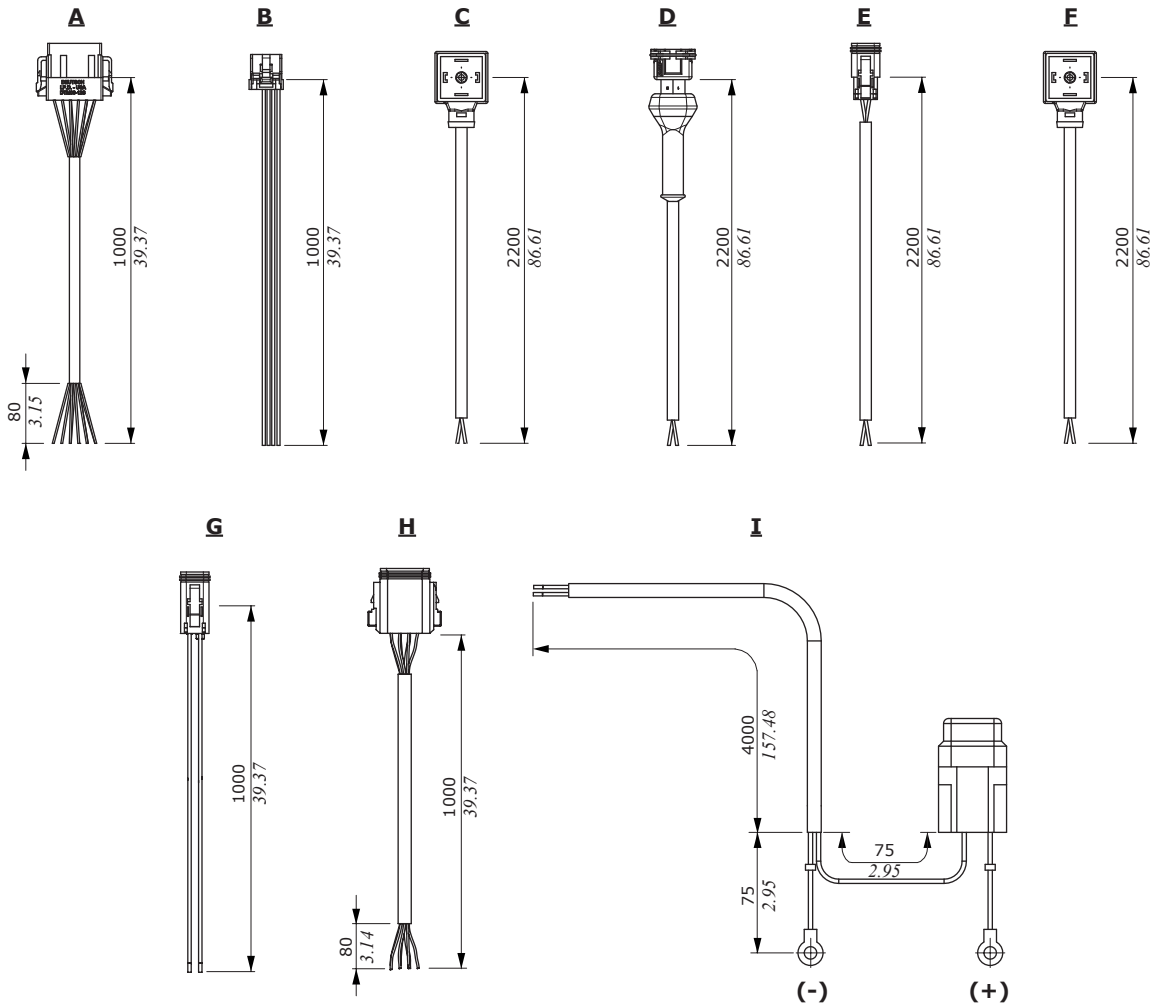


#### Electrical wiring



C1 connector PIN-OUT	
Pin	Functions
1	not connected
2	CAN_L
3	not connected
4	not connected
5	not connected
6	GND
7	CAN_H
8	not connected
9	not connected

## Cables kit



Cable kit types			
ID	Code	Connector	Connection to
A	YCON140041	DTM06-12S Grey Deutsch	CED400W-CED040-CED160 control units, AJW joysticks
A	YCON140067	DTM06-12SB Black Deutsch	CED400W-CED040-CED160 control units
B	YCON140073	Multilock series 040 Tyco	CJW joysticks
C	VCAV100008	ISO4400	Solenoid valves 3P + T
D	VCAV100011	JPT AMP	Solenoid valves
E	VCAV100071	DT06-2S Deutsch	Solenoid valves
F	VCAV100007	ISO4400	Solenoid valves 2P + T
G	YCON140072	DT06-4S	SPSD, SPSL sensors
H	YCON140081	Amphenol AT06-08SA Grey	PVD200
H	YCON140082	Amphenol AT06-08SB Black	PVD200
I	W0410005	Eyelet terminal	Battery

### Features

Wire colour and section						
Pin	A cable	B cable	C cable	D cable	E cable	F cable
1	brown (AWG20)	not connected	brown (AWG18) Valve 1/2-	blue (AWG18) Valve +	blue (AWG18) Valve +	brown (AWG18) Valve -
2	white (AWG20)	not connected	blue (AWG18) Valve1 +	brown (AWG18) Valve -	brown (AWG18) Valve -	blue (AWG18) Valve 1 +
3	violet (AWG20)	green (AWG20) CAN_H	black (AWG18) Valve 2 +	/	/	/
4	pink (AWG20)	yellow (AWG20) CAN_L	yellow green (AWG18) GND	/	/	/
5	red (AWG20)	black (AWG20) GND	/	/	/	/
6	gray (AWG20)	not connected	/	/	/	/
7	beige (AWG20)	not connected	/	/	/	/
8	blue (AWG20)	not connected	/	/	/	/
9	light blue (AWG20)	not connected	/	/	/	/
10	yellow (AWG20)	not connected	/	/	/	/
11	green (AWG20)	red (AWG20) VB+	/	/	/	/
12	black (AWG16)	gray (AWG20) GND	/	/	/	/

Wire colour and section			
Pin	G cable	H cable	I cable
1	red (1 mm <sup>2</sup> )	black (AWG16)	brown (1.5mm <sup>2</sup> ) battery +
2	green	beige (AWG20)	blue (1.5mm <sup>2</sup> ) battery -
3	black (1 mm <sup>2</sup> )	yellow (AWG20)	/
4	yellow (1 mm <sup>2</sup> )	green (AWG20)	/
5	/	blue (AWG20)	/
6	/	violet (AWG20)	/
7	/	gray (AWG20)	/
8	/	brown (AWG20)	/





## PHC electronic systems

- Complete electronic control systems, plug-and-play
- Pre-setted functionality
- Customization on request
- Applicable on a wide range of directional valves
- Robust construction
- Suitable for general applications

### Working conditions

General features		PHC400F	PHC400C	PHC400P	PHC200F	PHC220C	PHC250C	PHC251C	PHC640C
System type	potentiometric	•		•	•				
	ratiometric								
	CAN bus		•			•	•	•	•
Proportional functions (nr.)		4	4	4	2	2	2	2	6
Float function management		•	•	•	•	•	•	•	•
Digital outputs (nr)		/	/	/	/	2	3	3	2
"Dead man" switch management		•	•	/	•	/	/	/	•
Return to dig		/	/	/	/	/	•	•	/
Fast-Slow		/	/	/	/	/	/	•	/

## PHC400F

### System description

The system can be used for 12VDC or 24VDC applications.

It allows to drive up to four functions/sections on the directional valve, all the controls are proportional.

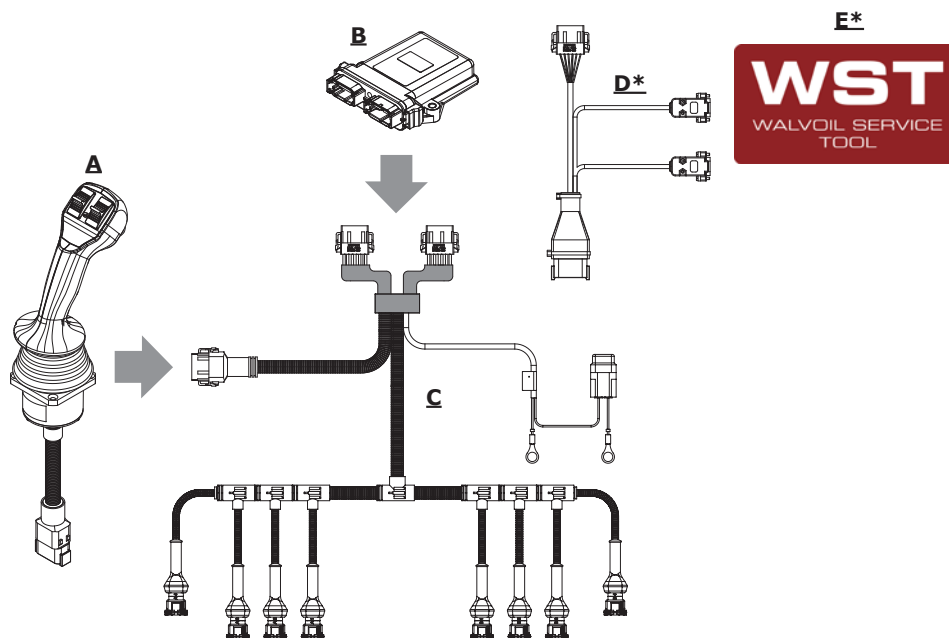
The control signals come from an analog AJW joystick. CED400W control unit drives the directional valve.

The "dead man" switch enables all the functions; the float and the fast/slow signals are used to control the float and fast/slow functions.

Acceleration and decelerations ramp times are programmable and applicable to the machine movements for those applications that require to manage heavy loads.

Through a dedicated WST software, a lot of customizations can be set to adjust the system dynamic.

<b>Code</b>	<b>1XSE40002</b>
<b>Description</b>	PHC400F electronic system
<b>Notes</b>	12-24V application, 4 proportional functions (1 floating)



PHC400F parts			
ID	Code	Type	Qty
A	183540028	AJW analog joystick: 4 proportional axis, "dead man" switch, 1 push-button	1
B	183337025	CED400W/PHC STUDIO/PHC400F/v29.01 electronic control unit	1
C	183480118	KCD04 harness	1
D*	VCAV600018	CED400W programming cable	1
E*	DCDSW0230005	WST SYSTEM PHC400F/v16.01 software	1

(\*) - Programming cable and WST must be ordered separately.



### System description

The system can be used for 12VDC or 24VDC applications.

It allows to drive up to four functions/sections on the directional valve, all the controls are proportional.

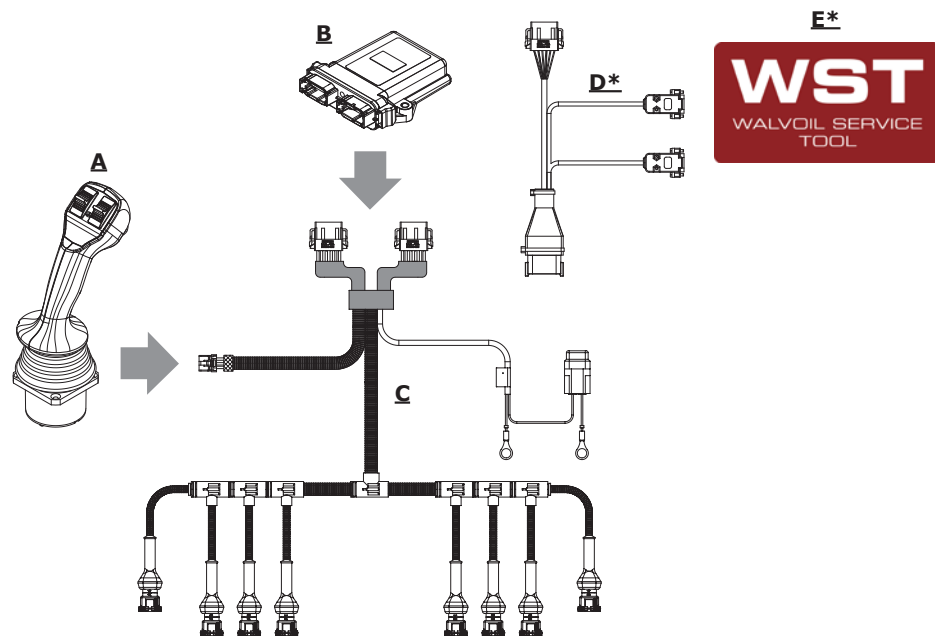
The control signals come from a CAN bus CJW joystick. CED400W control unit drives the directional valve.

The "dead man" switch enables all the functions; the float and the fast/slow signals are used to control the float and fast/slow functions.

Acceleration and decelerations ramp times are programmable and applicable to the machine movements for those applications that require to manage heavy loads.

Through a dedicated WST software, a lot of customizations can be set to adjust the system dynamic.

<b>Code</b>	<b>1XSE40003</b>
<b>Description</b>	PHC400C electronic system
<b>Notes</b>	12-24V application, 4 proportional functions (1 floating)



PHC400C parts			
ID	Code	Type	Qty
A	183530011	CJW CAN bus joystick: 4 proportional axis, "dead man" switch, 1 push-button	1
B	183337037	CED400W/PHC STUDIO/PHC400C CAN/v37.001 electronic control unit	1
C	1834800168	KCD04 harness	1
D*	VCAV600018	CED400W programming cable	1
E*	DCDSW0230013	WST SYSTEM PHC400C software CAN bus	1

(\*) - Programming cable and WST must be ordered separately.

## PHC400P

### System description

The system can be used for 12VDC or 24VDC applications.

It allows to drive up to four functions/sections on the directional valve, all the controls are proportional.

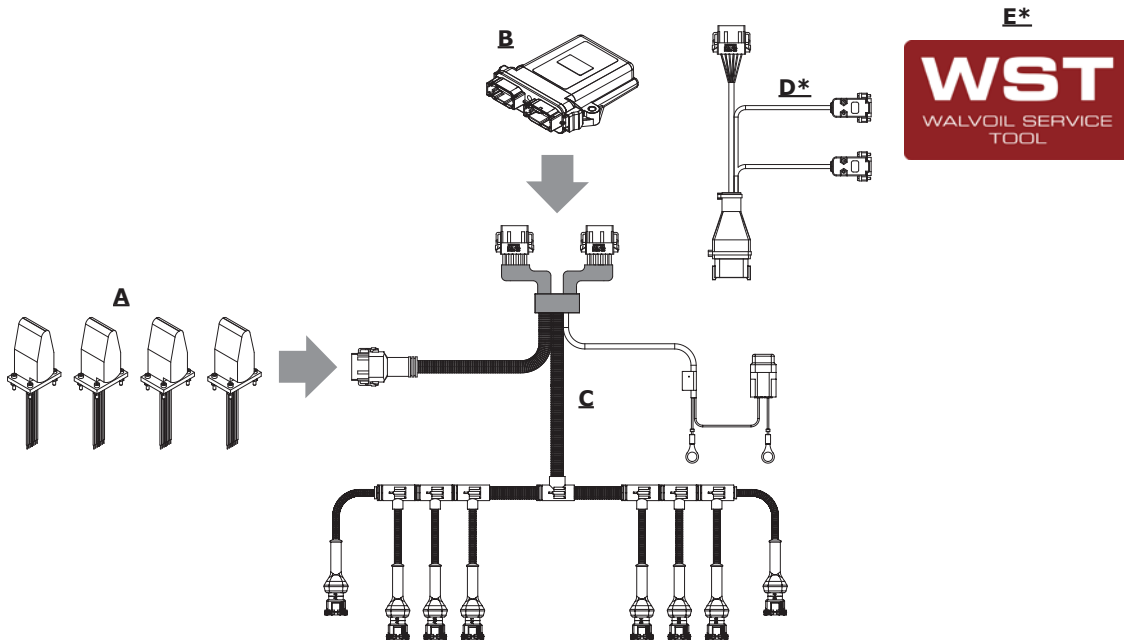
The control signals come from four single axis analog joysticks. CED400X control unit drives the directional valve.

The 'operator presence' switch enables all the functions, the float and the fast/slow commands are used to control the float and fast/slow functions.

Acceleration and decelerations ramp times are programmable and applicable to the machine movements for those applications that require to manage heavy loads.

Through a dedicated WST software, a lot of customizations can be set to adjust the system dynamic.

<b>Code</b>	<b>1XSE40005</b>
<b>Description</b>	PHC400P electronic system
<b>Notes</b>	12-24V application, 4 proportional functions (1 floating)



PHC400P parts			
ID	Code	Type	Qty
A	VJOY200001	MDN142 potentiometric joystick: 1 proportional axis with redundancy	4
B	183337025	CED400W/PHC STUDIO/PHC400F/v29.01 electronic control unit	1
C	183480118	KCD04 harness	1
D*	VCAV600018	CED400W programming cable	1
E*	DCDSW0230005	PHC-STUDIO PHC400F v16.01 software	1

(\* ) - Programming cable and WST must be ordered separately.

### System description

The system can be used for 12VDC or 24VDC applications.

It allows to drive up to two functions/sections on the directional valve, all the controls are proportional.

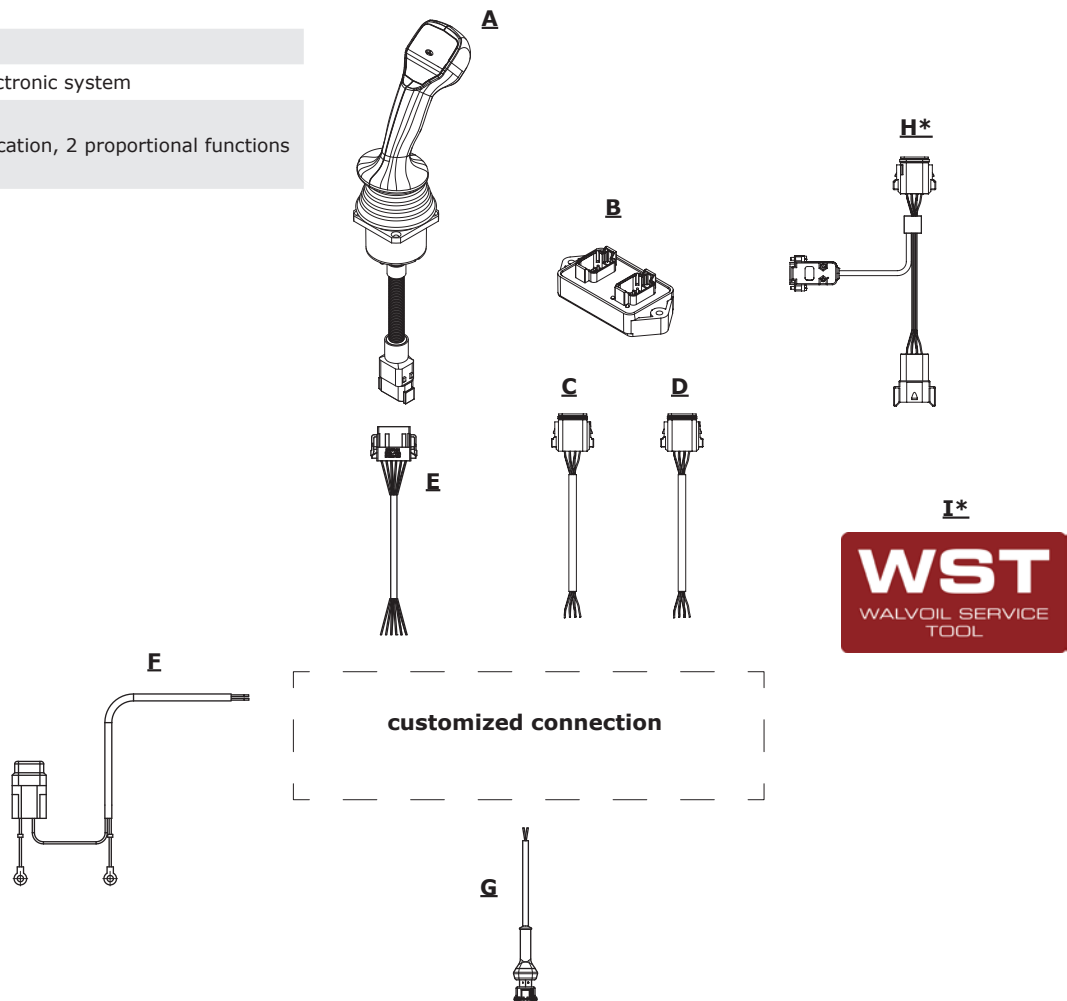
The control signals come from an analog joystick. CED400W control unit drives the directional valve.

The 'operator presence' switch enables all the functions, the float and the fast/slow commands are used to control the float and fast/slow functions.

Acceleration and decelerations ramp times are programmable and applicable to the machine movements for those applications that require to manage heavy loads.

Through a dedicated WST software, a lot of customizations can be set to adjust the system dynamic.

<b>Code</b>	<b>1XSE40010</b>
<b>Description</b>	PHC200F electronic system
<b>Notes</b>	12-24V application, 2 proportional functions



PHC400P parts			
ID	Code	Type	Qty
A	183540006	AJW analog joystick: 2 proportional axis, "dead man" switch	4
B	183380008	PVD200/PHC200F/v07.01 proportional valve driver	1
C	YCON140081	PVD200/AT06-08SA (grey) cable connection	1
D	YCON140082	PVD200/AT06-08SB (black) cable connection	1
E	YCON140041	AJW cable connection	1
F	W0410005	Battery supply cable	1
G	VCAV100011	Solenoid valves connection cable	4
H*	VCAV600024	PVD200 programming cable	1
I*	DCDSW0240007	PVD200-PHC400F v17.02 software	1

(\*) - Programming cable and WST must be ordered separately.

## PHC220C

### System description

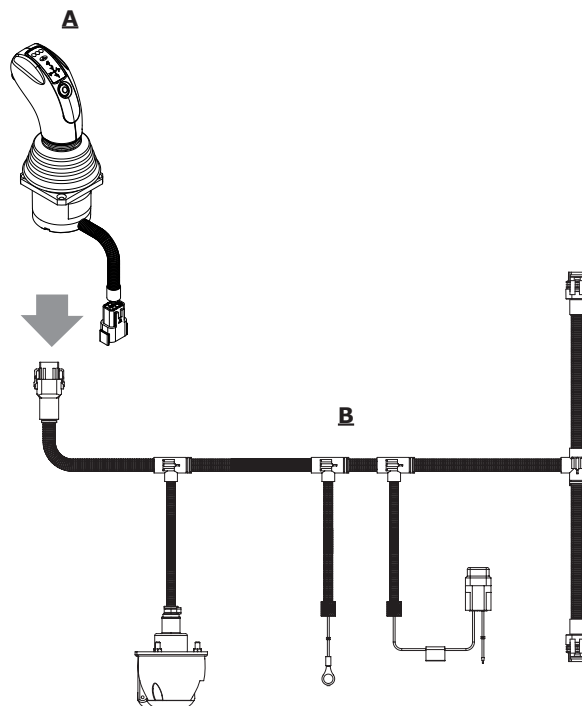
The system can be used for the front-end loader application with DLM122/SDM122 in mechatronic configuration.

It allows to drive up to two functions/sections on the directional valve, all the controls are proportional.

The control signals come from a CAN bus CJW joystick, that drives two mechatronic EME controls, which drive the directional valve.

The float signal is used to control the float function on the directional valve, two external diverter valves can be driven with one push-buttons on the joystick handle.

<b>Code</b>	<b>1XSE21005</b>
<b>Description</b>	PHC220C electronic system
<b>Notes</b>	12V application, 2 proportional functions (1 for floating), 4 <sup>th</sup> function through diverter valves



PHC220C parts			
ID	Code	Type	Qty
A	183530045	CJW SAE J1939 joystick: 2 proportional functions, 1 ON/OFF switch, 3 push-buttons	1
B	183480165	KCD05 harness	1

### System description

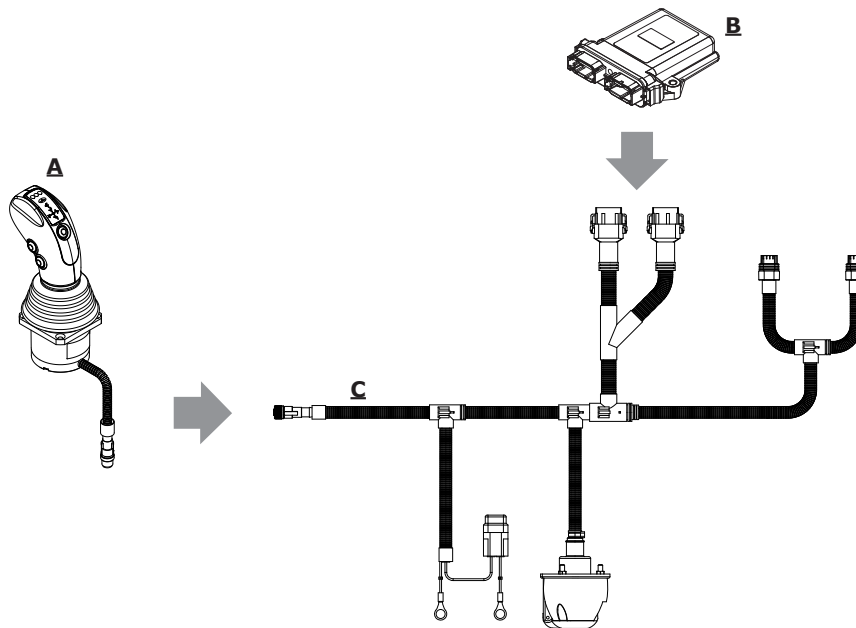
The system can be used for the front-end loader application with DLM122/SDM122 in mechatronic configuration.

It allows to drive up to two functions/sections on the directional valve, all the controls are proportional.

The control signals come from a CJW CAN bus joystick, that drives two mechatronic EME controls, which drive the directional valve.

The float and return to dig functions are available on the directional valve, three external diverter valves can be driven with the push-buttons from the joystick handle.

<b>Code</b>	<b>1XSE21006</b>
<b>Description</b>	PHC250C electronic system
<b>Notes</b>	12V application, 2 proportional functions (1 floating), 3 <sup>rd</sup> , 4 <sup>th</sup> and 5 <sup>th</sup> function for diverter valves, return to dig sensors



### PHC250C parts

ID	Code	Type	Qty
A	183530044	CJW SAE J1939 joystick: 2 proportional functions, 1 ON/OFF switch, 6 push-buttons	1
B	183360010	CED040/PHC250C-12V/v06.00 electronic control unit	1
C	183480166	KCD05 harness	1

## PHC251C

### System description

The system can be used for the front-end loader application, 12VDC.

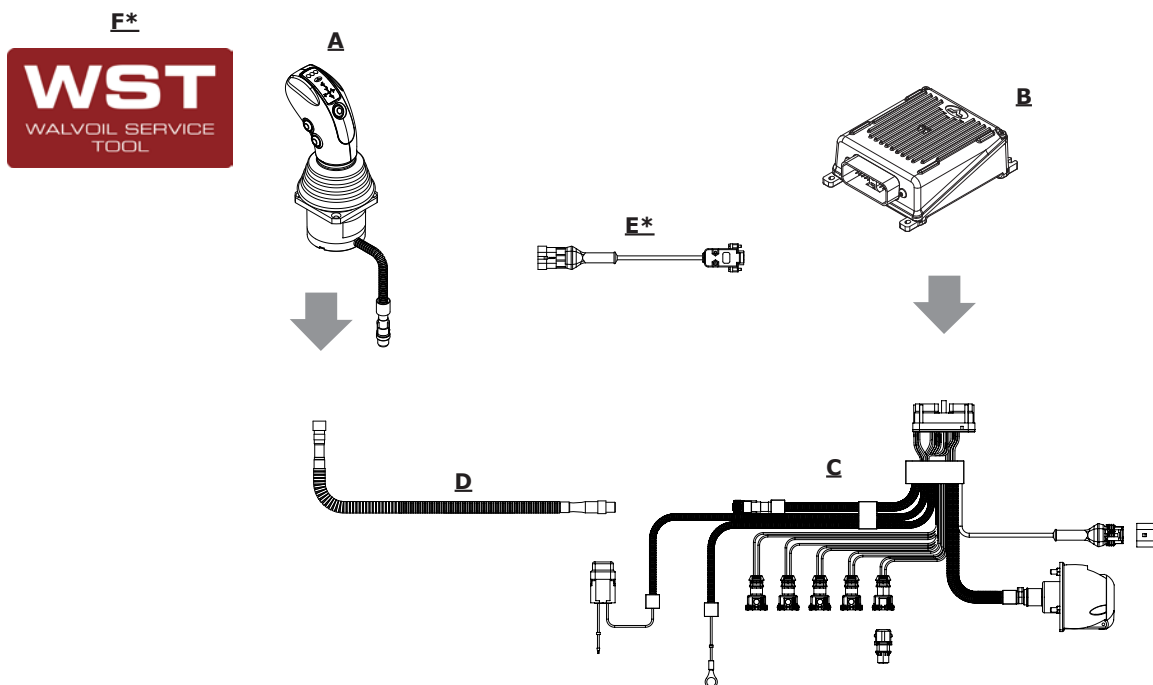
It allows to drive up to two functions/sections on the directional valve, all the controls are proportional.

The control signals come from a CJW CAN bus joystick. CED252 control unit drives the directional valve.

The float, Fast/Slow and return to dig functions are available on the directional valve, three external diverter valves can be driven with the push-buttons from the joystick handle.

Through a dedicated WST software, the diagnostic on the system can be executed.

<b>Code</b>	<b>1XSE21007</b>
<b>Description</b>	PHC251C electronic system
<b>Notes</b>	12V application, 2 proportional functions (1 floating), 3 <sup>rd</sup> , 4 <sup>th</sup> and 5 <sup>th</sup> function for diverter valves, return to dig sensors



PHC251C parts			
ID	Code	Type	Qty
A	183530044	CJW SAE J1939 joystick: 2 proportional functions, 1 ON/OFF switch, 6 push-buttons	1
B	183350025	CED252/PHC251C/v40.25 electronic control unit	1
C	183480137	KCD010 harness	1
D	183490001	extension for joystick connection , L=4m (157.48 in)	1
E*	VCAV600014	CED252 programming cable	1
F*	DCDSW004005	WST/FLC/v11.01 software	1

(\*) - Programming cable and WST must be ordered separately.

### System description

The system can be used for 12VDC or 24VDC applications.

It allows to drive up to eight functions/sections on the directional valve; six controls are proportional, two controls are on/off actuated.

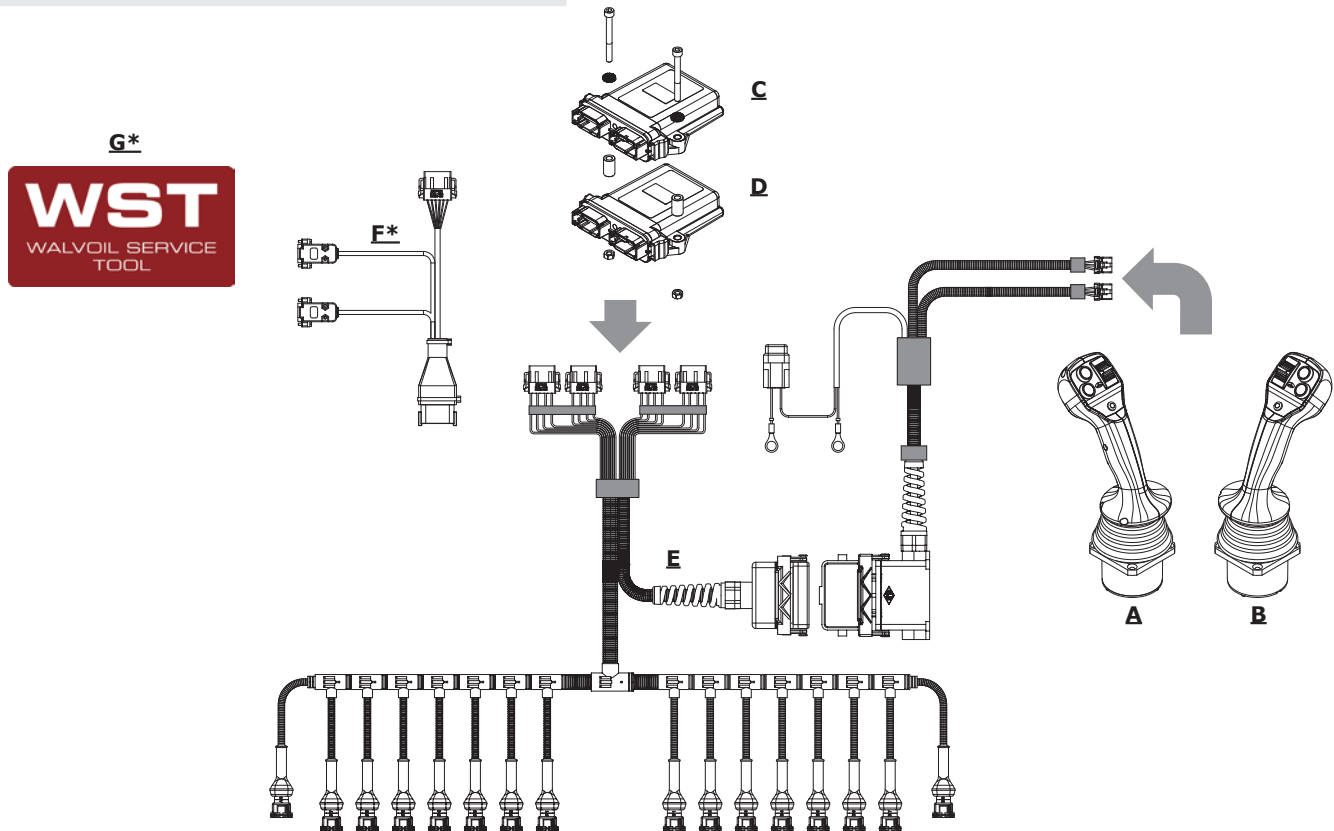
The control signals come from a CAN bus CJW joystick. CED400X control units drive the directional valve.

The "dead man" switch enables all the functions.

Acceleration and decelerations ramp times are programmable and applicable to the machine movements for those applications that require to manage heavy loads.

Through a dedicated WST software, a few customizations can be set to adjust the system dynamic.

<b>Code</b>	<b>1XSE40004</b>
<b>Description</b>	PHC640C electronic system
<b>Notes</b>	12-24V application, 6 proportional functions, 2 on/off functions



#### PHC640C parts

ID	Code	Type	Qty
A	183530012	CJW CAN bus joystick: 3 proportional functions, "dead man" switch, 2 push-buttons, 1 LED, left configuration	1
B	183530013	CJW CAN bus joystick: 3 proportional functions, "dead man" switch, 2 push-buttons, 1 LED, right configuration	1
C	183338010	CED400X/FORESTRY/v78.02	1
D	183338012	CED400X/FORESTRY/v89.01	1
E	183480169	KCD03 harness	1
F*	VCAV600018	CED400W programming cable	1
G*	DCDSW0170088	PHC/v2.0 SYSTEM WST software CAN bus	1

(\*) - Programming cable and WST must be ordered separately.



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