DSEControl®

DSEM870

PROGRAMMABLE DISPLAY FOR USE IN VEHICLES AND OFF-HIGHWAY MACHINERY

KEY FEATURES / SUMMARY

- Robust HMI/programmable display specifically designed for mobile applications
- Optically bonded 7” colour screen for harsh environments
- Capacitive touchscreen (M870-02 / M870-04 variants)
- Powerful ARM Cortex A9 processor with 800 MHz clock speed
- 512 MB of DDR3 SDRAM and 2 GB of NAND mass storage
- 4 configurable inputs, 4 configurable digital outputs
- Supports landscape and portrait orientation
- 2 independent CAN interfaces, J1939, CAN open and Raw CAN
- Ethernet interface for communication
- Flexible user programming via CODESYS 3.5 or Qt
- IP67 protection/NEMA 6
- 2 camera inputs

OVERVIEW

DC SUPPLY
8 V DC to 32 V DC

CURRENT CONSUMPTION
OPERATING CURRENT
< 1000 mA at 12 V and 24 V without external loads

< 1500 mA at 12 V and 24 V with Htr.

DISPLAY
800 px x 480 px
24 bit colour
Optically bonded

INPUTS/OUTPUTS (total)
4 inputs / 4 outputs

INPUTS
Configurable,
Digital inputs (positive / negative)
Analogue inputs (Voltage 0 V to 5 V, 0 V to 10 V, 0 V to 32 V, current 4 mA to 20 mA, Ratiometric, Resistive, Frequency)

OUTPUTS
Configurable
Digital Output High-Sided/Low-Sided

INTERFACES
CAN 1.2
CAN Interfaces 2.0 A/B, ISO11898
50 kbits/s... 1 Mbit/s
CAN Open, SAE J1939 or Raw CAN
ETHERNET
10 Mbit/s / 100 Mbit/s, Duplex

USB
USB Host 2.0 (12 Mbit/s)

DIMENSIONS
272 mm x 165 mm x 81 mm (W x H x D)
10.7” x 6.5” x 3.2” (W x H x D)

WEIGHT
< 1 kg

STORAGE TEMPERATURE RANGE
-40 ° C to +85 ° C
-40 ° F to +185 ° F

OPERATING TEMPERATURE RANGE
-30 ° C to +85 ° C
-22 ° F to +185 ° F

PROTECTION RATING
IP67/NEMA 6 (with mating connectors)

MOUNTING
8 x M5 bolts / RAM arm

RELATED MATERIALS

TITLE	PART NO
M870 Installation Instructions	053-187
M870 Installation and Operation Manual	057-246
M870 CODESYS Software Manual	057-320
M870 Qt Software Manual	057-321

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Technical Data

DSE**M870**

Supply		**Connector A**
Operating voltage	8 V DC to 32 V DC	Pin 7
Unit power supply maximum current consumption, full backlight (no external loads)	< 1000 mA at 12 V and 24 V	
Unit power supply maximum current consumption, full backlight and heater (no external loads)	< 1500 mA at 12 V and 24 V	
Unit power supply current consumption after controlled shutdown has occurred due to the ignition being turned off	< 5 mA at 24 V	
Fusing		**Connector A**
Unit power supply external protection fuse rating	3 A	Pin 7
High current outputs supply input external fuse protection rating (i.e. sum of output currents from all outputs provided for by an individual supply to < external fuse rating in total)	10 A	Pin 1
Housing		
PC PBT alloy plastic resin		
Dimensions		
140 mm x 230 mm x 60 mm (W x H x D) / 10.8” x 6.3” x 3.15” (W x H x D)		
Weight		
< 1 kg		
Temperature		
Operating temperature	-30 ˚ C to +85 ˚C / -22 ˚ F to +185 ˚ F	
Storage temperature	-40 ˚ C to +85 ˚C / -40 ˚ F to +185 ˚ F	
Protection Rating		
	IP67 (with mating connectors)	
Display		
Resolution, pixel	800 px x 480 px	
Colour	24 bit	
Format	7” diagonal	
Touchscreen	Capacitive touch (M870-02 / M870-04 variants)	
Mounting	Optically bonded	
Illumination	LED (lifetime > 50,000 hrs)	
Connectors		
Connector A	18 pin TE connectivity DT16-18SA-K004	
Connector C	18 pin TE connectivity DT16-18SC-K004	
Ethernet	M12, D-coded 4 pole socket	
USB	M12, B-coded 5 pole socket	
Digital Inputs		**Connector C**
Digital inputs configured high or low		Pin 14, 15, 16, 17
High level voltage threshold	> 6 V	
Low level voltage threshold	< 2 V	
Analogue Voltage Inputs		**Connector C**
0 V to 5 V programmable voltage range	0 V to 5 V	Pin 14, 15, 16, 17
0 V to 10 V programmable voltage range	0 V to 10 V	
0 V to 32 V programmable voltage range	0 V to 32 V	
Voltage measurement resolution	12 bits	
Voltage measurement accuracy	± 1% FSD	
Voltage measurement input resistance	≥ 30 kΩ	
Voltage measurement sampling rate	500 Hz	
FSD = Full Scale Deflection		

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Analogue Current Inputs		Connector C
Current measurement direction	Current sink only	Pin 14, 15, 16, 17
Current measurement ranges	0 mA to 20 mA	
	4 mA to 20 mA	
Current measurement resolution	12 bits	
Current measurement accuracy	± 1% FSD	
Current measurement input sink resistance	100 Ω ± 1%	
Current measurement sampling rate	500 Hz	
FSD = Full Scale Deflection		
Analogue Resistive Inputs		**Connector C**
Resistance measurement range	0 Ω to 3200 Ω	Pin 14, 15, 16, 17
Resistance measurement source voltage	12 V maximum	
Resistance measurement current	1 mA	
Resistance measurement resolution	12 bits	
Resistance measurement accuracy	± 1% FSD	
Resistance measurement sampling rate	500 Hz	
FSD = Full Scale Deflection		
Analogue Ratiometric Inputs		**Connector C**
Voltage ratiometric measurement voltage range		Pin 14, 15, 16, 17
Voltage ratiometric measurement Vref	Supply/Vref	
Voltage ratiometric measurement	Ratio of input pin to supply voltage	
Voltage ratiometric measurement accuracy	± 1% FSD	
FSD = Full Scale Deflection		
Frequency Inputs		**Connector C**
Frequency range	5 Hz to 30 KHz	Pin 14, 15, 16, 17
Resolution	100 Hz at max. freq	
Accuracy	400 Hz at max. freq	
Maximum space voltage	< 1.4 V	
Minimum mark voltage	> 2 V	
Digital Outputs High Side		**Connector C**
Switching current	2 A	Pin 2, 3, 4, 5
Digital output active high ‘ON’ state internal voltage drop at rated current	< 100 mV	
Digital output active high ‘OFF’ state leakage current	< 10 µA at 24 V	
Digital Outputs Low Side		**Connector C**
Switching current	2 A	Pin 2, 3, 4, 5
Digital output active low ‘ON’ state maximum voltage at rated current	< 100 mV	
Digital output active low ‘OFF’ state leakage current	< 5 µA at 24 V	
Reference Voltage		**Connector C**
Reference voltage output	Programmable 5 V or 10 V, 500 mA accuracy ±5%	6
		VRef GND Pin 18
Auxiliary Voltage		**Connector C**
12 V auxiliary voltage	max 100 mA	Pin 13
RTC		
Real time clock	Standard RTC, powered by Super Cap, backup time ~800 hours	

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Camera		Connector A
Analogue video input (supported video standards: PAL & NTSC)	2	5, 6, 11, 12
CAN Interfaces		**Connector A**
Number of CAN ports	2	Pin 2, 3, 8, 9, 14, 15
Supported protocols	J1939	
	CAN open	
	Raw CAN	
Supported programmable baud rates	50 kbit/s, 125 kbit/s, 250 kbit/s, 500 kbit/s, 800 Mbit/s, 1 Mbit/s	
Ethernet Interface		**M12, 4 pole**
Number of Ethernet ports	1	D-coded 4 pole socket
Supported data rates	10/100 Mbit/s	
Supported protocols	Modbus TCP	
	CODESYS 3.5	
USB Interface		**M12, 5 pole**
Number of USB host ports	1	B-coded, 5 pole socket
Supported USB version	2	
Speeds supported	Full speed (12 Mbit/s)	
Device class supported	08 (Mass Storage)	
Supported filing system	FAT32	
Processor		
Technexion Freescale iMX6-SOLO Microcontroller	ARM A9	
	800 MHz	
Memory		
Flash	2 GB	
RAM	512 MB	
Software		**Version**
CODESYS 3.5 (M870-01 / M870-02 / M870-03)		SP12 Patch 0
Qt (M870-04)		V 5.15

LED Status

Colour	Description	Operation	State
None	Device not powered	N/A	Off
Green	Unit powered up, application program loaded but not running	Static	Application stopped
	Unit powered up, application program loaded and running	1 Hz flash	Application running
	Unit powered up, but no application program loaded	5 Hz flash	No application
Amber	Bootloader functioning normally, firmware present	Static	Bootloader mode
	Firmware is at start-up	Static	Firmware start-up
	Unit stopped due to a serious fault	Static	Application exception
	Bootloader is decrypting the downloaded image	1 Hz flash	Decrypting image
	Bootloader is reading an image from the USB	5 Hz flash	Reading image from USB
Red	Fatal system/hardware fault - LEd may be driven directly by microcontroller error pin or firmware is in a fault condition	Static	Fatal error
	Unit running with a fault, see CODESYS error flags or web tool.	1 Hz flash	Faulty application running

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Environmental and Testing		
CE marking	Electromagnetic compatibility (EMC) noise immunity Electromagnetic compatibility (EMC) emission standard	BS EN ISO 13766-1:2018
E11 marking	Emission standard noise immunity with 100 V/m	UN/ECE-R10
Electrical tests	Pulse 1, severity level: IV; function state C Pulse 2a, severity level: IV; function state B Pulse 2b, severity level: IV; function state C Pulse 3a, severity level: IV; function state A Pulse 3b, severity level: IV; function state A Pulse 4, severity level: IV; function state B Pulse 5a, severity level: III; function state C	ISO 7637-2
Climatic tests	Damp heat, cyclic upper temperature 55 ˚C, number Damp heat, steady state test temperature 40 ˚C / 93% RH Test duration: 21 days Salt spray test severity level 3 (vehicle)	EN 60068-2-30 EN 60068-2-78 EN 60068-2-53
Mechanical tests	Test VII; vibration, random mounting location: vehicle body Vibration, sinusoidal 2000 Hz: 0.73 mm / 10g: 10 cycles/axis Bumps 30 g / 6 ms; 24,000 shocks	ISO 16750-3 EN 60068-2-6 ISO 16750-3
Additional Hardware		**DSE Part Number**
Deutsch connector A, 18 way complete with pins		007-850
Deutsch connector C, 18 way complete with pins		007-851
M870 connector harness		016-167
M870 panel gasket		020-579
Ethernet programming cable		016-160
M12 to USB cable		016-161
M870 Variants		**DSE Part Number**
CODESYS (Standard)		M870-01
CODESYS (Touchscreen)		M870-02
CODESYS (Standard with WebVisu)		M870-03
Qt (Touchscreen)		M870-04

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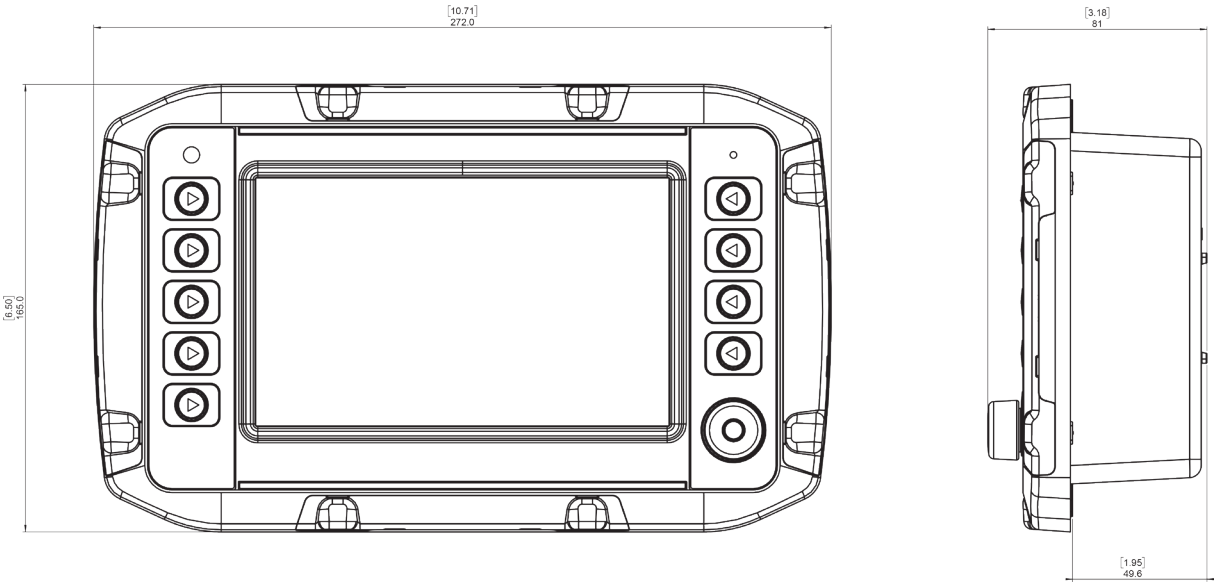
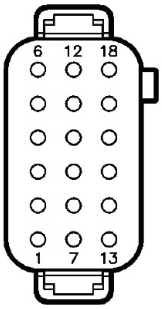
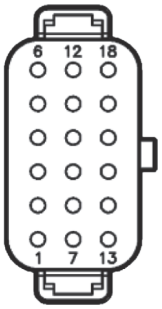




Connector A

PIN	DESCRIPTION
1	EGU Supply GND
2	CAN1 GND
3	CAN2 GND
4	No connection
5	Camera 1 GND
6	Camera 2 GND
7	ECU Supply +VE
8	CAN1 H
9	CAN 2 H
10	No connection
11	Camera 1 signal
12	Camera 2 signal
13	Ignnition +VE (15)
14	CAN1 L
15	CAN2 L
16	No connection
17	No connection
18	No connection



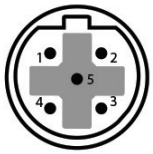
Connector C

PIN	DESCRIPTION	REF
1	Output supply +VE	
2	OUT H, L	QC001
3	OUT H, L	QC002
4	OUT H, L	QC003
5	OUT H, L	QC004
6	VREF +	
7	Output supply GND	
8	No connection	
9	No connection	
10	No connection	
11	No connection	
12	Output supply GND	
13	Aux 12 +VE Output	
14	AIN, DIN H, L, FREQ	IC001
15	AIN, DIN H, L, FREQ	IC002
16	AIN, DIN H, L, FREQ	IC003
17	AIN, DIN H, L, FREQ	IC004
18	VREF GND	

Ethernet

M12 'D' coded - 4 pin female

Pin - 01	TX+
Pin - 02	RC+
Pin - 03	TX-
Pin - 04	RC-



USB Host

M12 'B' coded - 5 pin female

Pin -01	+ 5 V DC
Pin - 02	Data -
Pin - 03	Data +
Pin - 04	ID
Pin - 05	GND

Abbreviations

OUT PWM, H, L	Output can be configured as a PWM, PWMi, digital high-side or digital low-side
OUT H	Output is digital high
OUT H, L	Output can be configured as a digital high-side or digital low side
AIN	Input can be configured to accept signals from positive digital, negative digital, 0 V to 10 V, 4 mA to 20 mA, ratiometric or resistive
DIN, H, L, FREQ	Input can be configured to accept signals from positive digital, negative digital or frequency
A GND	Ground connection for the analogue input channels

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