ELECTRONIC CONTROL UNITS

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OIL SOLUTIONS

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PWM DRIVERS

MODEL	DESCRIPTION	PAGE
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Page **EC3**

EC-PWM-A1-MPC1-P   PWM DRIVER

DESCRIPTION

Microprocessor-based PWM electronic driver for remote control of a single proportional solenoid valve.

OPERATION

The EC-PWM-A1-MPC1-P proportional valve driver receives a command signal from a potentiometer, PLC or other control systems, and supplies a solenoid with a PWM (Pulse Width Modulated) current proportional to the input signal. An auxiliary power supply (+5 V) is provided as a reference for the command signal. Adjustments of "Imin/Imax", "Ramp time" and "Dither" can be carried out directly from a key-pad integrated on the front panel.
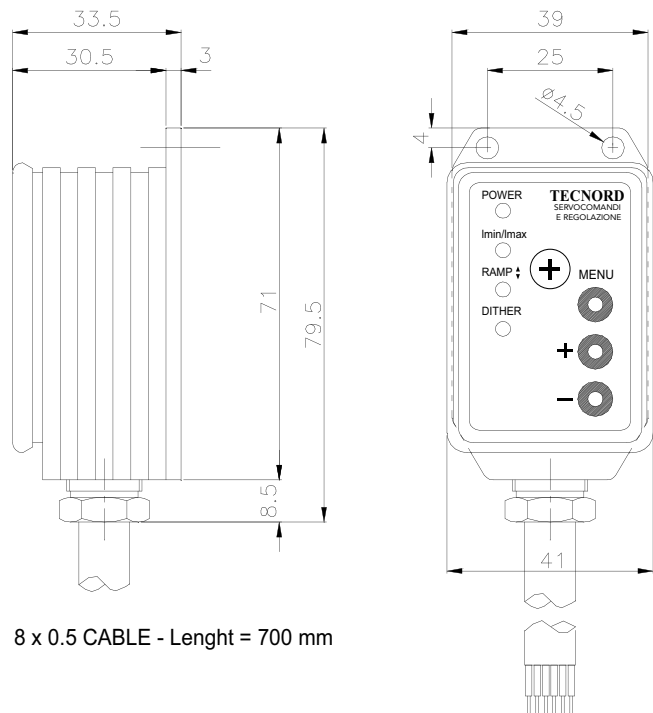**Mounting option:** panel-mounting style with INPUT/OUTPUT multi-core sheated cable.

FEATURES

- The current in the solenoid is independent from any change in the coil resistance or in the supply voltage.
- The inherent superimposed dither frequency helps to overcome friction and stiction effects in the controlled device.
- Power supply line is protected against reversed polarity and load dump.
- Input is protected against short circuits to GND and power supply.
- Output is protected against short circuits, over-current and over-temperature.
- The EC-PWM-A1-MPC1 is completely potted.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).

SPECIFICATIONS

Operating voltage:	8.5÷30 VDC
Max current consumption:	100 mA (no load applied)
Operating temperature:	-25°C / +85°C
Input resistance 0÷5 V voltage input:	560 KOhms
0÷10 V voltage input:	1 MOhm
0÷20mA current input:	250 Ohms
Degree of protection:	IP 67
Analog input signals available:	0÷5 V
	0÷10 V
	0÷20 mA
Typical ctrl pot resistance:	2÷47 kΩ
Current output range (PWM):	100÷3000 mA
PWM dither frequency:	55÷200 Hz (adjustable)
Ramp time:	0.05÷5 s (adjustable)
Max. current from auxiliary +5 V:	15 mA

APPLICATIONS

Primary applications are the control of proportional pressure reducing valves and proportional flow regulators to attain smooth acceleration/ deceleration and fine-metering control of electro-hydraulic functions.
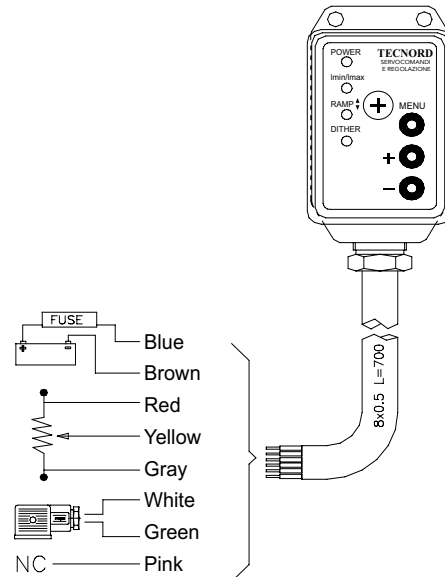
DIMENSIONS

8 x 0.5 CABLE - Lenght = 700 mm

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EC-PWM-A1-MPC1-P   PWM DRIVER

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connection Diagram for 0÷5 V Version

Wiring Colours

Blue	+Battery
Brown	-Battery (GND)
Red	Command signal supply (+5 V)
Yellow	Command signal in
Gray	Command signal GND
White	Proportional coil output
Green	Proportional coil current feedback line
Pink	Spare / Not used

Note

A 5A fuse must be inserted on the BLUE wire connecting the PWM driver to the power source.

FUSE — Blue
— Brown
— Red
— Yellow
— Gray
— White
— Green
NC — Pink

8x0.5 L=700

ADJUSTMENTS

The following adjustments can be made directly from the front key-pad by selecting the

- 3-pushpins in appropriate combinations:
- Imin (minimum output current)
- Imax (maximum output current)
- Ramp-up time
- Ramp-down time
- Dither frequency

POWER
Imin/Imax
RAMP
DITHER

TECNORD
SERVOCOMANDI
E REGOLAZIONE

MENU
+
—

APPLICATION EXAMPLE

Uni-directional control lever type FTC L1S

Proportional flow regulator

PROP VP/VP

On-off type venting valve

BATT +/-

B NO/-

Remote operation of a proportional flow control valve from single axis/unidirectional control lever incorporating a rotary potentiometer and a center/power-off switch for the energization of an auxiliary solenoid-operated dump valve.

ORDERING INFORMATION

EC-PWM-A1-MPC1-P

A = Adjustable   **P** = Panel Mounting
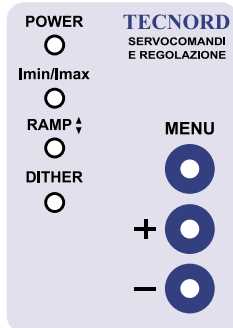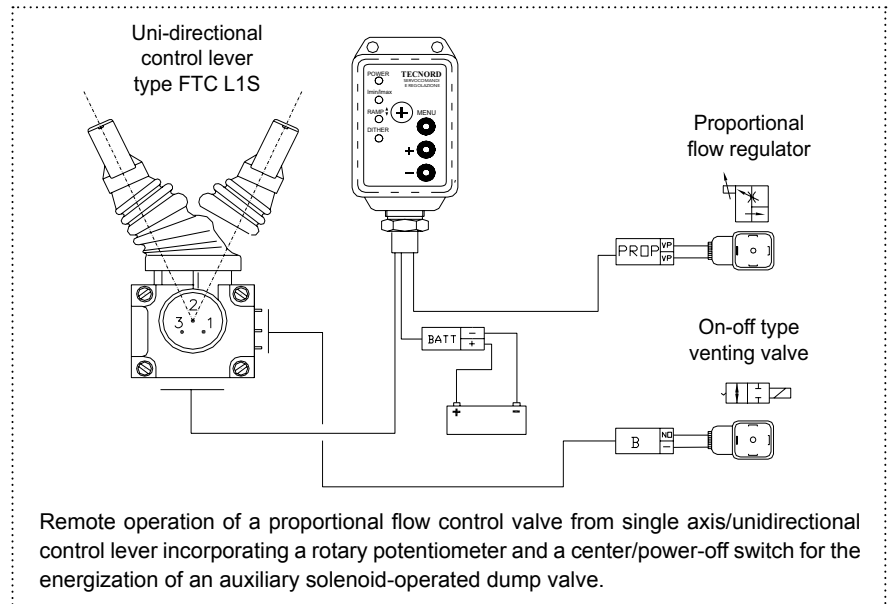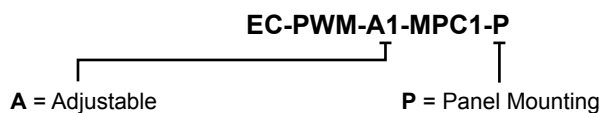
Part numbers	Version
23.0409.045	0-5 V
23.0409.087	0-10 V
23.0409.136	0-20 mA

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EC-PWM-A1-MPC1-D   PWM DRIVER

DESCRIPTION

Microprocessor-based PWM electronic driver for remote control of a single proportional solenoid valve.

OPERATION

The EC-PWM-A1-MPC1-D proportional valve driver receives a command signal from a potentiometer, PLC or other control systems, and supplies a solenoid with a PWM (Pulse Width Modulated) current proportional to the input signal. An auxiliary power supply (+5 V) is provided as a reference for the command signal. Adjustments of "Imin/Imax", "Ramp time" and "Dither" can be carried out directly from a key-pad integrated on the front panel.

Mounting option: female DIN 43650 socket on valve's side and sheated exit cable to connect to power source and remote control devices.
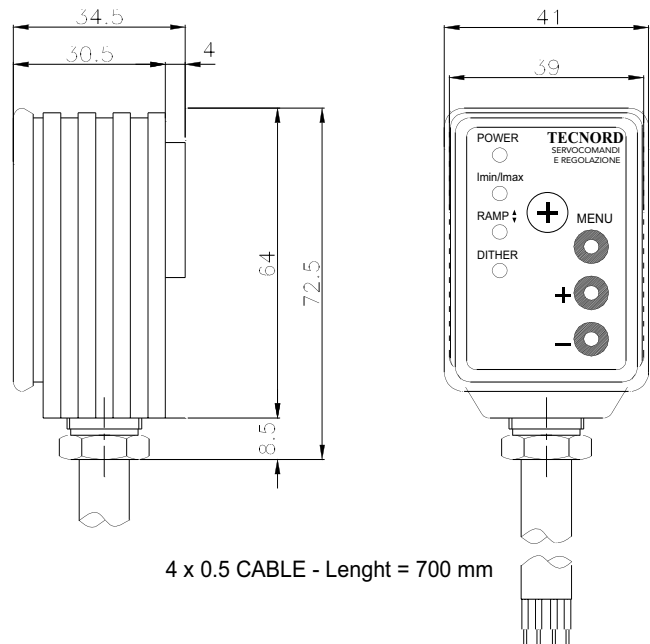
FEATURES

- The current in the solenoid is independent from any change in the coil resistance or in the supply voltage.
- The inherent superimposed dither frequency helps to overcome friction and stiction effects in the controlled device.
- Power supply line is protected against reversed polarity and load dump.
- Input is protected against short circuits to GND and power supply.
- Output is protected against short circuits, over-current and over-temperature.
- The EC-PWM-A1-MPC1 is completely potted.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).

SPECIFICATIONS

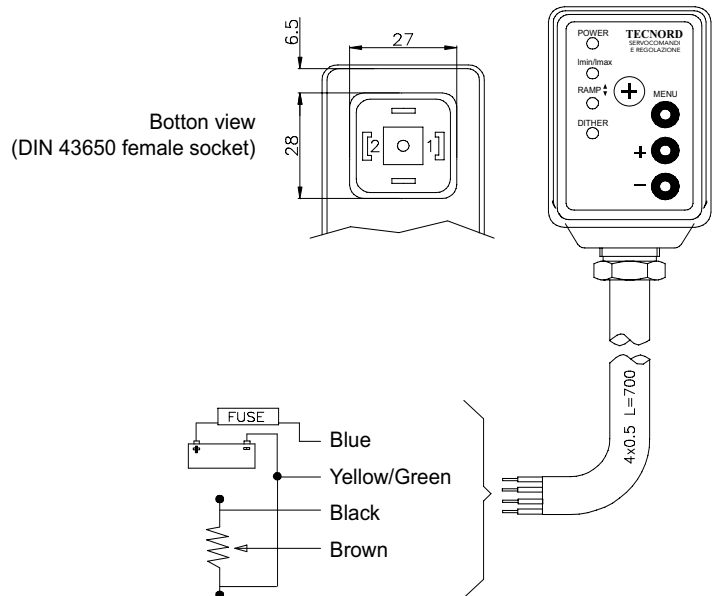|	
Operating voltage:	8.5÷30 VDC
Max current consumption:	100 mA (no load applied)
Operating temperature:	-25°C / +85°C
Input resistance 0÷5 V voltage input:	560 KOhms
0÷10 V voltage input:	1 MOhm
0÷20mA current input:	250 Ohms
Degree of protection:	IP 67
Analog input signals available:	0÷5 V
	0÷10 V
	0÷20 mA
Typical ctrl pot resistance:	2÷47 kΩ
Current output range (PWM):	100÷3000 mA
PWM dither frequency:	55÷200 Hz (adjustable)
Ramp time:	0.05÷5 s (adjustable)
Max. current from auxiliary +5 V:	15 mA

APPLICATIONS

Primary applications are the control of proportional pressure reducing valves and proportional flow regulators to attain smooth acceleration/deceleration and fine-metering control of electro-hydraulic functions.

DIMENSIONS

4 x 0.5 CABLE - Lenght = 700 mm

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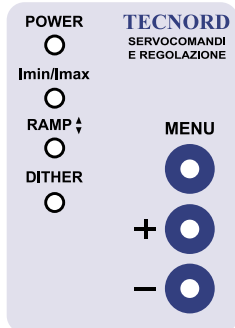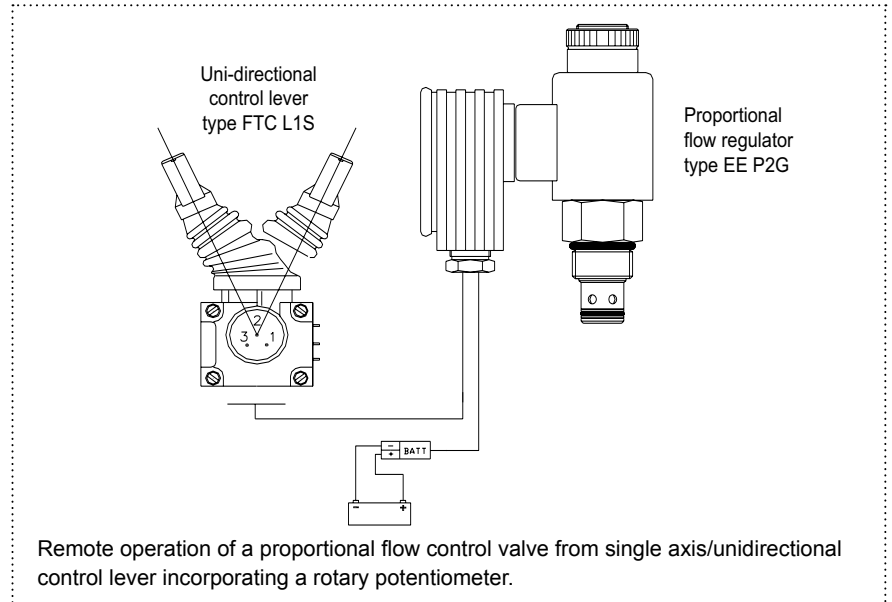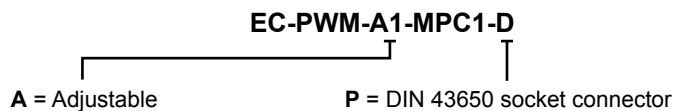
Page **EC6**

EC-PWM-A1-MPC1-D   PWM DRIVER

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connection Diagram for 0÷5 V Version

Power supply wiring colours

Blue   (+) Positive from power source
Yellow/Green (-) Negative from (GND)

Remote potentiometer wiring colours

Black   Command signal supply (+5 V)
Brown   Command signal in

Proportional valve connector pins

1 Proportional coil output
2 Proportional coil current feedback line

Note

A 5A fuse must be inserted on the BLUE wire connecting the PWM driver to the power source.

Botton view
(DIN 43650 female socket)

6.5   27   28

FUSE

Blue
Yellow/Green
Black
Brown

4x0.5 L=700

ADJUSTMENTS

The following adjustments can be made directly from the front key-pad by selecting the

- 3-pushpins in appropriate combinations:
- Imin (minimum output current)
- Imax (maximum output current)
- Ramp-up time
- Ramp-down time
- Dither frequency

POWER
TECNORD
SERVOCOMANDI
E REGOLAZIONE
Imin/Imax
RAMP
DITHER
MENU
+
—

APPLICATION EXAMPLE

Uni-directional
control lever
type FTC L1S

Proportional
flow regulator
type EE P2G

BATT

Remote operation of a proportional flow control valve from single axis/unidirectional control lever incorporating a rotary potentiometer.

ORDERING INFORMATION

EC-PWM-A1-MPC1-D

A = Adjustable   **P** = DIN 43650 socket connector

Part numbers	Version
23.0409.046	0-5 V
23.0409.065	0-10 V
23.0409.077	0-20 mA

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EC-PWM-A1-MPC1-E   PWM DRIVER

DESCRIPTION

Microprocessor-based PWM electronic driver for remote control of a single proportional solenoid valve.

OPERATION

The EC-PWM-A1-MPC1-E proportional valve driver receives a command signal from a potentiometer, PLC or other control systems, and supplies a solenoid with a PWM (Pulse Width Modulated) current proportional to the input signal. An auxiliary power supply (+5 V) is provided as a reference for the command signal. Adjustments of "Imin/Imax", "Ramp time" and "Dither" can be carried out directly from a key-pad integrated on the front panel.
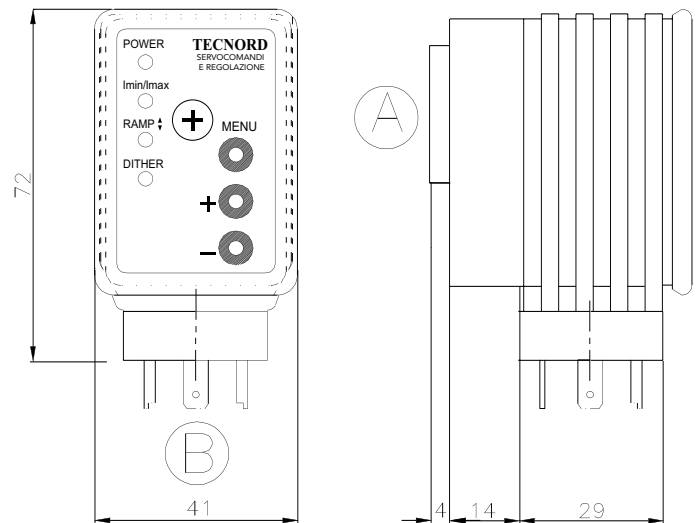**Mounting option:** female DIN 43650 socket on valve's side and male DIN 43650 plug to connect to power source and remote control devices.

FEATURES

- The current in the solenoid is independent from any change in the coil resistance or in the supply voltage.
- The inherent superimposed dither frequency helps to overcome friction and stiction effects in the controlled device.
- Power supply line is protected against reversed polarity and load dump.
- Input is protected against short circuits to GND and power supply.
- Output is protected against short circuits, over-current and over-temperature.
- The EC-PWM-A1-MPC1 is completely potted.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).

SPECIFICATIONS

Operating voltage:	8.5÷30 VDC
Max current consumption:	100 mA (no load applied)
Operating temperature:	-25°C / +85°C
Input resistance 0÷5 V voltage input:	560 KOhms
0÷10 V voltage input:	1 MOhm
0÷20mA current input:	250 Ohms
Degree of protection:	IP 67
Analog input signals available:	0÷5 V
	0÷10 V
	0÷20 mA
Typical ctrl pot resistance:	2÷47 kΩ
Current output range (PWM):	100÷3000 mA
PWM dither frequency:	55÷200 Hz (adjustable)
Ramp time:	0.05÷5 s (adjustable)
Max. current from auxiliary +5 V:	15 mA

APPLICATIONS

Primary applications are the control of proportional pressure reducing valves and proportional flow regulators to attain smooth acceleration/ deceleration and fine-metering control of electro-hydraulic functions.
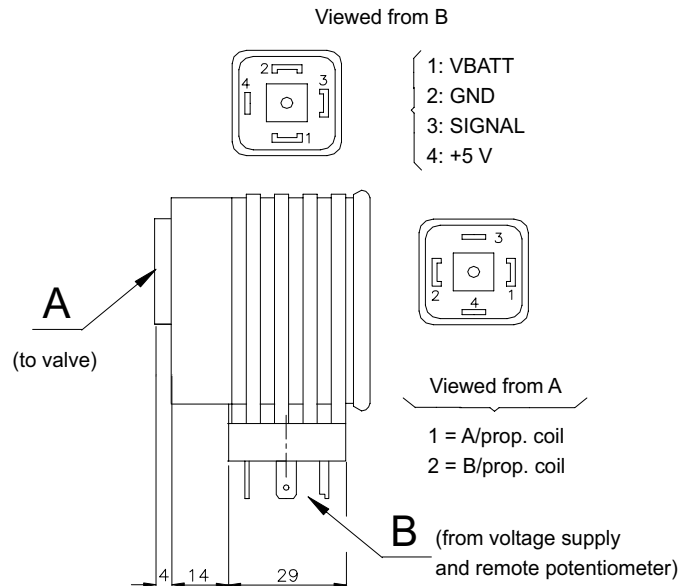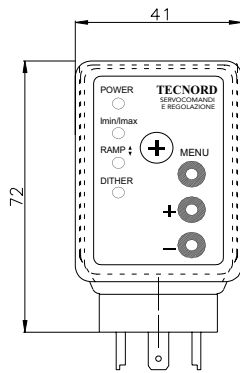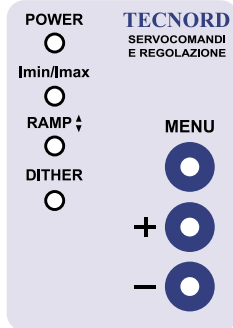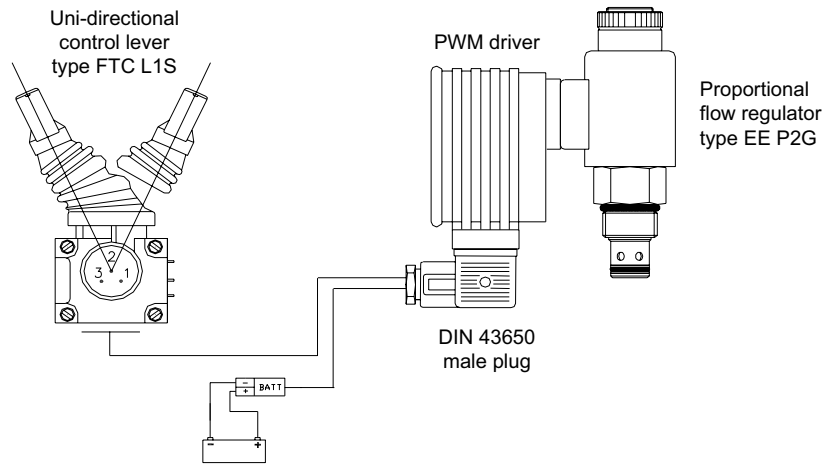
DIMENSIONS

A socket connector type DIN 43650 (to proportional valve)

B plug connector type DIN 43650 (from voltage supply and remote potentiometer)

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EC-PWM-A1-MPC1-E   PWM DRIVER

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connection Diagram for 0÷5 V Version

Viewed from B

1: VBATT
2: GND
3: SIGNAL
4: +5 V

41

72

POWER
Imin/Imax
RAMP
DITHER
MENU
+
–

A
(to valve)

Viewed from A

1 = A/prop. coil
2 = B/prop. coil

B (from voltage supply and remote potentiometer)

4   14   29

ADJUSTMENTS

The following adjustments can be made directly from the front key-pad by selecting the

- 3-pushpins in appropriate combinations:
- Imin (minimum output current)
- Imax (maximum output current)
- Ramp-up time
- Ramp-down time
- Dither frequency

POWER
Imin/Imax
RAMP
DITHER

TECNORD
SERVOCOMANDI
E REGOLAZIONE

MENU
+
–

APPLICATION EXAMPLE

Uni-directional control lever type FTC L1S

PWM driver

Proportional flow regulator type EE P2G

DIN 43650 male plug

BATT

Remote operation of a proportional flow control valve from single axis/unidirectional control lever incorporating a rotary potentiometer.

ORDERING INFORMATION

EC-PWM-A1-MPC1-E

A = Adjustable

E = DIN 43650 plug connector

Part numbers	Version
23.0409.089	0-5 V
23.0409.047	0-10 V
23.0409.137	0-20 mA

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EC-PWM-A2-MPC1-* PWM DRIVER

DESCRIPTION

Microprocessor-based PWM electronic driver for remote control of a dual-coil proportional solenoid valve.

OPERATION

The EC-PWM-A2-MPC1 proportional valve driver supplies a double solenoid with a PWM (Pulse Width Modulated current proportional to the input signal from a potentiometer, PLC or other control systems. Proportional valve A is controlled with an input command signal varying from 2.5 to 4.5 V. Proportional valve B is controlled with an input command signal varying from 2.5 to 0.5 V. An auxiliary on-off type solenoid can be energised anytime the input signal goes out of the 2.25-2.75 V range.
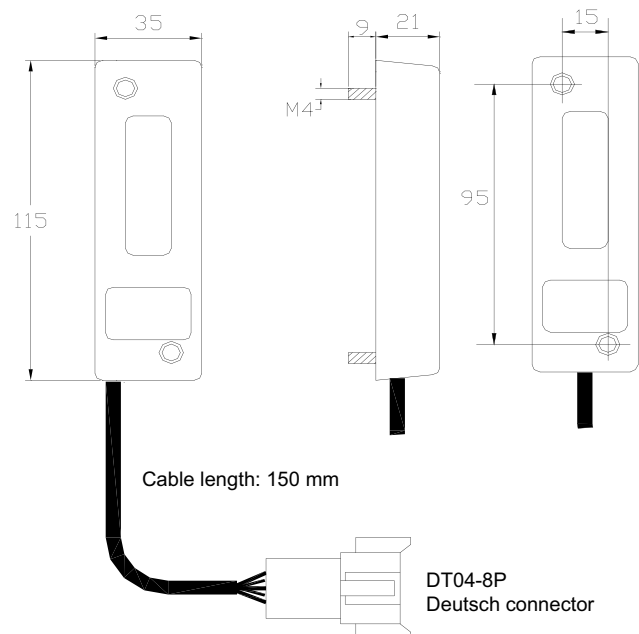
FEATURES

- The current in the solenoid is independent from any change in the coil resistance or in the supply voltage.
- The inherent superimposed dither frequency helps to overcome friction and stiction effects in the controlled device.
- Supply line is protected against reversed polarity.
- Input is protected against short circuits to GND and supply.
- Outputs are protected against short circuits, reversed polarity, over-current and over-temperature.
- The EC-PWM-A2 circuit is potted inside a plastic enclosure suitable for panel mounting by means of 2 set screws.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).
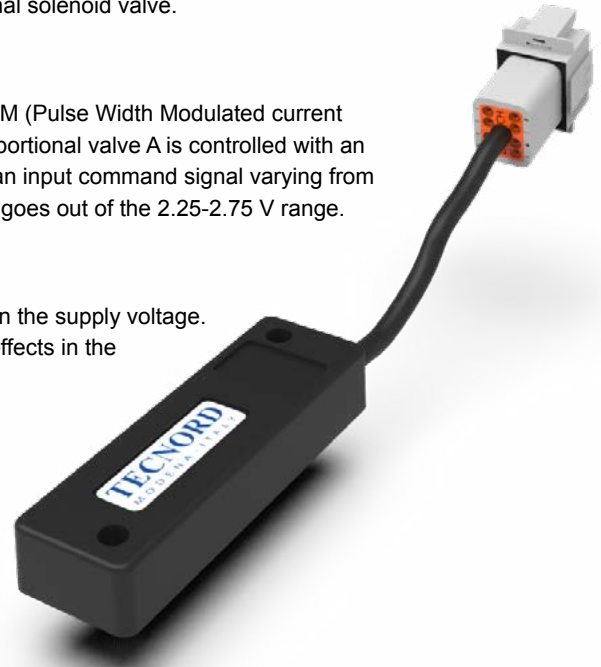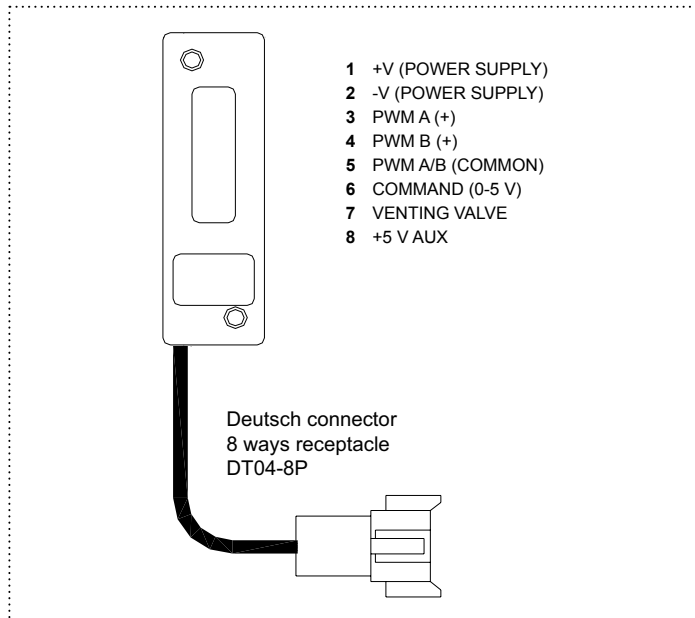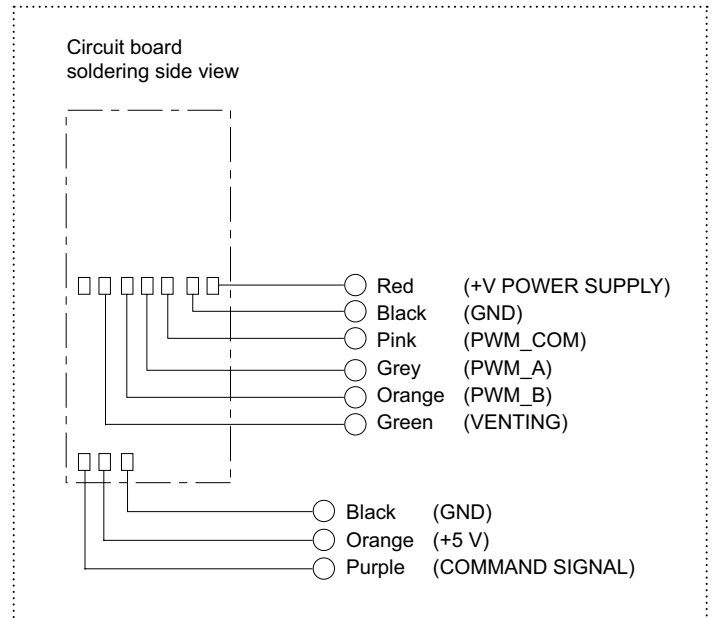
SPECIFICATIONS

Operating voltage:	8÷32 VDC
Max current consumption:	100 mA (no load applied)
Operating temperature:	-25°C / +85°C
Degree of protection:	IP 68
Input impedance:	40 kΩ
Analog input signals:	0.5 - 2.5 - 4.5 VDC
Typical ctrl pot resistance:	2÷10 kΩ
Current output range (PWM):	100÷1500 mA
Current on-off output:	max 1800 mA
PWM dither frequency:	100 Hz
Resolution:	10 bits

DT04-8P Deutsch connector (male contacts)

APPLICATIONS

- 12 VDC and 24 VDC systems.
- Remote control of proportional valves.
- Field-adjustable applications.
- Control of a proportional bidirectional valve with a venting valve.
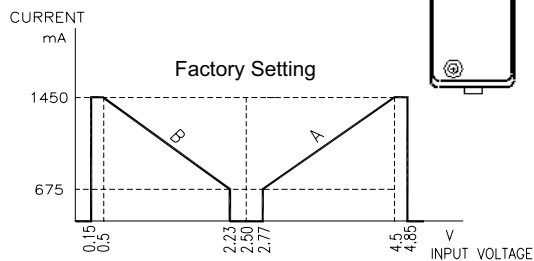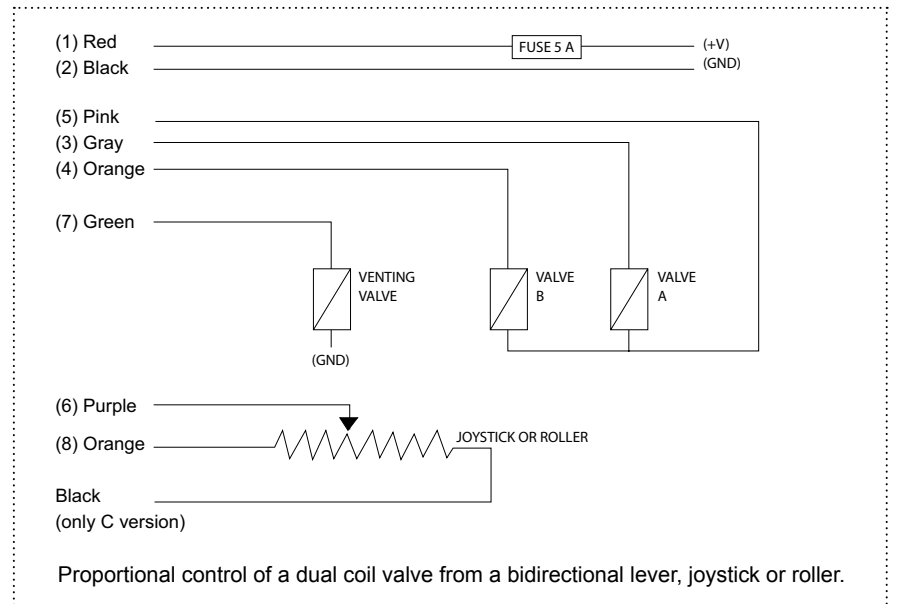
DIMENSIONS

Cable length: 150 mm

DT04-8P
Deutsch connector

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EC-PWM-A2-MPC1-*   PWM DRIVER

H VERSION - PINOUT

1   +V (POWER SUPPLY)
2   -V (POWER SUPPLY)
3   PWM A (+)
4   PWM B (+)
5   PWM A/B (COMMON)
6   COMMAND (0-5 V)
7   VENTING VALVE
8   +5 V AUX

Deutsch connector
8 ways receptacle
DT04-8P

C VERSION - WIRING DIAGRAM

Circuit board
soldering side view

Red   (+V POWER SUPPLY)
Black   (GND)
Pink   (PWM_COM)
Grey   (PWM_A)
Orange   (PWM_B)
Green   (VENTING)

Black   (GND)
Orange   (+5 V)
Purple   (COMMAND SIGNAL)

ADJUSTMENTS

Two rotary trimmers are located on the rear potted surface to provide the following field adjustments:

- Imin (minimum output current)
- Imax (maximum output current)

MIN
MAX

CURRENT
mA

Factory Setting

1450

675

B   A

0,15
0,5

2,23
2,50
2,77

4,5
4,85

V
INPUT VOLTAGE

APPLICATION EXAMPLE

(1) Red   FUSE 5 A   (+V)
(2) Black   (GND)

(5) Pink
(3) Gray
(4) Orange

(7) Green

VENTING
VALVE

VALVE
B

VALVE
A

(GND)

(6) Purple   JOYSTICK OR ROLLER
(8) Orange

Black
(only C version)

Proportional control of a dual coil valve from a bidirectional lever, joystick or roller.

ORDERING INFORMATION

EC-PWM-A2-MPC1-*

A = trimmer Adjustable version

H = potted plastic Housing
C = Circuit board only

Part numbers	Version
23.0409.138	H
23.0409.109	C

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EC-PWM-A*-MPC1-DT-CAN   SMART PWM DRIVER

DESCRIPTION

Microprocessor-based PWM electronic driver for the control of a single or double-acting proportional function by means of CANbus or analogue voltage signal. Any complex logic function is available thanks to the integrated microcontroller.

OPERATION

The EC-PWM-A*-MPC1-DT-CAN drives one or two solenoids with a PWM (Pulse Width Modulated) current proportional to the input signal provided by a CANbus ECU or a joystick.
The EC-PWM-A*-MPC1-DT-CAN is suitable for a variety of functions, from the classic PWM proportional driver (mono or bidirectional function) to customized and complex functions (e.g. clutch engagement cycle).
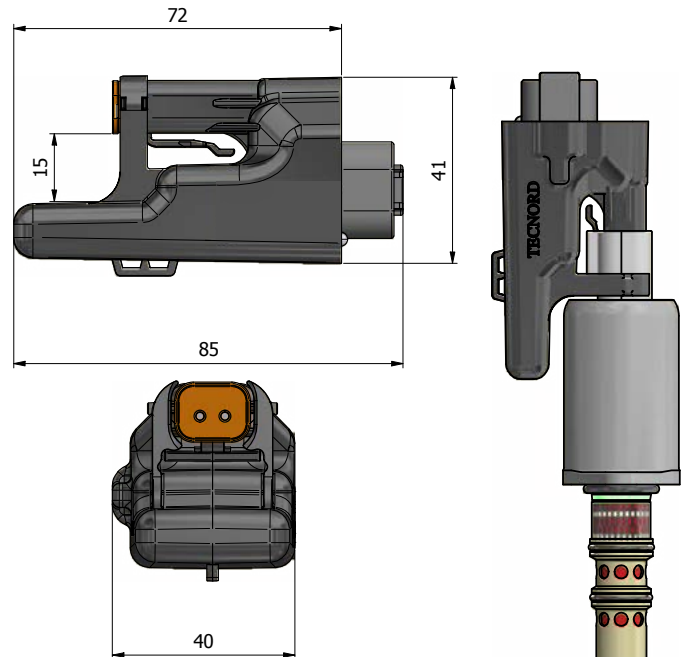
FEATURES

- Robust thermoplastic enclosure, fully potted against harsh environmental conditions
- Microprocessor architecture with high diagnostics capability
- Protection against disturbances on power supply: overvoltages, reversed polarity and load dump
- Protection of inputs against short circuits to GND and power supply
- Protection of outputs against short circuits, overcurrent and overtemperature
- CANbus connection: ISO 11898-2
- CANbus communication protocol: SAE J1939 (standard), CANopen (on specific request)
- Driver's parameters adjustable through CANbus (min/max current, ramps, dither)
- Driver's firmware can be updated through CANbus using Tecnord's CANprogrammer tool
- Electro Magnetic Compatibility (EMC): EN 13309 (construction) - EN 14982 (Ag & forest) - EN 13766 (earth moving)

SPECIFICATIONS

Operating Voltage:	8 ÷ 30 Vdc
Max. current consumption:	< 50 mA (without load)
Operating Temperature:	-40 ÷ 85°C
Degree of protection:	IP69K
Analogue voltage control (A2 version):	0.5 - 2.5 - 4.5 Vdc
Analogue voltage control (A1 version):	0.5 - 4.5 Vdc
Available options (A1 version):	0 ÷ 10V, 0 ÷ 20 mA
Current output range:	0 ÷ 1600 mA
Adjustable parameters:	min. current, Max. current ramps, dither
CANbus lines:	1
CANbus interface:	ISO 11898
CANbus protocol:	SAE J1939 (default) CANopen
CANbus speed selectable:	125 - 250 (default) - 500 kbit/s

APPLICATIONS

- 12/24 Vdc proportional valve driver
- Control of single proportional valve (A1)
- Control of dual proportional valve (A2)
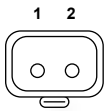- Possibility of customized working cycle (e.g. clutch engagement cycle)

DIMENSIONS

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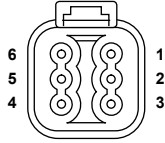
EC-PWM-A*-MPC1-DT-CAN   SMART PWM DRIVER

CONNECTOR PINOUT - A1 (SINGLE COIL) VERSION

Mating connectors:

Deutsch DT04-2P (solenoid)

Deutsch DT06-6S (harness)
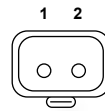
1 EV-A
2 FB (feedback)

1 +V (power)
2 CAN-H
3 ANALOG IN
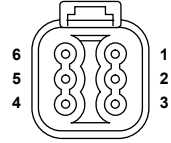4 do not connect
5 CAN-L
6 GND

CONNECTOR PINOUT - A2 (DUAL COIL) VERSION

Mating connectors:

Deutsch DT04-2P (solenoid)

Deutsch DT06-6S (harness)

1 EV-A
2 FB (feedback)

1 +V (power)
2 CAN-H/ANALOG IN
3 EV-B (solenoid)
4 FB (feedback)
5 CAN-L
6 GND

ADJUSTMENTS

Adjustments can be effected via CANbus line
to modify the following work parameters:

- Imin (minimum output current)
- Imax (maximum output current)
- Ramp-up time
- Ramp-down time
- Dither frequency
- non-linear characteristics
- CANbus communication parameters
- type of control signal (Can or analogue voltage)

**PC configuration
tool available**

**CANUSB adapter
ordering code: 21.0801.040**

**DEUTSCH DB9 linking cable
ordering code: 21.0801.075**

SW CONFIGURATION / ADJUSTMENT TOOL EXAMPLE

ORDERING INFORMATION

EC-PWM-A*-MPC1-DT-CAN

A1 = single proportional function
A2 = dual proportional function

Part numbers	Version
23.0409.326	A1
23.0409.327	A2

W 28/ 2022

EC-PWM-P4-MPC2-H   PWM DRIVER

DESCRIPTION

Microprocessor-based PWM driver for remote control of 2 dual-coil proportional solenoid valves.

OPERATION

The EC-PWM-P4-MPC2-H proportional valve driver supplies up to two dual-coil proportional valves with PWM (Pulse Width Modulated) current proportional to input signals coming from potentiometers, PLC or other control systems. The control characteristics (Imin/Imax, ramps, dither) are configurable via PC connected with a RS232 serial line to a configuration kit and PC interface of Tecnord supply.

FEATURES

- The current in the solenoid is independent from any change in the coil resistance or in the supply voltage.
- The inherent superimposed dither frequency helps to overcome friction and stiction effects in the controlled device.
- Supply line is protected against reversed polarity and load dump.
- Inputs are protected against short circuits to GND and supply.
- Outputs are protected against short circuits, reversed polarity, over-current and over-temperature.
- The EC-PWM-P4-MPC2-H is completely potted.
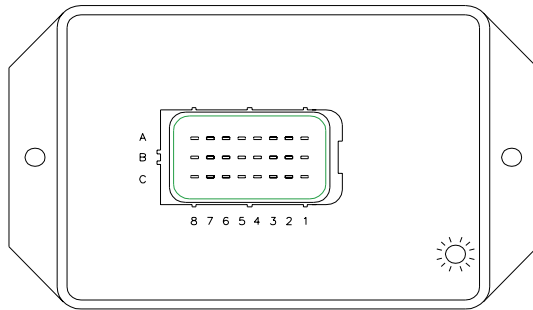- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).

SPECIFICATIONS

Operating voltage:	9÷30 VDC
Max current consumption:	100 mA (no load applied)
Operating temperature:	-25°C / +85°C
Degree of protection:	IP 67
Input impedance:	100 kΩ
Analog inputs:	4 x 0-5 V
Typical ctrl pot resistance:	1÷10 kΩ
Digital inputs:	analog inputs can be used as digital
Resolution:	10 bit
PWM outputs channels:	2 x dual-coil proportional valves
Current output range (PWM):	100÷1500 mA (3 A version available)
PWM dither frequency:	75÷250 Hz (adjustable)
On-off digital output:	1 (1500 mA)
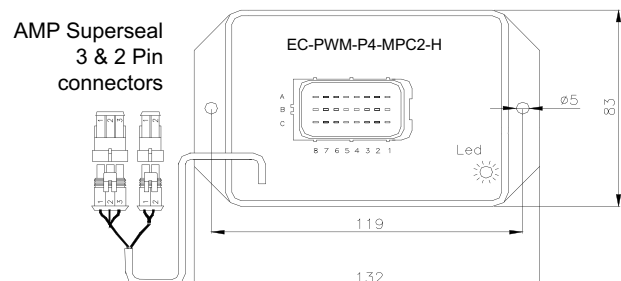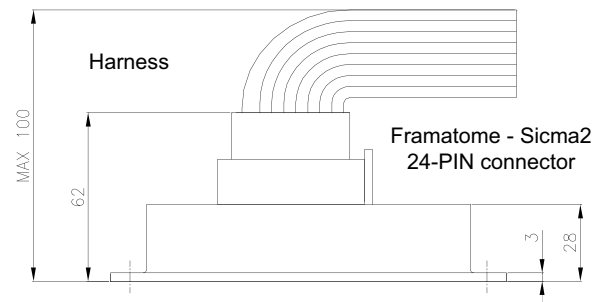
APPLICATIONS

- Specifically designed for applications requiring accurate adjustments and calibrations.
- 12 VDC and 24 VDC systems.
- Remote control of non-feedback proportional valves.
- Control of a proportional bidirectional valve with a venting valve.

DIMENSIONS

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EC-PWM-P4-MPC2-H   PWM DRIVER

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connector type: framatome SICMA2

Connector type: AMP-Seal

For software download
1 RTS
2 DTR

For calibration and adjustments
1 TX
2 RX
3 GND

A
1 ON-OFF OUTPUT
2 NOT CONNECTED
3 NOT CONNECTED
4 NOT CONNECTED
5 NOT CONNECTED
6 NOT CONNECTED
7 ANALOG INPUT FOR FUNCTION 1 (TO DRIVE EV1A/B)
8 FEEDBACK FOR EV1A/B
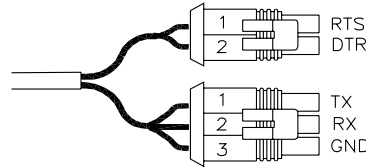
B
1 +V (POWER SUPPLY)
2 NOT CONNECTED
3 NOT CONNECTED
4 ANALOG INPUT FOR FUNCTION 2 (TO DRIVE EV2A/B)
5 NOT CONNECTED
6 FEEDBACK FOR EV2A/B
7 NOT CONNECTED
8 NOT CONNECTED

C
1 -V (POWER SUPPLY - GND)
2 +5 VDC EXTERNAL SUPPLY VOLTAGE
3 ANALOG INPUT - SPARE
4 ANALOG INPUT - SPARE
5 EV1A PROP. COIL OUTPUT (+)
6 EV1B PROP. COIL OUTPUT (+)
7 EV2A PROP. COIL OUTPUT (+)
8 EV2B PROP. COIL OUTPUT (+)

ADJUSTMENTS

Adjustments can be effected via RS232 serial line to modify the following work parameters:

- Imin (minimum output current)
- Imax (maximum output current)
- Ramp-up time
- Ramp-down time
- Dither frequency

PC configuration tool available

Ampseal-DB9 cable adapter ordering code: 20.1001.026/A

RS232 - USB converter ordering code: 21.0801.039

APPLICATION EXAMPLE

Proportional regulation of 2 dual-coil valves with 1 bidirectional joystick.
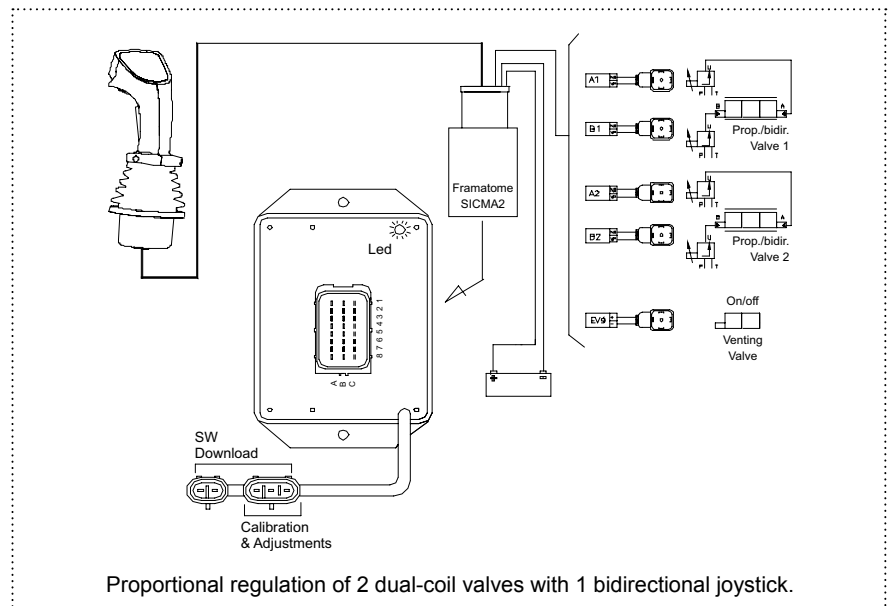
ORDERING INFORMATION

EC-PWM-P4-MPC2-H

P = Programmable   **H** = potted plastic Housing

Part numbers	Version
23.0409.237	1.5 A
23.0409.238	3 A

W 28/ 2022

EC-PWM-P8-MPC4-H   PWM DRIVER

DESCRIPTION

Microprocessor-based PWM driver for remote control of 4 dual-coil proportional solenoid valves.

OPERATION

The EC-PWM-P8-MPC4 proportional valve driver supplies up to four dual-coil proportional solenoid valves with PWM (Pulse Width Modulated) current proportional to the input signals coming from potentiometers, PLC or other control systems. The control characteristics (Imin/Imax, ramps, dither) are configurable via PC connected with a RS232 serial line to a configuration kit and PC interface of Tecnord supply.

FEATURES

- The current in the solenoid is independent from any change in the coil resistance or in the supply voltage.
- The inherent superimposed dither frequency helps to overcome friction and stiction effects in the controlled device.
- Supply line is protected against reversed polarity and load dump.
- Inputs are protected against short circuits to GND and supply.
- Outputs are protected against short circuits, reversed polarity, over-current and over-temperature.
- The EC-PWM-P8-MPC4-H is completely potted.
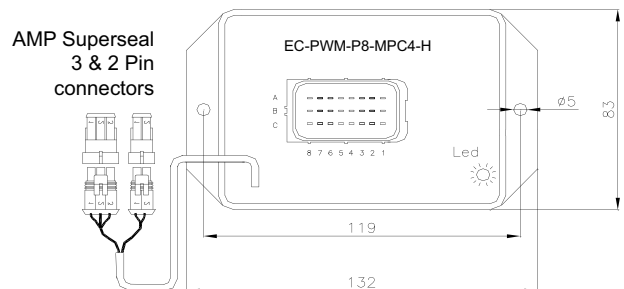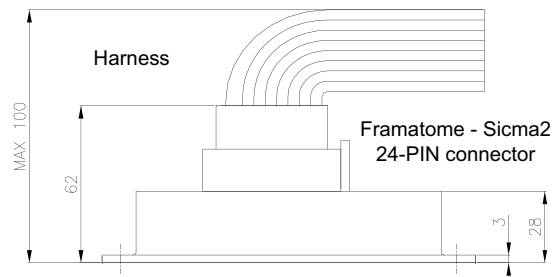- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).

SPECIFICATIONS

Operating voltage:	9÷30 VDC
Max current consumption:	100 mA (no load applied)
Operating temperature:	-25°C / +85°C
Degree of protection:	IP 67
Input impedance:	100 kΩ
Analog inputs:	8 x 0-5 V
Typical ctrl pot resistance:	1÷10 kΩ
Digital inputs:	analog inputs can be used as digital
Resolution:	10 bit
PWM outputs channels:	4 x dual-coil proportional valves
Current output range (PWM):	100÷1500 mA (3 A version available)
PWM dither frequency:	75÷250 Hz (adjustable)

APPLICATIONS

- Specifically designed for applications requiring accurate adjustments and calibrations.
- 12 VDC and 24 VDC systems.
- Remote control of non-feedback proportional valves.
- Control of up to 4 proportional bidirectional valves.

NOTE: a fixed parameters version, without programming cable, is available.

DIMENSIONS

Harness

Framatome - Sicma2
24-PIN connector

MAX 100

62

3

28

AMP Superseal
3 & 2 Pin
connectors

EC-PWM-P8-MPC4-H

Ø5

83

Led

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EC-PWM-P8-MPC4-H   PWM DRIVER

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connector type: framatome SICMA2

Connector type: AMP-Seal

For software download
1 RTS
2 DTR

For calibration and adjustments
1 TX
2 RX
3 GND
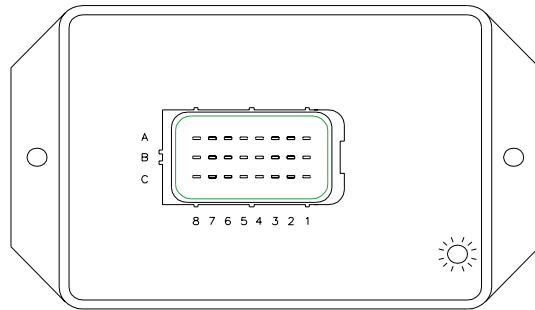
A
1 EV4A PROP. COIL OUTPUT (+)
2 EV4B PROP. COIL OUTPUT (+)
3 EV3A PROP. COIL OUTPUT (+)
4 EV3B PROP. COIL OUTPUT (+)
5 ANALOG INPUT FOR FUNCTION 4 (TO DRIVE EV4A/B)
6 ANALOG INPUT FOR FUNCTION 3 (TO DRIVE EV3A/B)
7 ANALOG INPUT FOR FUNCTION 1 (TO DRIVE EV1A/B)
8 FEEDBACK FOR EV1A/B

B
1 +V (POWER SUPPLY)
2 NOT CONNECTED
3 ANALOG INPUT - SPARE
4 ANALOG INPUT FOR FUNCTION 2 (TO DRIVE EV2A/B)
5 ANALOG INPUT - SPARE
6 FEEDBACK FOR EV2A/B
7 FEEDBACK FOR EV4A/B
8 FEEDBACK FOR EV3A/B

C
1 -V (POWER SUPPLY - GND)
2 +5 VDC EXTERNAL SUPPLY VOLTAGE
3 ANALOG INPUT - SPARE
4 ANALOG INPUT - SPARE
5 EV1A PROP. COIL OUTPUT (+)
6 EV1B PROP. COIL OUTPUT (+)
7 EV2A PROP. COIL OUTPUT (+)
8 EV2B PROP. COIL OUTPUT (+)

ADJUSTMENTS

Adjustments can be effected via RS232 serial line to modify the following work parameters:

- Imin (minimum output current)
- Imax (maximum output current)
- Ramp-up time
- Ramp-down time
- Dither frequency

PC configuration tool available

Ampseal-DB9 cable adapter
ordering code: 20.1001.026/A

RS232 - USB converter
ordering code: 21.0801.039

APPLICATION EXAMPLE

Proportional regulation of 4 dual-coil valves with 2 bidirectional joysticks.

ORDERING INFORMATION

EC-PWM-P8-MPC4-H

P = Programmable   **H** = potted plastic Housing

Part numbers	Version
23.0409.081	1.5 A
23.0409.071	3 A
23.0409.170	Fixed Parameters max 1.5 A

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Page **EC17**

EC-PWM-P12-MPC6-H   PWM DRIVER AND MACHINE MANAGEMENT SAFETY CONTROLLER

DESCRIPTION

Multi-function PWM controller in a rugged nylon enclosure, fully potted. Control through CANbus or analogue voltage signals.
Microprocessor-based PWM driver for remote control of 6 dual-coil proportional solenoid valves. Enhanced version available, with redundant electronics to be used in safety related applications up to PL=d. Fully adjustable via a specific software calibration tool.

OPERATION

EC-PWM-P12 is designed to be the main controller of multi-function hydraulic manifolds.
The control signals can be provided using either CAN Bus or analogue voltage signals.
Last generation microcontroller for handling the PWM proportional solenoids.
Firmware upgrade available through CANbus line.
Enhanced version is equippred with a 16-bit Automotive CPU
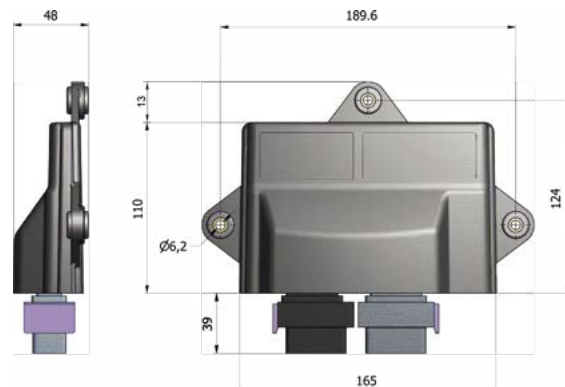for Safety architecture up to HW Cat.3.

FEATURES

- Robust nylon enclosure, fully potted (excellent power dissipation).
- Hardware Category 1 (standard driver) or Category 3 (enhanced version).
- Power Supply is protected against reversed polarity and automotive disturbances.
- Inputs are protected against short circuits to GND and power supply.
- Outputs are protected against short circuits, overcurrent and overtemperature.
- Electro Magnetic Compatibility (EMC): EN 13766, EN 14982.
- High Diagnostics Capability.
- Enhanced version for applications with high safety requirements:
    - Two microcontrollers with independent power supply and watchdog.
    - 2 CANbus connections, can be merged in one single physical line.
    - Combination of High and Low Side outputs from two independent controllers.
    - Detection of ground disconnection (as according to ISO EN 13849).
    - Independent Power pin on specific High Side outputs.

SPECIFICATIONS

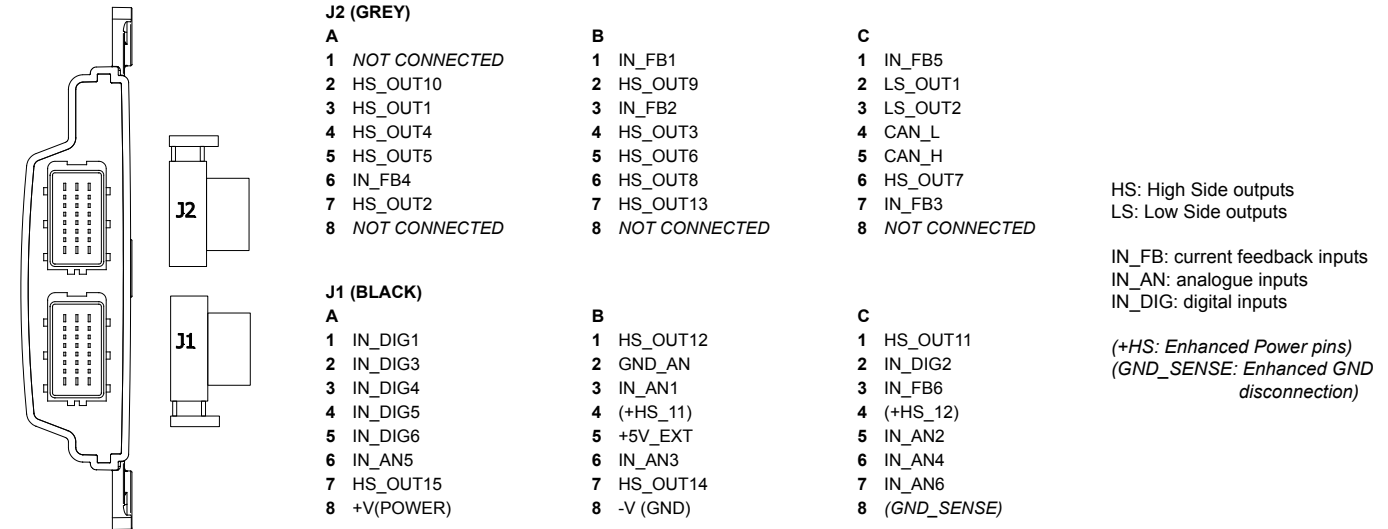|	
Operating voltage:	8 ÷ 30 Vdc
Max. current consumption:	< 200 mA (no load applied)
Operating Temperature:	-40 ÷ +105°C
Degree of protection:	IP69K
Analog inputs (16 bits):	6 (0 ÷ 5 V or 4 ÷ 20 mA)
Digital inputs:	6
Inputs for current feedback	6
High Side power outputs	15
Low Side outputs	2
(Enhanced) Outputs with Power pin	6
(Enhanced) Ground detection input	1
CANbus line:	1 (Enhanced: 2)
CANbus interface	ISO 11898
	CAN 2.0A/B
	baudrate up to 1 Mbit/s

APPLICATIONS

- 12/24 Vdc Multi-function PWM Driver or machine management systems.
- Enhanced Safety ECU for aerial platforms, cranes, telehandlers, agriculture vehicles (architecture up to Category 3).

DIMENSIONS

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EC-PWM-P12-MPC6-H   PWM DRIVER AND MACHINE MANAGEMENT SAFETY CONTROLLER

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connector type: framatome SICMA2

J2 (GREY)

A		B		C	
1	*NOT CONNECTED*	1	IN_FB1	1	IN_FB5
2	HS_OUT10	2	HS_OUT9	2	LS_OUT1
3	HS_OUT1	3	IN_FB2	3	LS_OUT2
4	HS_OUT4	4	HS_OUT3	4	CAN_L
5	HS_OUT5	5	HS_OUT6	5	CAN_H
6	IN_FB4	6	HS_OUT8	6	HS_OUT7
7	HS_OUT2	7	HS_OUT13	7	IN_FB3
8	*NOT CONNECTED*	8	*NOT CONNECTED*	8	*NOT CONNECTED*

J1 (BLACK)

A		B		C	
1	IN_DIG1	1	HS_OUT12	1	HS_OUT11
2	IN_DIG3	2	GND_AN	2	IN_DIG2
3	IN_DIG4	3	IN_AN1	3	IN_FB6
4	IN_DIG5	4	(+HS_11)	4	(+HS_12)
5	IN_DIG6	5	+5V_EXT	5	IN_AN2
6	IN_AN5	6	IN_AN3	6	IN_AN4
7	HS_OUT15	7	HS_OUT14	7	IN_AN6
8	+V(POWER)	8	-V (GND)	8	*(GND_SENSE)*

HS: High Side outputs
LS: Low Side outputs

IN_FB: current feedback inputs
IN_AN: analogue inputs
IN_DIG: digital inputs

(+HS: Enhanced Power pins)
(GND_SENSE: Enhanced GND disconnection)

J2

J1

ADJUSTMENTS

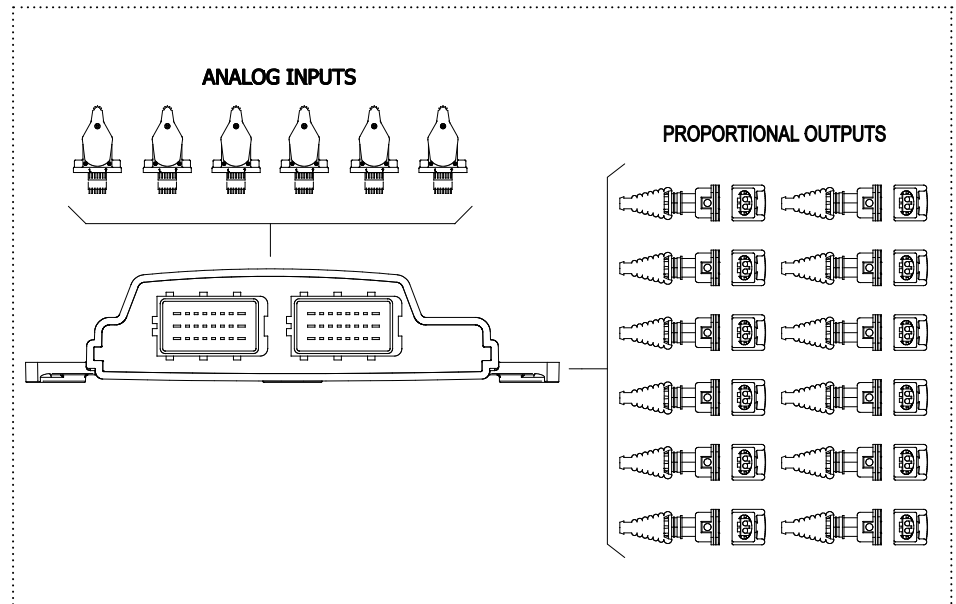Working parameters can be adjusted via CANbus line.

- Imin (minimum output current)
- Imax (maximum output current)
- Ramp-up time
- Ramp-down time

PC configuration tool available

CANUSB adapter ordering code: 21.0801.040

APPLICATION EXAMPLE

ANALOG INPUTS

PROPORTIONAL OUTPUTS

ORDERING INFORMATION

EC-PWM-P12-MPC6-H

P12 = 12 PWM proportional outputs

MPC6 = 6 Bidirectional functions

Part number (Std Version)
23.0412.113

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MACHINE MANAGEMENT SYSTEMS

MODEL	DESCRIPTION	PAGE
EC-MMS-1012-H	10 inputs, 12 outputs meter-in systems controller	EC22
EC-MMS-2218-H	22 inputs, 18 outputs RS232 CANbus interface	EC24
EC-MMS-1417-H	14 inputs, 17 outputs CANbus interface	EC26
EC-MMS-1521-H	15 inputs, 21 outputs CANbus interface	EC28
EC-MMS-5020-H	50 inputs, 20 outputs RS 485 / CANbus interface	EC30
EC-MMS-0713-H	7 inputs, 13 outputs Deutsch connection / RS 485 interface	EC32
EC-MMS-6252-H	62 inputs, 52 output RS485 / CANbus interface	EC34

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EC-MMS-1012-H   MACHINE MANAGEMENT SYSTEM

DESCRIPTION

Digital MMS (Machine Management System) with built-in advanced safety and fault detection features for integrated control of mobile equipment functions.

OPERATION

10 inputs and 12 outputs are managed by this small-size unit. PWM current outputs are field-adjustable and their setting is stored in a EEPROM memory. Parameters can be loaded via software from a standard PC connected with a RS232 serial line. It can be used as a stand-alone controller for both meter-in systems (up to 5 functions) and bidirectional proportional systems (up to 4 functions). Additional output for a safety venting valve is available.
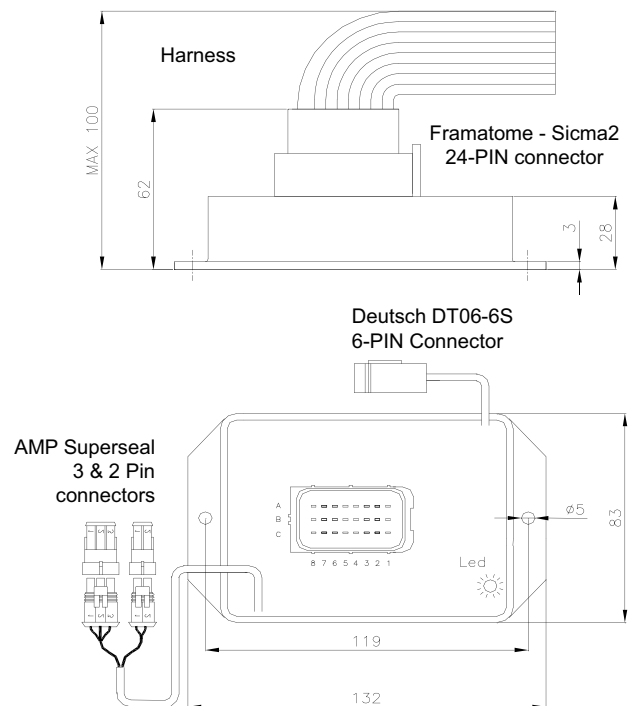
FEATURES

- Supply line is protected against reversed polarity and overvoltage.
- Inputs are protected against short circuits to GND and power supply.
- Outputs are protected against short circuits, reversed polarity, over-current and over-temperature.
- 3-wires RS232 serial interface.
- Auxiliary +5 V supply for control devices (e.g. potentiometers).
- Performance level c capability according to ISO 13849, due to high reliability of components and embedded diagnostics.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).
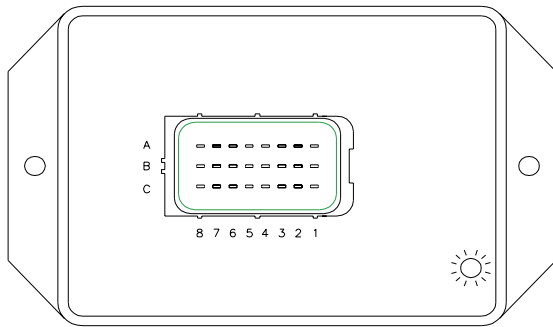
SPECIFICATIONS

Operating voltage:	9÷30 VDC
Max current consumption:	100 mA (no load applied)
Operating temperature:	-25°C / +85°C
Degree of protection:	IP 67
Input impedance:	100 kΩ
Analog inputs (10 bits):	8 (0-5 V)
Typical ctrl pot resistance:	1÷10 kΩ
Digital inputs:	2
High side power outputs:	12 (3.5 A max)
Inputs for current feedback:	4
Current output range (PWM):	100÷1500 mA
PWM dither frequency:	60÷200 Hz

APPLICATIONS

- 12 VDC and 24 VDC systems.
- Remote control of non-feedback proportional and on-off valves.
- Specifically designed for applications requiring accurate adjustments and calibrations.
- Control of up to 4 proportional bidirectional valves plus a venting valve and additional 3 auxiliary outputs.
- Control of up to 5 functions in meter-in configuration (10 on-off valves plus 1 proportional valve and 1 venting valve).
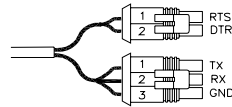
DIMENSIONS

Harness

Framatome - Sicma2
24-PIN connector

MAX 100

62

3

28

Deutsch DT06-6S
6-PIN Connector

AMP Superseal
3 & 2 Pin
connectors

A
B
C

8 7 6 5 4 3 2 1

ø5

83

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119

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EC-MMS-1012-H   MACHINE MANAGEMENT SYSTEM

CIRCUIT BOARD PINOUT - WIRING DIAGRAM (reference: meter-in layout)

Connector type: framatome SICMA2

Connector type: AMP-Seal

For software download
1 RTS
2 DTR

For calibration and adjustments
1 TX
2 RX
3 GND

Connector type: Deutsch DT06-6S

1 DIGITAL IN - SPARE
2 DIGITAL IN - DEAD MAN
3 NOT CONNECTED
4 EV1A (HIGH SIDE)
5 EV1B (HIGH SIDE)
6 EV5B (HIGH SIDE)

A
1 EV4A (HIGH SIDE)
2 EV4B (HIGH SIDE)
3 EV3A (HIGH SIDE)
4 EV3B (HIGH SIDE)
5 ANALOG IN 4
6 ANALOG IN 3
7 ANALOG IN 1
8 PROP. CURRENT FEEDBACK

B
1 +V (POWER SUPPLY)
2 EV9 (VENTING - HIGH SIDE)
3 ANALOG IN - SPARE
4 ANALOG IN 2
5 ANALOG IN 5
6 PROP. CURRENT FEEDBACK - SPARE
7 PROP. CURRENT FEEDBACK - SPARE
8 PROP. CURRENT FEEDBACK - SPARE

C
1 -V (POWER SUPPLY - GND)
2 5V EXT
3 ANALOG IN - SPARE
4 ANALOG IN - SPARE
5 EVP (HIGH SIDE)
6 EV5A (HIGH SIDE)
7 EV2A (HIGH SIDE)
8 EV2B (HIGH SIDE)

ADJUSTMENTS

Adjustments can be effected via RS232 serial line to modify the following work parameters:

- Imin (minimum output current)
- Imax (maximum output current)
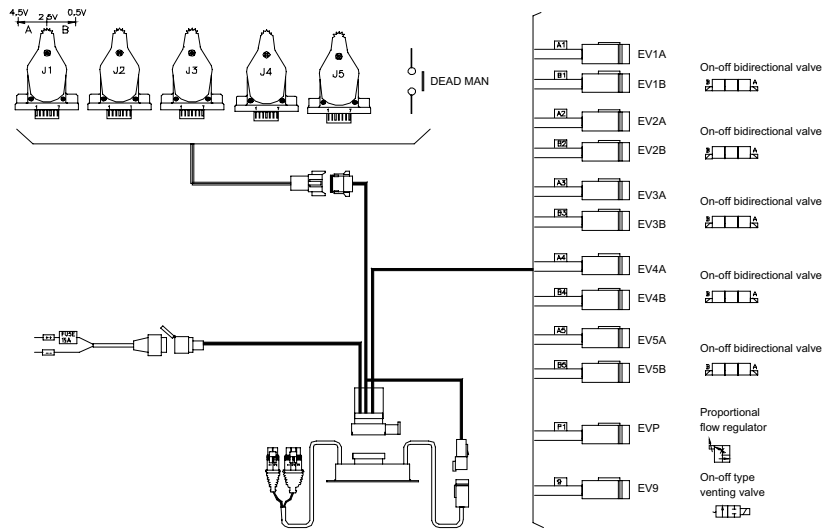- Ramp-up time
- Ramp-down time
- Dither frequency

PC configuration tool available

Ampseal-DB9 cable adapter ordering code: 20.1001.026/A

RS232 - USB converter ordering code: 21.0801.039

APPLICATION EXAMPLE

ORDERING INFORMATION

EC-MMS-1012-H

1012 = 10 inputs - 12 outputs

H = potted plastic
Housing for panel mounting

Part number (Std Version)
23.0409.177

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Page **EC23**

EC-MMS-2218-H   MACHINE MANAGEMENT SYSTEM

DESCRIPTION

Digital MMS (Machine Management System) with built-in advanced safety and fault detection features for integrated control of Mobile Equipment functions. CANbus capability make it suitable for high-end network systems.

OPERATION

22 inputs and 18 outputs are managed by this small-size unit. Analog outputs are field-adjustable and their setting is stored in an EEPROM memory and can be loaded via software from vehicle's controller through CANbus or from a standard PC connected through an RS232 serial line. It can be used as a stand-alone controller or in conjunction with other MMS electronic units like Tecnord's Mod. MMS-4820.
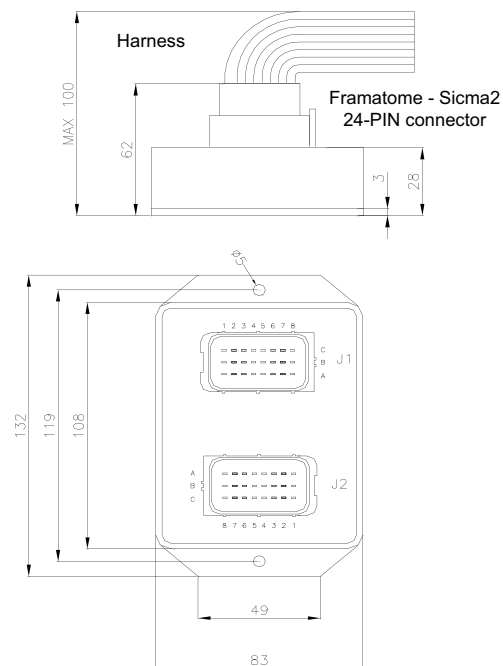
FEATURES

• Power Supply line is protected against reversed polarity and overvoltage.
• Inputs are protected against short circuits to GND and supply.
• High resolution, 16-bits, analog inputs.
• Outputs are protected against short circuits, reversed polarity, over-current and over-temperature.
• CANbus serial interface.
• RS232 serial interface.
• Especially designed to drive up to 6 electro-hydraulic proportional actuators Tecnord type MLT-FD4/5.
• Auxiliary +5 V supply for control devices (e.g. potentiometers).
• Performance Level c capability according to ISO 13849, due to high reliability of components and embedded diagnostics.
• Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).

SPECIFICATIONS

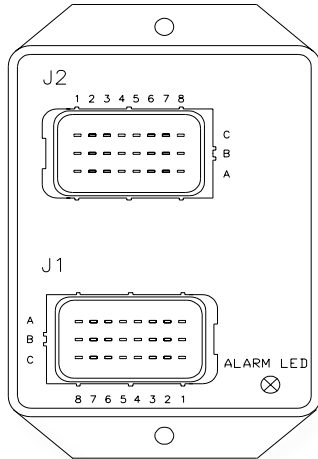|	
Operating voltage:	8÷32 VDC
Max current consumption:	0.5 A (no load applied)
Operating temperature:	-30 ÷ +85°C
Degree of protection:	IP 67
Analog inputs (10 bits):	8 (0-5 V)
Input impedance:	100 kΩ
Typical ctrl pot resistance:	1÷10 kΩ
Digital inputs:	14
High side power outputs:	12 (3.5 A max)
PWM current feedback:	1
Max current load on all outputs:	10 A
Analog outputs:	6 (0-5 V)

APPLICATIONS

• 12 VDC and 24 VDC systems.
• Closed loop systems with electro-hydraulic proportional actuators.
• General purpose applications requiring field-adjustments.
• MMS-2218 can be connected to a CANbus network (J1939 or CANopen).

DIMENSIONS

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EC-MMS-2218-H   MACHINE MANAGEMENT SYSTEM

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connector type: framatome SICMA2

J1

A		B		C	
1	ANALOG IN 2	1	ANALOG IN 1	1	ANALOG IN 0
2	ANALOG IN 5	2	ANALOG IN 4	2	ANALOG IN 3
3	DIGITAL IN 0	3	ANALOG IN 7	3	ANALOG IN 6
4	DIGITAL IN 2	4	DIGITAL IN 1	4	5V EXT
5	DIGITAL IN 4	5	DIGITAL IN 3	5	RS232 GND
6	DIGITAL IN 7	6	DIGITAL IN 6	6	DIGITAL IN 5
7	DIGITAL IN 9	7	DIGITAL IN 8	7	DIGITAL IN 10
8	RS232 TX	8	RS232 RX	8	DIGITAL IN 11

J2

A		B		C	
1	OUT 0 (WITH FEEDBACK)	1	OUT 7	1	OUT 6
2	OUT 1	2	CAN L	2	OUT 9
3	OUT 2	3	ANALOG OUT 0	3	OUT 8
4	OUT 3	4	CAN H	4	OUT 11
5	OUT 4	5	ANALOG OUT 2	5	OUT 10
6	OUT 5	6	ANALOG OUT 1	6	DIGITAL IN 12
7	ANALOG OUT 4	7	ANALOG OUT 5	7	DIGITAL IN 13
8	-V (POWER SUPPLY - GND)	8	+V (POWER SUPPLY)	8	ANALOG OUT 3

ADJUSTMENTS

- MMS controllers have a customized firmware to fulfill machine functions.
- A customized calibration tool is available to set main working parameters.

PC configuration tool available

CANUSB adapter ordering code: 21.0801.040

APPLICATION EXAMPLE

Electro-hydraulic multi-function system requiring individual calibration of each semi-function to meet specific working or safety-related conditions.
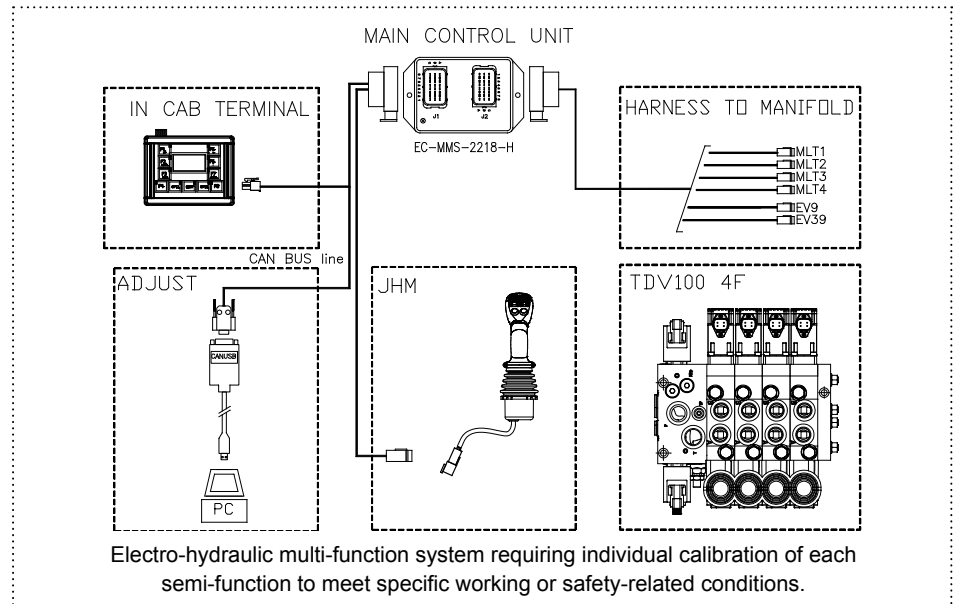
ORDERING INFORMATION

EC-MMS-2218-H

2218 = 22 inputs - 18 outputs

H = potted plastic Housing for panel mounting

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EC-MMS-1417-H   MACHINE MANAGEMENT SYSTEM CONTROLLER

DESCRIPTION

MMS (Machine Management System) controller in a rugged nylon enclosure fully potted, dual microprocessor (master and supervisor), CANbus, built-in safety and fault-detection features for integrated control of complex functions in mobile equipment applications.

OPERATION

MMS-1417 is normally used as the main or redundant (depending on architecture) control unit in a complete management system. Inside a microprocessor with supervisor and advanced diagnostics for safety applications. PLd capability installing two units (based on architecture of Category 3). CANbus for system communication.
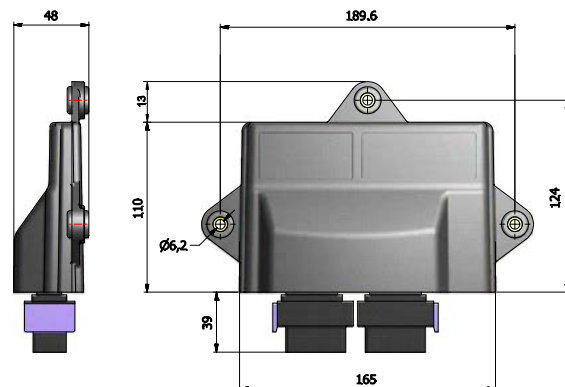
FEATURES

- Robust nylon enclosure fully potted with an excellent power dissipation.
- Microprocessor and supervisor (architecture of Category 2) for advanced diagnostics capability.
- Power Supply is protected against reversed polarity (external fuse required) and load dump.
- Inputs are protected against short circuits to GND and power supply.
- Outputs protected against short circuits, overcurrent and over temperature.
- 1 CANbus connection.
- 2 current feedback inputs for closed loop PWM drivers (maximum two proportional valves driven at the same time).
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).
- Designed for applications with high safety requirements.
- Detection of ground disconnection according to ISO EN 13849.
- +5V auxiliary power supply for e.g. potentiometers or sensors.
- Dedicated power supply pins for redundant safety power outputs.

SPECIFICATIONS

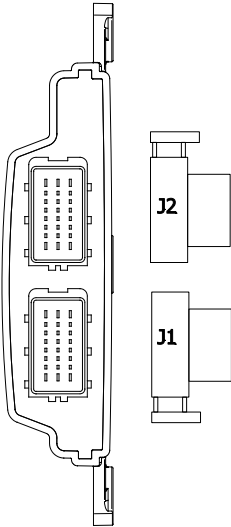|	
Operating voltage:	8 ÷ 32 Vdc
Max. current consumption:	< 400 mA (no load applied)
Operating Temperature:	-40 ÷ +105°C
Degree of protection:	IP69K
Analog inputs (16 bits):	11 (0 ÷ 5 V)
Digital inputs:	2
High Side power outputs:	15
Low Side power outputs:	2
Current feedback inputs (1,6A):	2
Ground detection input:	1
Pin selectable as power OUT or digital IN:	1
Dedicated power supply for outputs:	10
CANbus line:	ISO 11898, CAN 2.0A/B
Available bus speed:	up to 1 Mbit/s

APPLICATIONS

- High precision Hydraulic systems controller.
- Main ECU for aerial platforms, cranes, telehandlers, agriculture vehicles (architecture of Category 2).
- Redundant ECUs for architecture of Category 3 (ISO EN-13849) systems.
- Generic safety critical controller (up to PL-d).

DIMENSIONS

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EC-MMS-1417-H   MACHINE MANAGEMENT SYSTEM CONTROLLER

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connector type: framatome SICMA2

J1 (BLACK)

A		**B**		**C**	
1	HS10	1	+HS10	1	+HS9
2	CAN-H	2	CAN-L	2	HS9
3	INAN0	3	INF2	3	INF1
4	HS11	4	INAN2	4	INAN1
5	HS12	5	INAN4	5	INAN3
6	HS13	6	INAN6	6	INAN5
7	HS14	7	GND-SENSE	7	INAN7
8	HS15	8	VBATT	8	GND

J2 (BLACK)

A		**B**		**C**	
1	HS8	1	+HS8	1	LS1
2	HS7	2	+HS7	2	FB0
3	HS6	3	+HS6	3	FB1
4	HS5	4	+HS5	4	INAN8
5	HS4	5	+HS4	5	INAN9
6	HS3	6	+HS3	6	INAN10
7	HS2	7	+HS2	7	5VEXT / INAN11
8	HS1	8	+HS1	8	LS2

ADJUSTMENTS

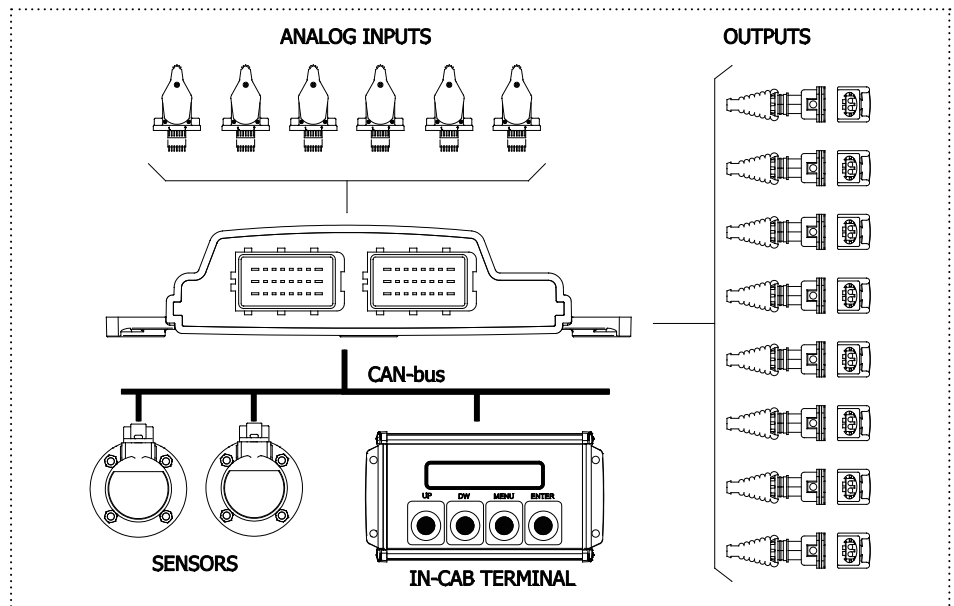Adjustments of working OUTPUTS parameters can be effected via CANbus interface.

- Imin (minimum output current)
- Imax (maximum output current)
- Ramp-up time
- Ramp-down time

PC configuration tool available

CANUSB adapter ordering code: 21.0801.040

APPLICATION EXAMPLE

ANALOG INPUTS

OUTPUTS

CAN-bus

SENSORS

IN-CAB TERMINAL

ORDERING INFORMATION

EC-MMS-1417-H

1417 = 14 inputs - 17 outputs

H = Plastic Housing

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Page **EC27**

## EC-MMS-1521-H   MACHINE MANAGEMENT SYSTEM CONTROLLER

DESCRIPTION

MMS (Machine Management System) controller in rugged aluminum enclosure dual microprocessor, CANbus, built-in safety and fault-detection features for integrated control of complex functions in mobile equipment applications.

OPERATION

It is normally used as the main control unit in a complete management system. Two microprocessors and advanced diagnostics for safety applications. The EC-MMS-1521 comes with an aluminium casing, a silicon rubber gasket and connectors, designed to ensure power dissipation, robustness and tightness required in severe environment conditions. Software download available.

FEATURES

- Robust aluminum enclosure.
- Power supply is protected against reversed polarity (external fuse required) and overvoltage.
- Inputs are protected against short circuits to GND and power supply.
- Outputs protected against short circuits, over-current and over-temperature.
- 2 CANbus connections.
- PWM drivers with current feedback.
- +5 V auxiliary power supply for external control devices.
- Performance level d capability according to ISO 13849, thanks to redundant microcontroller and embedded diagnostics.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).
- Reserved power supply pins for safety power outputs.
- Optional add-on inclinometer.
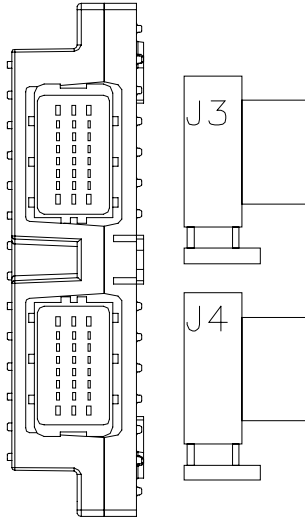- Optional real time clock for data logging.
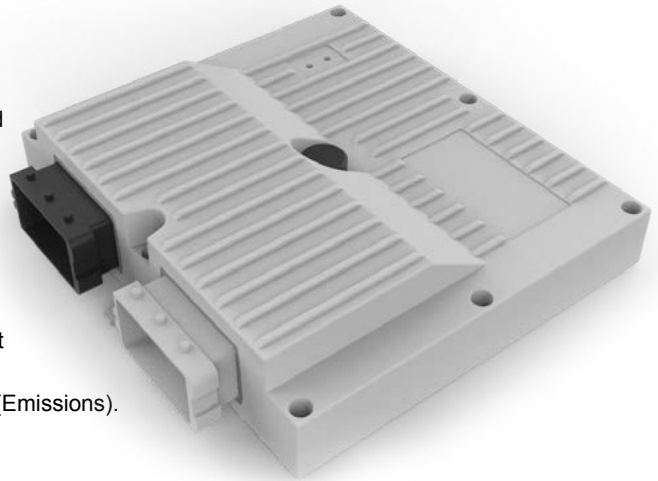
SPECIFICATIONS

Operating voltage:	8÷32 VDC
Max. current consumption:	< 400 mA (no load applied)
Operating temperature:	-40°C / +105°C
Degree of protection:	IP 69
Analog inputs (16 bits):	3 (0-5 V)
Analog inputs (10 bits):	8 (0-5 V)
Digital (frequency) inputs:	4
High side power outputs:	18 (6 if PWM outputs are used)
Low side power outputs (LS):	2
PWM outputs with current feedback (3A):	12
Analog voltage outputs (0-5 V):	1
Pins selectable as power OUT or digital IN:	6
Inputs with SW selectable pull-up:	4
CANbus lines:	2 (ISO 11898, CAN 2.0A/B)
Available bus speed:	up to 1 Mbit/s

DIMENSIONS

APPLICATIONS

- Main ECU for aerial platforms, cranes, telehandlers, agriculture vehicles.
- 12 VDC and 24 VDC systems.
- Two or more MMS boards can be interconnected through the CANbus line.
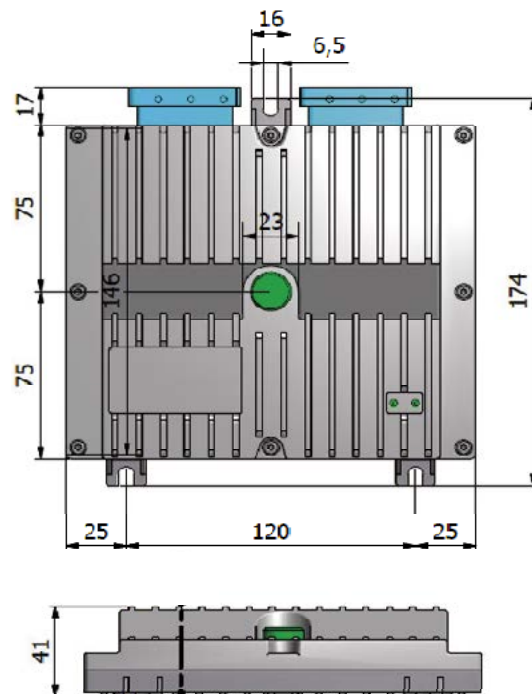
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EC-MMS-1521-H   MACHINE MANAGEMENT SYSTEM CONTROLLER

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connector type: framatome SICMA2

J3 (GREY)

A		B		C	
1	VHS4	1	LS1	1	LS0
2	OUT_PWM7	2	OUT_PWM6	2	5V EXT
3	OUT_PWM2	3	ANALOG IN 8	3	ANALOG IN 9
4	OUT_PWM3	4	ANALOG IN 10	4	CAN L 1
5	DIG INT 1	5	DIG INT 3	5	CAN H 1
6	DIG INT 0	6	DIG INT 2	6	CAN L 2
7	OUT_PWM4	7	OUT_PWM5	7	CAN H 2
8	VHS3	8	VHS2	8	VHS1

J4 (BLACK)

A		B		C	
1	OUT 4	1	OUT 2	1	OUT_PWM0
2	OUT 5	2	OUT 3	2	OUT_PWM1
3	OUT 0	3	ANALOG IN 1	3	ANALOG IN 0
4	OUT 1	4	ANALOG IN 3	4	ANALOG IN 2
5	OUT_PWM8	5	ANALOG IN 5	5	ANALOG IN 4
6	OUT_PWM9	6	ANALOG IN 7	6	ANALOG IN 6
7	OUT_PWM10	7	OUT_PWM11	7	OUT AN 0
8	+V (POWER SUPPLY)	8	-V (POWER SUPPLY - GND)	8	-V (POWER SUPPLY - GND)

ADJUSTMENTS

- MMS controllers have a customized firmware to fulfill machine functions.
- A customized calibration tool is available to set main working parameters.

PC configuration tool available

CANUSB adapter ordering code: 21.0801.040

APPLICATION EXAMPLE

Forklift control system

ORDERING INFORMATION

EC-MMS-1521-H

1521 = 15 inputs - 21 outputs

H = Aluminium Housing
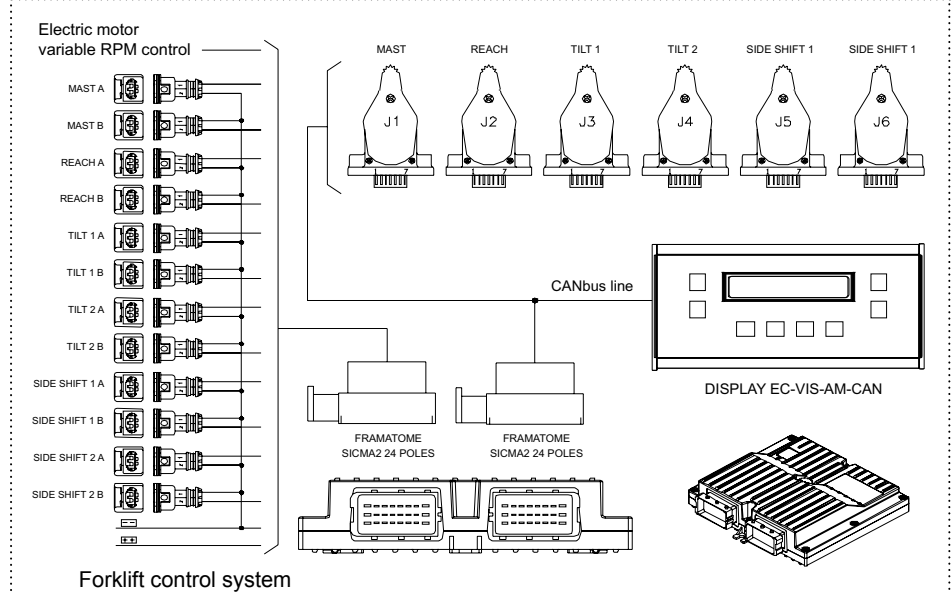
EC-MMS-5020-H   MACHINE MANAGEMENT SYSTEM

DESCRIPTION

MMS (Machine Management System) coding card with CANbus , built-in advanced safety, redundant load cells management, and fault-detection features for integrated control of mobile equipment functions.

OPERATION

The MMS-5020 can be lodged inside any remote control box or panel to make command signals compatible with CANbus networks. It can be used as a stand-alone controller for Multidrom MLT/FD5 CANbus -configured electro-hydraulic proportional actuators. It can be used as a remote coding card for connection to other MMS electronic units like Tecnord's Mod. MMS-2218.

FEATURES

- Power supply line is protected against reversed polarity and overvoltage.
- Inputs are protected against short circuits to GND and supply.
- Outputs are protected against short circuits, reversed polarity, over-current and over-temperature.
- 2-wires CANbus.
- 2 load cells redundant management.
- Performance level d capability according to ISO 13849, thanks to microprocessor redundancy.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).
- Auxiliary +5 V supply for control devices (e.g. potentiometers).
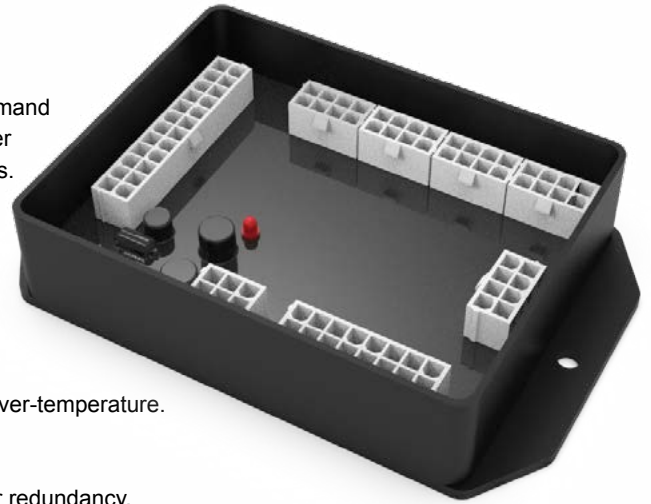
SPECIFICATIONS

Operating voltage:	8.5÷40 VDC
Max current consumption:	0.5 A (no load applied)
Operating temperature:	-25°C / +85°C
Degree of protection:	IP 54
Input impedance:	100 kΩ
Analog inputs (10 bits):	16 (0-5 V)
Typical ctrl pot resistance:	1÷10 kΩ
Digital inputs:	32
High side power outputs:	4 (3.5 A max)
Max current load on all outputs:	5 A
High side signal outputs:	16 (0.7 A max)
Inputs for current feedback:	1
Load cell inputs	2
Current output range (PWM):	100÷1500 mA
PWM dither frequency:	60÷200 Hz (adjustable)
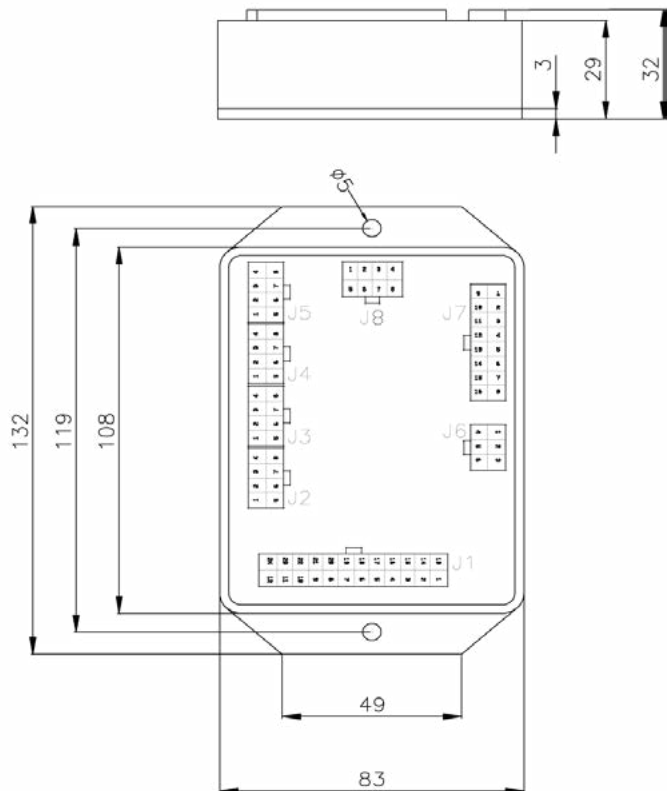
### APPLICATIONS

- 12 /24 VDC systems.
- Control panel management.
- Field-adjustable applications.
- Closed loop systems with electro-hydraulic digital actuators.

DIMENSIONS

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EC-MMS-5020-H   MACHINE MANAGEMENT SYSTEM

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connector type: Molex MINIfit
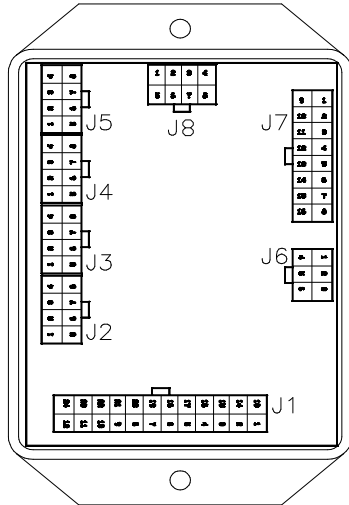
J1
1 +V (POWER SUPPLY)
2 5V EXT
3 CANH / RS485+
4 CANL / RS485-
5÷12 ANALOG IN [1÷8]
13 -V (POWER SUPPLY - GND)
14 PROG1 (#1 MICROCONTROLLER)
15 PROG2 (#2 MICROCONTROLLER)
16 RESET
17÷24 ANALOG IN [9÷16]

J2÷J5
1÷8 DIGITAL IN [1÷32]

J6
1 POWER OUT 1
2 GND
3 PWM CURRENT FEEDBACK
4 POWER OUT 2
5 POWER OUT 3
6 POWER OUT 4

**J7**
1÷16 SIGNAL OUT [1÷16]

J8
1 POSITIVE POWER SUPPLY LOAD CELL #1
2 NEGATIVE POWER SUPPLY LOAD CELL #1
3 POSITIVE POWER SUPPLY LOAD CELL #2
4 NEGATIVE POWER SUPPLY LOAD CELL #2
5 POSITIVE SIGNAL LOAD CELL #1
6 NEGATIVE SIGNAL LOAD CELL #1
7 POSITIVE SIGNAL LOAD CELL #2
8 NEGATIVE SIGNAL LOAD CELL #2

ADJUSTMENTS

- MMS controllers have a customized firmware to fulfill machine functions.
- A customized calibration tool is available to set main working parameters.

PC configuration tool available

CANUSB adapter ordering code: 21.0801.040

APPLICATION EXAMPLE
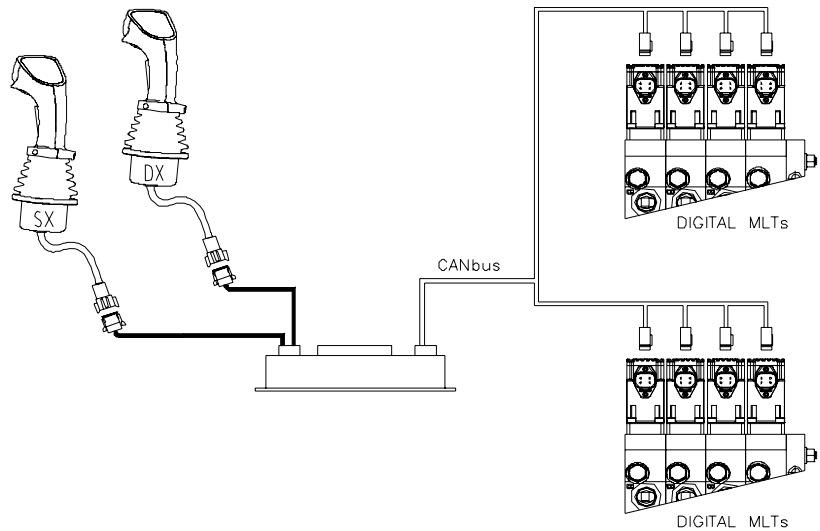
Electro-hydraulic system with MLT digital actuators controlled via 2-wires CANbus line.

ORDERING INFORMATION

EC-MMS-5020-H

5020 = 50 inputs - 20 outputs

H = potted plastic Housing for panel mounting

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EC-MMS-0713-H   MACHINE MANAGEMENT SYSTEM

DESCRIPTION

MMS (Machine Management System) controller with built-in advanced driving and fault-detection features
to be used as a stand-alone unit or in connection with other CANbus units (e.g. joysticks, MLTs, radio,
other MMS).

OPERATION

EC-MMS-0713 can be used as a stand-alone controller for applications with a single PWM
or dual proportional manifolds where the functions are operated in meter-in configuration. Its CANbus
interface allows it to be used as a part of complex CAN networks e.g. equipped with radio systems.
EC-MMS-0713 is provided with display and push-buttons to configure the control characteristics
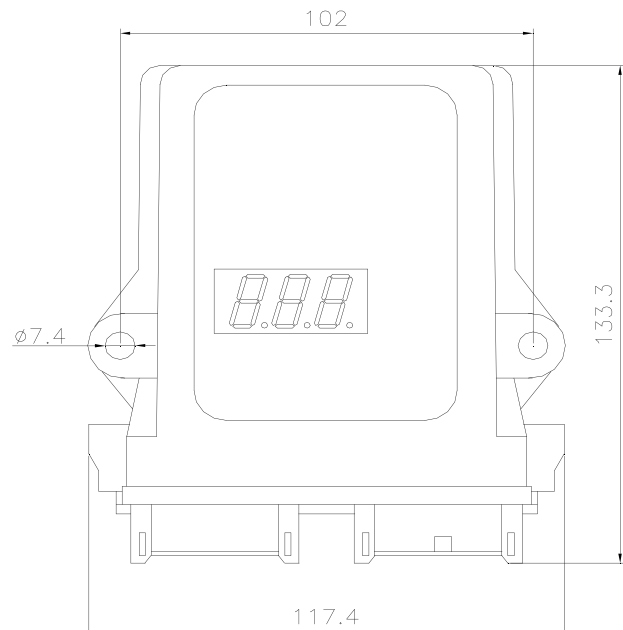(Imin/Imax, ramps, deadbands, dither) of its PWM output channels.

FEATURES

- Power supply line is protected against reversed polarity and overvoltage.
- Inputs are protected against short circuits to GND and supply.
- Outputs are protected against short circuits, over-current and over-temperature.
- CANbus (CAN 2.0B) interface
- Internal measurement of battery voltage.
- The current in the proportional solenoids is independent of change in the coil resistance and supply voltage variations.
- Especially designed for applications with manifolds in meter-in configuration (single or dual proportional).

SPECIFICATIONS

|	
Operating voltage:	8.5÷32 VDC
Max current consumption:	0.25 A (no load applied)
Operating temperature:	-25°C / +85°C
Degree of protection:	IP 65 (with housing)
Analogue inputs:	1, 10-bits resolution
Analogue input type:	0÷20 mA or 0÷5 V selectable by sw (HW option 0÷10 V)
Digital inputs:	6
Input impedance:	100kΩ (internal pull-down)
Max current load on all outputs:	10 A
High Side power outputs:	13 (3.5A max each) (HW option: 14-one digital input not available)
Current output range (PWM):	3 A
Available current feedbacks:	2 (on the high side) (HW option: 4)

APPLICATIONS

- 12 VDC and 24 VDC systems.
- For hand held terminal cable/radio applications.
- Field - adjustable applications.
- Machine management systems based on CANbus.

DIMENSIONS

102
133.3
ø7.4
117.4

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EC-MMS-0713-H   MACHINE MANAGEMENT SYSTEM

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connector type: Deutsch - DTM12

INTERNAL
FUSE
10A

A (gray)

B (black)
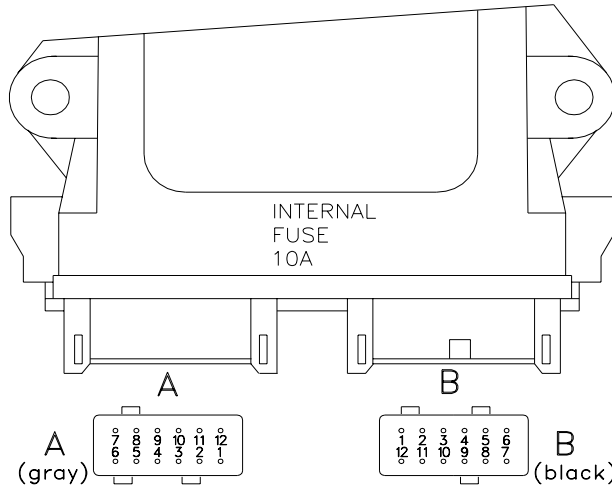
A (GREY)	
1	DI1 (DIGITAL INPUT)
2	EVP1 (HS OUTPUT WITH CURRENT FEEDBACK)
3	-V (POWER SUPPLY - GND)
4	EVP2 (HS OUTPUT WITH CURRENT FEEDBACK)
5	HS11 (HIGH SIDE OUTPUT)
6	+V (POWER SUPPLY - POSITIVE)
7	HS1 (HIGH SIDE OUTPUT)
8	HS2 (HIGH SIDE OUTPUT)
9	HS3 (HIGH SIDE OUTPUT)
10	HS4 (HIGH SIDE OUTPUT)
11	HS5 (HIGH SIDE OUTPUT)
12	HS6 (HIGH SIDE OUTPUT)

B (BLACK)	
1	HS7 (HIGH SIDE OUTPUT)
2	HS8 (HIGH SIDE OUTPUT)
3	DI2 (DIGITAL INPUT)
4	DI3 (DIGITAL INPUT)
5	HS9 (HIGH SIDE OUTPUT)
6	HS10 (HIGH SIDE OUTPUT)
7	CAN HIGH
8	CAN LOW
9	AIN (ANALOGUE INPUT)
10	DI4 (DIGITAL INPUT)
11	DI5 (DIGITAL INPUT)
12	DI6 (DIGITAL INPUT)

ADJUSTMENTS

Adjustments through integrated display
and pushbuttons

APPLICATION EXAMPLE

[A1] EV1A — On-Off Bidirectional Valve
[B1] EV1B

[A2] EV2A — On-Off Bidirectional Valve
[B2] EV2B

[A3] EV3A — On-Off Bidirectional Valve
[B3] EV3B

[A4] EV4A — On-Off Bidirectional Valve
[B4] EV4B

[P1] EVP — Proportional Flow Regulator

[9] EV9 — ON-OFF type Venting Valve
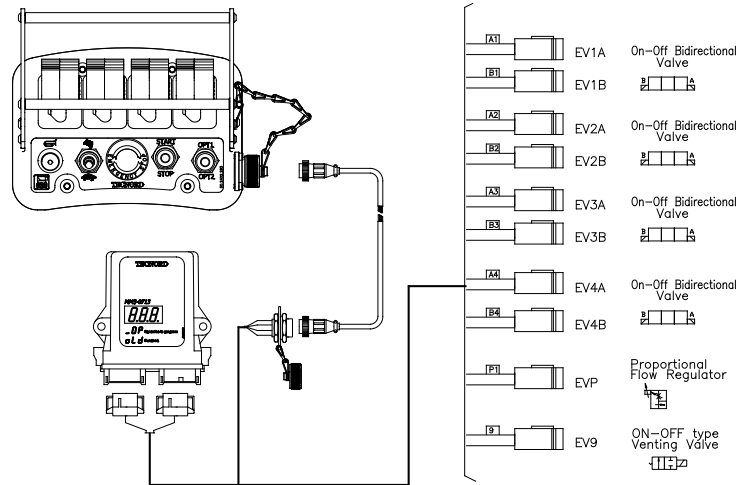
One MMS connected to a portable control unit through a CANbus line.
Radio connection available.

ORDERING INFORMATION
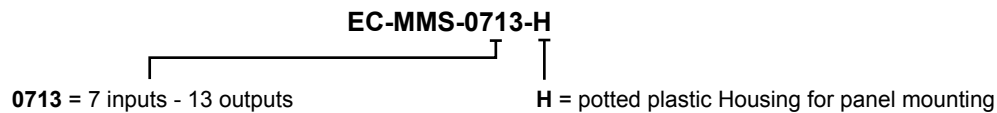
EC-MMS-0713-H

0713 = 7 inputs - 13 outputs

H = potted plastic Housing for panel mounting

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EC-MMS-6252-H   MACHINE MANAGEMENT SYSTEM CONTROLLER

DESCRIPTION

MMS (Machine Management System) controller with built-in advanced safety and fault-detection features for integrated control of a high number of functions in mobile equipment applications.

OPERATION

It is normally used as the main control unit in a complete machine management system. Two microprocessors and advanced diagnostics for safety applications. CANbus communication. Serial connection for software download.
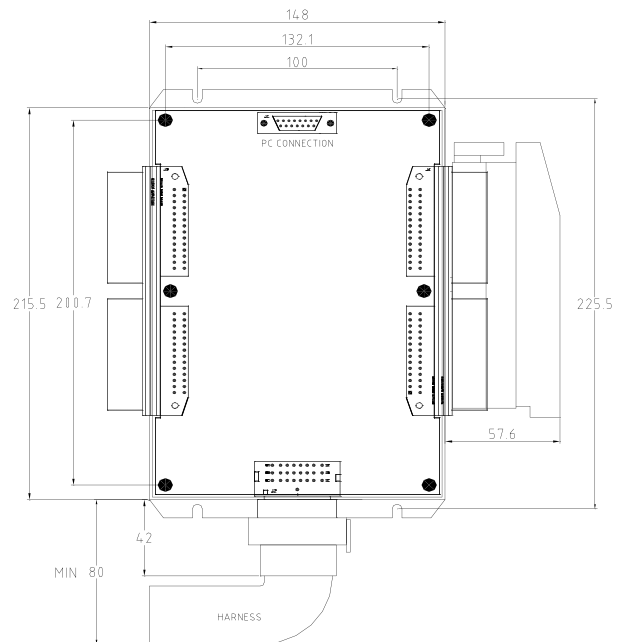
FEATURES

- Robust metal enclosure and complete potting.
- Power supply line is protected against reversed polarity and overvoltage.
- Inputs are protected against short circuits to GND and supply.
- Outputs are protected against short circuits, reversed polarity, over-current and over-temperature.
- Dual microprocessor for advanced diagnostics capability.
- Serial communication ports: CANbus, RS485, RS232.
- Optional add-on inclinometer.
- +5 V auxiliary power supply for external control devices.
- Performance level d capability according to ISO 13849, thanks to redundant microcontroller and embedded diagnostics.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).

SPECIFICATIONS

Operating voltage:	8.5÷32 VDC
Max current consumption:	400 mA (no load applied)
Operating temperature:	-25°C / +85°C
Degree of protection:	IP 67
Input impedance:	100 kΩ
Analog inputs (10 bits):	16 (0-5 V)
	6 (0-20 mA)
Typical ctrl pot resistance:	1÷10 kΩ
High side power outputs:	8 (5 A max)
	28 (3.5 A max)
High side signal outputs:	10 (0.7 A max)
Digital inputs:	40
Max current load on all outputs:	16 A
Inputs for current feedback:	4
Current output range (PWM):	100÷1600 mA
Analog voltage outputs:	6 (0-5 V)

APPLICATIONS

- 12 VDC and 24 VDC systems.
- Main ECU for aerial platforms, cranes, telehandlers, agric. machines.
- Field-adjustable applications.
- Two or more MMS boards can be interconnected by means of 2-wires RS485 serial lines or CANbus.

DIMENSIONS

Stainless steel enclosure completely potted.

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EC-MMS-6252-H   MACHINE MANAGEMENT SYSTEM CONTROLLER

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Main Connectors type: SICMA2/DCS1 (56 poles)
Auxiliary connector type: SICMA2 (24 poles)
PC connector type: DB15 female

J3
1	CAN BUS
4	ANALOG INPUTS (0÷20 MA)
8	ANALOG INPUTS (0÷5 V)
24	ANALOG INPUTS
10	DIGITAL OUTPUTS (0.7 A)
1	RS485
2	+5 V AUX
2	+VBATT
2	GND
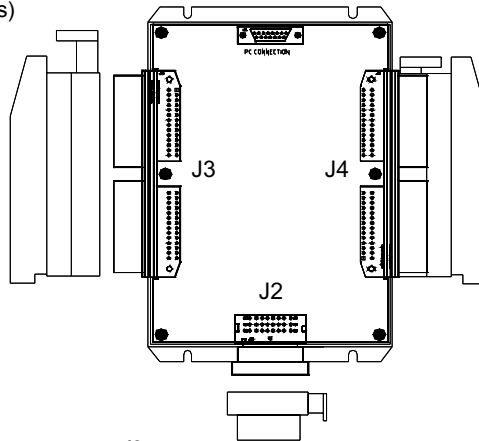
J4
2	CAN BUS
2	ANALOG INPUTS (0÷20 MA)
2	ANALOG INPUTS (0÷5 V)
16	DIGITAL INPUTS
18	DIGITAL OUTPUTS (3.5 A)
8	DIGITAL OUTPUTS (5 A)
4	CURRENT FEEDBACKS
2	GND

J2
6	ANALOG INPUTS (0÷5 V)
10	DIGITAL OUTPUTS (3.5 A)
6	ANALOG OUTPUTS (0÷5 V)
2	GND

For wiring schematics consult factory.

ADJUSTMENTS

- MMS controllers have a customized firmware to fulfill machine functions.
- A customized calibration tool is available to set main working parameters.

PC configuration tool available

CANUSB adapter ordering code: 21.0801.040

APPLICATION EXAMPLE
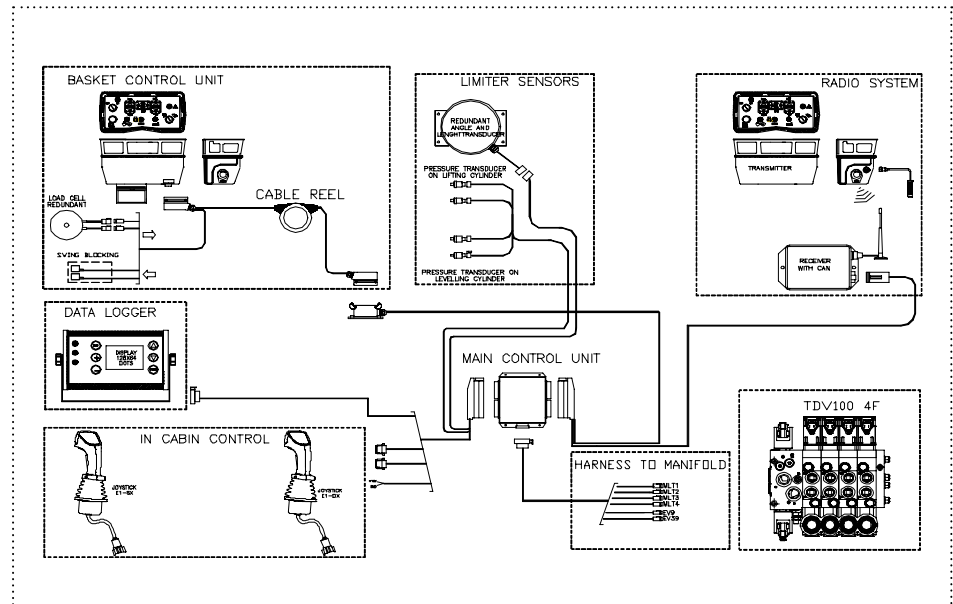
ORDERING INFORMATION

EC-MMS-6252-H

6252 = 62 inputs - 52 output

H = stainless steel Housing

Two configuration available:
Standard (2 main connectors)
Full (all connectors)

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GRAPHIC DISPLAY UNITS

MODEL	DESCRIPTION	PAGE
EC-VIS-G-3DIGITS-P	3 digits display (7 segments)	EC38
EC-VIS-G-D128X64-P	Graphic display 128x64	EC40
EC-VIS-G-D480x272px-P	TFT Color Graphic LCD Display	EC42

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EC-VIS-G-D128X64-P   GRAPHIC DISPLAY UNIT

DESCRIPTION

Graphic Display Unit to be used as operator's interface in complex Machine Management Systems.

FEATURES

- Compact control unit to be fixed inside a cabin.
- Robust suction cup on the rear.
- CANbus connection.
- Graphic display 128 x 64 dots backlighted.

MECHANICAL / ENVIRONMENTAL SPECIFICATIONS

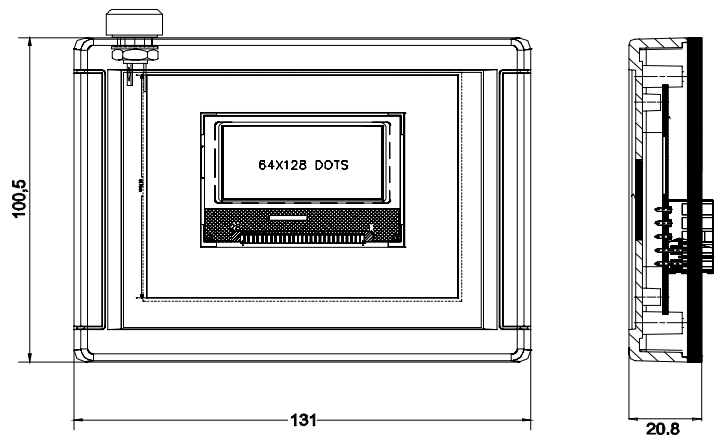|	
Dimensions:	131 x 100.5 x 20.8 mm
Housing:	Plastic body
	Membrane keypad
Operating temperature:	-25 / 85°C
Degree of protection:	IP 67
Connector:	Molex Minifit 20 poles

ELECTRICAL SPECIFICATIONS

Display

Type and size:	graphic
Resolution:	128 x 64 dot-matrix
Viewing area:	50 x 25 mm
Backlight:	led
Backlight color:	white
Viewing angle range:	40°

ELECTRONIC CONTROL UNIT

Operating voltage:	8.5÷30 VDC
Communication interfaces:	CANbus
	SAE J1939
Analog inputs (10 bits):	4 (0-5 V)
Digital inputs:	5
High side power outputs:	4 (3.5 A max each)
Internal inputs:	
for current feedback:	4
PWM output current range:	100 - 1500 mA
Membrane keypad with:	
Pushbuttons:	9
SMD leds:	9
Control potentiometer on the top:	1

APPLICATIONS

- 12 VDC and 24 VDC systems.
- Service/Maintenance Tool.
- Diagnostic/Configuration unit for Hedgecutters.
- In-cab terminal.

DIMENSIONS

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EC-VIS-G-D128X64-P   GRAPHIC DISPLAY UNIT

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connector type: Molex Minifit

1	-V (POWER - GND)	**11**	+V (POWER)
2	CAN H	**12**	CAN L
3	ANALOG IN 2	**13**	ANALOG IN 3
4	ANALOG IN 0	**14**	ANALOG IN 1
5	DIGITAL IN 2	**15**	DIGITAL IN 3
6	DIGITAL IN 0	**16**	DIGITAL IN 1
7	DIGITAL IN 4	**17**	OUT P0
8	OUT P1	**18**	OUT P2
9	N.C.	**19**	OUT P3
10	N.C.	**20**	+5 V EXT
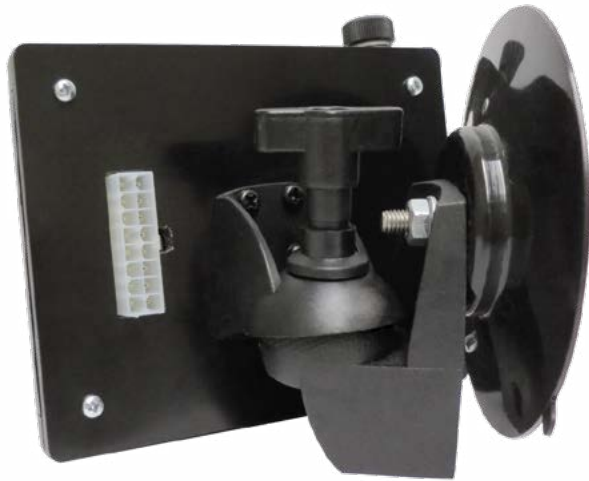
APPLICATION EXAMPLE
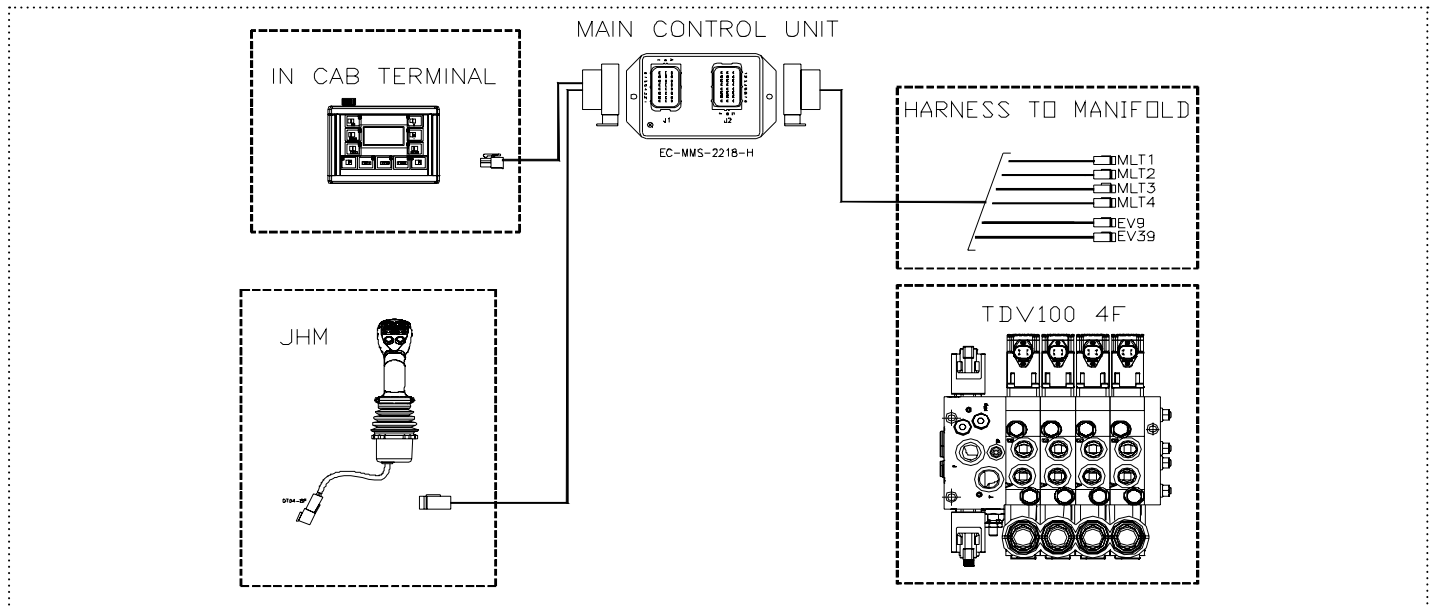
ORDERING INFORMATION

EC-VIS-G-D128X64-P

P = Plastic enclosure

D = 128 x 64 Dots

G = Graphic display

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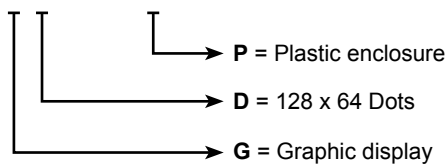
EC-VIS-G-D480X272PX-P   GRAPHIC DISPLAY UNIT

new

DESCRIPTION

The Opus A3 color display unit is a cost-effective, rugged operator control panels for use on heavy-duty vehicles and work machines that must operate outdoors in harsh conditions. It is fully equipped with (3) hard and (8) soft function keys, push-button encoder, integrated buzzer.

FEATURES

- Color display control unit to be fixed inside a cabin.
- Mounting adaptor on the rear for installation.
- CAN Bus 2.0, USB 2.0, RS232 connections.
- Color Graphic display 480 x 272 px ,15:9 led backlighted.

### MECHANICAL / ENVIRONMENTAL SPECIFICATIONS

Dimensions:	198 x 98 x 64.7 mm
Housing:	Plastic body, colored light grey with black rubber frame.
Operating temperature:	-30 / 65°C
Degree of protection:	IP 67
Main Connector 26 poles:	Tyco-AMP 1437288-6
Mating connector:	Tyco-AMP 3-1437290-7
Mating crimp contacts:	Tyco-AMP 3-1447221-4
Dummy plug	Tyco AMP 4-1437284-3

ELECTRICAL SPECIFICATIONS

Display

Type:	TFT Color Graphic LCD
Resolution:	480 x 272 px
Viewing area:	95 x 53 mm (4,3")
Backlight:	led
Backlight color:	16.7 Mio.
Contrast Ratio:	400:1

ELECTRONIC CONTROL UNIT

Operating voltage:	9÷36 VDC
Communication interfaces:	2 x CAN Bus
	USB 2.0 RS 232
Left keypad:	4 Keys
	Blue led backlight
Right keypad:	4+3 Keys
	Blue led backlight
Indicators and sensors:	Light sensor
	1 Multicolor led
	2 status led
Encoder:	Mechanical with push function

DIMENSIONS
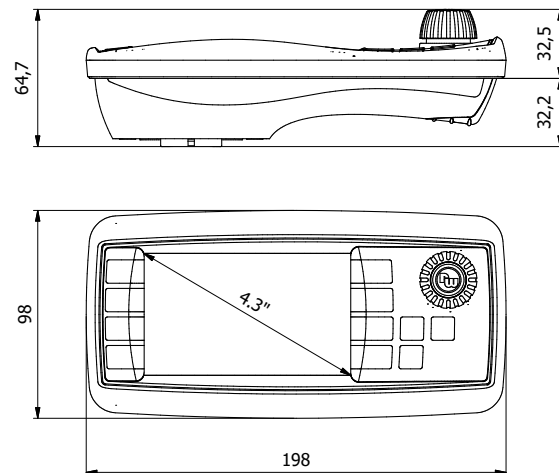
APPLICATIONS

- In-cab terminal.
- Service/Maintenance Tool.
- Diagnostic/Configuration unit.

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EC-VIS-G-D480X272PX-P   GRAPHIC DISPLAY UNIT

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Pin. No.	Assignment	Description	Pin. No.	Assignment	Description
1	VCC	supply voltage +; terminal 30	14	USB_D-	USB Data line -
2	Ignition Input	ignition input; terminal 15	15	USB_D+	USB Data line +
3	GND	supply voltage-; terminal 31	16	RS232 RxD	RS232 receive data
4	CarGDN	Car ground	17	RS232 TxD	RS232 transmit data
5	n.c.	Not connected	18	RS232 GND	RS232 ground
6	n.c.	Not connected	19	n.c.	Not connected
7	n.c.	Not connected	20	n.c.	Not connected
8	CAN1H	CAN 1 hight	21	n.c.	Not connected
9	CAN1L	CAN 1 low	22	n.c.	Not connected
10	CAN2H	CAN 2 hight	23	SERV_EN	service enable
11	CAN2L	CAN 2 low	24	n.c.	Not connected
12	USB_VCC	USB+5V DC supply	25	n.c.	Not connected
13	USB_GND	USB supply ground	26	n.c.	Not connected

APPLICATION EXAMPLE
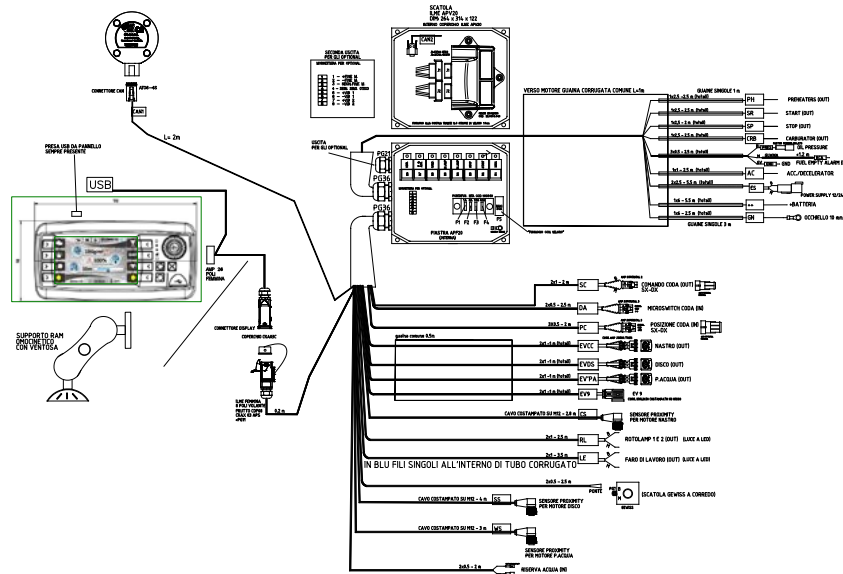
ORDERING INFORMATION

EC-VIS-G-D480X272PX-P
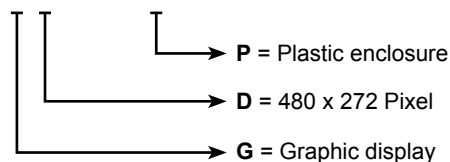
P = Plastic enclosure

D = 480 x 272 Pixel

G = Graphic display

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ACCESSORIES

MODEL	DESCRIPTION	PAGE
Control Unit connectors	Connector kits	EC46
Calibration tool	Software for ECU calibration	EC48
Linking cables	Cables from ECU to PC	EC49

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CONNECTOR KITS

6 POLES DEUTSCH DT04-6P

Kit includes: female connector, male contacts, secondary lock and fillers.
Available for electronic control unit: EC-MMS-1012-H.

ORDERING CODE: **13.0310.386**

8 POLES DEUTSCH DT06-8S

Kit includes: male connector, female contacts, secondary lock and fillers.
Available for electronic control unit: EC-PWM-A2-MPC1-H.

ORDERING CODE: **13.0310.432**

12 POLES "DEUTSCH DTM06-12SA & DTM06-12SB"

Kit includes: male connector, female contacts, secondary lock and fillers.
Available for electronic control unit: EC-MMS-0713-H.

ORDERING CODE: **13.0310.253**

26 POLES AMP SUPERSEAL

Kit includes: male connector, female contacts.
Available for electronic control unit: EC-VIS-G-D480x272PX-P.

ORDERING CODE: **13.0310.635**

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CONNECTOR KITS

24 POLES SICMA BLACK COLOR

Kit includes: male connector, female contacts, locking cam, fillers.
Available for electronic control unit: EC-PWM-P4-MPC2-H, EC-PWM-P8-MPC4-H, EC-PWM-P12-MPC6-H, EC-MMS-1012-H, EC-MMS-1417-H, EC-MMS-2218-H, EC-MMS-1521-H.

ORDERING CODE: **13.0310.150**

24 POLES SICMA GREY COLOR

Kit includes: male connector, female contacts, locking cam, fillers.
Available for electronic control unit: EC-PWM-P12-MPC6-H, EC-MMS-1521-H.

ORDERING CODE: **13.0310.634**

24 POLES SICMA BLACK COLOR WITH WIRES 0.8 M LENGTH

Kit includes: male connector, female contacts, locking cam and wires 0,8 m length.
Available for electronic control unit: EC-PWM-P4-MPC2-H, EC-PWM-P8-MPC4-H, EC-MMS-1012-H, EC-MMS-2218-H, EC-MMS-1521-H.

ORDERING CODE: **13.0310.236**

56 POLES SICMA

Kit includes: male connector, female contacts, locking cam, cover and fillers.
Available for electronic control unit: EC-MMS-6252-H.

ORDERING CODE: **13.0310.324**

56 POLES SICMA WITH WIRES 0.8 M LENGTH

Kit includes: male connector, female contacts, locking cam, cover and fillers.
Available for electronic control unit: EC-MMS-6252-H.

ORDERING CODE: **13.0310.868**

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CALIBRATION TOOL

CALIBRATION TOOL FOR TECNORD ELECTRONIC CONTROL UNITS

Electronic control units are supplied with standard operation parameters, which satisfies most applications.For customized applications, the calibration software allows the tuning of the parameters for proportional solenoid valves to be modified via computer; for example the minimum and maximum current or ramp up and down times may be defined. The linking cable shown in the following page (optional, to be ordered separately) is necessary for the computer connection.

CUSTOMER'S AREA

DOWNLOAD SOFTWARE

CALIBRATON INTERFACE

CONNECTIONS

- **RS232 serial** an USB-RS232 converter is recommended
- **CANBus** an CAN-USB converter is recommended

CAN-USB CONVERTER

PROGRAM INSTALLATION

To install the calibration software onto a personal computer, simply execute the setup.exe file previously downloaded from the Customers' area of the Tecnord web site (login necessary).

ELECTRONIC CONTROL UNITS

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LINKING CABLES

AMPSEAL-DB9 CABLE ADAPTER (with software calibration tool).

Available for electronic control unit: EC-PWM-P4; EC-PWM-P8; EC-MMS-1012-H.

ORDERING CODE: **20.1001.026/A**

DEUTSCH-DB9 LINKING CABLE (with customized software calibration tool).

Available for electronic control unit: EC-MMS-2218-H.

ORDERING CODE: **21.0801.031**

DEUTSCH-M+F DB9 LINKING CABLE (with software calibration tool).

Available for electronic control unit: EC-PWM-A*-MPC1-DT-CAN.

ORDERING CODE: **21.0801.075**

DB15-DB9 LINKING CABLE (with software calibration tool).

Available for electronic control unit: EC-MMS-6252-H.

ORDERING CODE: **21.0801.053**

RS232 - USB CONVERTER

It allows Tecnord electronic control units to personal computer connection when the latter is unprovided of serial port; for installation follow the instruction enclosed with the converter.

ORDERING CODE: **21.0801.039**

CAN - USB CONVERTER

It allows Tecnord CAN electronic control units to Personal Computer connection with a USB port; for installation follow the instruction enclosed with the interface device.

Available for electronic control unit: EC-MMS-1417-H, EC-MMS-2218-H, EC-MMS-4820-H, EC-MMS-1521-H, EC-MMS-6252-H.

ORDERING CODE: **21.0801.040**