DATASHEET
MO 662.H1X.SXXXX.PXXX.EXX

MAKERSAN
Display

Product Characteristics

Application	User Configurable or Custom
Main Processor	ARM Cortex M4, 32 bit
Graphic Processor	External
Boot Time	< 2 seconds

Display

Type	TFT with LED backlight
Size	7"
Resolution	800x480
Color Depth	24 bit RGB
Display Color	16.7M
Contrast	800:1
Brightness	1000 cd/m²
Backlight Dimming	Automatic dimming through an ambient light sensor or manual
Viewing Angle	All O'clock

HMI

Touch Screen	None
Real Time Clock	Buffered with a supercap
Buzzer	Piezo alarm approx.85 dB and configurable
Storage Memory	4 MByte Flash

Communication

CAN	ISO 11898, CAN specification 2.0A - 2.0B
Protocol	SAE J1939
Baud Rate	250 kbit/s default (500 kbit/s on request)
Termination Resistor	External

Electrical Data

Supply Voltage	8...32 VDC
Supply Current	250mA - 24VDC
Digital Inputs	
Active Low	Up to 14 - activation voltage <1V
Active High	Up to 14 - activation voltage >5V
Digital Outputs	
Low Side	Up to 2 - max. 500mA, the max. switching voltage 36V
High Side	Up to 2 - total max. 1A, the max. switching voltage 36V, only one current sense capability
Universal Inputs	
Voltage	Up to 12 - 0...32V
Current	Up to 4 - 0...20mA measuring range, 120R current sense resistor
Resistor	Up to 6 - 0...50kOhm
Frequency	Up to 4 - 0...10kHz
Overvoltage Protection	Up to 36 VDC
Reverse Battery Protection	Provided

- For applications outside this parameters, please consult us.

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Enclosure

Mating Connector	18 pin Tyco Seal Connector (TE-2203663-5)
Mechanical Installation	Panel mounting

Size and Weight

W x H x D (mm)	193 x 125 x 45
Weight (kg)	0.5

Environment

Temperature Range (°C)	
Operating	-30 ... +85°C
Storage	-40 ... +90°C
IP Class	IP67

Test

Electrical	
Direct current supply voltage	ISO 16750:2 Ch. 4.2
Overvoltage	ISO 16750:2 Ch. 4.3.2
Superimposed Voltage	ISO 16750:2 Ch. 4.4
Slow Decrease and Increase	ISO 16750:2 Ch. 4.5
Momentary Drop	ISO 16750:2 Ch. 4.6.1
Reset Behavior	ISO 16750:2 Ch. 4.6.2
Starting Profile	ISO 16750:2 Ch. 4.6.3
Reverse Voltage	ISO 16750:2 Ch. 4.7
Ground Reference and Offset	ISO 16750:2 Ch. 4.8
Single Line Interruption	ISO 16750:2 Ch. 4.9.1
Multiple Line Interruption	ISO 16750:2 Ch. 4.9.2
Short Circuit Protection	ISO 16750:2 Ch. 4.10.2
EMC	ECE-R10 Rev.5
ESD	ISO 10605
Environmental	
Temperature Step	ISO 16750:4 Ch 5.2
Low Temperature - Storage	ISO 16750:4 Ch 5.1.1.1
High Temperature - Storage	ISO 16750:4 Ch 5.1.2.1
Low Temperature - Operation	ISO 16750:4 Ch 5.1.1.2
High Temperature - Operation	ISO 16750:4 Ch 5.1.2.2
Change of Temperature	DIN EN 60068-2-14 Nb
Humid Heat Cyclic	ISO 16750:4 Ch 5.6 Test1
Damp Heat	ISO 16750:4 Ch 5.7
Salt Spray	DIN EN 60068-2-11
Dust	ISO 20653
Immersion	ISO 20653
Ice Water Shock – Submersion	ISO 16750:4 Ch 5.4
Mechanical	
Vibration, Random	DIN EN 60068-2-64
Shock	ISO 16750:3 Ch 4.2.2
Free Fall	ISO 16750:3 Ch 4.3

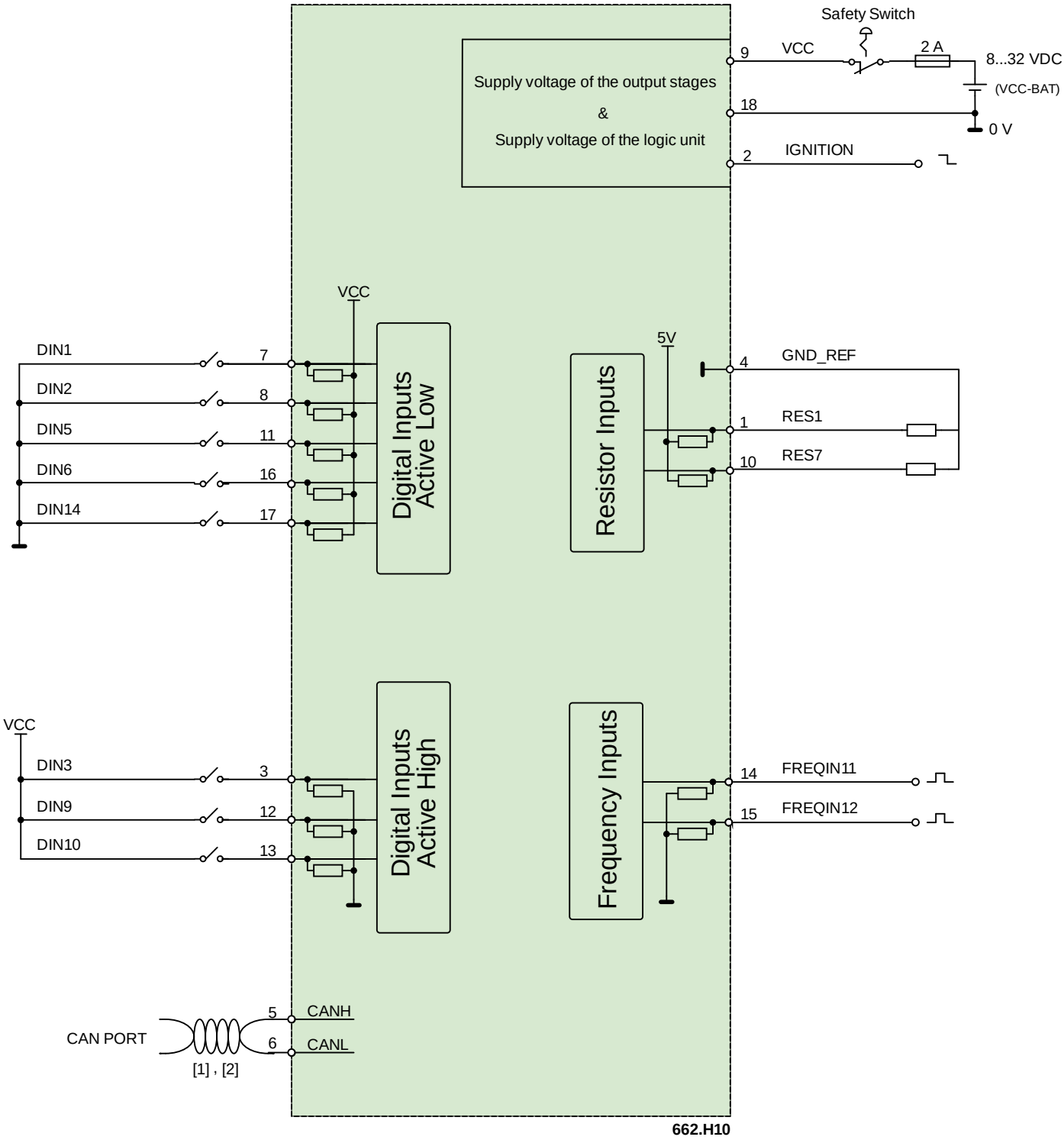
All the tests specified above were performed in Makersan’s in-house testing facility for the purpose of design verification except EMC.
The in-house testing facility does not hold an accreditation.

Feature List

Features	662.H10.SXXXX.PXXX.E10	662.H11.SXXXX.PXXX.E10	662.H12.SXXXX.PXXX.E10					
CAN	1	1	1					
RTC	Yes	Yes	Yes					
Buzzer	Yes	Yes	Yes					
Digital Input - Active Low	5	5	2					
Digital Input - Active High	3	2	-					
Universal Input - Voltage	-	1	-					
Universal Input - Current	-	-	-					
Universal Input - Frequency	2	-	-					
Universal Input - Resistor	2	1	1					
Digital Output - Low Side	-	-	-					
Digital Output - High Side	-	1	-					
Analog Output	-	-	-					

* Available upon request with minimum order quantity.

Electrical Connection (MO 662.H10.SXXXX.PXXX.E10)



[1] No internal termination resistor for CAN BUS.

[2] CAN wiring should be kept away from the high current cables and cross them at right angles when necessary.

[3] For inductive load, an external free-wheeling diode must be connected if clamp energy exceeds 140 mJ. Solenoid return line should be connected to the battery ground. (e.g:chassis)

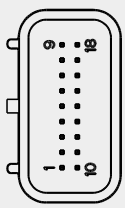
[4] For inductive load, an external free-wheeling diode must be connected if clamp energy exceeds 80 mJ.

Electrical Connection (MO 662.H10.SXXXX.PXXX.E10)

Pin	Description	Alternative Functions 1	Alternative Functions 2
3,12,13	**Digital Inputs - Active High** 7.5 kΩ pulldown resistor DIN3, DIN9, DIN10	No	No
7,8,11,16,17	**Digital Inputs - Active Low** 5.1 kOhm internal pull-up resistor to 5 V DIN5, DIN6, DIN8, DIN13, DIN14	No	No
1,10	**Universal Inputs - Resistor** 0-30 kΩ input range 3 kΩ pullup resistor (to internal 5 V) 265 Hz cutoff frequency 1 ms measurement update rate RES1, RES7	**Temperature Sensor Input** Passive temperature sensor	**Digital Inputs** Active-Low 1.6 mA max. switch current
14,15	**Universal Inputs - Frequency** 0...10 kHz input range 3 kΩ pulldown resistor 6.26 MHz cutoff frequency FREQIN11 & FREQIN12	**Digital Inputs** Active-High 1 mA max. switch current	No
15	**Digital Outputs - High Side** Output current max. 500 mA (per channel) Inductive or Resistive Load For inductive load, an external free-wheeling diode must be connected externally if clamp energy exceeds 80 mJ. 27 kΩ internal pullup resistor to VCCBAT for open load detection Current feedback Short circuit protection (shutdown current limit min. 6 A) DOUT12	**Analog Inputs** Current Sense 16.6 mV resolution 8 ms measurement update rate 328 Hz cutoff frequency	**Digital Inputs** Active-High Software programmable threshold
2	**Ignition Input / Terminal 2** 58 kΩ input resistance to GND	No	No
4	**GND-REF** Seperate from GND-BAT	No	No
9	**VCC-BAT** Supply voltage of outputs Must be connected through fuse	No	No
18	**GND-BAT**	No	No
5,6	**CAN** CAN 2.0A and CAN 2.0B (Termination resistor not present.)	No	No

Electrical Connection (MO 662.H10.SXXXX.PXXX.E10)

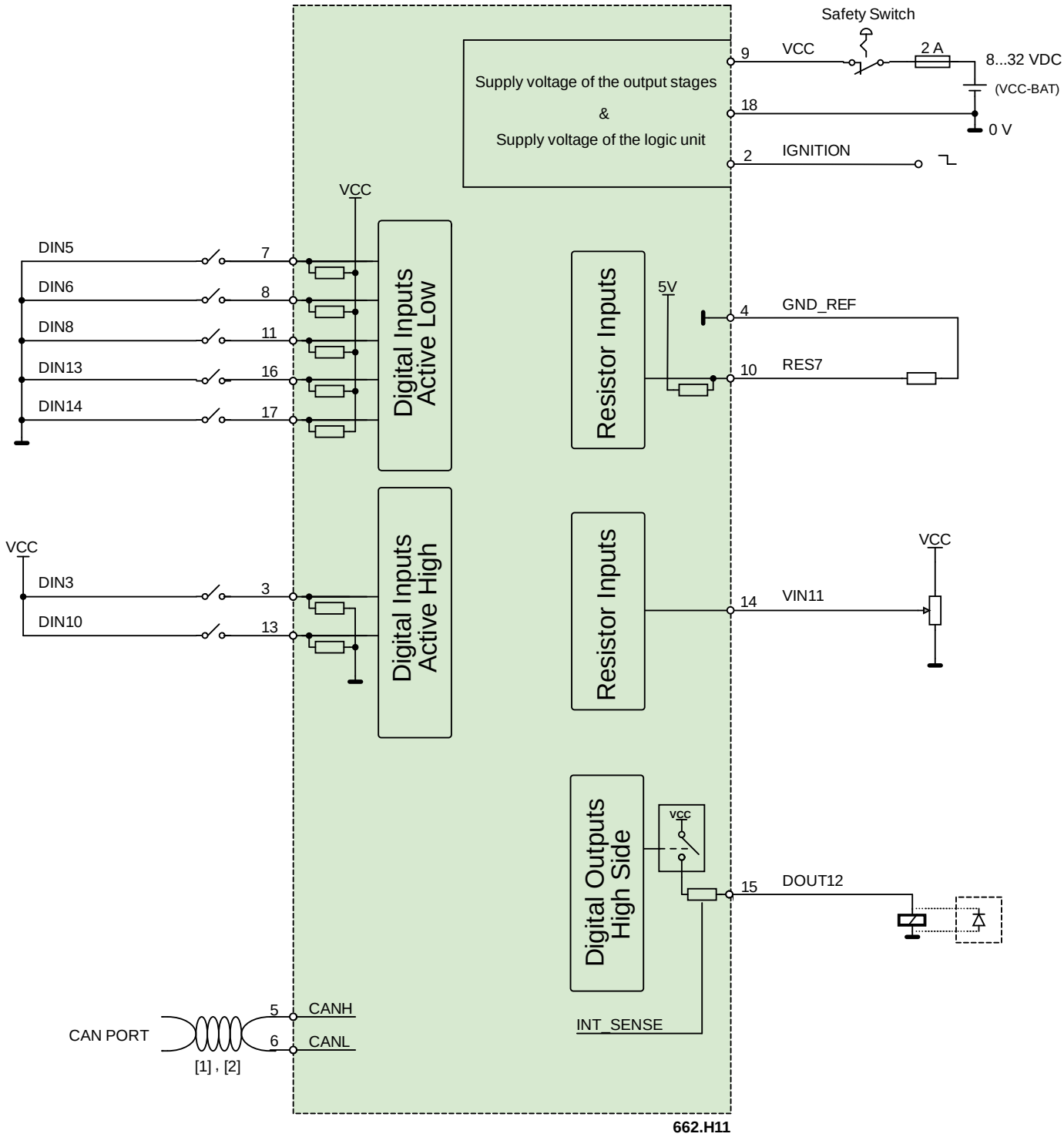
TYCO CONNECTOR



Mating Connector :
TE 2203663-5

Pin	Assignment	Pin	Assignment
1	RESIN1	10	RESIN7
2	K15	11	DIN8
3	DIN3	12	DIN9
4	GND_REF	13	DIN10
5	CAN1H	14	FREQ11
6	CAN1L	15	FREQ12
7	DIN5	16	DIN13
8	DIN6	17	DIN14
9	VCC_BAT	18	GND_BAT

Electrical Connection (MO 662.H11.SXXXX.PXXX.E10)



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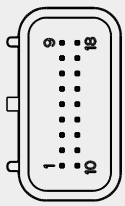
Electrical Connection (MO 662.H11.SXXXX.PXXX.E10)

Pin	Description	Alternative Functions 1	Alternative Functions 2
3,13	**Digital Inputs - Active High** 7.5 kΩ pulldown resistor DIN3, DIN10	No	No
7,8,11,16,17	**Digital Inputs - Active Low** 5.1 kOhm internal pull-up resistor to 5 V DIN5, DIN6, DIN8, DIN13, DIN14	No	No
14	**Universal Inputs - Voltage** 0-32 V (max. 36 V) 8.8 mV resolution 175 Hz cutoff frequency 1 ms measurement update rate VIN11	**Digital Input** Software programmable threshold	No
10	**Universal Inputs - Resistor** 0-30 kΩ input range 3 kΩ pullup resistor (to internal 5 V) 265 Hz cutoff frequency 1 ms measurement update rate RES7	**Temperature Sensor Input** Passive temperature sensor	**Digital Inputs** Active-Low 1.6 mA max. switch current
15	**Digital Outputs - High Side** Output current max. 500 mA (per channel) Inductive or Resistive Load For inductive load, an external free-wheeling diode must be connected externally if clamp energy exceeds 80 mJ. 27 kΩ internal pullup resistor to VCCBAT for open load detection Current feedback Short circuit protection (shutdown current limit min. 6 A) DOUT12	**Analog Inputs** Current Sense 16.6 mV resolution 8 ms measurement update rate 328 Hz cutoff frequency	**Digital Inputs** Active-High Software programmable threshold
2	**Ignition Input / Terminal 2** 58 kΩ input resistance to GND	No	No
4	**GND-REF** Seperate from GND-BAT	No	No
9	**VCC-BAT** Supply voltage of outputs Must be connected through fuse	No	No
18	**GND-BAT**	No	No
5,6	**CAN** CAN 2.0A and CAN 2.0B (Termination resistor not present.)	No	No

Electrical Connection (MO 662.H11.SXXXX.PXXX.E10)

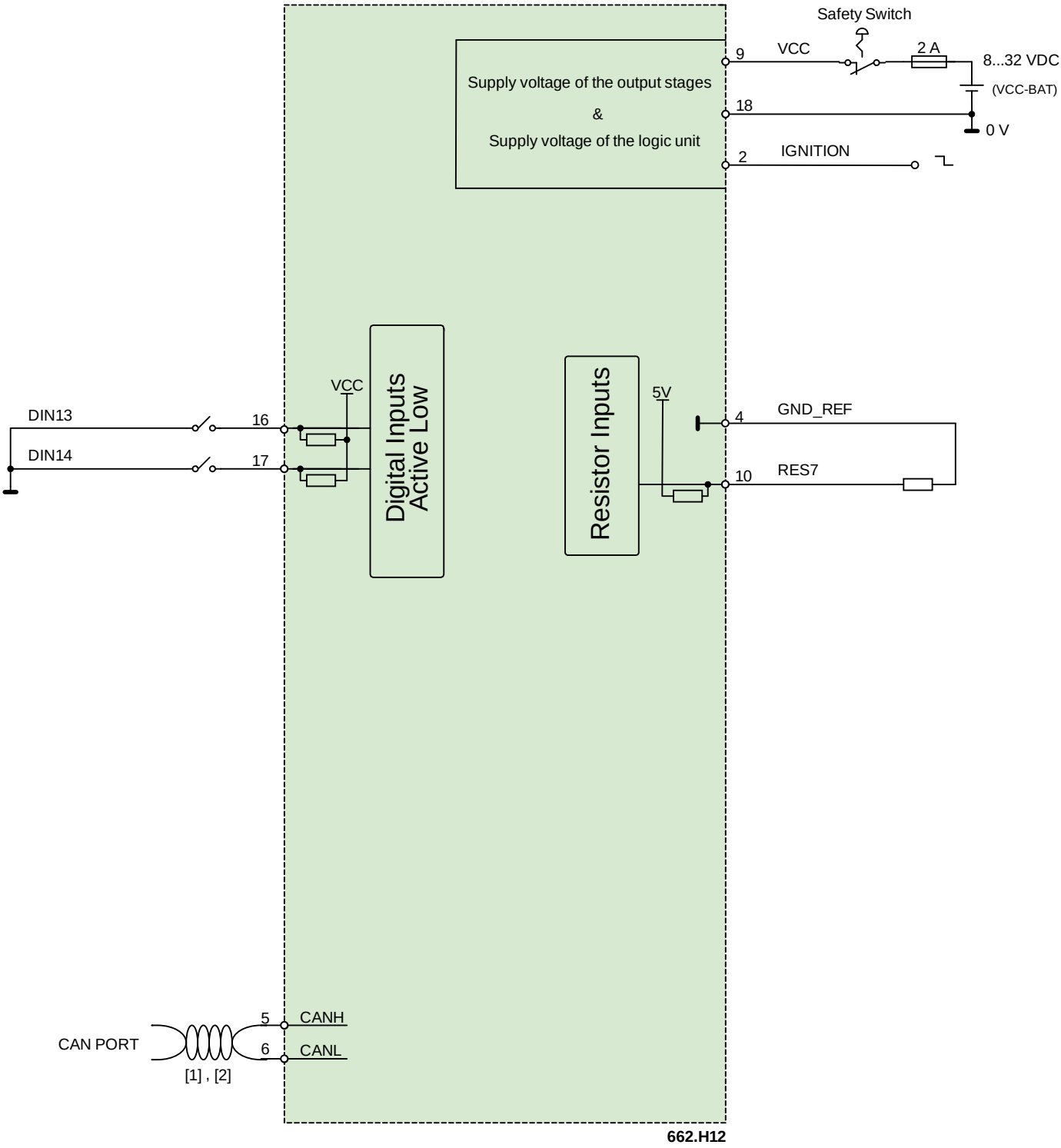
TYCO CONNECTOR



Mating Connector :
TE 2203663-5

Pin	Assignment	Pin	Assignment
1	NC	10	RESIN7
2	K15	11	DIN8
3	DIN3	12	NC
4	GND_REF	13	DIN10
5	CAN1H	14	VIN11
6	CAN1L	15	DOUT12
7	DIN5	16	DIN13
8	DIN6	17	DIN14
9	VCC_BAT	18	GND_BAT

Electrical Connection (MO 662.H12.SXXXX.PXXX.E10)



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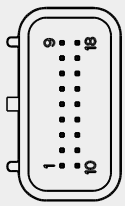
Electrical Connection (MO 662.H12.SXXXX.PXXX.E10)

Pin	Description	Alternative Functions 1	Alternative Functions 2
16,17	**Digital Inputs - Active Low** 5.1 kOhm internal pull-up resistor to 5 V DIN13, DIN14	No	No
10	**Universal Inputs - Resistor** 0-30 kΩ input range 3 kΩ pullup resistor (to internal 5 V) 265 Hz cutoff frequency 1 ms measurement update rate RES7	**Temperature Sensor Input** Passive temperature sensor	**Digital Inputs** Active-Low 1.6 mA max. switch current
2	**Ignition Input / Terminal 2** 58 kΩ input resistance to GND	No	No
4	**GND-REF** Seperate from GND-BAT	No	No
9	**VCC-BAT** Supply voltage of outputs Must be connected through fuse	No	No
18	**GND-BAT**	No	No
5,6	**CAN** CAN 2.0A and CAN 2.0B (Termination resistor not present.)	No	No

Electrical Connection (MO 662.H12.SXXXX.PXXX.E10)

TYCO CONNECTOR



Mating Connector :
TE 2203663-5

Pin	Assignment	Pin	Assignment
1	NC	10	RESIN7
2	K15	11	NC
3	NC	12	NC
4	NC	13	NC
5	CAN1H	14	NC
6	CAN1L	15	NC
7	NC	16	DIN13
8	NC	17	DIN14
9	VCC_BAT	18	GND_BAT

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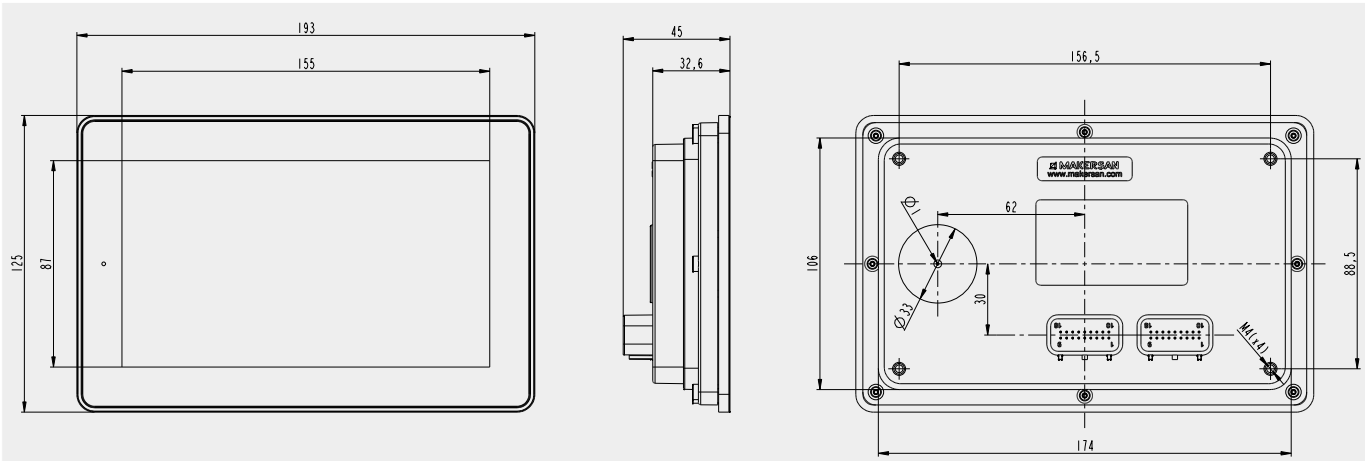
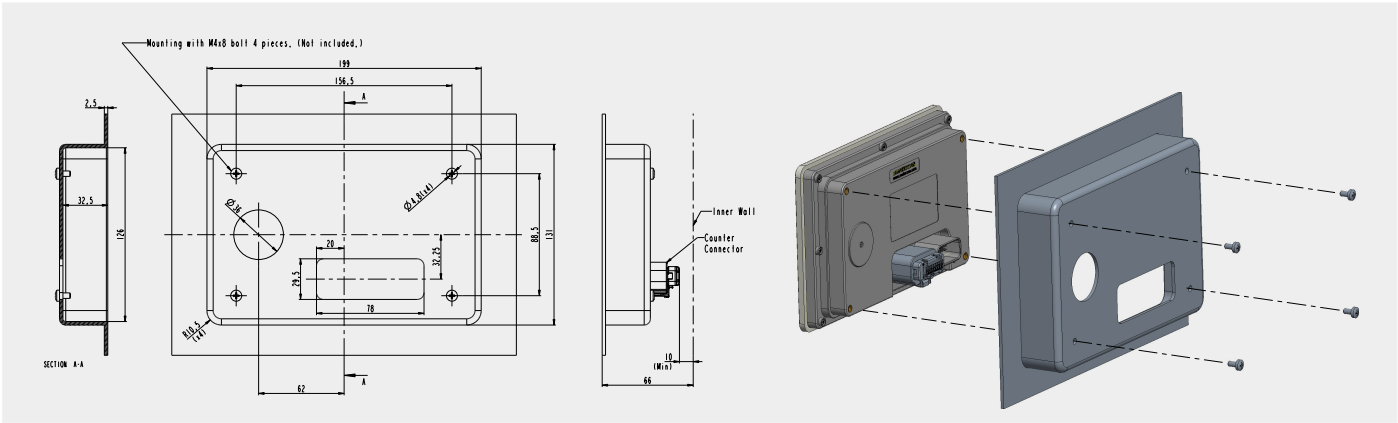
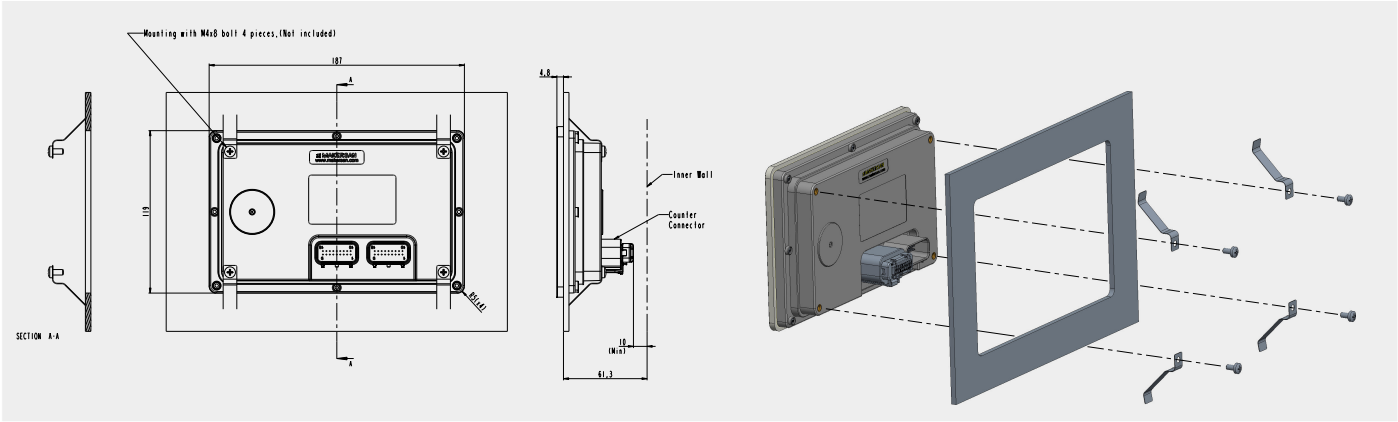
Technical Drawing



Mounting Cut-Out



Mounting Cut-Out



Wiring Information

* All wiring must be suitable for the operating temperature range.
* Use appropriate type and size of cable for each I/O and power pins. Consider current carrying capability of cable and connector.

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Ordering Code

MO 662 . H1X . SXXXX . PXXX . EXX

- SXXXX — Software:
  - S1000 - Default
  - * - Custom
- PXXX — Image Library:
  - P001 - Default
  - * - Custom
- EXX — Add-On Board:
  - E10 - Default
  - * - No
- H1X — Hardware Configurations:
  - H10 - 5 Active-Low Inputs, 3 Active-High Inputs, 2 Frequency Inputs, 2 Resistor Inputs
  - H11 - 5 Active-Low Inputs, 2 Active-High Inputs, 1 Voltage Input, 1 Resistor Input, 1 High-Side Output
  - H12 - 2 Active-Low Inputs, 1 Resistor Input

***** Available upon request with minimum order quantity.

Example : MO 662 - H10 - S1000 - P100 - E10 is 5 Active-Low Inputs, 3 Active-High Inputs, 2 Frequency Inputs, 2 Resistor Inputs, add-on button board with SAE J1939 interface.

Safety Instructions

*Do not use the device in hazardous and explosive environment.

*Keep the device away from magnets and radio equipment .

*Do not place the device to the direct air flow of vehicles heating cooling air duct due to the high temperature stress.

*Screen with the vehicle's ground the electric cables connected to the device.Far away the device cable from power-conducting lines.

*Provide a clean power supply to the device. Otherwise voltage transients may damage the module.

*Do not direct the pressure washing jet to the device.

*Unplug connectors from the device during electrical welding operations.

*Damages which result from improper use, all warranty and liability claims with respect to the manufacturer void.

*To perform a risk analysis of the system is customer’s responsibility at use in safety-related functions of the device.

*These products are ESD (Electrostatic Discharge) sensitive devices. ESD may cause permanent damage. When handling these devices please observe standard ESD precautions.

*Please refer to product user manual for installation, commissioning and programming information.

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