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Our Certifications



Company Overview

Smart Mobile & Field Solutions

Makersan has a long tradition of providing state of the art, reliable solutions for developing and managing mechanic and electronic innovative products through trusted customer relationship in the areas of developing, designing and manufacturing reliable advanced operation controllers and sensors for commercial, construction, marine and agricultural equipment applications. Our renowned legacy in the automotive industry, makes us your excellent partner in the endeavor to stay ahead of the quality & cost competition on the field of sensing, controlling and actuating applications within the scope of quality certified by IATF 16949, ISO 14001, ISO 9001 and ISO 45001.



Electronic Pedals



Pg. 6

Suspended
MO 126



Pg. 7

Floor
MO 129L



Pg. 8

Floor
MO 129S



Pg. 9

Floor
MO 129LW



Pg. 10

Bidirectional Pedal
MO 367



Pg. 11

Suspended
MO 370



Pg. 12

Suspended
MO 372



Pg. 13

Clutch Pedal
MO 381D



Pg. 14

Tractor
MO 382



Pg. 15

Underfloor
MO 383B



Pg. 16

Skid Steer
MO 383D



Pg. 17

Tractor
MO 383T



Pg. 18

Control Knob
MO 375A



Pg. 19

Control Knob
MO 376A



Pg. 20

Control Lever
MO 376C



Pg. 21

Control Knob
MO 378



Pg. 22

Control Lever
MO 378M



Pg. 23

Control Lever
MO 378N



Pg. 24

Control Lever
MO 378S



Pg. 25

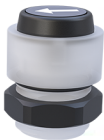
Control Lever
MO 379

Control Levers & Knobs

Joysticks

		Pg. 33-36	Pg. 37
Pg. 26-27	Pg. 30	 Joystick Mini MO 395	 Joystick Micro MO 397
 Joystick Grip MO 394	 Joystick Grip MO 387	Pg. 8  Single Axis Joystick MO 389	
Pg. 28-29  Joystick MO 390	Pg. 31-32  Joystick MO 391	Pg. 38  Fingertip Joystick MO 377	Pg. 39  Thumbwheel MO 393

Buttons

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 Push Button MO 392 H1X	 Push Button MO 392S	 Touch Button MO 400	

Remote
Keyless Entry

Pg. 43	Pg. 44	Pg. 45	Pg. 46
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Keypads & Joystick Keypads



Keypad
MO 405 H1X



Keypad
MO 405 H4X



Keypad
MO 405 H2X



Keypad
MO 405 H3X



CAN Joystick Keypad
MO 406



CAN Joystick Keypad
MO 407

Sensors



Rotary Position Sensor
MO 450A



Position Sensor
MO 450D



IMU Sensor
MO 415



Pressure Sensor
MO 420



Temperature Sensor
MO 413



Temperature Sensor
MO 414

Displays



HMI 7"
MO 662



HMI 4.3"
MO 661 H1X

I/O Modules & Controllers

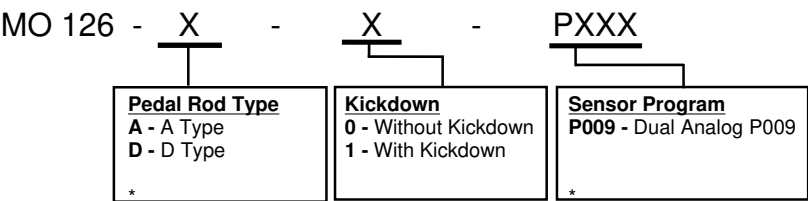
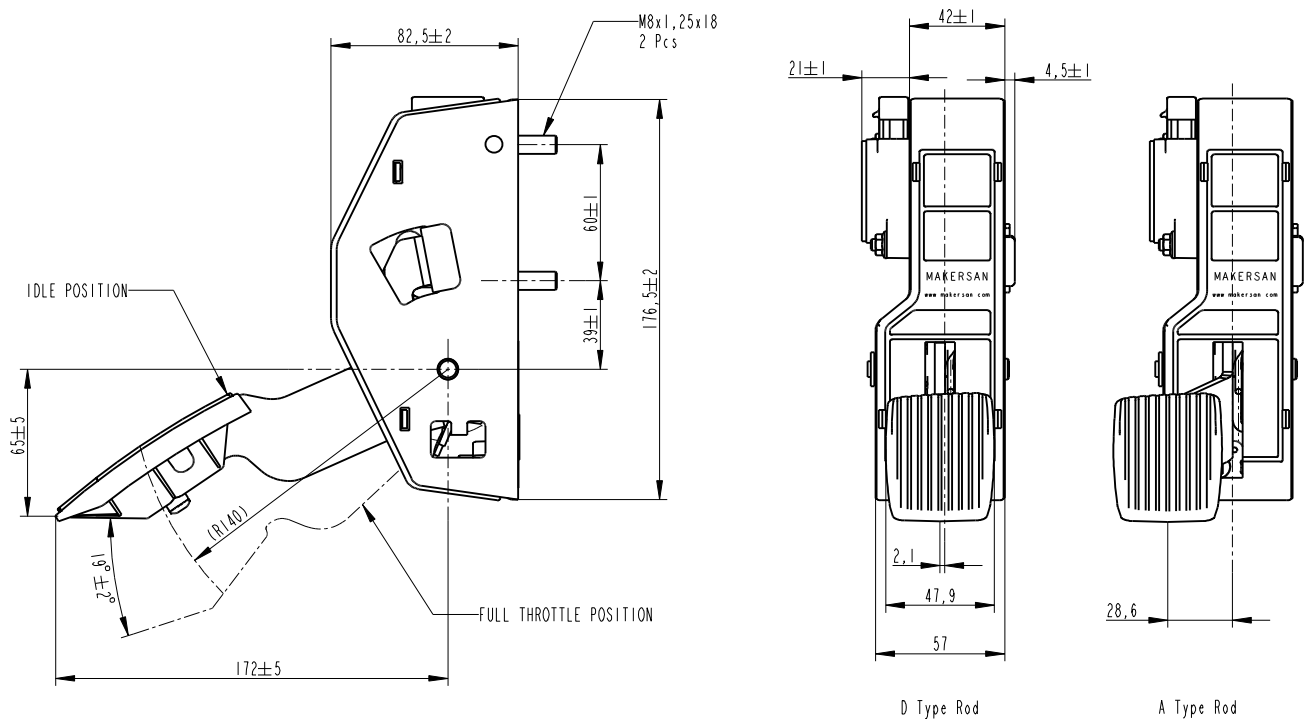
Pg. 61  Mix I/O Controller MO 692 H1X	Pg. 62  Mix I/O Controller MO 691 H1X	Pg. 63  Valve Controller MO 691 H2X	Pg. 64  Motor Controller MO 691 H3X
Pg. 65  Mix I/O Controller MO 690 H1X	Pg. 66  Relay Extension Module MO 690 HAX	Pg. 67  Relay Extension Module MO 690 HBX	Pg. 68  FET Extension Module MO 690 HCX
Pg. 69  Valve Controller MO 699 H1X	Pg. 70  Motor Controller MO 699 H2X	Pg. 71  Start Stop Converter MO 780 H1X	Pg. 72  Start Stop Converter MO 780 H2X

ACCELERATOR PEDAL MO 126



Technical Data

Engines	Suitable for different engine interfaces
Technology	Contactless measuring principle
Output	Single or Double full redundant programmable outputs
	Single / Dual Analog type : 0-5V / 4-20mA / PWM
	Analog+IVS type : Analog+Highside or Lowside Switch
Output Type	Analog, PWM, IVS options
Supply Voltage	5V or 8-32V
Kickdown	Virtual effect option
Protective rating	IP6K9K Sensor
Counter connector	6 way, Delphi Packard Metric Pack 150
Mechanic	Two independent springs
Operating Angle	19°
Operating Temp.	-40°C ... +85°C
Actuations	Up to 2 million
Weight	1.3 kg
Housing material	Heavy duty metal case
Application	Commercial and off road vehicles
Treadle	A and D treadle position option



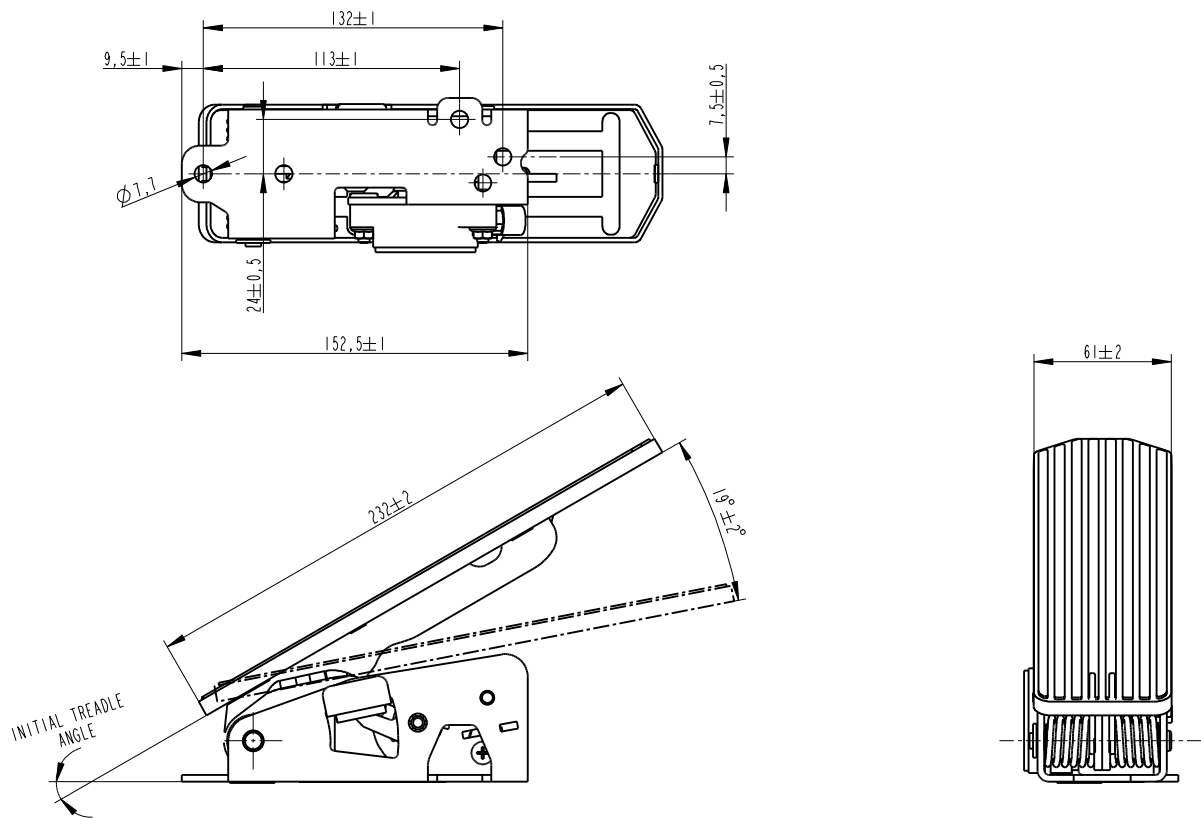
* Different types and values can be produced on request.
Example: MO 126-D-1-P009 is D type rod, with kickdown, sensor prog. 009(Dual Analog)

ACCELERATOR PEDAL MO 129L



Technical Data

Engines	Suitable for different engine interfaces
Technology	Contactless measuring principle
Output	Single or Double full redundant programmable outputs
	Single / Dual Analog type : 0-5V / 4-20mA / PWM
	Analog+IVS type : Analog+Highside or Lowside Switch
	CAN Type : SAE J1939
Output Type	CAN, Analog, PWM, IVS options
Supply Voltage	5V or 8-32V
Kickdown	Virtual effect option
Protective rating	IP6K9K Sensor
Counter connector	6 way, Delphi Packard Metric Pack 150
Mechanic	Two independent springs
Operating Angle	19°
Operating Temp.	-40°C ... +85°C
Actuations	Up to 2 million
Weight	1.05 kg
Housing material	Heavy duty metal case
Application	Commercial and off road vehicles
Initial Treadle Angle	30°, 35°, 40°, 45° treadle angle position option



MO 129L - X	-	X	-	PXXX
Initial Treadle Angle 1- 30° 2- 35° 3- 40° 4- 45°		Kickdown 0 - Without Kickdown 1 - With Kickdown		Sensor Program P009 - Dual Analog P009 *

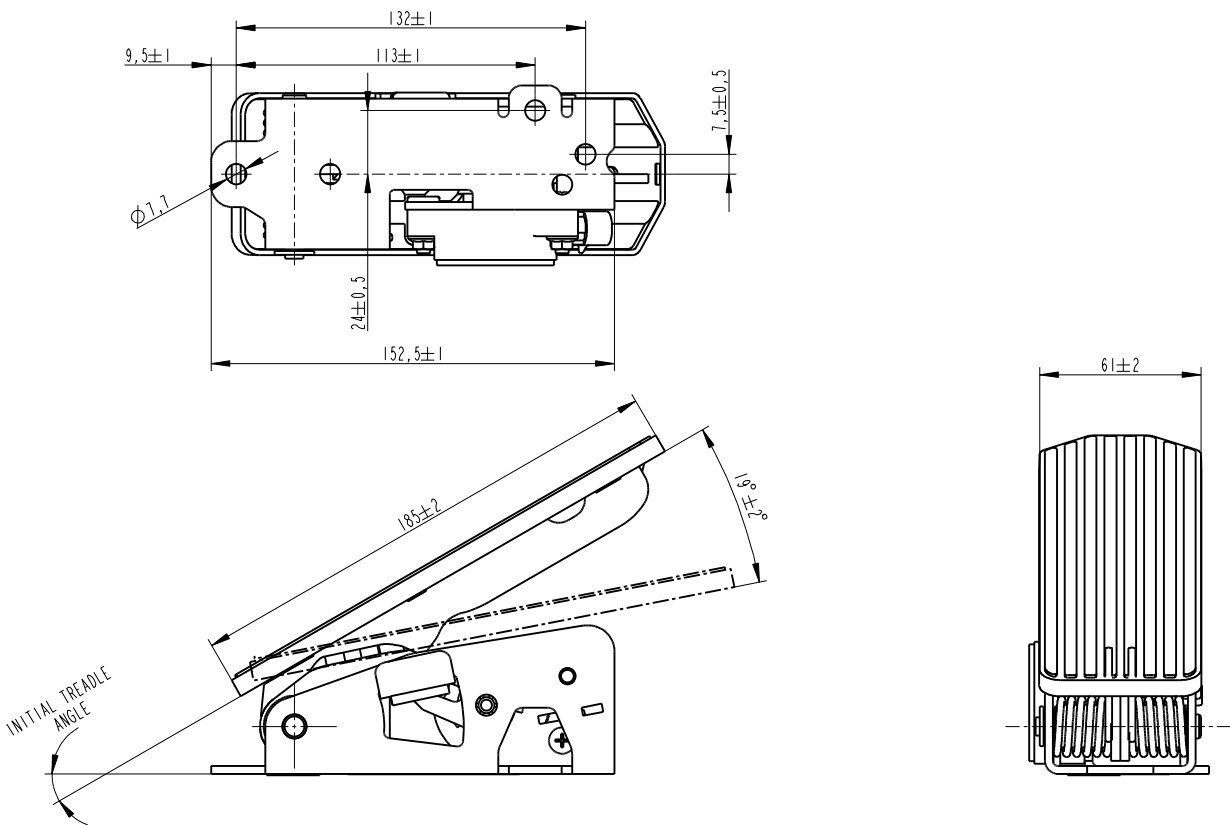
* Different types and values can be produced on request.
 Example: MO 129L-1-1-P009 is 30° initial treadle angle, with kickdown, sensor prog. 009(Dual Analog)

ACCELERATOR PEDAL MO 129S



Technical Data

Engines	Suitable for different engine interfaces
Technology	Contactless measuring principle
Output	Single or Double full redundant programmable outputs
	Single / Dual Analog type : 0-5V / 4-20mA / PWM
	Analog+IVS type : Analog+Highside or Lowside Switch
	Analog, PWM, IVS options
Output Type	Virtual effect option
Supply Voltage	5V or 8-32V
Kickdown	IP6K9K Sensor
Protective rating	6 way, Delphi Packard Metric Pack 150
Counter connector	Two independent springs
Mechanic	19°
Operating Angle	-40°C ... +85°C
Operating Temp.	Up to 2 million
Actuations	0.95 kg
Weight	Heavy duty metal case
Housing material	Commercial and off road vehicles
Application	30°, 35°, 40°, 45° treadle angle position option
Initial Treadle Angle	



MO 129S - X	-	X	-	PXXX
Initial Treadle Angle 1- 30° 2- 35° 3- 40° 4- 45°		Kickdown 0 - Without Kickdown 1 - With Kickdown		Sensor Program P009 - Dual Analog P009 *

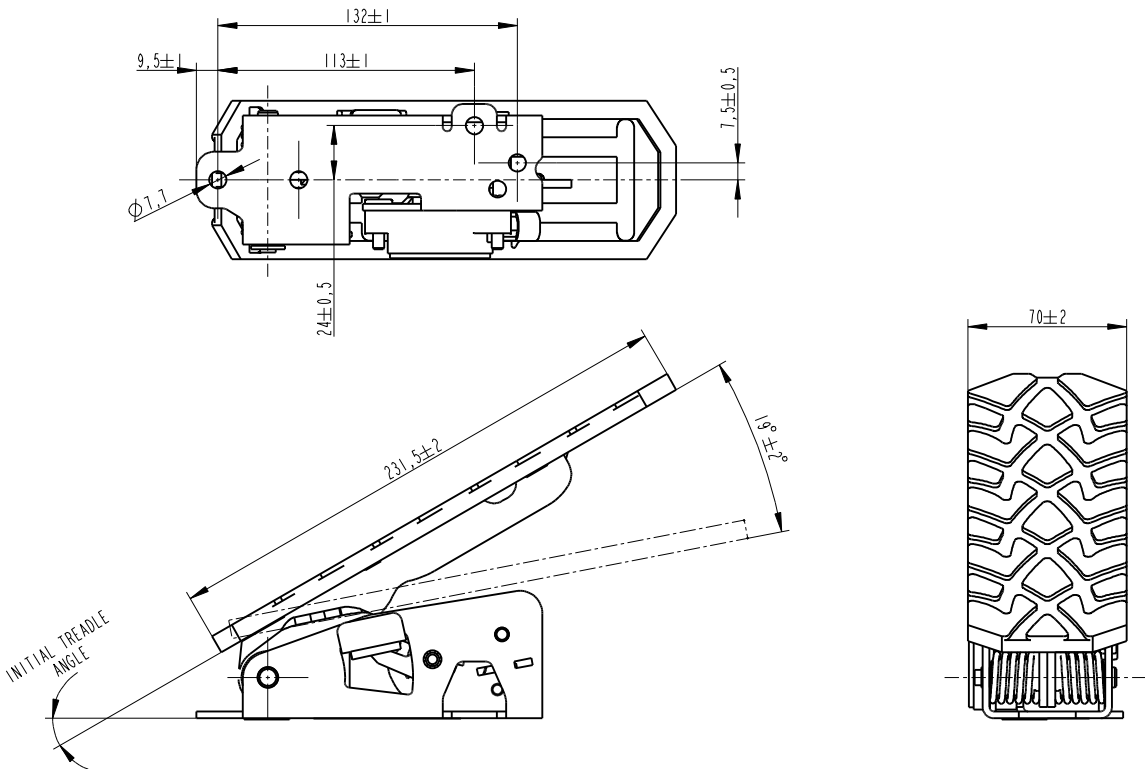
* Different types and values can be produced on request.
Example: MO 129S-1-1-P009 is 30° initial treadle angle, with kickdown, sensor prog. 009(Dual Analog)

ACCELERATOR PEDAL MO 129LW



Technical Data

Engines	Suitable for different engine interfaces
Technology	Contactless measuring principle
Output	Single or Double full redundant programmable outputs
	Single / Dual Analog type : 0-5V / 4-20mA / PWM
	Analog+IVS type : Analog+Highside or Lowside Switch
Output Type	Analog, PWM, IVS options
Supply Voltage	5V or 8-32V
Kickdown	Virtual effect option
Protective rating	IP6K9K Sensor
Counter connector	6 way, Delphi Packard Metric Pack 150
Mechanic	Two independent springs
Operating Angle	19°
Operating Temp.	-40°C ... +85°C
Actuations	Up to 2 million
Weight	1.05 kg
Housing material	Heavy duty metal case
Application	Commercial and off road vehicles
Initial Treadle Angle	30°, 35°, 40°, 45° treadle angle position option



MO 129LW -	<u> X </u>	-	<u> X </u>	-	<u> PXXX </u>
	Initial Treadle Angle		Kickdown		Sensor Program
	1- 30°		0 - Without Kickdown		P009 - Dual Analog P009
	2- 35°		1 - With Kickdown		
	3- 40°				
	4- 45°				*

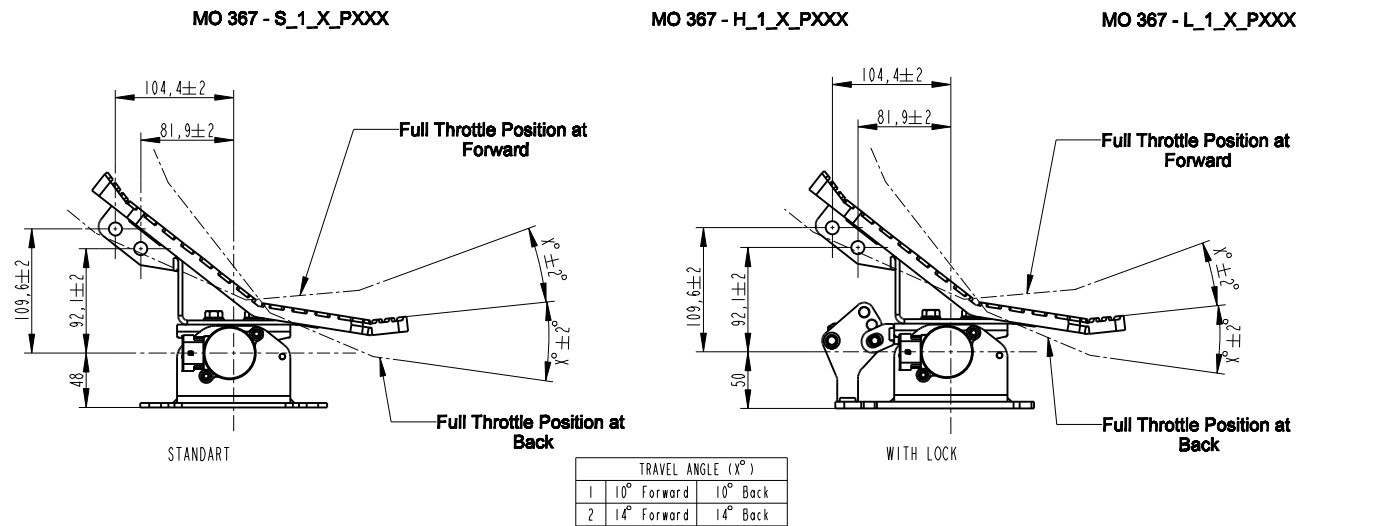
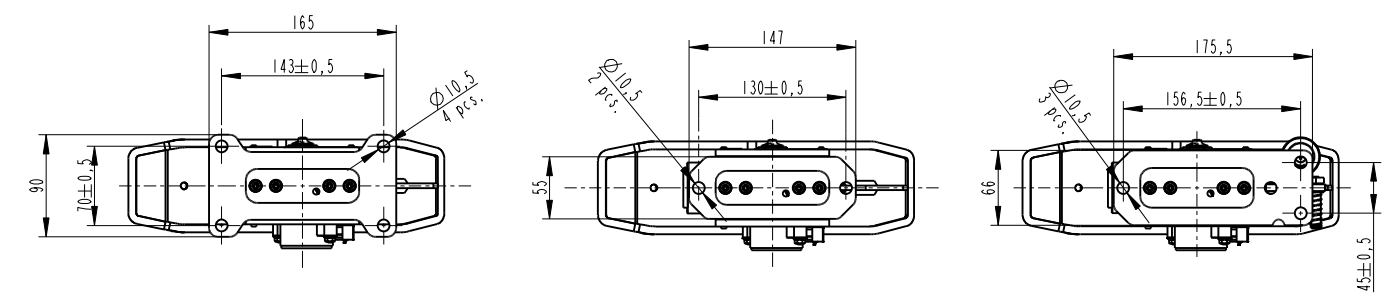
* Different types and values can be produced on request.
Example: MO 129LW-1-1-P009 is 30° initial treadle angle, with kickdown, sensor prog. 009(Dual Analog)

ACCELERATOR PEDAL MO 367



Technical Data

Engines Technology Output	Suitable for different engine interfaces Contactless measuring principle Single or Double full redundant programmable outputs Single / Dual Analog type : 0-5V / 4-20mA / PWM Analog+IVS type : Analog+Highside or Lowside Switch CAN Type : SAE J1939
Output Type	CAN, Analog, PWM, IVS options
Supply Voltage	5V or 8-32V
Protective rating	IP6K9K Sensor
Counter connector	6 way, Delphi Packard Metric Pack 150
Mechanic	Two independent springs
Operating Angle	30°
Operating Temp.	-40°C ... +85°C
Actuations	Up to 1 million
Weight	2.5 kg - S Type 2,4 kg - H Type 2,8 kg - L Type
Housing material	Heavy duty metal case
Application	Commercial and off road vehicles



MO 367 -	X	-	X	-	X	-	PXXX
	Connection Type S - Standart Type H - Hydraulic Type L - Lock Type **		Pad Type 0 - Without Pad 1 - Type 1 2 - Type 2 3 - Type 3		Travel Angle 1 - 10° 2 - 14°		Sensor Program P009 - Dual Analog P009 *

* Different types and values can be produced on request.

** Each pedal type can be purchasable without pedal pad.

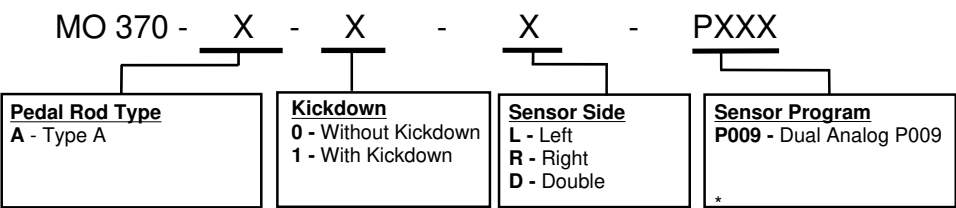
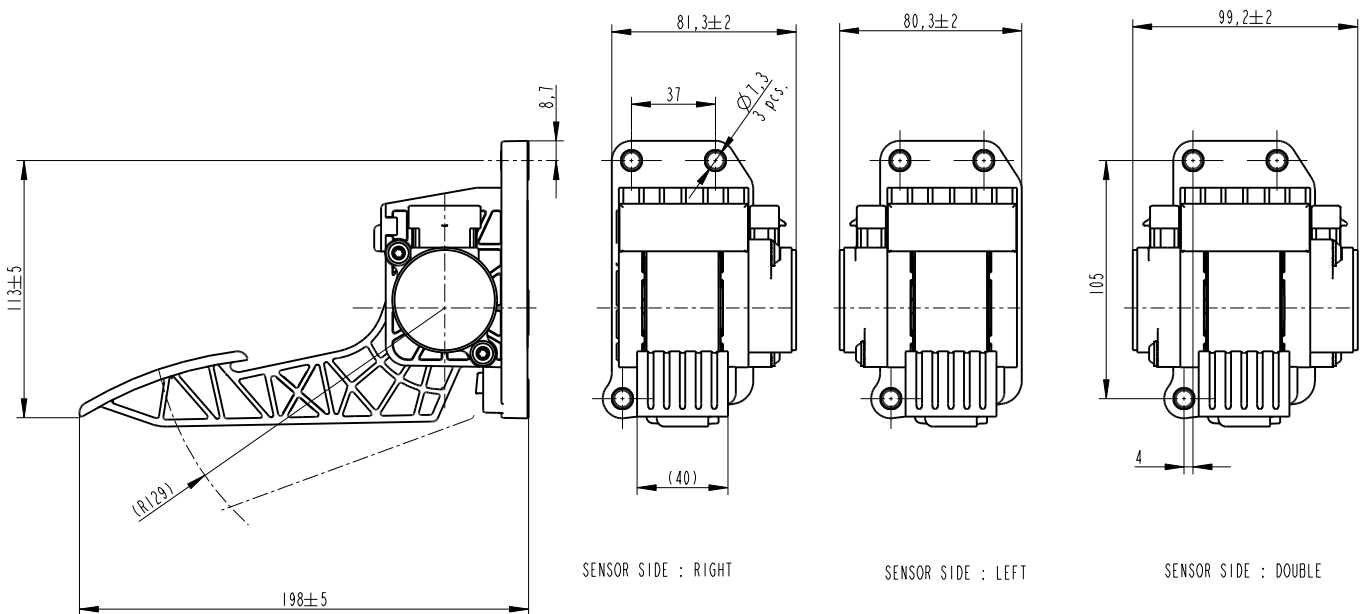
Example: MO 367-S-1-2-P009 is standart connection type, pad type 1, travel angle 14° sensor prog. 009(Dual Analog)

ACCELERATOR PEDAL MO 370



Technical Data

Engines	Suitable for different engine interfaces
Technology	Contactless measuring principle
Output	Single or Double full redundant programmable outputs
	Single / Dual Analog type : 0-5V / 4-20mA / PWM
	Analog+IVS type : Analog+Highside or Lowside Switch
	CAN Type : SAE J1939
Output Type	CAN, Analog, PWM, IVS options
Supply Voltage	5V or 8-32V
Kickdown	Virtual effect option
Protective rating	IP6K9K Sensor
Counter connector	6 way, Delphi Packard Metric Pack 150
Mechanic	Two independent springs
Operating Angle	19°
Operating Temp.	-40°C ... +85°C
Actuations	Up to 2 million
Weight	0.400 kg
Housing material	% 30 GF reinforced polyamide plastic case
Application	Passenger, commercial and off road vehicles
Sensor side	Double sensor (4 outputs), right or left sensor (2 outputs)



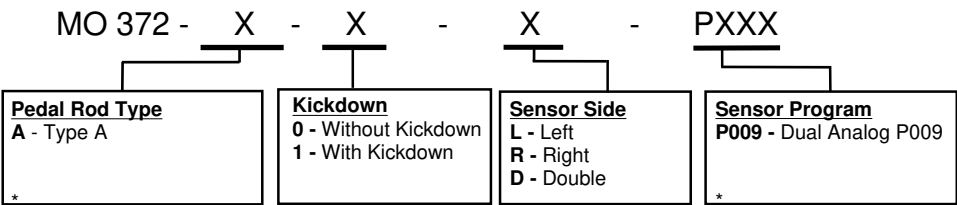
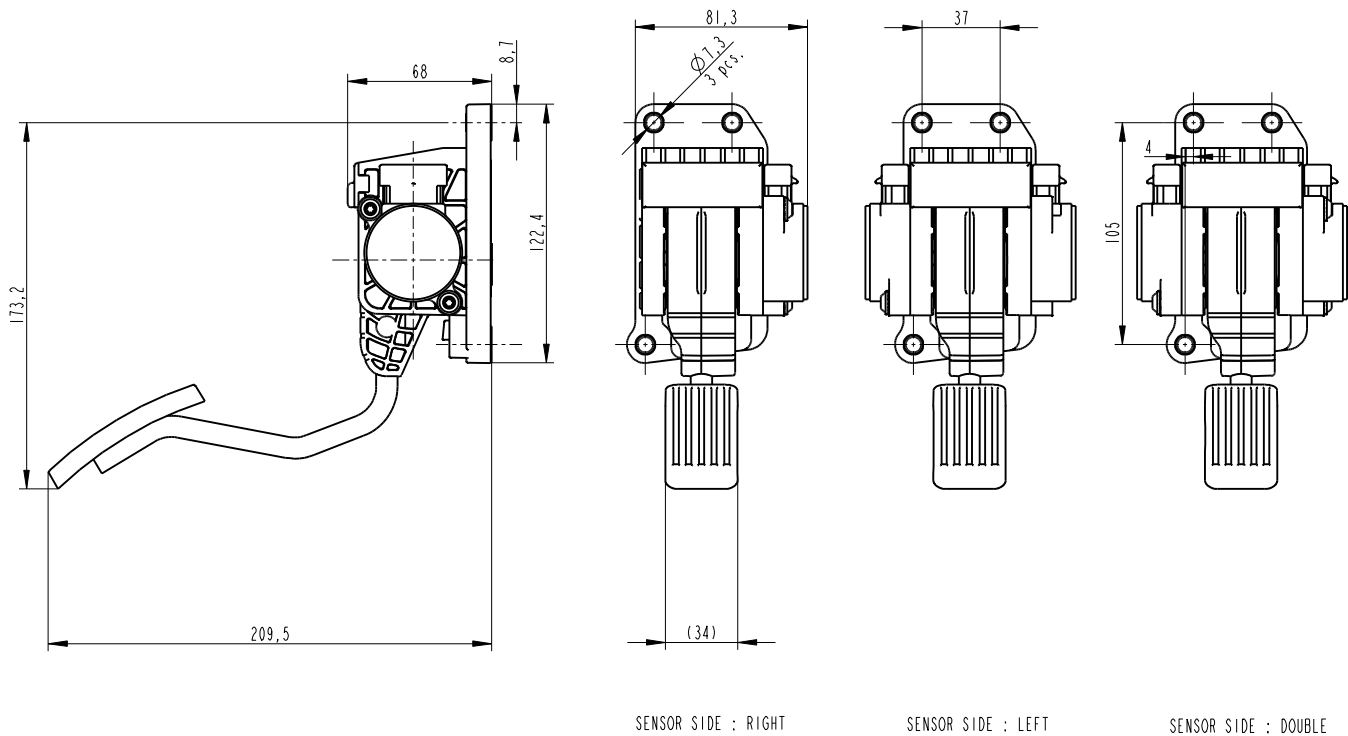
* Different types and values can be produced on request.
Example: MO 370-A-1-L-P009 is A type rod, with kickdown, left sensor, sensor prog. 009(Dual Analog)

ACCELERATOR PEDAL MO 372



Technical Data

Engines	Suitable for different engine interfaces
Technology	Contactless measuring principle
Output	Single or Double full redundant programmable outputs
	Single / Dual Analog type : 0-5V / 0-10V / 4-20mA / PWM
	Analog+IVS type : Analog+Highside or Lowside Switch
Output Type	Analog, PWM, IVS options
Supply Voltage	5V or 8-32V
Kickdown	Virtual effect option
Protective rating	IP6K9K Sensor
Counter connector	6 way, Delphi Packard Metric Pack 150
Mechanic	Two independent springs
Operating Angle	19°
Operating Temp.	-40°C ... +85°C
Actuations	Up to 2 million
Weight	0.500 kg
Housing material	% 30 GF reinforced polyamide plastic case
Application	Passenger, commercial and off road vehicles
Sensor side	Double sensor (4 outputs), right or left sensor (2 outputs)



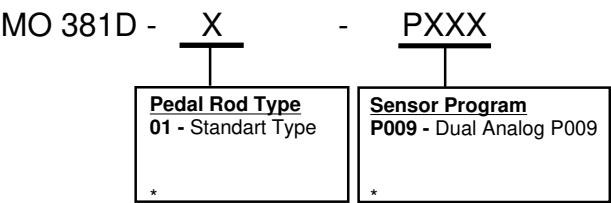
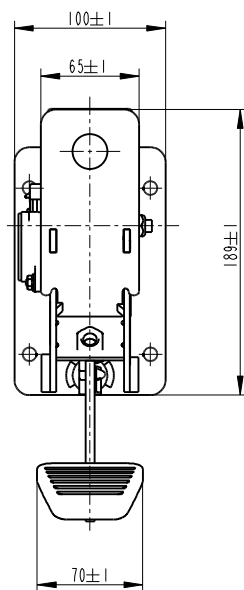
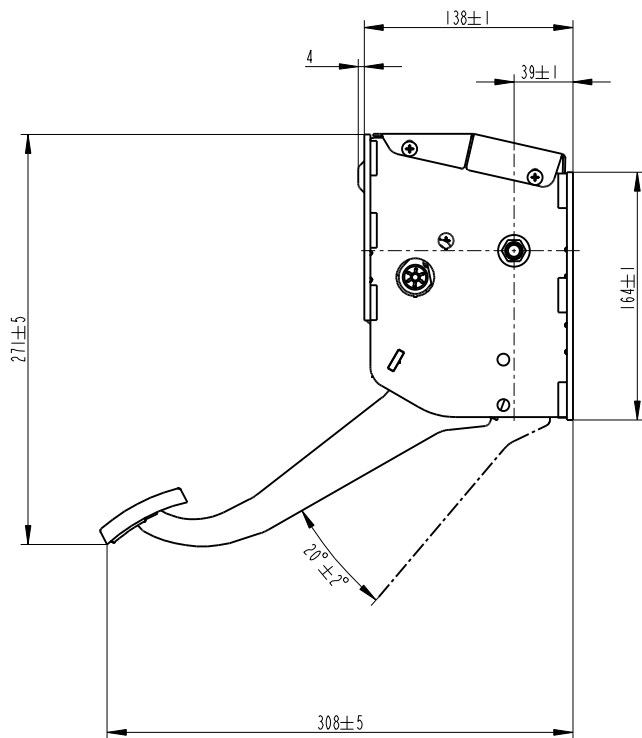
* Different types and values can be produced on request.
Example: MO 372-A-1-L-P009 is A type rod, with kickdown, left sensor, sensor prog. 009(Dual Analog)

CLUTCH PEDAL MO 381D



Technical Data

Engines	Suitable for different engine interfaces
Technology	Contactless measuring principle
Output	Single or Double full redundant programmable outputs
	Single / Dual Analog type : 0-5V / 4-20mA / PWM
	Analog+IVS type : Analog+Highside or Lowside Switch
	Analog , PWM , IVS options.
Output Type	5 V or 8-32 V
Supply Voltage	IP6K9K Sensor
Protective rating	6 way, Delphi Packard Metric Pack 150
Counter connector	Two independent springs
Mechanic	200
Operating Angle	-40 0C +85 0C
Operating Temp.	Up to 1 million
Actuations	3,4 kg
Weight	Heavy duty metal case
Housing material	Commercial and off road vehicles
Application	



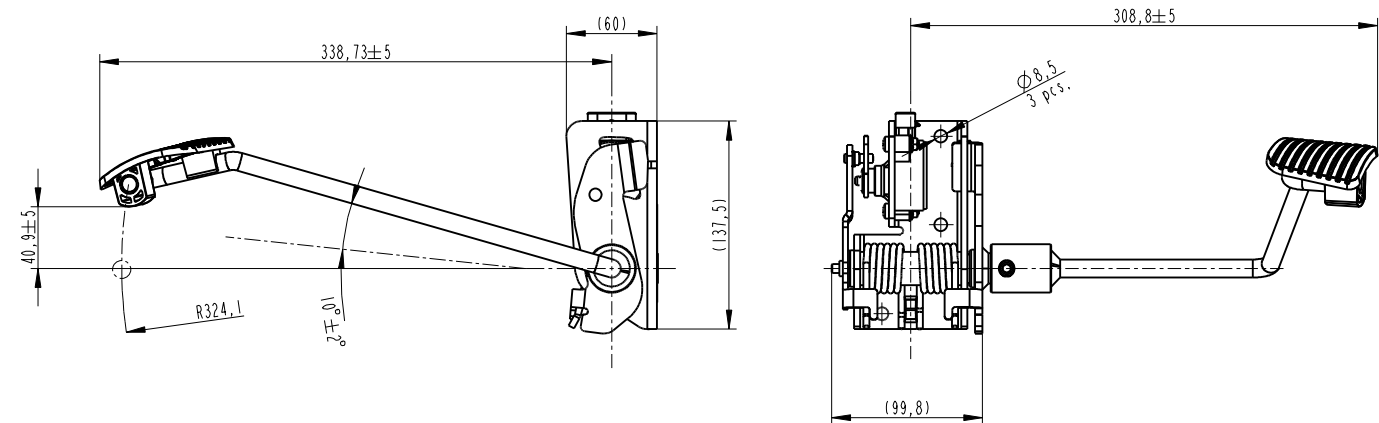
* Different types and values can be produced on request.
Example: MO 381D-01-P009 is standart type rod, sensor prog. 009(Dual Analog)

ACCELERATOR PEDAL MO 382



Technical Data

Engines	Suitable for different engine interfaces
Technology	Contactless measuring principle
Output	Single or Double full redundant programmable outputs
	Single / Dual Analog type : 0-5V / 4-20mA / PWM
	Analog+IVS type : Analog+Highside or Lowside Switch
	CAN Type : SAE J1939
	CAN, Analog, PWM, IVS options
Output Type	5V or 8-32V
Supply Voltage	Virtual effect option
Kickdown	IP6K9K Sensor
Protective rating	6 way, Delphi Packard Metric Pack 150
Conterplug	Two independent springs
Mechanic	10°
Operating Angle	-40°C ... +85°C
Operating Temp.	Up to 2 million
Actuations	2.25 kg
Weight	Heavy duty metal case
Housing material	Agricultural tractors and off road vehicles
Application	Spring rotational treadle for max. comfort
Treadle	



MO 382 -	<u>X</u> -	<u>X</u> -	<u>PXXX</u>
	Pedal Rod Type	Sensor Position	Sensor Program
	C - C Type	V - Vertical	P009 - Dual Analog P009
		H - Horizontal	
	*		*

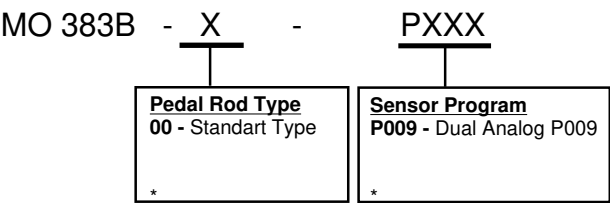
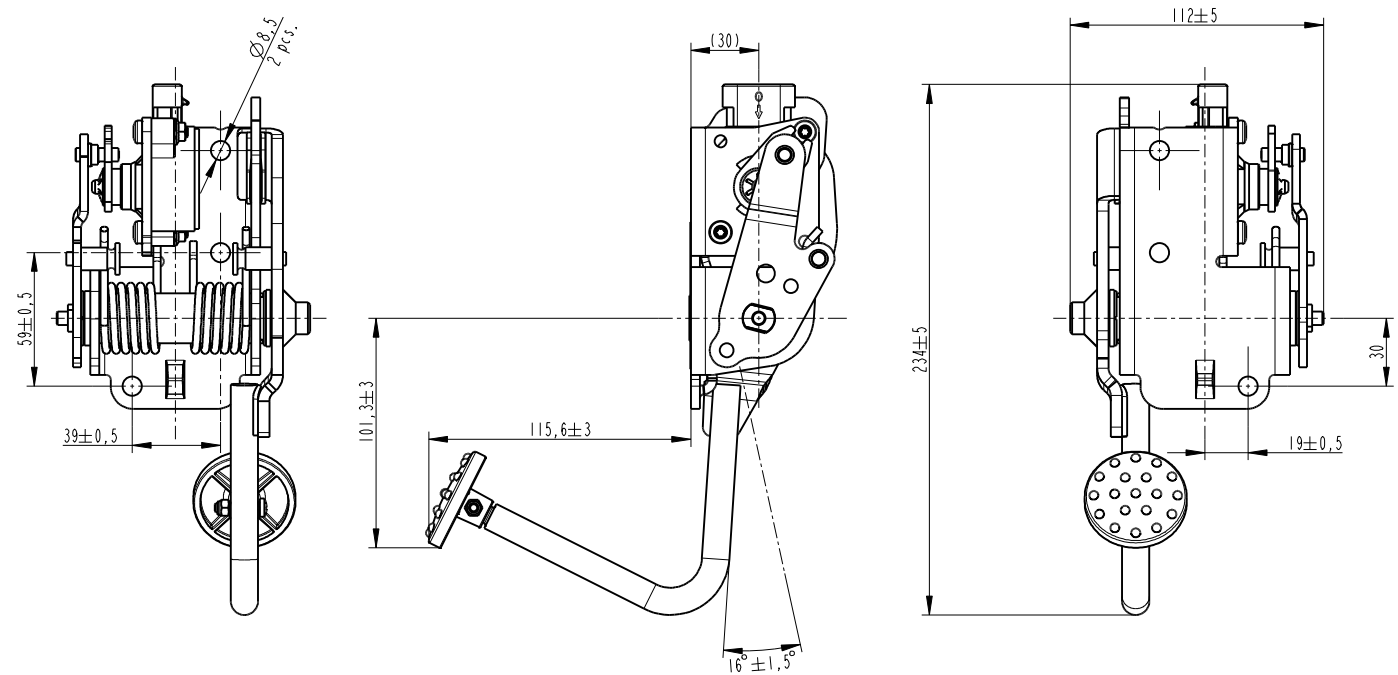
* Different types and values can be produced on request.
Example: MO 382-C-H-P009 is C type rod, horizontal sensor position, sensor prog. 009(Dual Analog)

ACCELERATOR PEDAL
MO 383B



Technical Data

Engines	Suitable for different engine interfaces
Technology	Contactless measuring principle
Output	Single or Double full redundant programmable outputs
	Single / Dual Analog type : 0-5V / 4-20mA / PWM
	Analog+IVS type : Analog+Highside or Lowside Switch
	CAN Type : SAE J1939
Output Type	CAN, Analog, PWM, IVS options
Supply Voltage	5V or 8-32V
Protective rating	IP6K9K Sensor
Counter connector	6 way, Delphi Packard Metric Pack 150
Mechanic	Two independent springs
Operating Angle	16°
Operating Temp.	-40°C ... +85°C
Actuations	Up to 2 million
Housing material	Heavy duty metal case
Application	Agricultural tractors and off road vehicles
Options	Different Rod Type is available on request



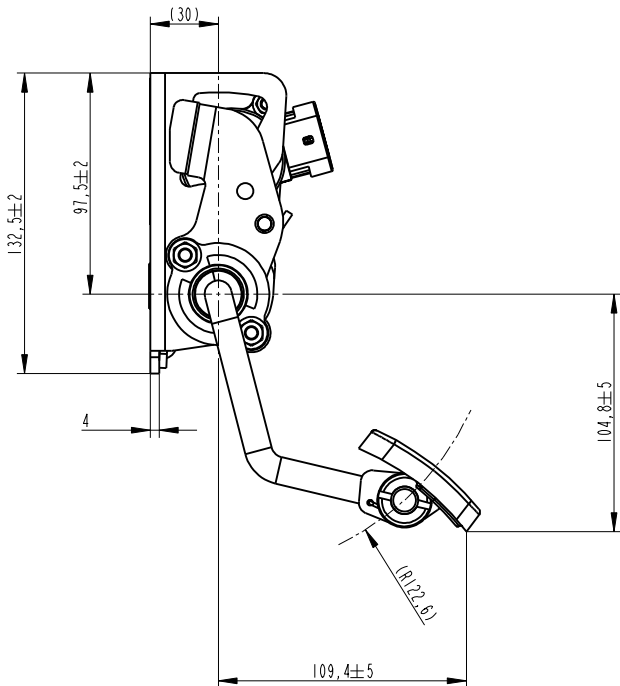
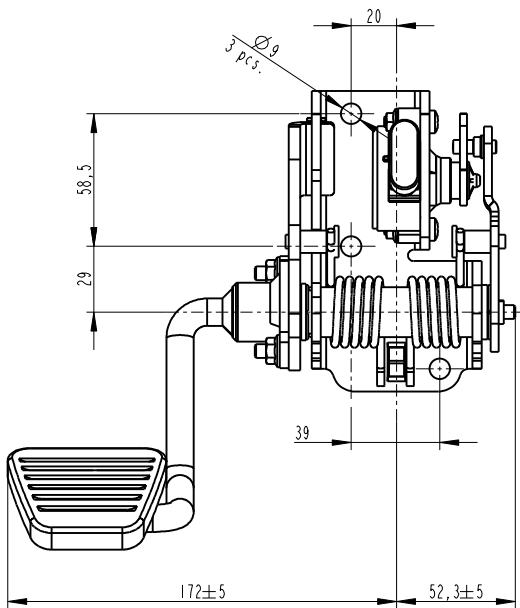
* Different types and values can be produced on request.
Example: MO 383B-00-P009 is standart type rod, sensor prog. 009(Dual Analog)

ACCELERATOR PEDAL MO 383D



Technical Data

Engines	Suitable for different engine interfaces
Technology	Contactless measuring principle
Output	Single or Double full redundant programmable outputs
	Single / Dual Analog type : 0-5V / 4-20mA / PWM
	Analog+IVS type : Analog+Highside or Lowside Switch
Output Type	5V or 8-32V
Supply Voltage	IP6K9K Sensor
Protective rating	6 way, Delphi Packard Metric Pack 150
Counter connector	Two independent springs
Mechanic	17°
Operating Angle	-40°C ... +85°C
Operating Temp.	Up to 2 million
Actuations	Heavy duty metal case
Housing material	Agricultural tractors and off road vehicles
Application	Different Rod Type is available on request
Options	



MO 383D -	X	-	X	-	X	PXXX
	Rod Type		Sensor Position		Weld Nuts	Sensor Program
	0 - Without Rod		H - Horizontal		0 - Without Weld Nuts	P009 - Dual Analog P009
	1 - With Rod		V - Vertical		1 - With Weld Nuts	
	**					*

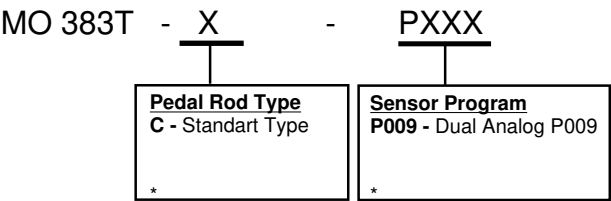
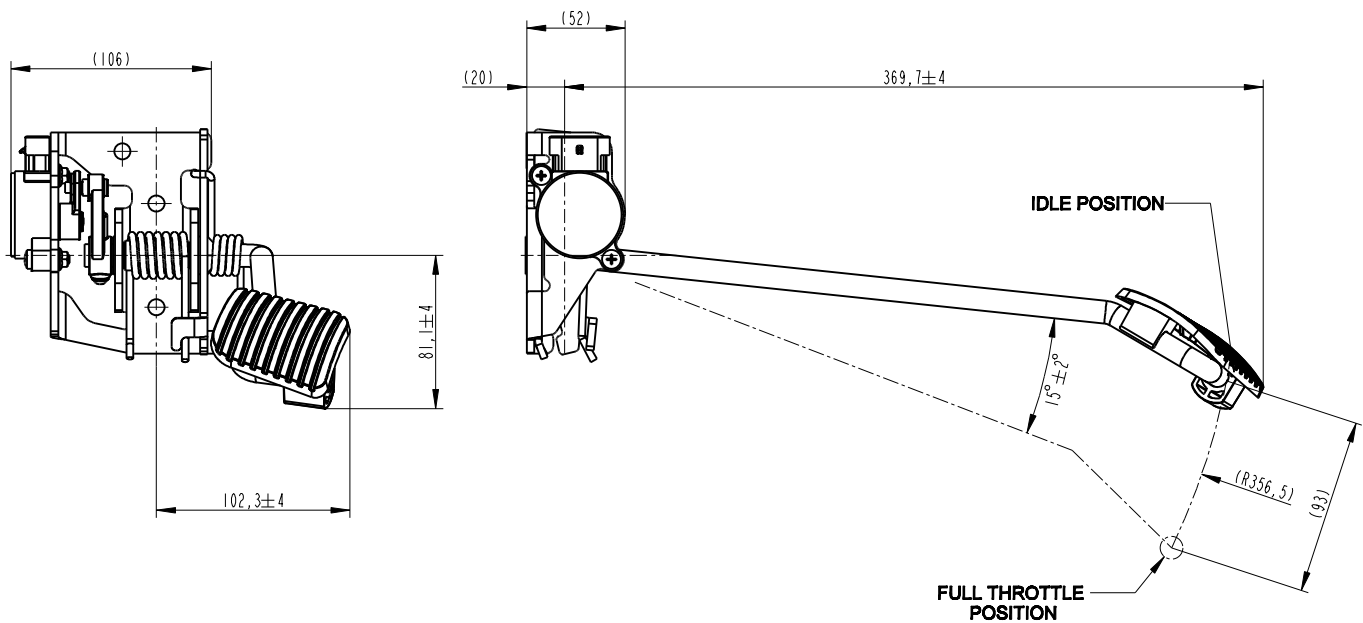
* Different types and values can be produced on request.
 ** MO383D pedal can be purchasable without pedal rod.
Example: MO 383D-1-H-P009 is with rod, horizontal sensor position, sensor prog. 009(Dual Analog)

ACCELERATOR PEDAL MO 383T



Technical Data

Engines	Suitable for different engine interfaces
Technology	Contactless measuring principle
Output	Single or Double full redundant programmable outputs
	Single / Dual Analog type : 0-5V / 4-20mA / PWM
	Analog+IVS type : Analog+Highside or Lowside Switch
	CAN Type : SAE J1939
Output Type	CAN, Analog, PWM, IVS options
Supply Voltage	5V or 8-32V
Protective rating	IP6K9K Sensor
Counter connector	6 way, Delphi Packard Metric Pack 150
Mechanic	Two independent springs
Operating Angle	15°
Operating Temp.	-40°C ... +85°C
Actuations	Up to 2 million
Housing material	Heavy duty metal case
Application	Agricultural tractors and off road vehicles
Options	Different Rod Type is available on request



* Different types and values can be produced on request.
Example: MO 383T-C-P009 is standart type rod, sensor prog. 009(Dual Analog)

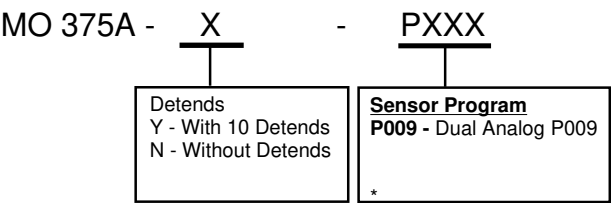
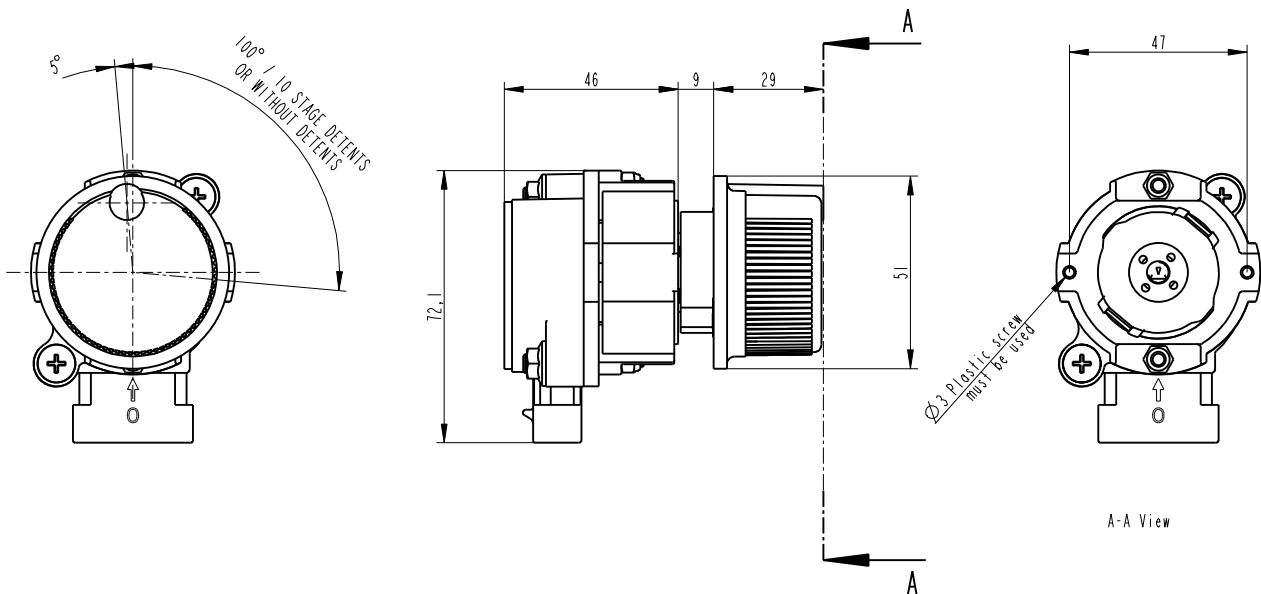
CONTROL LEVERS

MO 375A



Technical Data

Technology	Contactless / Full redundant double die hall sensor
Angle Range	100° with 10 stage detents or without detents programmable (0.1° resolution)
Connector	6 way, Delphi Packard Metri Pack 150
Protection	Sensor IP6K9K sealed
Operating Temp.	-40°C ... +85°C
Lifetime	2 Million cycles
Supply Voltage	5V or 8-32V
Output	Programmable Outputs - Single/Dual Analog type: 0-5V / 0-10V / 4-20mA / PWM - Analog+IVS type: Analog + HighSide or LowSide Switch - CAN type: SAE J1939 / CANopen
Weight	0.120 kg
Design	Embedded type compact design with button or handle
Application	Tractors, yachts and off road vehicles
Options	Customized output signal program Customized for different engine interfaces



* Different types and values can be produced on request.
Example: MO 375A-Y-P009 is with 10 detends, sensor prog. 009(Dual Analog)

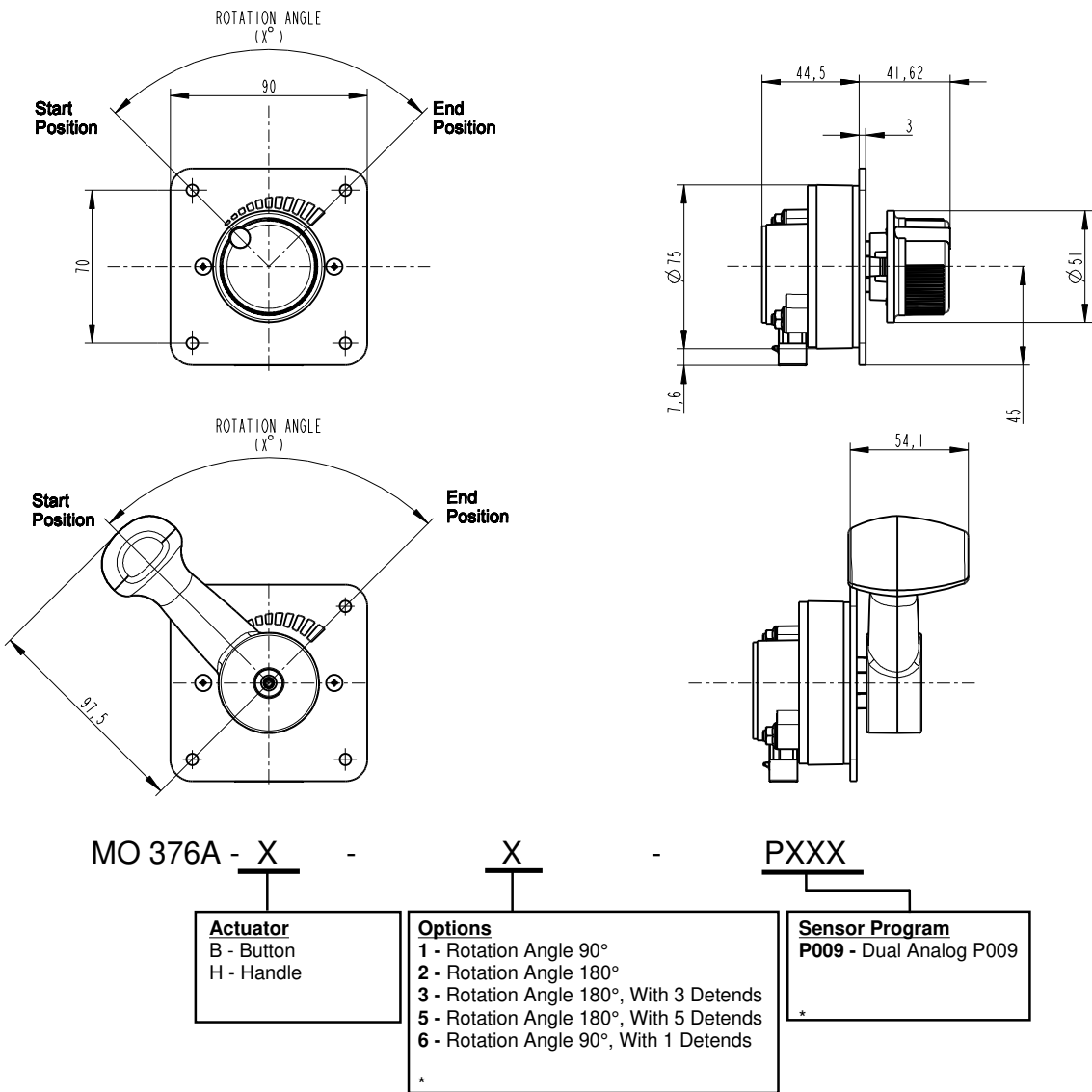
CONTROL LEVERS

MO 376A



Technical Data

Technology	Contactless / Full redundant double die hall sensor
Angle Range	90° or 180° programmable (0.1° resolution)
Connector	6 way, Delphi Packard Metri Pack 150
Protection	Sensor IP6K9K sealed
Operating Temp.	-40°C ... +85°C
Lifetime	2 Million cycles
Supply Voltage	5V or 8-32V
Output	Programmable Outputs - Single/Dual Analog type: 0-5V / 0-10V / 4-20mA / PWM - Analog+IVS type: Analog + HighSide or LowSide Switch - CAN type: SAE J1939 / CANopen
Weight	0.520 kg for button, 0.550 kg for handle
Design	Embedded type compact design with button or handle
Application	Tractors, yachts and off road vehicles
Options	Customized output signal program Customized for different engine interfaces



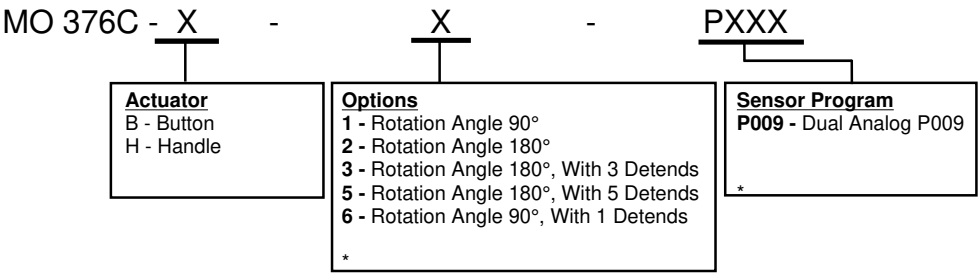
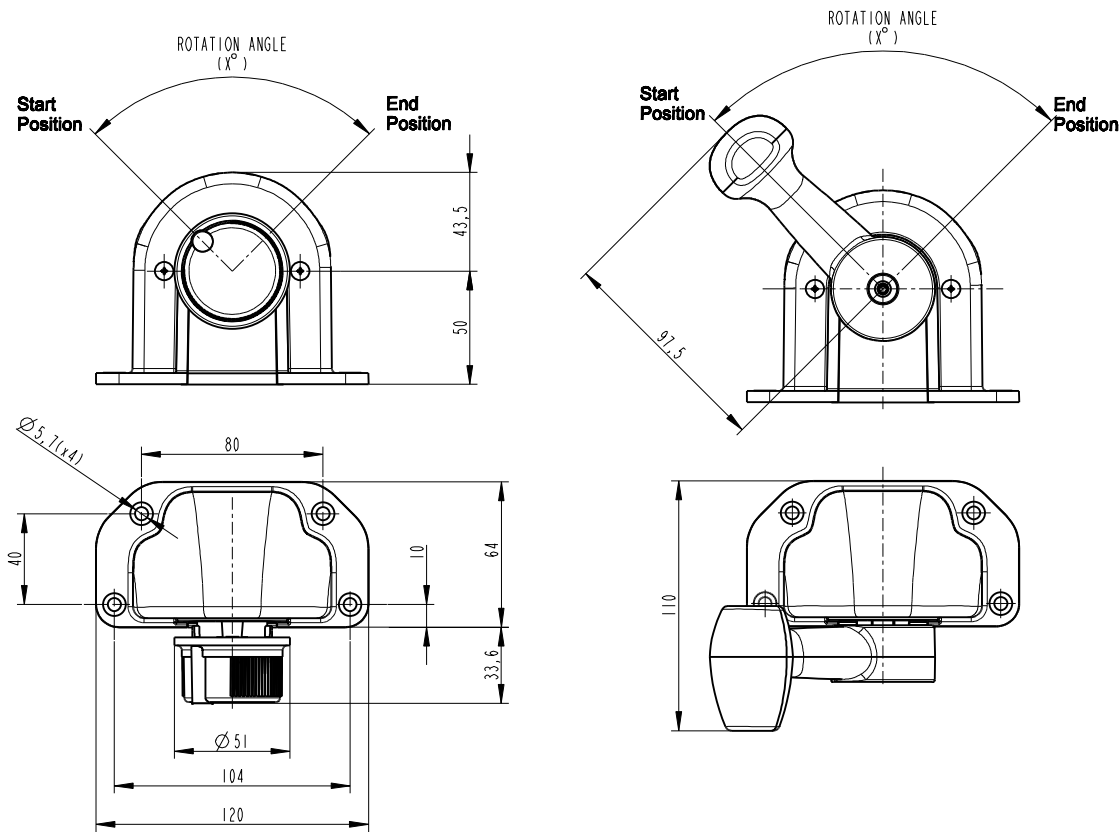
* Different types and values can be produced on request.
 Example: MO 376A-B-1-P009 is button, rotation angle 90°, sensor prog. 009(Dual Analog)

CONTROL LEVERS
MO 376C



Technical Data

Technology	Contactless / Full redundant double die hall sensor
Angle Range	90° or 180° programmable (0.1° resolution)
Connector	6 way, Delphi Packard Metri Pack 150
Protection	Sensor IP6K9K sealed
Operating Temp.	-40°C ... +85°C
Lifetime	2 Million cycles
Supply Voltage	5V or 8-32V
Output	Programmable Outputs - Single/Dual Analog type: 0-5V / 0-10V / 4-20mA / PWM - Analog+IVS type: Analog + HighSide or LowSide Switch - CAN type: SAE J1939 / CANopen
Weight	0.450 kg for button, 0.490 kg for handle
Design	Case type compact design with button or handle
Application	Tractors, yachts and off road vehicles
Options	Customized output signal program Customized for different engine interfaces



* Different types and values can be produced on request.

Example: MO 376C-B-1-P009 is button actuator, rotation angle 90°, sensor prog. 009(Dual Analog)

CONTROL LEVERS

MO 378



Technical Data

Technology	Contactless / Full redundant double die hall sensor
Angle Range	60° programmable (0.1° resolution)
Connector	6 way, Delphi Packard Metri Pack 150
Protection	Sensor IP6K9K sealed
Operating Temp.	-40°C ... +85°C
Lifetime	2 Million cycles
Supply Voltage	5V or 8-32V
Output	Programmable Outputs - Single/Dual Analog type: 0-5V / 0-10V / 4-20mA / PWM - Analog+IVS type: Analog + HighSide or LowSide Switch - CAN type: SAE J1939 / CANopen
Application	Tractors, yachts and off road vehicles
Options	Customized output signal program Customized for different engine interfaces



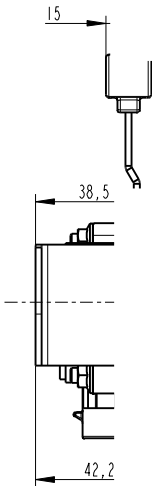
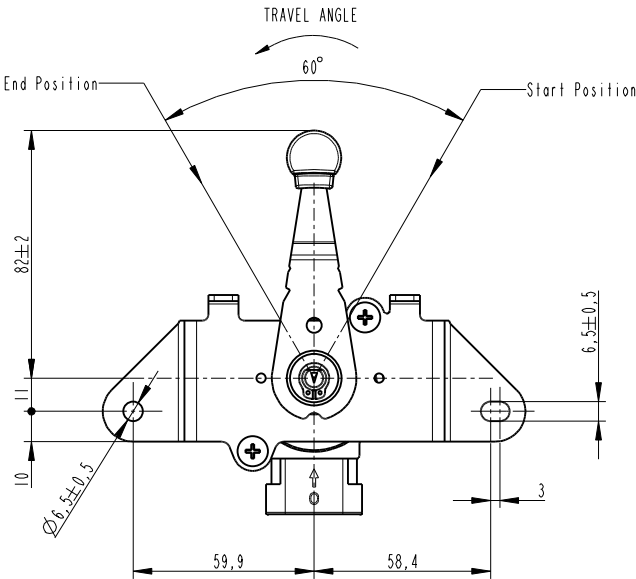
Front Mounting



Sub Mounting



Opposite Mounting



MO 378 - X - X - PXXX

Mounting 1 - Front 2 - Sub 3 - Opposite	Rod Type 1 - Standart Rod *	Sensor Program P009 - Dual Analog P009 *
---	--	---

* Different types and values can be produced on request.
 Example: MO 378-1-1-P009 is front mounting, standart rod, sensor prog. 009(Dual Analog)

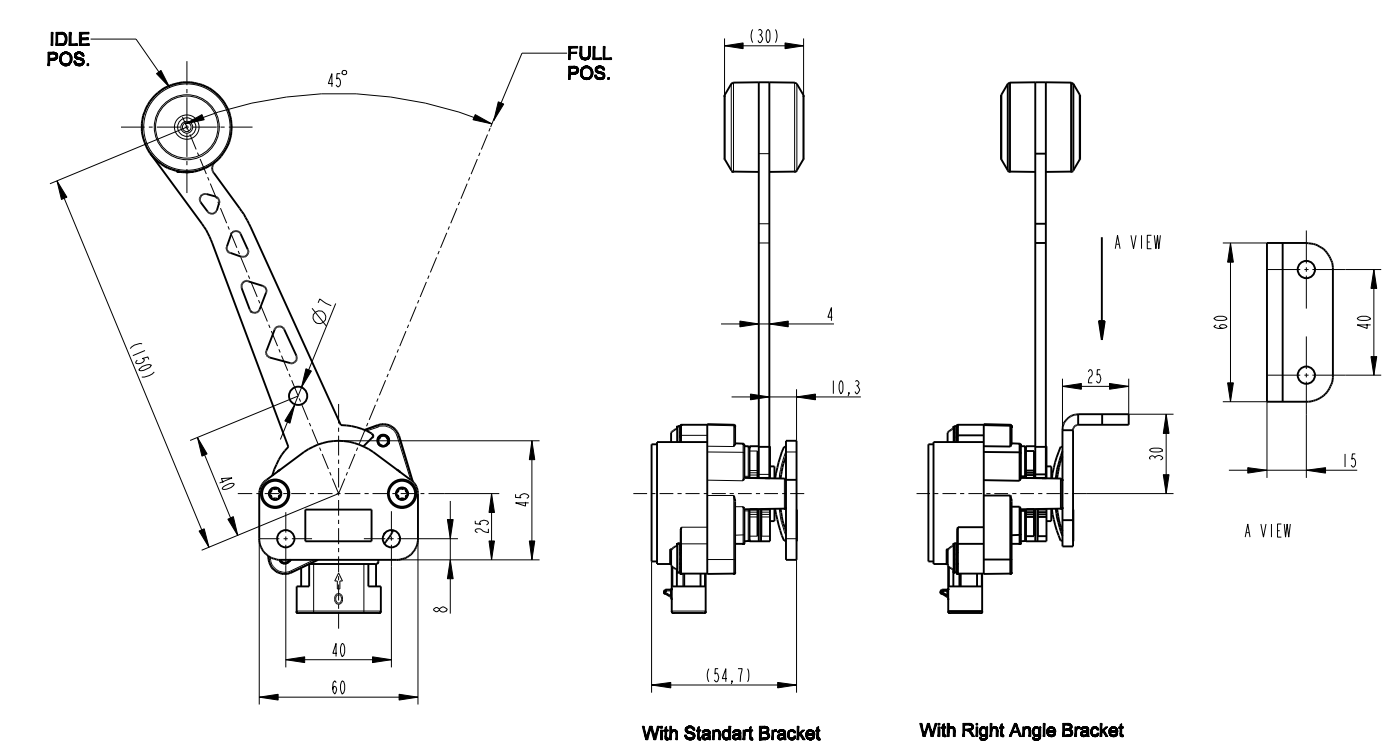
CONTROL LEVERS

MO 378M



Technical Data

Technology	Contactless / Full redundant double die hall sensor
Angle Range	45° programmable (0.1° resolution)
Connector	6 way, Delphi Packard Metri Pack 150
Protection	Sensor IP6K9K sealed
Operating Temp.	-40°C ... +85°C
Lifetime	2 Million cycles
Supply Voltage	5V or 8-32V
Output	Programmable Outputs - Single/Dual Analog type: 0-5V / 0-10V / 4-20mA / PWM - Analog+IVS type: Analog + HighSide or LowSide Switch - CAN type: SAE J1939 / CANopen
Application	Tractors, yachts and off road vehicles
Options	Customized output signal program Customized for different engine interfaces



MO 378M	-	X	-	X	-	PXXX
		Bracket		Lever Type		Sensor Program
		1 - Standart		1 - Standart Lever		P009 - Dual Analog P009
		2 - Right Angle				*

* Different types and values can be produced on request.

Example: MO 378M-1-1-P009 is standart bracket, standart lever, sensor prog. 009(Dual Analog)

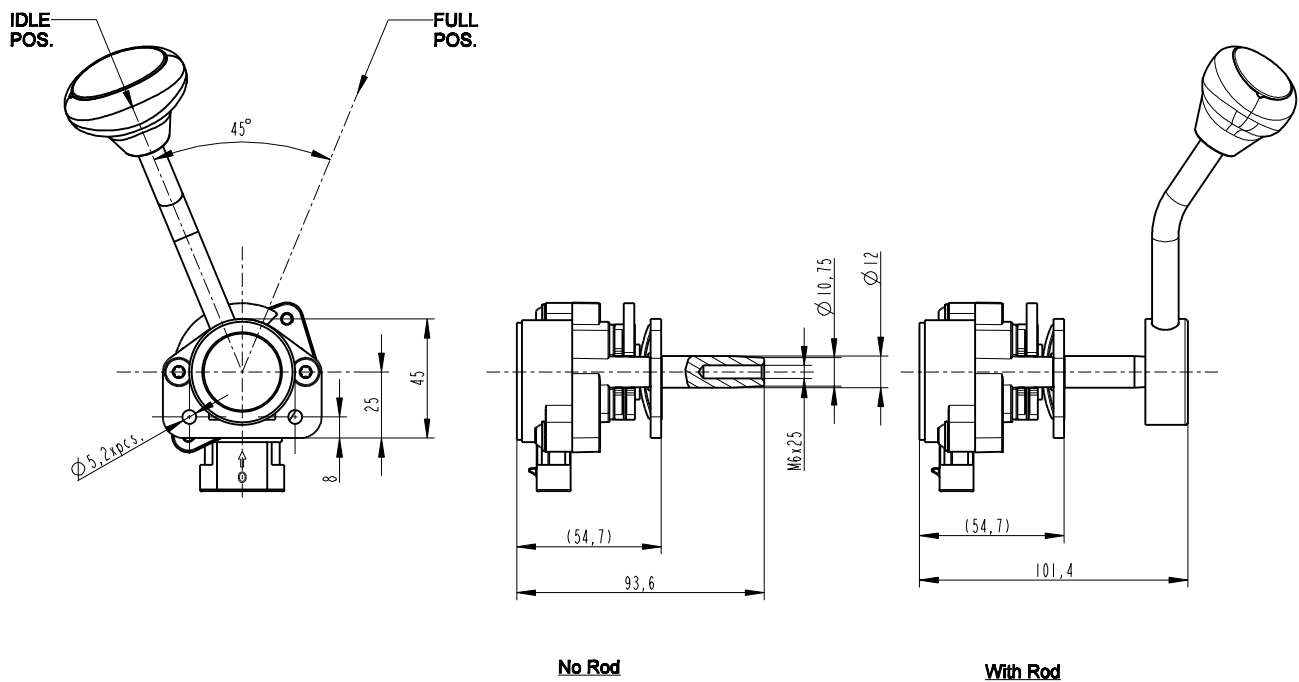
CONTROL LEVERS

MO 378N



Technical Data

Technology	Contactless / Full redundant double die hall sensor
Angle Range	45° programmable (0.1° resolution)
Connector	6 way, Delphi Packard Metri Pack 150
Protection	Sensor IP6K9K sealed
Operating Temp.	-40°C ... +85°C
Lifetime	2 Million cycles
Supply Voltage	5V or 8-32V
Output	Programmable Outputs - Single/Dual Analog type: 0-5V / 0-10V / 4-20mA / PWM - Analog+IVS type: Analog + HighSide or LowSide Switch - CAN type: SAE J1939 / CANopen
Application	Tractors, yachts and off road vehicles
Options	Customized output signal program Customized for different engine interfaces



MO 378N -	<u> X </u>	-	<u> X </u>	-	<u> PXXX </u>
	Bracket		Lever Type		Sensor Program
	1 - Standart		0 - No rod 1 - With Rod		P009 - Dual Analog P009
					*

* Different types and values can be produced on request.
 Example: MO 378N-1-1-P009 is standart bracket, with rod, sensor prog. 009(Dual Analog)

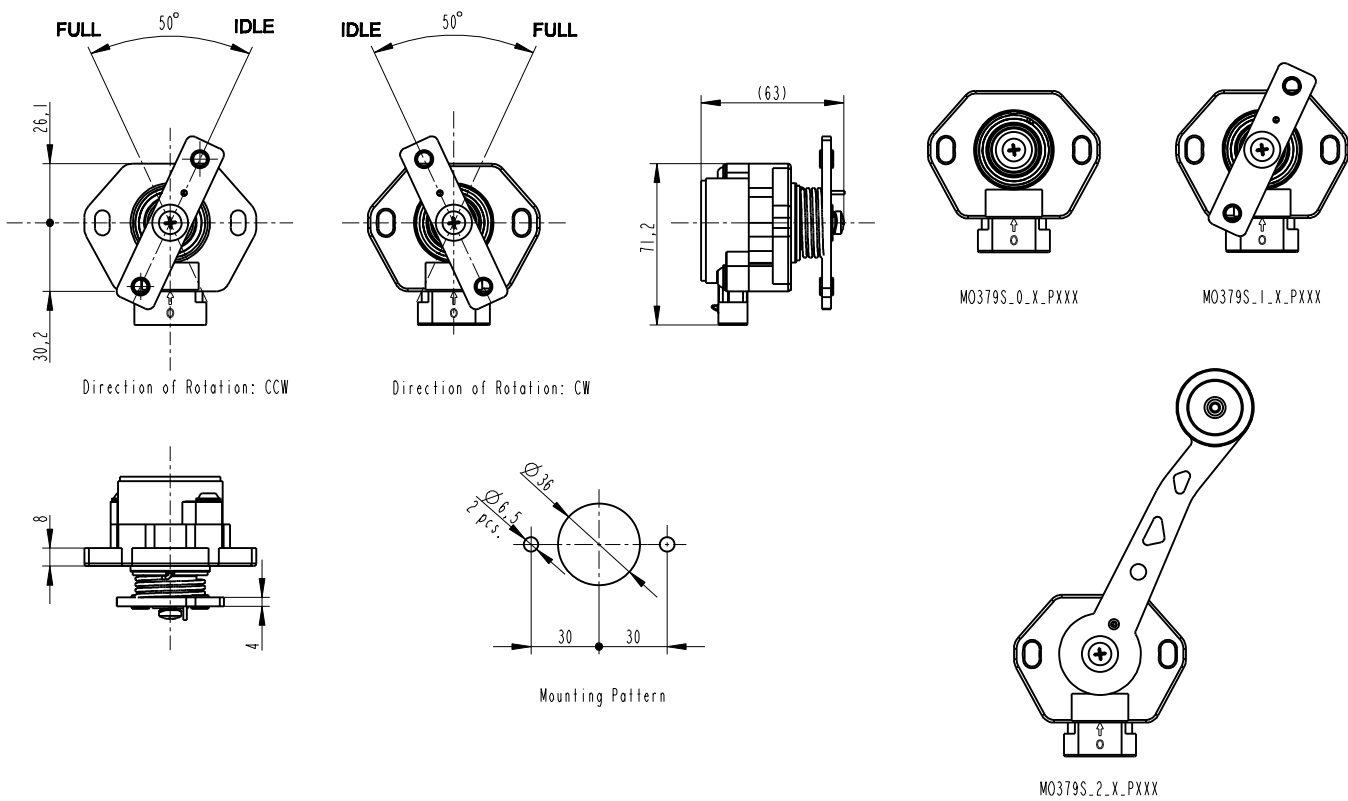
CONTROL LEVERS

MO 378S



Technical Data

Technology	Contactless / Full redundant double die hall sensor
Angle Range	45° programmable (0.1° resolution)
Connector	6 way, Delphi Packard Metri Pack 150
Protection	Sensor IP6K9K sealed
Operating Temp.	-40°C ... +85°C
Lifetime	2 Million cycles
Supply Voltage	5V or 8-32V
Output	Programmable Outputs - Single/Dual Analog type: 0-5V / 0-10V / 4-20mA / PWM - Analog+IVS type: Analog + HighSide or LowSide Switch - CAN type: SAE J1939 / CANopen
Application	Tractors, yachts and off road vehicles
Options	Customized output signal program Customized for different engine interfaces



MO 378S	-	X	-	X	-	PXXX
		Bracket	Direction of Rotation		Sensor Program	
		0 - Without Lever 1 - Double Sided Bracket 2 - Lever With Grip	1 - CCW 2 - CW		P009 - Dual Analog P009	
					*	

* Different types and values can be produced on request.
Example: MO 378S-1-1-P009 is double sided bracket, direction of rotation ccw, sensor prog. 009(Dual Analog)

CONTROL LEVERS MO 379



Technical Data

Technology
Angle Range
Connector
Protection
Operating Temp.
Lifetime
Supply Voltage
Output

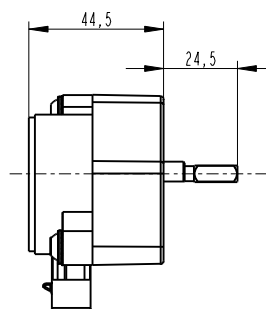
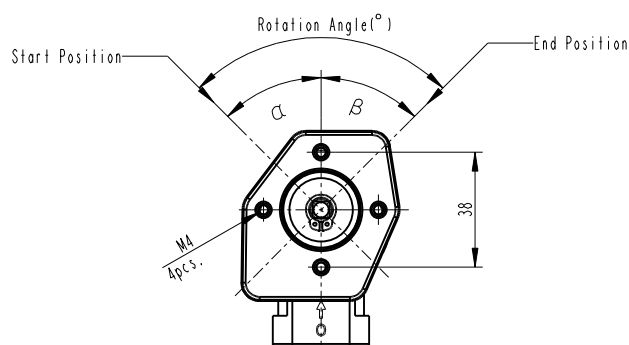
Contactless / Full redundant double die hall sensor
90°, 180° or with detents programmable (0.1° resolution)
6 way, Delphi Packard Metri Pack 150
Sensor IP6K9K sealed
-40°C ... +85°C
2 Million cycles, 500.000 cycles with detent
5V or 8-32V
Programmable Outputs
- Single/Dual Analog type: 0-5V / 0-10V / 4-20mA / PWM
- Analog+IVS type: Analog + HighSide or LowSide Switch
- CAN type: SAE J1939 / CANopen

Application

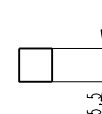
Tractors, yachts and off road vehicles

Options

Customized output signal program
Customized for different engine interfaces



Shaft Type Square: □ 5,5



Shaft Type D: Ø 6

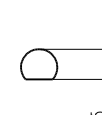


Plate Type 1	Plate Type 2	Knob Type 1

MO 379 - X - X

- X -

X

PXXX

Plate Type
0 - No Plate
1 - Plate Type 1
2 - Plate Type 2

Knob Type
0 - No Knob
1 - Knob

Rotation Angle
0 - 90° (α=45° / β= 45°)
1 - 180° (α=90° / β= 90°)
2 - 60° with 3 detents (α=30° / β= 30°)
3 - 120° with 5 detents (α=60° / β= 60°)
4 - 90° with 4 detents (α=60° / β= 30°)

Shaft Type
1 - Type Square
2 - Type D

Sensor Program
P009 - Dual Analog P009
*

* Different types and values can be produced on request.

Example: MO 379-1-1-0-1-P009 is plate type 1, with knob, 90° rotation angle, shaft type square, sensor prog. 009 (Dual Analog)

JOYSTICK ANALOG GRIP MO 394 H1X



Technical Data

Technology

Output

Output Type

Output Voltage

Supply Voltage

Protective rating

Connector

Operating Temp.

Total Controls

Contactless Hall measuring principle

Double output, full redundant.

Analog , PWM options.

Analog: 0-5V PWM: 5V

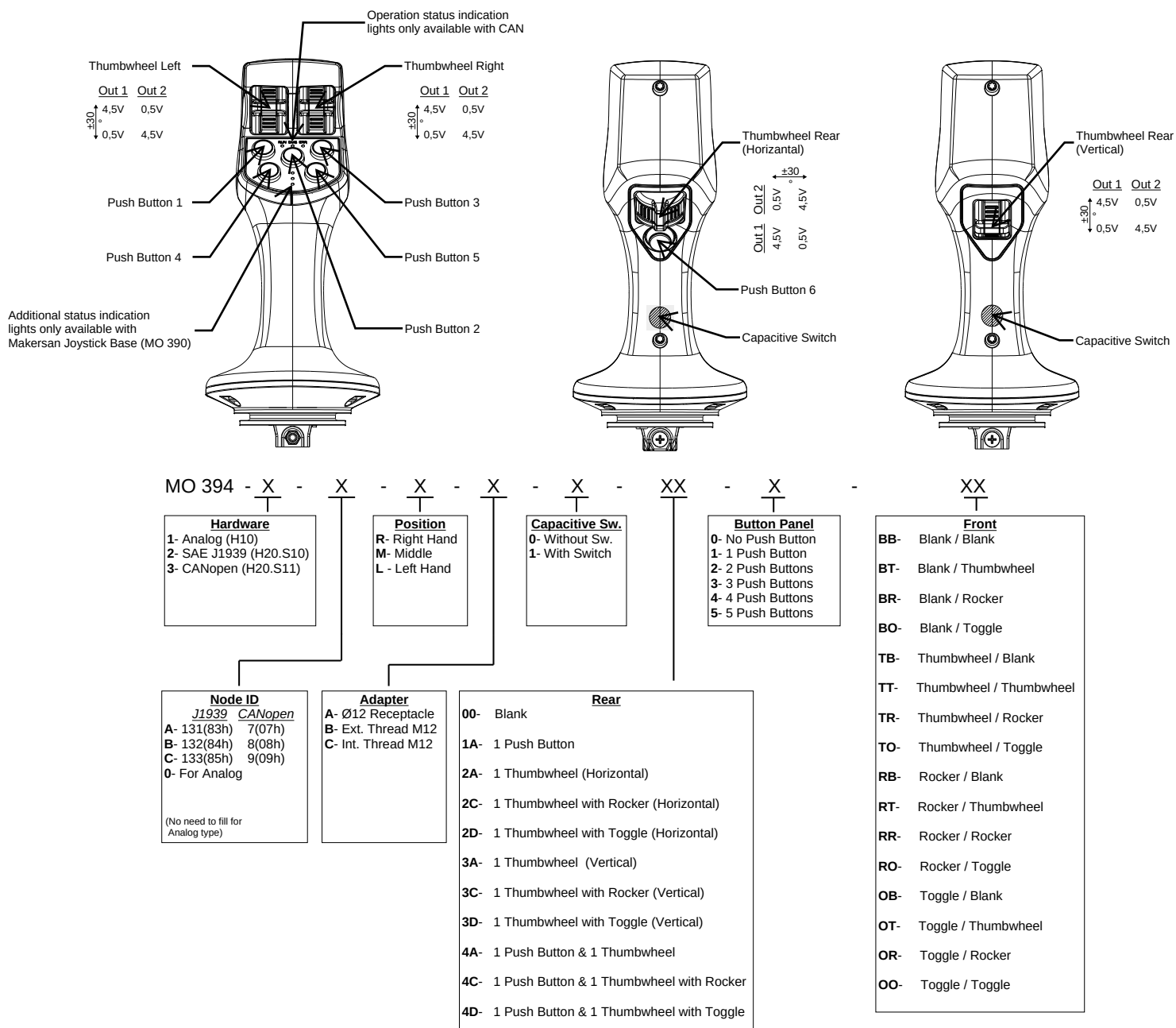
5V

IP67

Molex 18 pins

-40°C ... +85°C

Up to 6 push buttons, 3 thumbwheels (with or without detent), 1 presence detection sensor and 6 indication LEDs

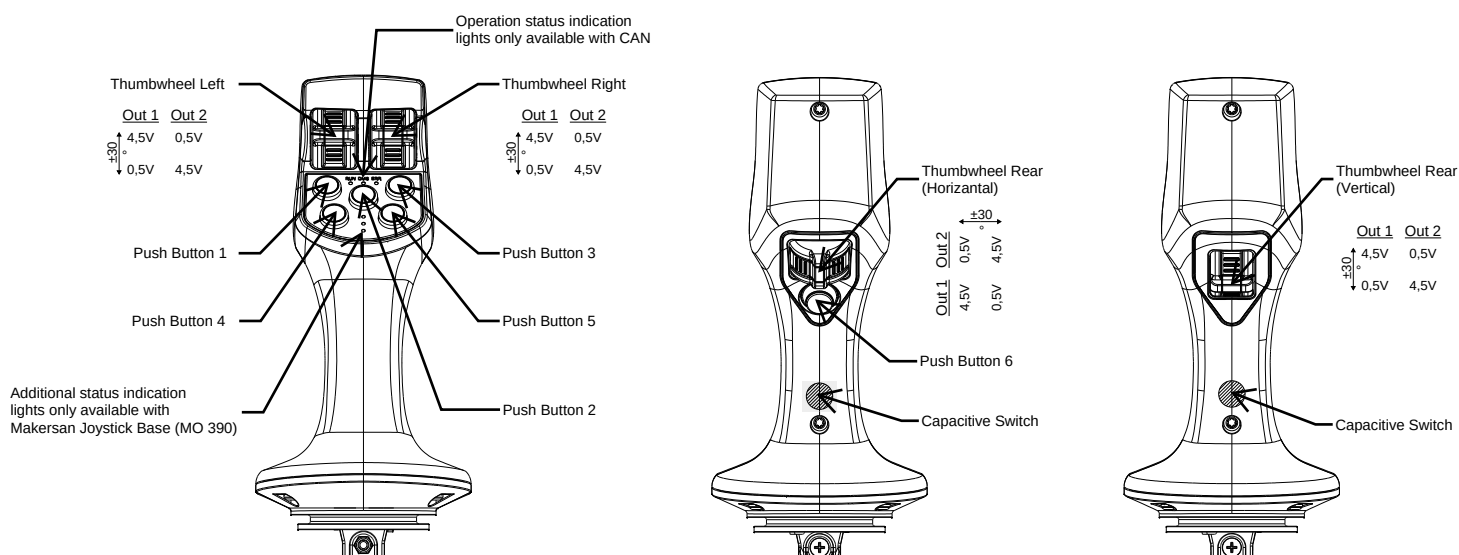


JOYSTICK CAN GRIP MO 394 H2X



Technical Data

Technology	Contactless Hall measuring principle
Output	Double output, full redundant.
Output Type	CANopen, SAE J1939
Supply Voltage	8-32V DC
Protective rating	IP67
Connector	Deutsch 4 pins
Operating Temp.	-40°C ... +85°C
Total Controls	Up to 6 push buttons, 3 thumbwheels (with or without detent), 1 presence detection sensor and 3 indication LEDs



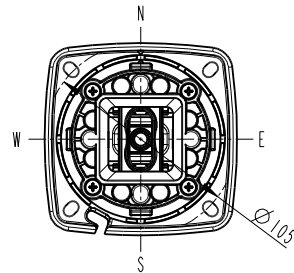
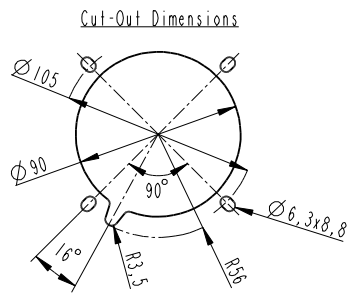
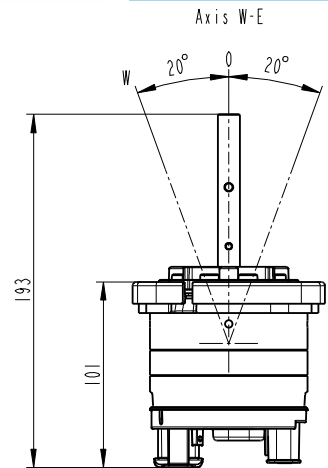
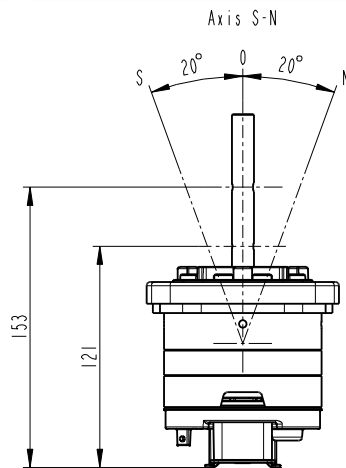
MO 394	-	X	-	X	-	X	-	X	-	XX	-	X	-	XX
Hardware 1- Analog (H10) 2- SAE J1939 (H20.S10) 3- CANopen (H20.S11)			Position R- Right Hand M- Middle L - Left Hand			Capacitive Sw. 0- Without Sw. 1- With Switch			Button Panel 0- No Push Button 1- 1 Push Button 2- 2 Push Buttons 3- 3 Push Buttons 4- 4 Push Buttons 5- 5 Push Buttons			Front BB- Blank / Blank BT- Blank / Thumbwheel BR- Blank / Rocker BO- Blank / Toggle TB- Thumbwheel / Blank TT- Thumbwheel / Thumbwheel TR- Thumbwheel / Rocker TO- Thumbwheel / Toggle RB- Rocker / Blank RT- Rocker / Thumbwheel RR- Rocker / Rocker RO- Rocker / Toggle OB- Toggle / Blank OT- Toggle / Thumbwheel OR- Toggle / Rocker OO- Toggle / Toggle		
Node ID <i>J1939</i> <i>CANopen</i> A- 131(83h) 7(07h) B- 132(84h) 8(08h) C- 133(85h) 9(09h) 0- For Analog (No need to fill for Analog type)			Adapter A- Ø12 Receptacle B- Ext. Thread M12 C- Int. Thread M12			Rear 00- Blank 1A- 1 Push Button 2A- 1 Thumbwheel (Horizontal) 2C- 1 Thumbwheel with Rocker (Horizontal) 2D- 1 Thumbwheel with Toggle (Horizontal) 3A- 1 Thumbwheel (Vertical) 3C- 1 Thumbwheel with Rocker (Vertical) 3D- 1 Thumbwheel with Toggle (Vertical) 4A- 1 Push Button & 1 Thumbwheel 4C- 1 Push Button & 1 Thumbwheel with Rocker 4D- 1 Push Button & 1 Thumbwheel with Toggle								

POWER / ANALOG BASE MO 390 H1X



Technical Data

Technology	Contactless Hall measuring principle
Output	Double output axis, full redundant
Output Type	Analog, PWM, Digital options
Output Voltage	Analog: 0-5V / 0-10V 4-20mA PWM: 5V / 0-32V / 8-32V 100...1kHz
Supply Voltage	5V or 8(12)-32V
Protective Rating	IP67
Lever Op. Angle	±20°
Lever	Self centering
Connector	Deutsch 8 pins
Operating Temp.	-40°C ... +85°C
Lifetime at Full Stroke	Up to 5 million
Other Specification	2 centering spring forces 1000N from 100mm rotation point, 500N from Z axis 2 axis full square, 2 axis cross, single axis actuation
Options	Customized output signal program



MO 390 - H1X - X - X - X - XX - PXXX

Axis of Actuation
 0- 2 Axis Full
 1- 2 Axis Plus (+)
 2- Single Axis WE
 3- Single Axis NS
 4- Single Axis NS_V
 5- Single Axis
 NS_V_Em

NS Axis
 A- Free
 B- Detent Return North-South
 BN- Detent Return North
 BS- Detent Return South
 C- Detent Hold North-South
 CN- Detent Hold North
 CS- Detent Hold South
 D- Friction
 Z- No Need

WE Axis
 A- Free
 B- Detent Return West-East
 BW- Detent Return West
 BE- Detent Return East
 C- Detent Hold West-East
 CW- Detent Hold West
 CE- Detent Hold East
 D- Friction
 Z- No Need

Lever
 00- Standard
 *

Program
 *See the output signal diagrams

Hardware

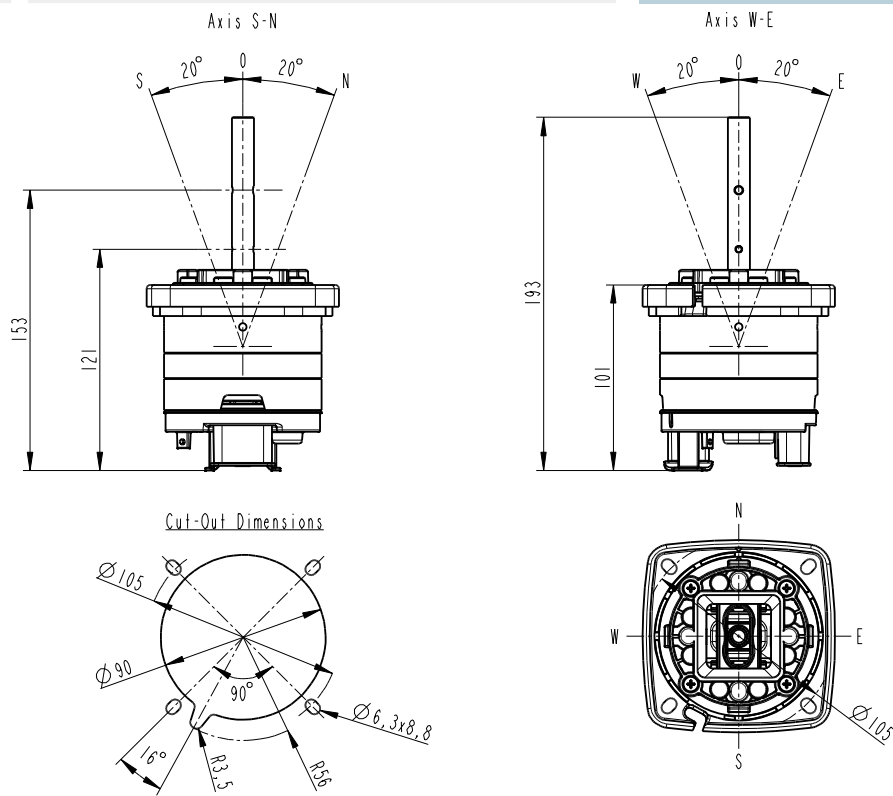
H10- S:5V ; 0:0-5V Analog Voltage or PWM Output
 H11- S:5V ; 0:0-32V PWM Low Side Output
 H12- S:8-32V ; 0:0-5V Analog Voltage or PWM Output
 H13- S:8-32V ; 0:0-32V PWM Low Side Output
 H14- S:12-32V ; 0:0-10V Analog Voltage Output
 H15- S:12-32V ; 0:4-20mA Analog Current Output
 H16- S:8-18V ; 0:8-18V PWM or ON/OFF High Side Output (1.5A/Ch)
 H17- S:8-32V ; 0:8-32V PWM or ON/OFF High Side Output (1.5A/Ch)
 H18- S:8-18V ; 0:0-5V Analog Voltage Output with Neutral Position (1.5A/Ch) and Direction High Side Outputs (1.5A/Ch)
 H19- S:8-32V ; 0:0-5V Analog Voltage Output with Neutral Position (1.5A/Ch) and Direction High Side Outputs (1.5A/Ch)
 *

CAN BASE MO 390 H2X



Technical Data

Technology	Contactless Hall measuring principle
Output	Double output axis, full redundant
Output Type	Analog, PWM, Digital options
Output Voltage	Analog: 0-5V / 0-10V 4-20mA PWM: 5V / 0-32V / 8-32V 100...1kHz
Supply Voltage	5V or 8(12)-32V
Protective Rating	IP67
Lever Op. Angle	±20°
Lever	Self centering
Connector	Deutsch 8 pins
Operating Temp.	-40°C ... +85°C
Lifetime at Full Stroke	Up to 5 million
Other Specification	2 centering spring forces 1000N from 100mm rotation point, 500N from Z axis 2 axis full square, 2 axis cross, single axis actuation
Options	Customized output signal program



CAN Protocol	Node ID	Axis of Actuation	NS Axis	WE Axis	Lever
S10- CAN SAE J1939	J1939 CANopen	0- 2 Axis Full	A- Free	A- Free	00- Standard
S11- CANopen	A- 128(80h) 4(04h)	1- 2 Axis Plus (+)	B- Detent Return North-South	B- Detent Return West-East	
	B- 129(81h) 5(05h)	2- Single Axis WE	BN- Detent Return North	BW- Detent Return West	
	C- 130(82h) 6(06h)	3- Single Axis NS	BS- Detent Return South	BE- Detent Return East	
		4- Single Axis NS_V	C- Detent Hold North-South	C- Detent Hold West-East	
		5- Single Axis NS_V_Em	CN- Detent Hold North	CW- Detent Hold West	
			CS- Detent Hold South	CE- Detent Hold East	
			D- Friction	D- Friction	
			Z- No Need	Z- No Need	

Joystick Grip MO 387



Tecnicl Data

Design Ergonomics Electronic Config. Mechanical Connec. Connector Lifetime Operating Temp. Protection	Multifunctional Modular Design Right Hand, Left Hand and Symmetric Options Analog Round Pin Receptacle, External or Internal Threads and Customized Connections Available Molex 10-12 Pins Up to 2 million cycles for Push Button and Thumbwheel -40C° ~ +85C° IP67
--	--



MO 387 - X

Rear

0: Without Button and Present Det. Switch
1: With Button - Without Present Det. Switch
2: Without Button-With Present Det. Switch
3: With Button and Present Det. Switch

- XX

Front Panel

A0: No push button
A1: 1 push button
A2: 2 push button
A3: 3 push button
A4: 4 push button
A5: 5 push button
B1: 1 Thumbwheel left vertical with no push button
B2: 1 Thumbwheel left vertical with 1 push button
B3: 1 Thumbwheel left vertical with 2 push button
B4: 1 Rocker left vertical with no push button
B5: 1 Rocker left vertical with 1 push button
B6: 1 Rocker left vertical with 2 push button
B7: 1 Toggle left vertical with no push button
B8: 1 Toggle left vertical with 1 push button
B9: 1 Toggle left vertical with 2 push button

*

- XX

Grip Connection

00: Loose Cable (27 AWG)
01: Molex Micro-Fit Connector (27 AWG)

* See the product datasheet for other options.

Example : MO 387 - 0 - A0 - 01
Joystick Grip, Without Button and Present Det. Switch, No push button, Molex Micro-Fit Connector

Joystick Base Analog MO 391 H1X



Tecnical Data

Technology

Lifetime at full stroke

Connector

Lever operating angle

Lever

Other specification

Operating Temp.

Protection

Axis of Actuation

Contactless Hall Measuring Principle (Full Redundant)

Up to 5 million

Deutsch 8 & Tyco 18 Pins

± 20°

Self Centering

Two Centering Spring Forces

-40C° ~ +85C°

IP67 Ingress

2 Axis Full

Supply Voltage

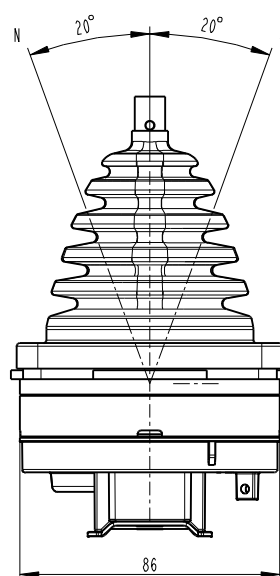
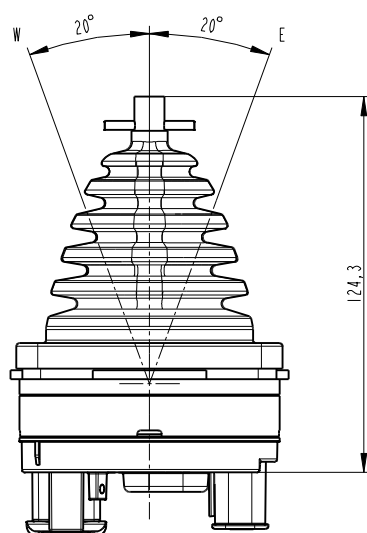
Supply Current

Options

5V & 8-18V & 8-32V

30 mA (typical - no load)

Customized Output Signal Program



MO 391 - H1X

- X

- PXXX

- XX

Axis of Actuation
0- 2 Axis Full

Program
P001- Dual Cross

Grip Option
01: Micro-Fit 10 Pins (27 AWG)
02: Micro-Fit 12 Pins (27 AWG)

*

**

Hardware

H10- S:5V ; O:0-5V Analog Voltage or PWM Output

H11- S:5V ; O:0-32V PWM Low Side Output

H12- S:8-32V ; O:0-5V Analog Voltage or PWM Output

H13- S:8-32V ; O:0-32V PWM Low Side Output

H14- S:12-32V ; O:0-10V Analog Voltage Output

H15- S:12-32V ; O:4-20mA Analog Current Output

H16- S:8-18V ; O:8-18V PWM or ON/OFF High Side Output (1.5A/Ch)

H17- S:8-32V ; O:8-32V PWM or ON/OFF High Side Output (1.5A/Ch)

H18- S:8-18V ; O:0-5V Analog Voltage Output with Neutral Position (1.5A/Ch) and Direction High Side Outputs (1.5A/Ch)

H19- S:8-32V ; O:0-5V Analog Voltage Output with Neutral Position (1.5A/Ch) and Direction High Side Outputs (1.5A/Ch)

*

* Available upon request with minimum order quantity.

Example : MO 391 - H10 - 0 - P001 - 01

Joystick Base Analog, Supply 5V, Output 0-5V, 2 Axis Full Actuation, Dual Cross Program, Micro-Fit 10 Pins

Joystick Base CAN MO 391 H2X



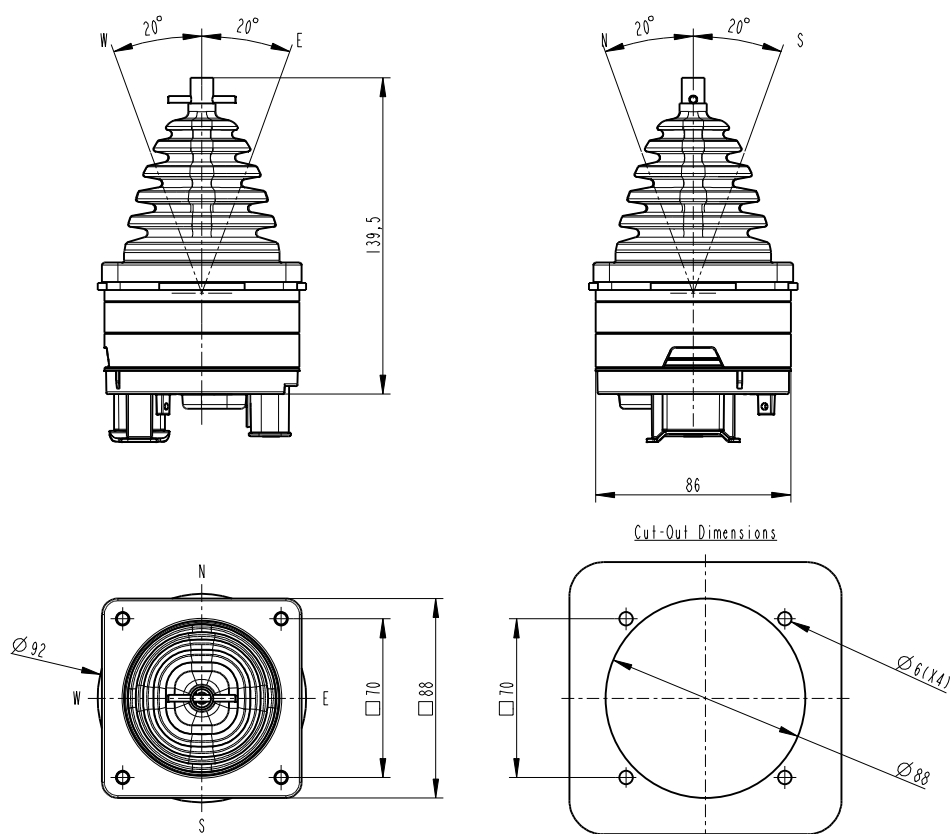
Technical Data

Technology
Lifetime at full stroke
Connector
Lever operating angle
Lever
Other specification
Operating Temp.
Protection
Axis of Actuation

Contactless Hall Measuring Principle (Full Redundant)
Up to 5 million
Deutsch 8 & Tyco 18 Pins
± 20°
Self Centering
Two Centering Spring Forces
-40C° ~ +85C°
IP67 Ingress
2 Axis Full

Supply Voltage
Supply Current
CAN
Protocol
Baud Rate
Termination Resistor
Programmable
Parameters

8-32V DC
80 mA typ. @12V Supply
ISO 11898, CAN specification 2.0A - 2.0B
SAE J1939 or CANopen
250 kbit/s (default)
External
Node ID, baud rate and others



MO 391 - H20 - SXX - X - X - PXXX - XX

CAN Protocol	Node ID	Axis of Actuation	Program	Grip Connection
S10- SAE J1939 S11- CANopen	J1939 CANopen A- 128(80h) 4(04h) B- 129(81h) 5(05h) C- 130(82h) 6(06h)	0- 2 Axis Full	P001- Dual Cross	01: Micro-Fit 10 Pins (27 AWG) 02: Micro-Fit 12 Pins (27 AWG)
*			*	**

* Available upon request with minimum order quantity.

** See page 2, for Grip Connection details.

Example : MO 391 - H20 - S10 - A - 0 - P001 - 01

Joystick Base CAN, SAE J1939, Node ID of 128(80h), 2 Axis Full Actuation, Dual Cross Program, Micro-Fit 10 Pins

JOYSTICK MINI ANALOG MO 395 H1X



Technical Data

Technology

Contactless Hall measuring principle
For safety double sensor output per axis, up to 2 axis
Self centering
2 axis full square, 2 axis cross, single axis actuation for base
Up to 3 buttons
Z Axis: $\pm 45^\circ$ working angle
Detent: 40° working angle with 3 detent positions
 $-40^\circ\text{C} \dots +85^\circ\text{C}$
Programmable analog voltage or PWM output
Analog: 0-5V
PWM: 5V/0-32V(LowSide)/8-32V(HiSide) 100Hz...1kHz
5V or 8-32V DC

Lever

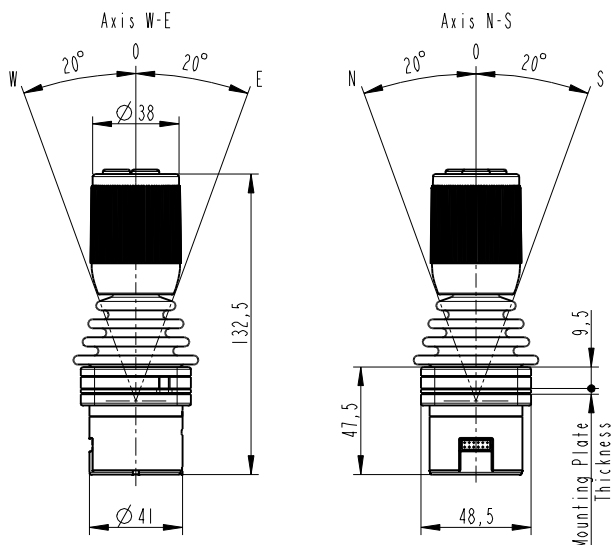
Other Specification Grip

Operating Temp. Output

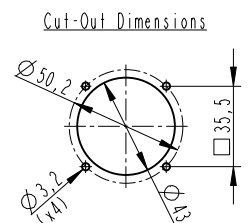
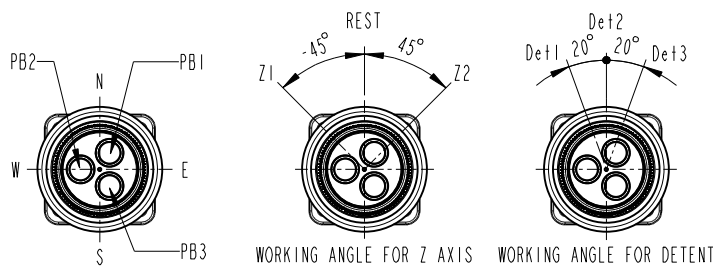
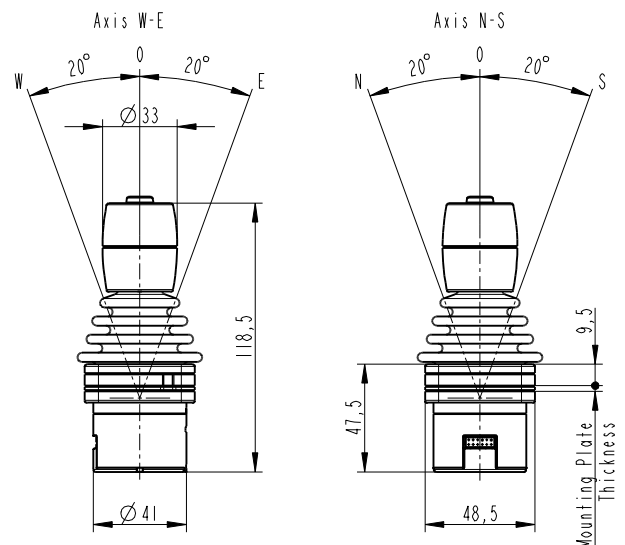
Supply Voltage



With 388 Grip



With 388B Grip



MO 395 - H1X -

X

X

XX

PXXX

XX

Hardware

H10 - S:5V ; O:0-5V Full Redundant
H11 - S:8-32V ; O:0-5V Full Redundant
H12 - S:5V ; O:0-32V PWM Low Side Full Redundant
H13 - S:8-32V ; O:0-32V PWM Low Side Full Redundant
H14 - S:8-32V ; O:8-32V PWM High Side Full Redundant
H15 - S:5V ; O:0-5V with Z Axis Redundant
H16 - S:8-32V ; O:0-5V with Z Axis Redundant
H17 - S:5V ; O:0-32V PWM Low Side with Z Axis Redundant
H18 - S:8-32V ; O:0-32V PWM Low Side with Z Axis Redundant
H19 - S:8-32V ; O:8-32V PWM High Side with Z Axis Redundant
*

Axis of Actuation

0 - 2 Axis Full
1 - 2 Axis Plus
2 - Single Axis WE
3 - Single Axis SN

Elec. Connection

0 - Hirose Conn 12 Pos

Grip

B0 - 388B No Button
B1 - 388B 1 Button
C0 - 388C No Button
C1 - 388C 1 Button
A2 - 388 Grip with 2 Button
A3 - 388 Grip with 3 Button
Z0 - 388 Grip No Button with Z Axis
Z1 - 388 Grip 1 Button with Z Axis
Z2 - 388 Grip 2 Button with Z Axis
Z3 - 388 Grip 3 Button with Z Axis
Y0 - 388 Grip No Button with 3 Detent
Y1 - 388 Grip 1 Button with 3 Detent
Y2 - 388 Grip 2 Button with 3 Detent
Y3 - 388 Grip 3 Button with 3 Detent
**

Program

*See the output signal diagrams

Button Voltage

00 - Mechanic Switch
05 - 5V Push Button
12 - 12V Push Button
24 - 24V Push Button
1W - 5-24V Push Button without LED

*00 is not available for B1 or C1 Grip option.

* For H10 to H14 variants, Z axis and Detent not available

* Available upon request with minimum order quantity.

JOYSTICK MINI CAN MO 395 H2X



Technical Data

Technology

Contactless Hall measuring principle
For safety double sensor output per axis, up to 2 axis
Self centering
2 axis full square, 2 axis cross, single axis actuation for base
Up to 3 buttons
Z Axis: $\pm 45^\circ$ working angle
Detent: 40° working angle with 3 detent positions
 $-40^\circ\text{C} \dots +85^\circ\text{C}$

Lever

Other Specification Grip

Operating Temp.

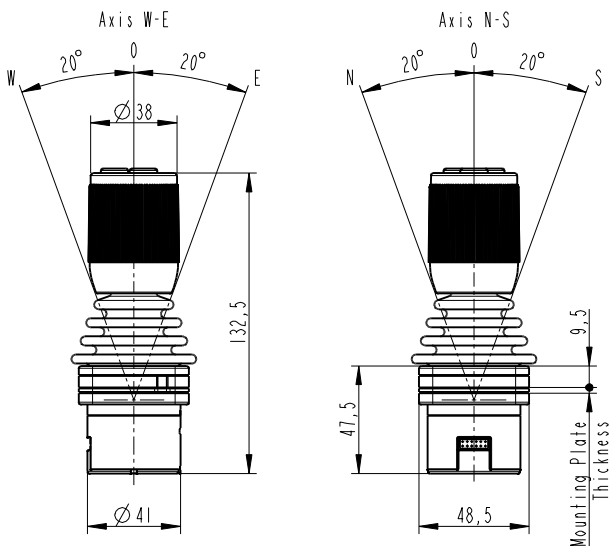
Output

Supply Voltage

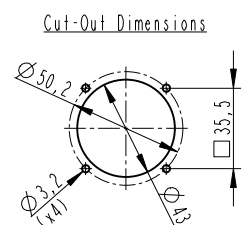
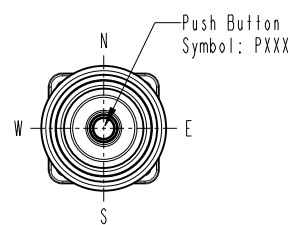
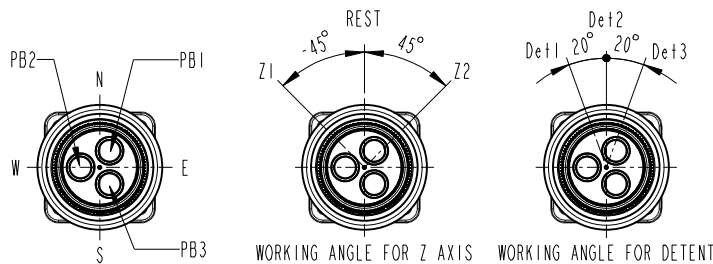
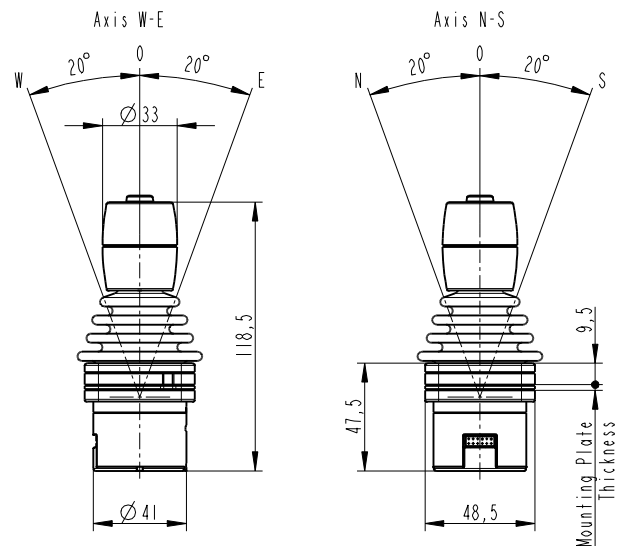
CANopen, SAE J1939
8-32V DC



With 388 Grip



With 388B Grip



MO 395 - H2X - S1X - X - X - X - XX

Hardware

395.H20.S10 - S:8-32V ; O: CANJ1939
395.H20.S11 - S:8-32V ; O: CANopen
395.H21.S10* - S:8-32V ; O: CANJ1939
395.H21.S11* - S:8-32V ; O: CANopen
*

Node ID

J1939 CANopen
A - 134(86h) 10(0Ah)
B - 135(87h) 11(0Bh)
C - 136(88h) 12(0Ch)

Axis of Actuation

0 - 2 Axis Full
1 - 2 Axis Plus
2 - Single Axis WE
3 - Single Axis SN

Elec. Connection

0 - Hirose Conn 6 Pos

Grip

B0 - 388B Grip with No Button
B1 - 388B Grip with 1 Button
A2 - 388 Grip with 2 Button
A3 - 388 Grip with 3 Button
Z0 - 388 Grip No Button with Z Axis
Z1 - 388 Grip 1 Button with Z Axis
Z2 - 388 Grip 2 Button with Z Axis
Z3 - 388 Grip 3 Button with Z Axis
Y0 - 388 Grip No Button with 3 Detent
Y1 - 388 Grip 1 Button with 3 Detent
Y2 - 388 Grip 2 Button with 3 Detent
Y3 - 388 Grip 3 Button with 3 Detent
*

* For 395.H21.S1X, the button signal is directly provided to user and not included in CAN data

* Available upon request with minimum order quantity.

JOYSTICK MINI (USB) MO 395 H3X



Technical Data

Technology

Contactless Hall measuring principle
For safety double sensor output per axis, up to 2 axis
Self centering
2 axis full square, 2 axis cross, single axis actuation for base
Up to 3 buttons
Z Axis: $\pm 45^\circ$ working angle
Detent: 40° working angle with 3 detent positions
 $-40^\circ\text{C} \dots +85^\circ\text{C}$
USB HID Joystick or Mouse
5V DC (Bus powered)

Lever

Other Specification Grip

Operating Temp.

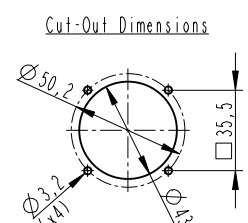
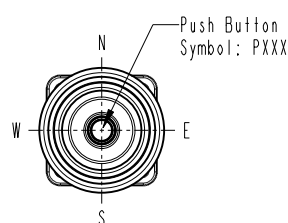
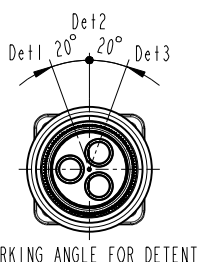
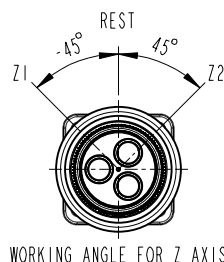
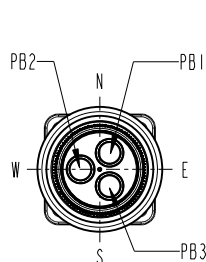
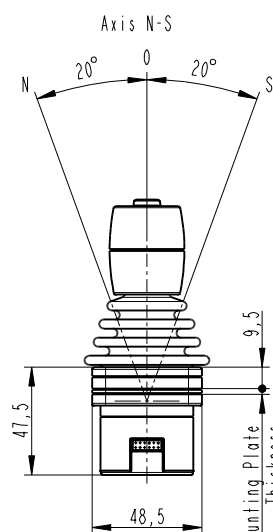
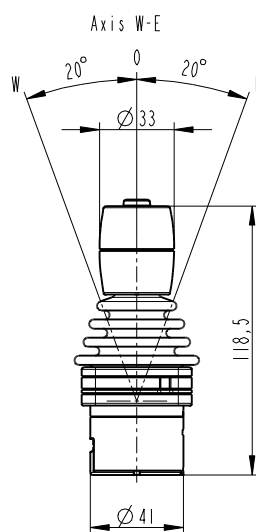
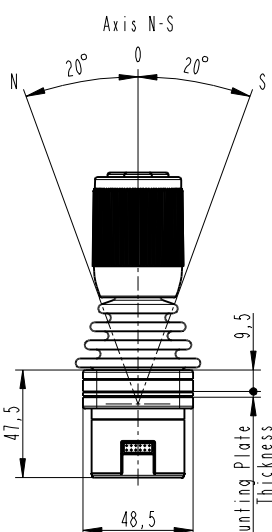
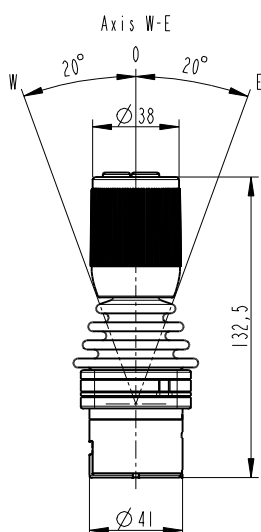
Output

Supply Voltage



With 388 Grip

With 388B Grip



MO 395 - H3X - S1X

X

X

XX

Hardware

395.H30.S10 - S:5V ; O: USB Joystick
395.H30.S11 - S:5V ; O: USB Mouse
*

Axis of Actuation

0 - 2 Axis Full
1 - 2 Axis Plus
2 - Single Axis WE
3 - Single Axis SN

Elec. Connection

0 - Hirose USB Mini B

Grip

B0 - 388B No Button
B1 - 388B 1 Button
A2 - 388 Grip with 2 Button
A3 - 388 Grip with 3 button
Z0 - 388 Grip No Button with Z Axis
Z1 - 388 Grip 1 Button with Z Axis
Z2 - 388 Grip 2 Button with Z Axis
Z3 - 388 Grip 3 Button with Z Axis
Y0 - 388 Grip No Button with 3 Detent
Y1 - 388 Grip 1 Button with 3 Detent
Y2 - 388 Grip 2 Button with 3 Detent
Y3 - 388 Grip 3 Button with 3 Detent
*

* Available upon request with minimum order quantity.

JOYSTICK MINI POWER MO 395 H4X

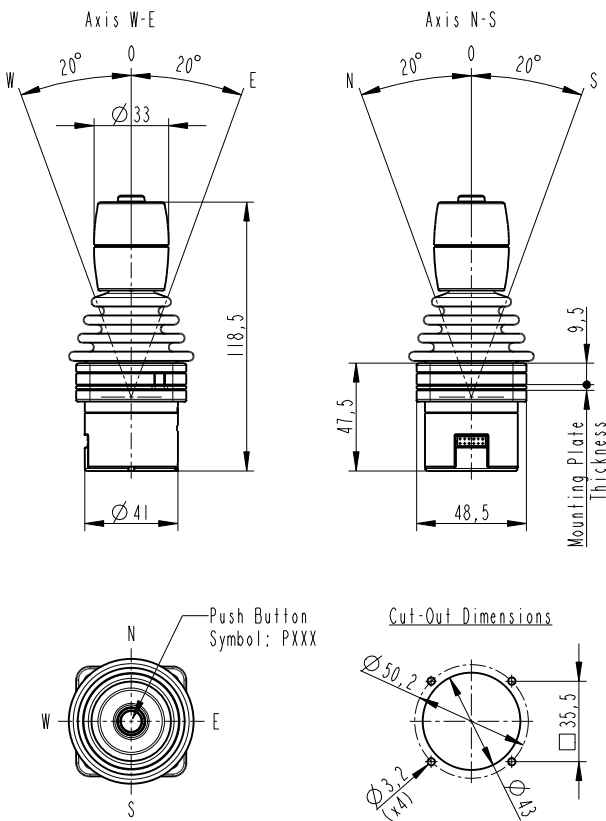


Technical Data

Technology	Contactless Hall measuring principle
Lever	For safety double sensor output per axis, up to 2 axis
Other Specification	Self centering
Grip	2 axis full square, 2 axis cross, single axis actuation for base
Operating Temp.	Up to 1 button for grip
Output	-40°C ... +85°C
Supply Voltage	8-32V HiSide PWM output 2.5A/ch 100Hz...1kHz
	8-32V DC



With 388B Grip



MO 395 -	<u>H4X</u>	-	<u>X</u>	-	<u>X</u>	-	<u>XX</u>
	Hardware		Axis of Actuation		Elec. Connection		Grip
395.H40 - S:8-32V ; O: 8-32V PWM High Side 2A/ch *		0 - 2 Axis Full 1 - 2 Axis Plus 2 - Single Axis WE 3 - Single Axis SN		0 - Hirose Conn 12 Pos		B0 - 388B No Button B1 - 388B 1 Button *	

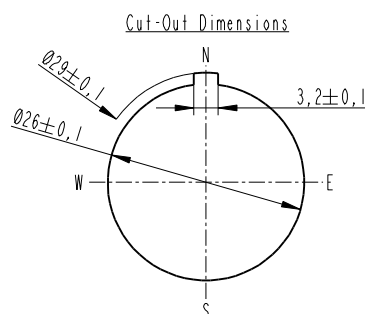
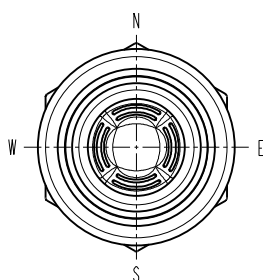
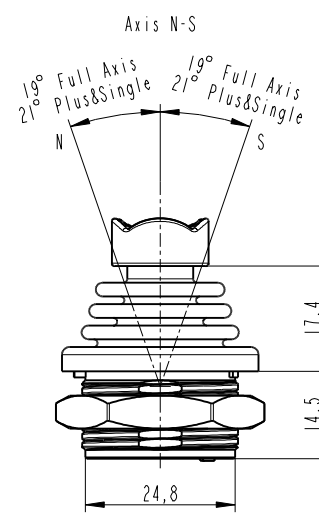
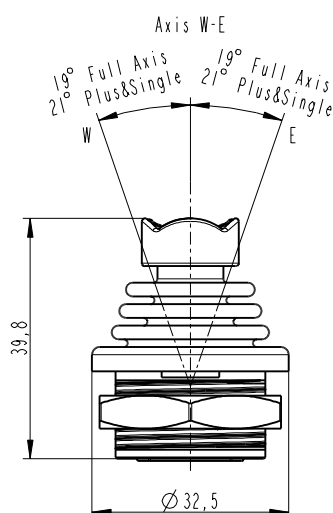
* Available upon request with minimum order quantity.

JOYSTICK MICRO MO 397 H1X



Technical Data

Technology	Contactless Hall measuring principle For safety double sensor output per axis, up to 2 axis
Lifetime at full stroke	Up to 1 million
Lever op. angle	$\pm 25^\circ$
Lever op. angle Plus&Single	$\pm 21^\circ$
Lever	Self centering
Axis of Actuation	2 axis full square, 2 axis plus, Single axis actuation
Precision	$\pm 0.1^\circ$
Operating Temp.	$-40^\circ\text{C} \dots +85^\circ\text{C}$
Protection	IP67
Protection with Header	IP65 top of mounting plate
Supply Voltage	5V
Supply Current	$<30 \text{ mA}$
Options	Customized output signal program Programmable analog voltage or PWM output Ratiometric 0-5V analog voltage or PWM:5V Push-Pull 100Hz...1kHz (1mA max.)
Output	



MO 397 -	<u>HXX</u>	-	<u>X</u>	-	<u>X</u>	-	<u>PXX</u>	-	<u>XX</u>
	Hardware		Axis		Legend		Program		Elec. Connection
	H10 - S:5V; O:0-5V Full Redundant H11 - S:5V; O:0-5V Redundant		0 - 2 Axis Full 1 - 2 Axis Plus 2 - Single Axis		0 - No Legend		*See the output signal diagrams		00 - 250mm Loose Cable (AWG 24) 01 - Molex Micro-Fit Connector 250mm cable 03 - Header
									*

* 250mm loose cable is standard. Different types and values can be produced on request. Header is only available with 8 pins.

Example: MO 397 - H10 - 0 - 0 - P01 - 00

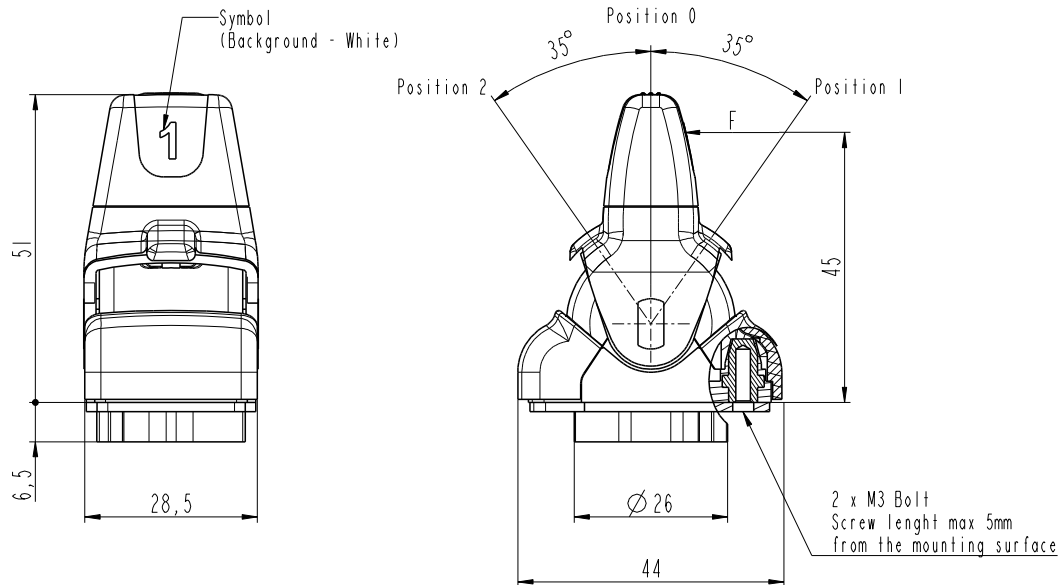
Full Redundant Micro Joystick, 2 Axis Full, No Legend, Dual Cross Program, 250mm Loose Cable

FINGERTIP JOYSTICK MO 377 H1X



Tecnical Data

Technology	Contactless Hall Measuring Principle, Full Redundant - Redundant
Service life ; Full Stroke	> 5 million
Service life ; Detent	> 0,5 million
Service life ; Rocker	> 1 million
Service life ; Friction	> 2 million
Service life ; Back Turn	> 1 million
Lever Operating Angle	± 30° max. for Rocker, Friction and Full stroke; ±35° max. for Detent; 60° max. for Back Turn
Lever	Self Centering, Soft touch
Vertical Load Max	50 N
Options	Customized output signal program, customized wire harness, customized color options
Actuation	Single axis
Actuation Type	No Detent, With Detent , Rocker 3 Position, Friction, Back Turn
Operating Temp.	-40°C ... +85°C
Ingress Protection	IP6K9K Electronic / IP54 Mechanical
Safety	Full Redundant Sensor
Supply Voltage	5V or 8-32V
Output	Double Output: Analog or PWM
Output Voltage	Analog, Programmable 0 - 5 V / PWM (100-500 Hz - 5V)



1-Red
RAL 3001



2-Green
RAL 6010



3-Yellow
RAL 1023



4-Black
RAL 9005



5-Blue
RAL 5005



6-Orange
RAL 2010



7-Gray
RAL 7043

MO 377 - HXX - X - X - XX - PXXX - XX

Hardware Configuration

H10 - Full Redundant
H11 - Full Redundant
H16 - Redundant
H17 - Redundant

Detent

0- No Detent
1- With Detent
2- Rocker
3- Friction
4- Back Turn

Colour

1- Red
2- Green
3- Yellow
4- Black
5- Blue
6- Orange
7- Gray

Symbol

00 - No symbol
XX- Symbol

* See symbol table for symbol codes

Program

P001- Dual Cross- No Detent
P002- Single - No Detent
P003- Dual Cross - Rocker
P004- Single - Rocker

* See datasheet for other variant

Connection

00- 250mm loose cable (AWG 24)
01- Molex Micro-Fit Connector 250mm cable

**

* No symbol is standard, other symbols are available upon request with minimum order quantity.

** 250mm loose cable is standard, other connections are available upon request with minimum order quantity.

Example: MO 377-H10-0-1-00-P001-00 is fingertip joystick, full redundant S:5V/O:0-5V, no detent, red, no symbol, dual cross program and 250mm loose cable.

Technical Data

Technology

Lifetime at Full Stroke

Lever Operating Angle

Lever

Options

Actuation

Actuation Type

Operating Temp.

Protection

Supply Voltage

Output

Output Voltage

Contactless Hall measuring principle, Full Redundant
Up to; 5 million, 500k with Rocker, 1 million with Toggle
 $\pm 30^\circ$ max.

Self Centering, Blue illumination

Customized output signal program, customized wire
harness, customized actuation cap color options

Single Axis

Spring Return, Rocker, Toggle

$-40^\circ \dots +85^\circ$

IP6K9K Electronic / IP54 Mechanical

5V / 8-32V

Double output: Analog , PWM options

Ratiometric Analog Output, Programmable 0-5V / PWM
(100Hz...1kHz) 5V



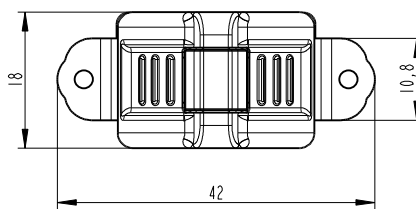
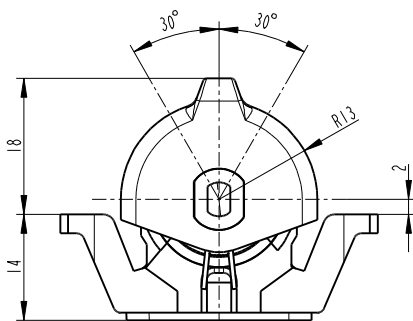
Spring Return



Rocker



Toggle



Black Flat Mounting Adaptor

*Must be ordered separately.



1-Red
RAL 3001



2-Green
RAL 6010



3-Yellow
RAL 1023



4-Black
RAL 9005



5-Blue
RAL 5005



6-Orange
RAL 2010



7-Gray
RAL 7043

MO 393 - H1X - X - X - PXXX - XX

Hardware Configuration

H10- 0-5V, Full Redundant
H11- 0-5V, Redundant
H12- 8-32V, Full Redundant
H13- 8-32V, Redundant

*

Type

0- Spring Return
2- Rocker
3- Toggle

Cap Colour

1- Red
2- Green
3- Yellow
4- Black
5- Blue
6- Orange
7- Gray

Program

P001- Dual Cross
P003- Single Program
P005- Dual Rocker
P006- Single Rocker
*See datasheet for other variant.

Connection

00- 250mm Loose Cable (AWG 24)
01- Molex Micro-Fit Connector 250mm Cable

**

* 5V supply voltage and blue night light is standard, other configs are available upon request with minimum order quantity.

** 250mm loose cable is standard, other connections are available upon request with minimum order quantity.

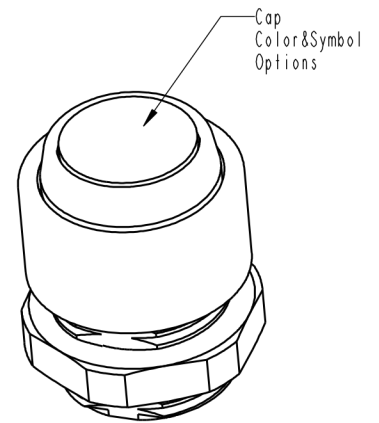
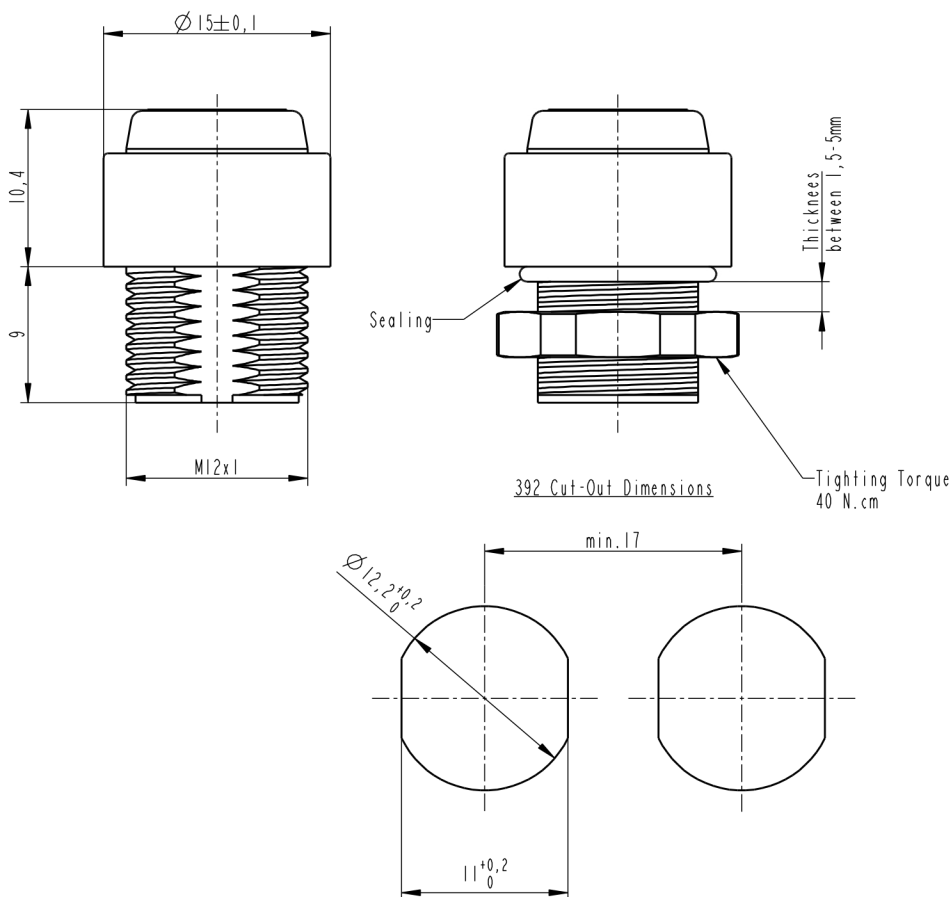
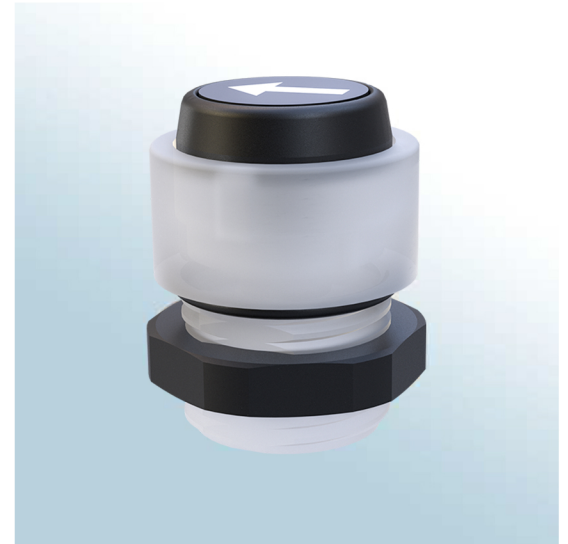
Example: 393-H10-0-1-P001-00 is thumbwheel, H10- 0-5V, Full Redundant,
Spring Return, Red, Dual Cross Program, 250mm Loose Cable.

PUSH BUTTON SIGNAL MO 392 H1X



Tecnical Data

Technology	Non-Contact Hall Switch
Lifetime at Full Stroke	Up to 2 million cycles
Mounting	M12x1 Thread with Locking Nut
Other specification	Blue night illumination and Red function illumination, Sealed Housing
Options	Customized Color Options, Customized Symbol Options
Operating Temp.	-40C° ... +85C°
Protection	IP6K9K Electronic / IP54 Mechanical
Supply Voltage	5V or 12V or 24V
Output	Low Side Switch (NO) , 10mA



MO 392 - H1X - PXXX - XX

Hardware Configurations
H10 - 5V
H11 - 12V
H12 - 24V
H1W - 5-24V (no LED)
*

Symbol Opt.
P001- Signal White
**

Cable
00- 250mm loose cable (AWG 24)
01- Molex Micro-Fit Connector
250mm cable

* 5V supply voltage and blue night / red function light is standard, other configs are available upon request with minimum order quantity.

** For other available symbols please see "Symbol Options".

*** 250mm loose cable is standard, other connections are available upon request with minimum order quantity.

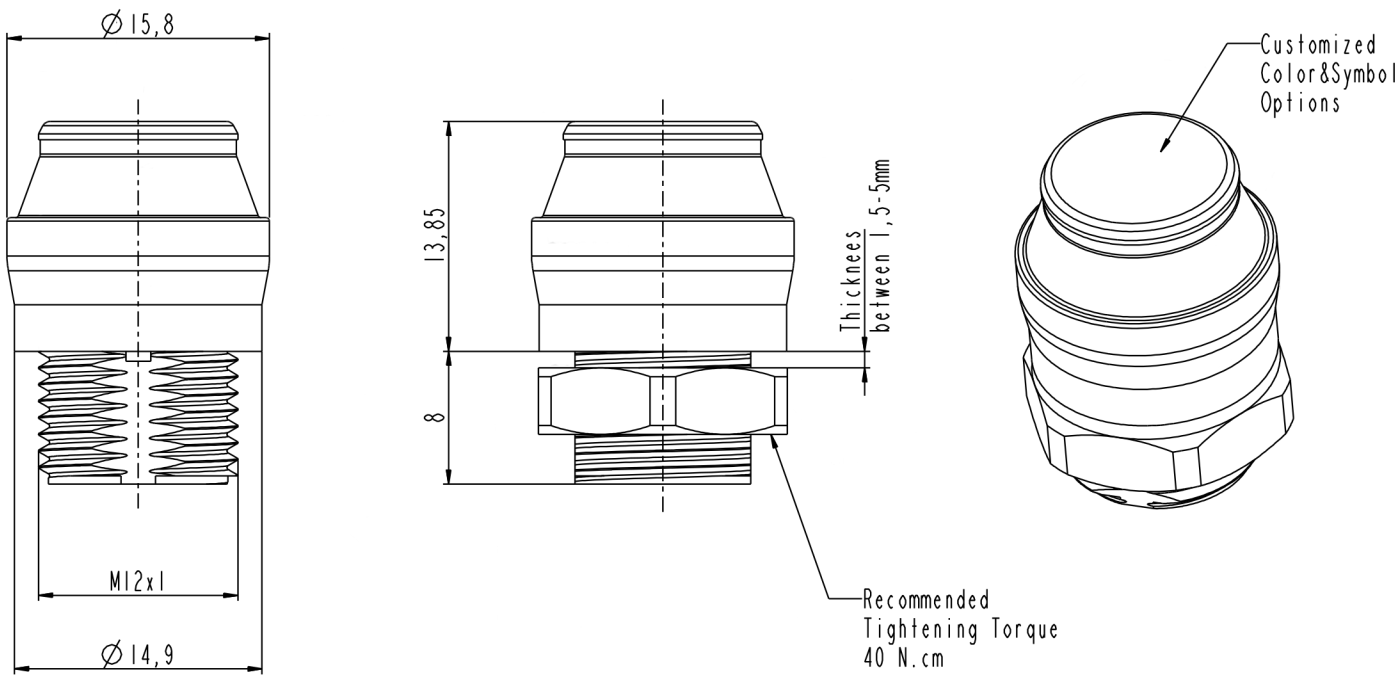
Example: MO 392-H10-P001-00 is push button , 5V supply voltage and blue night / red function light, RAL9003 cap and 250mm loose cable.

PUSH BUTTON MO 392S



Tecnical Data

Technology	Non-Contact Hall Switch
Lifetime at Full Stroke	Up to 1 million cycles
Mounting	M12x1 Thread with Locking Nut
Other specification	Blue night illumination and Red function illumination, Sealed Housing
Options	Customized Color Options, Customized Symbol Options
Operating Temp.	-40C° ... +85C°
Protection	IP6K9K Electronic / IP66 Mechanical
Supply Voltage	5V or 12V or 24V
Output	Low Side Switch (NO) , 10mA



MO 392 -	<u>H1X</u>	-	<u>PXXX</u>	-	<u>XX</u>
Hardware Configurations H10 - 5V H11 - 12V H12 - 24V H1W - 5-24V (no LED) *		Symbol Opt. P001- Signal White **		Cable 00- 250mm loose cable (AWG 24) 01- Molex Micro-Fit Connector 250mm cable ***	

* 5V supply voltage and blue night / red function light is standard, other configs are available upon request with minimum order quantity.

** For other available symbols please see "Symbol Options".

*** 250mm loose cable is standard, other connections are available upon request with minimum order quantity.

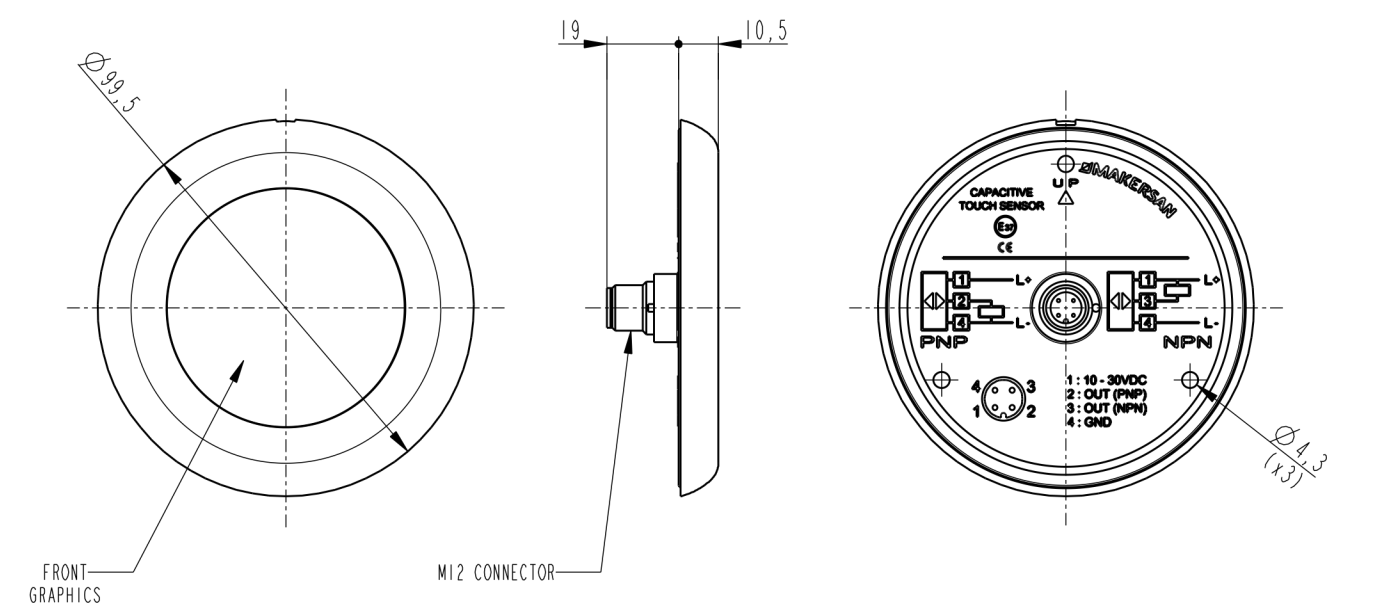
Example: MO 392-H10-P001-00 is push button , 5V supply voltage and blue night / red function light, RAL9003 cap and 250mm loose cable.

CAPACITIVE TOUCH BUTTON MO 400



Technical Data

Technology	Capacitive Touch Button, Switching through glass
Life Test	1.000.000 cycle life test at 24V, 23°C %60 humidity
Connector	M12x1 - 4 pin connector
Operation Force	Touch without force
Symbol	Different symbols available
Supply Voltage	10 ~ 30V DC
Output	NPN & PNP Normally Open
Output Signal	250 ms Period (typ.)
Output Current	500 mA (max.)
Status Display	8 red LEDs
Light Display	8 green LEDs
Electrical Protection	Overvoltage, Short-Circuit and Overcurrent
Protection	IP67
Cur. Consumption	< 20 mA (no load)



1-Red RAL 3001	2-Green RAL 6010	3-Yellow RAL 1023	4-Black RAL 9005	5-Blue RAL 5005	6-Orange RAL 2010	7-Gray RAL 7043

MO 400	-	H1X	-	X	-	LXXX	-	XX
		Type		Color		Program		Connection
		H10 - Standard		1 - Red 2 - Green 3 - Yellow 4 - Black 5 - Blue 6 - Orange 7 - Gray		*See the Legend Table.		CB - 250mm Loose Cable (AWG 20) CN - M12 Connector (AWG 24)

Example: MO 400_H10_1_L001_CN is Standart, Red Color, L001 Legend and M12 Connector type.

REMOTE KEYLESS ENTRY with CAN Bus MO 651 H3X



Technical Data

Features Security

Three zone (with external relays) secure access control
Secure code transmission with code rolling technology that eliminates the risk of code grabbing

Communication Frequency Supply Voltage Operating Temp.

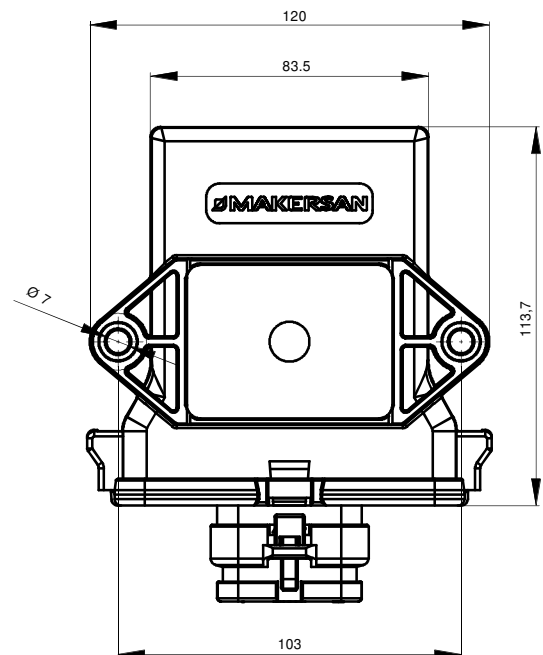
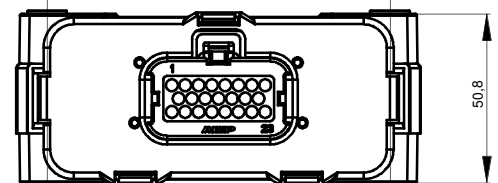
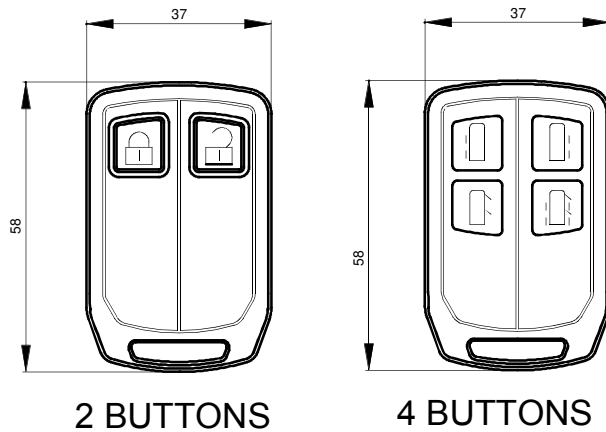
CAN Bus (SAE J1939)
433.92 MHz
8(12)-32V
Receiver : -40°C ... +80°C
Transmitter : -30°C ... +70°C

Electrical Protection Ingress Protection Housing Material Battery Connector

Over-voltage protection
IP67 sealed
% 30 GF reinforced polyamid plastic case
CR 2032 lithium battery
23 pin Tyco Seal Connector

Application

Suitable for door latches, trunk lids, and lift gates



MO 651 - H3X - SXXXX

Supply & Output

Supply 8(12)-32V Standard * H30.S1000
Supply 8(12)-32V Extended ** H31.S1000

* 1 zone control & CAN

** 1 zone control + 2 zone control with external relays & CAN

Example : 651.H30.S1000 is 1 zone control RKE module with SAE J1939 interface

REMOTE KEYLESS ENTRY with CAN Bus MO 651 H4X



Technical Data

Features Security

Three zone (with external relays) secure access control
Secure code transmission with code rolling technology that eliminates the risk of code grabbing

Communication Frequency Supply Voltage Operating Temp.

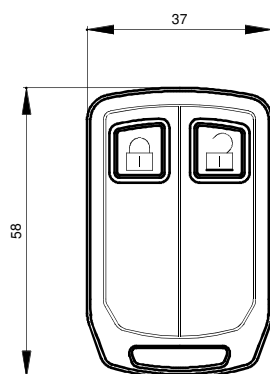
CAN Bus (SAE J1939)
433.92 MHz
8(12)-32V
Receiver : -40°C ... +80°C
Transmitter : -30°C ... +70°C

Electrical Protection Housing Material Battery Connector

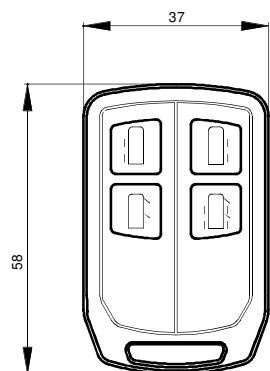
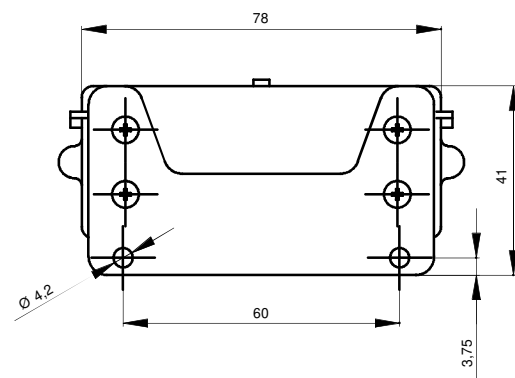
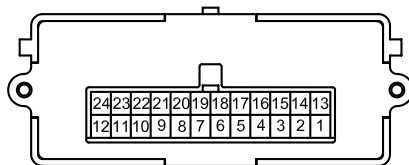
Over-voltage protection
% 30 GF reinforced polyamid plastic case
CR 2032 lithium battery
24 pin connector

Application

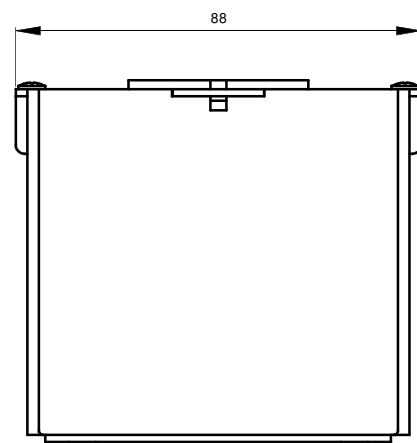
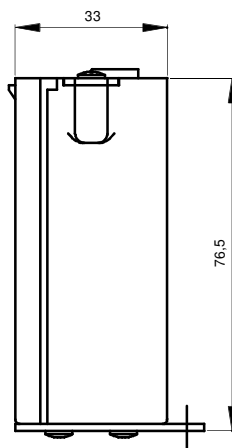
Suitable for door latches, trunk lids, and lift gates



2 BUTTONS



4 BUTTONS



MO 651 . H4X . SXXXX

Supply & Output

Supply 8(12)-32V Standard *	H40.S1000
Supply 8(12)-32V Extended **	H41.S1000

* 1 zone control & CAN

** 1 zone control + 2 zone control with external relays & CAN

Example : 651.H40.S1000 is 1 zone control RKE module with SAE J1939 interface

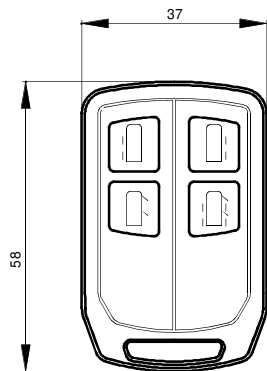
REMOTE KEYLESS ENTRY with CAN Bus

MO 651 H5X



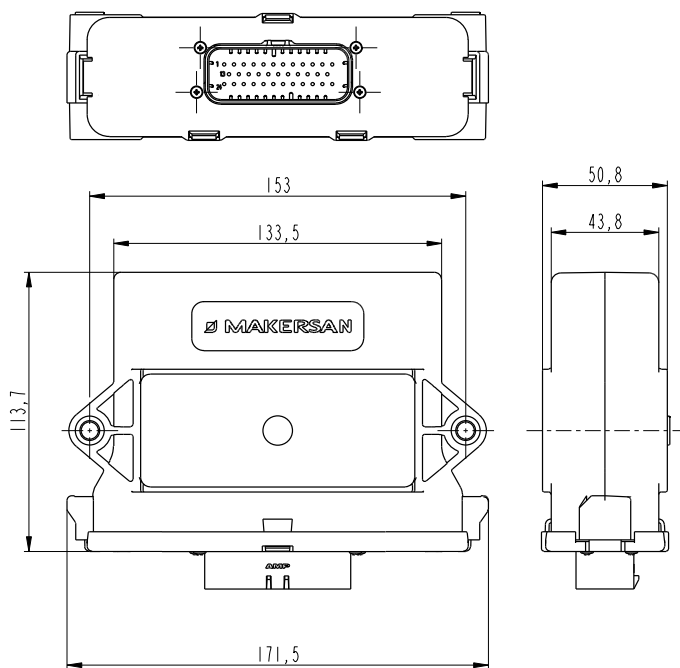
Technical Data

Features	Three zone secure access control
Security	Secure code transmission with code rolling technology that eliminates the risk of code grabbing
Communication	CAN Bus (SAE J1939)
Frequency	433.92 MHz
Rated Voltage	12V or 24V
Operating Temp.	Receiver : -40°C ... +80°C Transmitter : -30°C ... +70°C
Electrical Protection	Over-voltage protection
Ingress Protection	IP67 sealed
Housing Material	% 30 GF reinforced polyamid plastic case
Battery	CR 2032 lithium battery
Connector	35 pin Tyco connector
Application	Suitable for door latches, trunk lids, and lift gates



4 BUTTONS

CONNECTOR
35 PIN



MO 651 . H5X . SXXXX

Supply & Output	
Supply 12V*	H50.S1000
Supply 24V*	H51.S1000

* 3 zone control & CAN

Example : 651.H50.S1000 is 3 zone control RKE module with 12V supply voltage and SAE J1939 interface

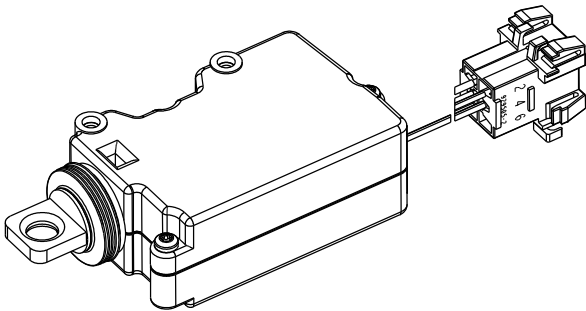
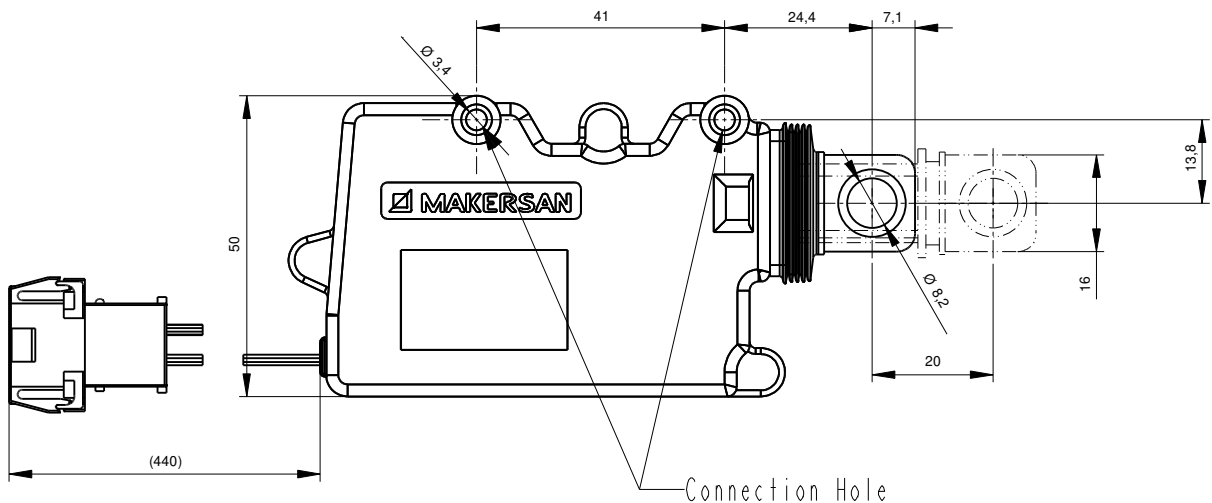
ACTUATOR MO 055



Technical Data

Rated Voltage	12V or 24V
Operating Temp.	-30°C ... +80°C
Actuating Force	≥ 25N
Weight	0.15 kg
Economic Life Time	50000 Cycles
Connector *	Without connector AMP 928161-2 connector AMP super seal connector
Protective Rating	IP54 Actuator housing
Housing Material	% 30 GF reinforced polyamide plastic case
Application	Suitable for door latches, trunk lids, and lift gates
Design	Durable construction for long service life
Linear Motion	20mm stroke
Components	Highest quality DC motor and micro switches

* Different types and values can be produced on request.



MO 055	-	XX	-	X	-	X	-	X
Motor Type								
12- 12 V								
24- 24 V								
Micro Switch Type								
0 - Without micro switch								
1 - With micro switch								
Connector Type								
0 - Without Connector								
1 - AMP 928161-2 connector								
Force								
- 25 N								
K- 50 N								

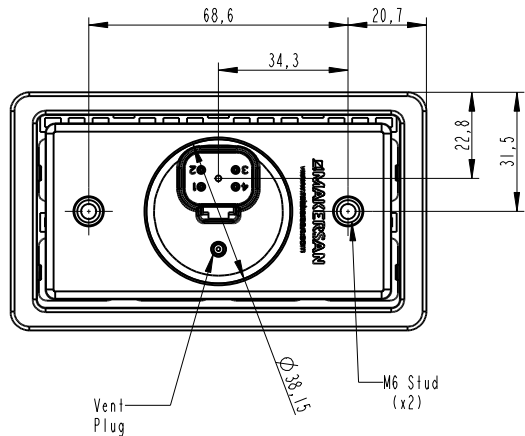
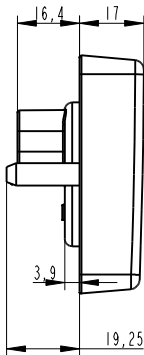
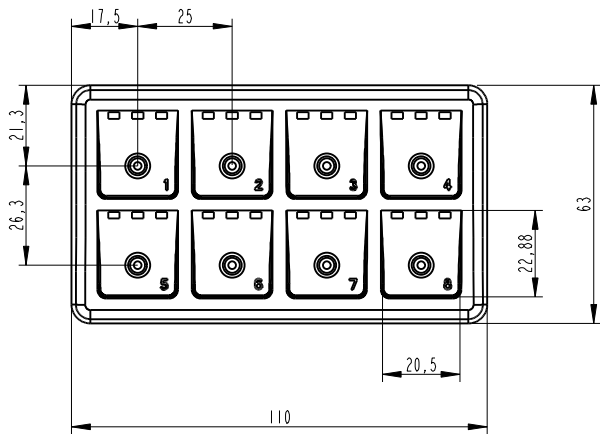
* Different types and values can be produced on request.
Example: MO 055-24-1-1 is 24 V motor type, with micro switch, AMP 928161-2 connector.

KEYPADS
MO 405 H1X



Technical Data

Type	2x4 Key Combination
Lifetime	Up to 1 million cycles per key
Operating Temp.	-40C° ... +85C°
Protection	Sealed to IP67
Supply Voltage	8-32V
Supply Current	50 mA at 24V (typical)
Overvoltage Protect.	Up to 36V
Features	SAE J1939, CANopen and Modbus versions Vibration and impact resistant Dimmable LED indicators and legends Up to 3 LED indicators per key Programmable parameters
Options	Custom legends and configurations available Custom keytop legends Indicators colors : Red (default) Custom backlight colors : Blue (default)



MO 405 - H1XS1X - LXXX

Electronic Config
H10.S10- KP2x4 Supply : 8-32V / Output : SAE J1939
H10.S11- KP2x4 Supply : 8-32V / Output : CANopen
H11.S12- KP2x4 Supply : 8-32V / Output : Modbus

* Legend Config

* Legend L001 is standard, other symbols are available upon request with minimum order quantity.

Example: MO 405 - H10S10 - L001 Keypad - KP2x4 S:8 - 32V / O: SAE J1939 - L001 Legend

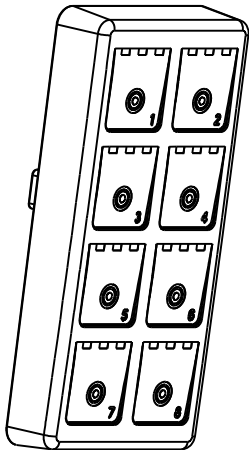
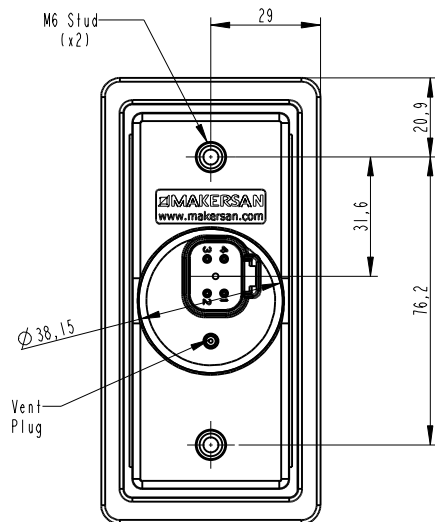
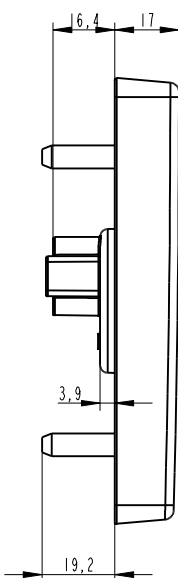
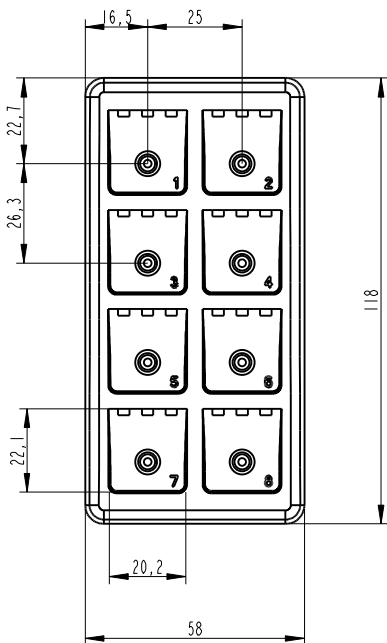
KEYPADS

MO 405 H2X



Technical Data

Type	4x2 Key Combination
Lifetime	Up to 1 million cycles per key
Operating Temp.	-40C° ... +85C°
Protection	Sealed to IP67
Supply Voltage	8-32V
Supply Current	50 mA at 24V (typical)
Overvoltage Protect.	Up to 36V
Features	SAE J1939, CANopen and Modbus versions Vibration and impact resistant Dimmable LED indicators and legends Up to 3 LED indicators per key Programmable parameters
Options	Custom legends and configurations available Custom keytop legends Indicators colors : Red (default) Custom backlight colors : Blue (default)



MO 405 - H2XS1X - LXXX

Electronic Config
H20.S10- KP4x2 Supply : 8-32V / Output : SAE J1939
H20.S11- KP4x2 Supply : 8-32V / Output : CANopen
H21.S12- KP4x2 Supply : 8-32V / Output : Modbus

* Legend Config

* Legend L001 is standard, other symbols are available upon request with minimum order quantity.
 Example: MO 405 - H20S10 - L001 Keypad - KP4x2 S:8 - 32V / O: SAE J1939 - L001 Legend

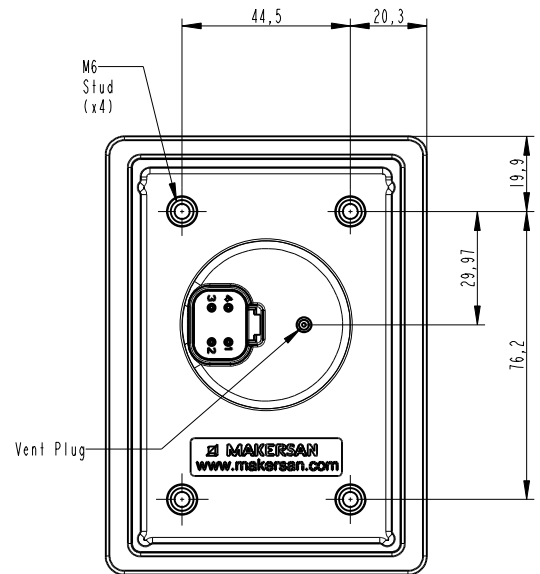
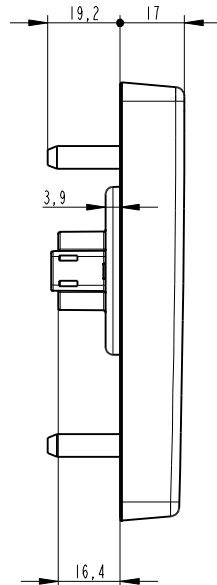
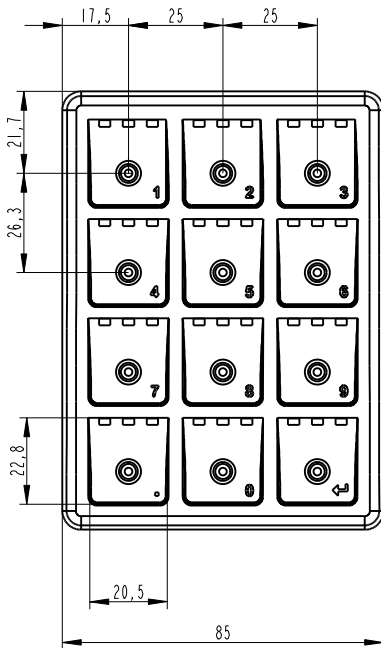
KEYPADS

MO 405 H3X



Technical Data

Type	4x3 Key Combination
Lifetime	Up to 1 million cycles per key
Operating Temp.	-40C° ... +85C°
Protection	Sealed to IP67
Supply Voltage	8-32V
Supply Current	70 mA at 24V (typical)
Overvoltage Protect.	Up to 36V
Features	SAE J1939, CANopen and Modbus versions Vibration and impact resistant Dimmable LED indicators and legends Up to 3 LED indicators per key Programmable parameters
Options	Custom legends and configurations available Custom keytop legends Indicators colors : Red (default) Custom backlight colors : Blue (default)



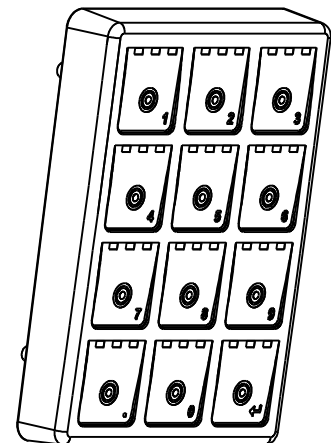
MO 405 - H3XS1X

LXXX

Electronic Config

H30.S10- KP4x3 Supply : 8-32V / Output : SAE J1939
H30.S11- KP4x3 Supply : 8-32V / Output : CANopen
H31.S12- KP4x3 Supply : 8-32V / Output : Modbus

* Legend Config



* Legend L001 is standard, other symbols are available upon request with minimum order quantity.

Example: MO 405 - H30S10 - L001 Keypad - KP4x3 S:8 - 32V / O: SAE J1939 - L001 Legend

KEYPADS

MO 405 H4X



Technical Data

Type
Lifetime
Operating Temp.
Protection
Supply Voltage
Supply Current
Overvoltage Protect.

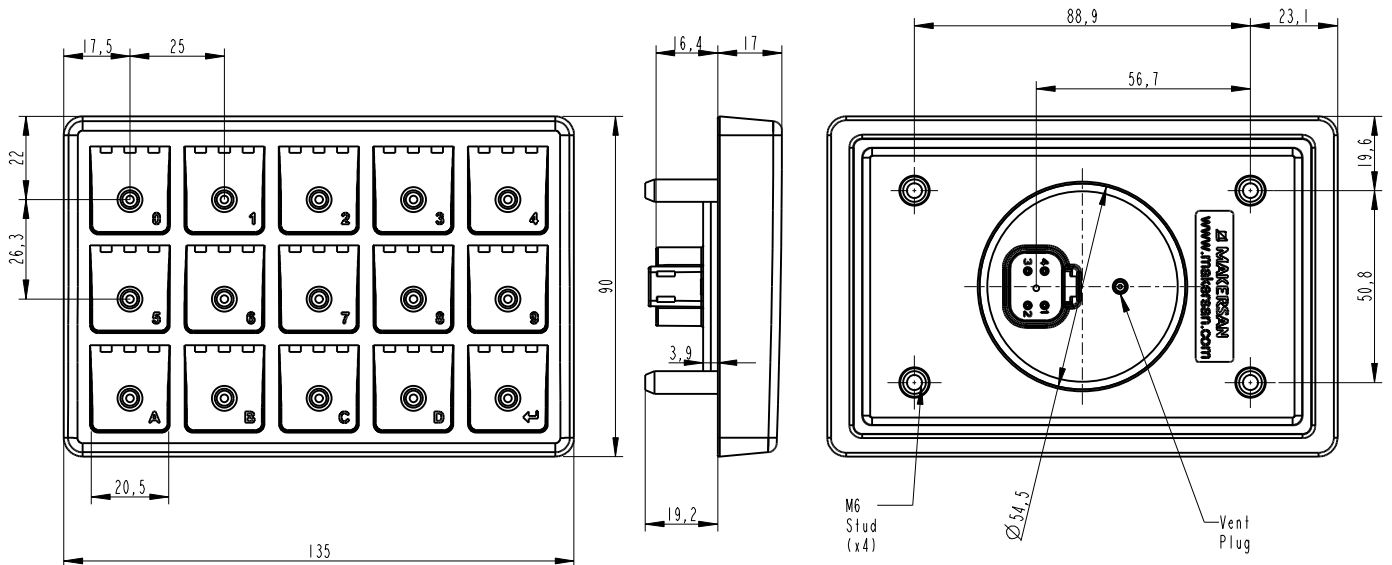
3x5 Key Combination
 Up to 1 million cycles per key
 -40C° ... +85C°
 Sealed to IP67
 8-32V
 80 mA at 24V (typical)
 Up to 36V

Features

SAE J1939, CANopen and Modbus versions
 Vibration and impact resistant
 Dimmable LED indicators and legends
 Up to 3 LED indicators per key
 Dimmable multicolor ring and backlight LED
 Programmable parameters and LED color

Options

Custom legends and configurations available
 Custom keytop legends
 Indicators colors : Red (default)



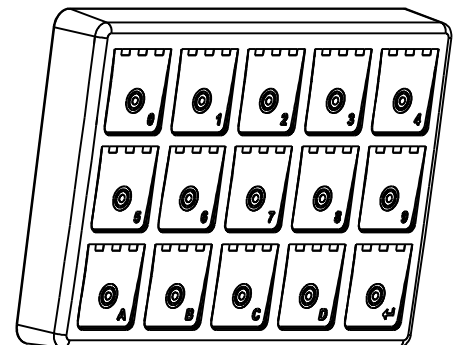
MO 405 - H4XS1X -

LXXX

Electronic Config

H40.S10- KP3x5 Supply : 8-32V / Output : SAE J1939
H40.S11- KP3x5 Supply : 8-32V / Output : CANopen
H41.S12- KP3x5 Supply : 8-32V / Output : Modbus

* Legend Config



* Legend L001 is standard, other symbols are available upon request with minimum order quantity.

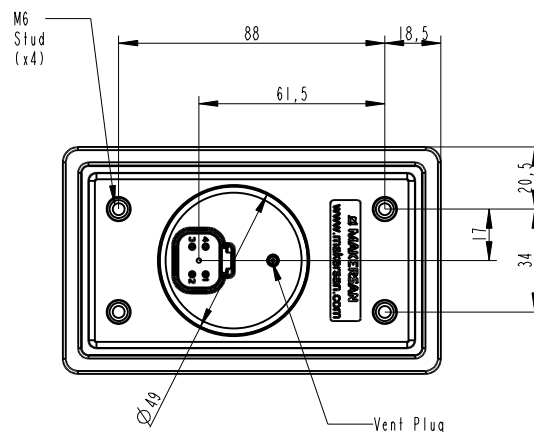
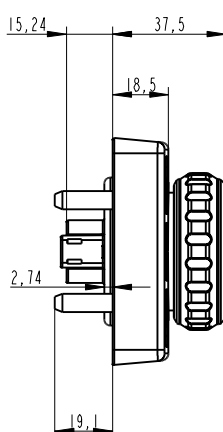
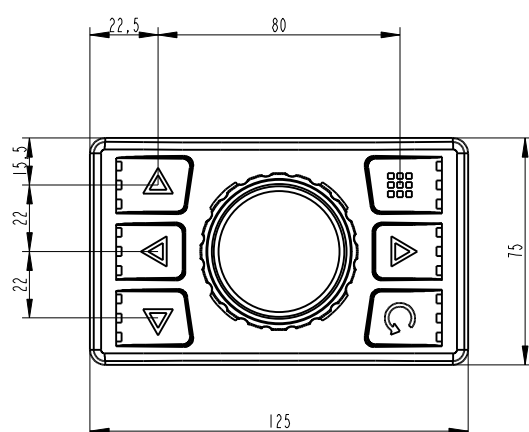
Example: MO 405 - H40S10 - L001 Keypad - KP3x5 S:8 - 32V / O: SAE J1939 - L001 Legend

JOYSTICK KEYPADS MO 406 H1X



Technical Data

Type	Rotary Push / Pull Button Knob with 6 quick-pick keys
Lifetime	Up to 1 million cycles per key
Operating Temp.	-40C° ... +85C°
Protection	Sealed to IP65
Supply Voltage	8-32V
Supply Current	80 mA at 24V (typical)
Overvoltage Protect.	Up to 36V
Features	SAE J1939, CANopen and Modbus versions Vibration and impact resistant Dimmable LED indicators and legends Up to 3 LED indicators per key Dimmable multicolor ring and backlight LED Programmable parameters and LED color
Options	Custom legends and configurations available Custom keytop legends Indicators colors : Red (default)



MO 406 - H1XS1X - LXXX

Electronic Config

H10.S10- Supply : 8-32V / Output : SAE J1939
H10.S11- Supply : 8-32V / Output : CANopen
H11.S12- Supply : 8-32V / Output : Modbus

* Legend Config

* Legend L001 is standard, other symbols are available upon request with minimum order quantity.

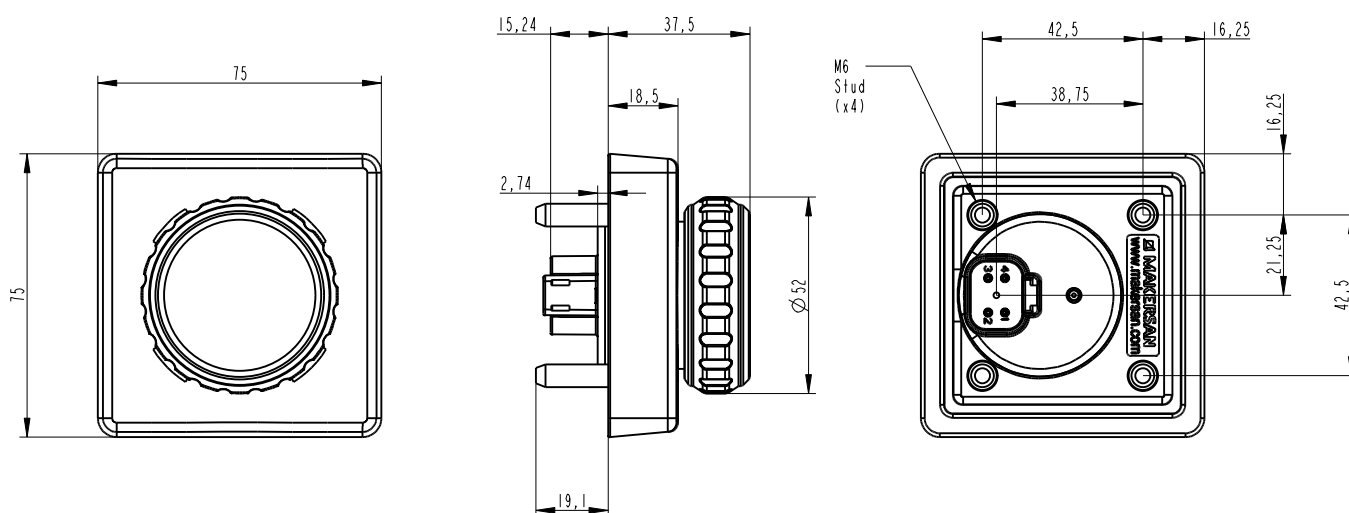
Example: MO 406 - H10S10 - L001 Joystick Keypad - S:8 - 32V / O: SAE J1939 - L001 Legend

JOYSTICK KEYPADS MO 407 H1X



Technical Data

Type	Rotary Push / Pull Button Knob
Lifetime	Up to 1 million cycles
Operating Temp.	-40C° ... +85C°
Protection	Sealed to IP65
Supply Voltage	8-32V
Supply Current	50 mA at 24V (typical)
Overvoltage Protect.	Up to 36V
Features	SAE J1939, CANopen and Modbus versions Vibration and impact resistant Dimmable multicolor ring LED Programmable parameters and LED color
Options	Custom configurations available



MO 407 - H1XS1X

Electronic Config

H10.S10- Supply : 8-32V / Output : SAE J1939

H10.S11- Supply : 8-32V / Output : CANopen

H11.S12- Supply : 8-32V / Output : Modbus

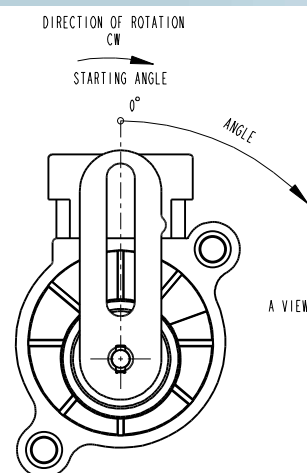
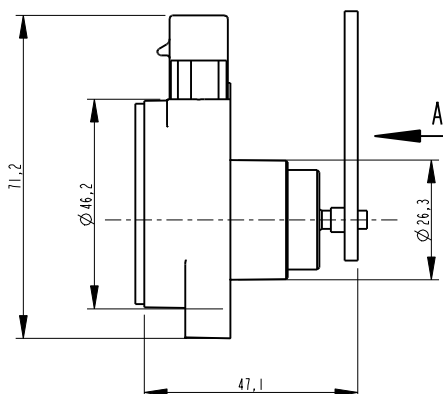
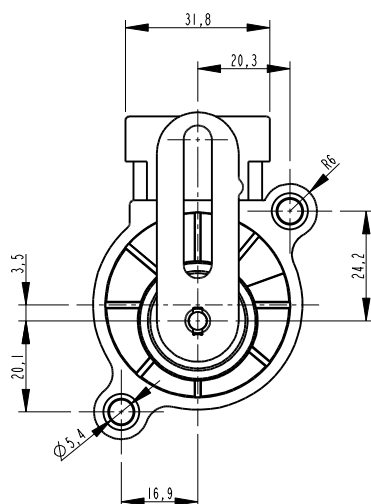
Example: MO 407 - H10S10 Joystick Keypad - S:8 - 32V / O: SAE J1939

ROTARY POSITION SENSOR MO 450A



Technical Data

Technology	Contactless / Full redundant double die hall sensor
Angle Range	0 - 360° programmable (0.1° resolution)
Connector	6 way, Delphi Packard Metri Pack 150
Protection	Seal Integrity....IP6K9K sealed
Operating Temp.	-40°C ... +85°C
Lifetime	10 Million cycles
Weight	0.080 kg
Supply Voltage	5V or 8(12)-32V
Output	Programmable Outputs
	- Single/Dual Analog type: 0-5V / 0-10V / 4-20mA / PWM
	- Analog+IVS type: Analog + HighSide or LowSide Switch
	- CAN type: SAE J1939 / CANopen
Options	Customized wire harness Customized output signal program Customized rotation direction, start angle and travel angle



MO 450A - HXX - PXX - XX

Sensor Type

H10: SUPPLY:5V / OUTPUT:5V Analog
H20: SUPPLY:8-32V / OUTPUT:5V Analog
H21: SUPPLY:5V & 8-32V / OUTPUT:5V Analog
H22: SUPPLY:8-32V / OUTPUT:0-32V PWM
H23: SUPPLY:5V&8-32V / OUTPUT:5V Analog,OUTPUT:0-32V IVS
H24: SUPPLY:5V / OUTPUT:5V Analog, OUTPUT:0-32V IVS
H26: SUPPLY:5V&8-32V / OUTPUT:5V Analog,OUTPUT:P Type
H27: SUPPLY:8-32V / OUTPUT:5V Analog, OUTPUT:P Type
H30: SUPPLY:5V / OUTPUT:5V Analog & 0-32V Dual SPDT SWT IVS
H31: SUPPLY:8-32V / OUTPUT:5V Analog & 0-32V Dual SPDT SWT IVS
H32: SUPPLY:5V / OUTPUT:5V Analog & 0-32V SPDT SWT IVS
H33: SUPPLY:8-32V / OUTPUT:5V Analog & 0-32V SPDT SWT IVS
H43: SUPPLY:12-32V / OUTPUT2:0-10V Analog,OUTPUT1:12-32V IVS HiSide
H45: SUPPLY:12-32V / OUTPUT2:4-20mA Analog,OUTPUT1:12-32V IVS HiSide
H48: SUPPLY:12-32V / OUTPUT:0-10V Analog Single
H49: SUPPLY:12-32V / OUTPUT:4-20mA Analog Single
H4A: SUPPLY2:12-32V & SUPPLY1:48-80V / OUTPUT:10V Analog,OUTPUT:P Type
H50: SUPPLY:8-32V / OUTPUT:SAE J1939, CANopen
H62: SUPPLY:8-32V / OUTPUT:8-32V Single HSide PWM Valve Driver 2,5A /ch
H63: SUPPLY:8-32V / OUTPUT:8-32V Dual HSide PWM Valve Driver 2,5A /ch

Sensor Program

Custom programmed according to customer request

Angle Config

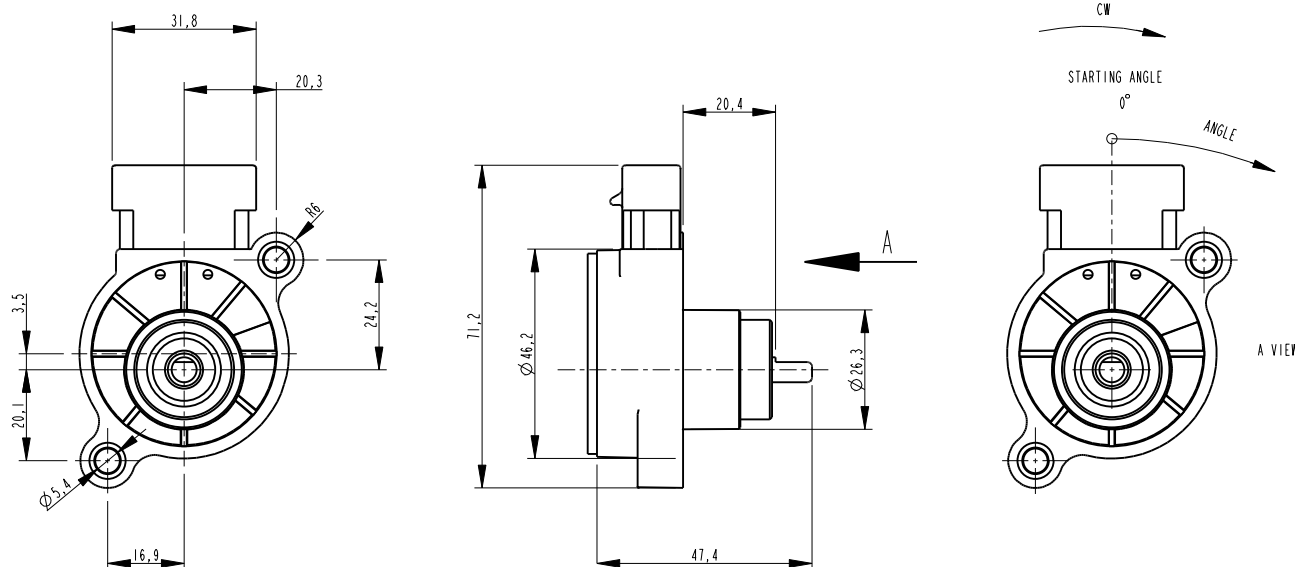
Custom programmed according to customer request

ROTARY POSITION SENSOR MO 450D



Technical Data

Technology	Contactless / Full redundant double die hall sensor
Angle Range	0 - 360° programmable (0.1° resolution)
Connector	6 way, Delphi Packard Metri Pack 150
Protection	Seal Integrity....IP6K9K sealed
Operating Temp.	-40°C ... +85°C
Lifetime	10 Million cycles
Weight	0.065 kg
Supply Voltage	5V or 8(12)-32V
Output	Programmable Outputs - Single/Dual Analog type: 0-5V / 0-10V / 4-20mA / PWM - Analog+IVS type: Analog + HighSide or LowSide Switch - CAN type: SAE J1939 / CANopen
Options	Customized wire harness Customized output signal program Customized rotation direction, start angle and travel angle



MO 450D - HXX - PXX - XX

Sensor Type

H10: SUPPLY:5V / OUTPUT:5V Analog
H20: SUPPLY:8-32V / OUTPUT:5V Analog
H21: SUPPLY:5V & 8-32V / OUTPUT:5V Analog
H22: SUPPLY:8-32V / OUTPUT:0-32V PWM
H23: SUPPLY:5V&8-32V / OUTPUT:5V Analog,OUTPUT:0-32V IVS
H24: SUPPLY:5V / OUTPUT:5V Analog, OUTPUT:0-32V IVS
H26: SUPPLY:5V&8-32V / OUTPUT:5V Analog,OUTPUT:P Type
H27: SUPPLY:8-32V / OUTPUT:5V Analog, OUTPUT:P Type
H30: SUPPLY:5V / OUTPUT:5V Analog & 0-32V Dual SPDT SWT IVS
H31: SUPPLY:8-32V / OUTPUT:5V Analog & 0-32V Dual SPDT SWT IVS
H32: SUPPLY:5V / OUTPUT:5V Analog & 0-32V SPDT SWT IVS
H33: SUPPLY:8-32V / OUTPUT:5V Analog & 0-32V SPDT SWT IVS
H43: SUPPLY:12-32V / OUTPUT2:0-10V Analog,OUTPUT1:12-32V IVS HiSide
H45: SUPPLY:12-32V / OUTPUT2:4-20mA Analog,OUTPUT1:12-32V IVS HiSide
H48: SUPPLY:12-32V / OUTPUT:0-10V Analog Single
H49: SUPPLY:12-32V / OUTPUT:4-20mA Analog Single
H4A: SUPPLY2:12-32V & SUPPLY1:48-80V / OUTPUT:10V Analog,OUTPUT:P Type
H50: SUPPLY:8-32V / OUTPUT:SAE J1939, CANOpen
H62: SUPPLY:8-32V / OUTPUT:8-32V Single HSide PWM Valve Driver 2,5A /ch
H63: SUPPLY:8-32V / OUTPUT:8-32V Dual HSide PWM Valve Driver 2,5A /ch

Sensor Program

Custom
programmed
according to
customer request

Angle Config

Custom
programmed
according to
customer request

INCLINATION - ACCELERATION - GYRO SENSOR MO 415



Technical Data

Technology Measuring Range

6D IMU (3D Accelerometer + 3D Gyroscope) / Sensor Fusion

Inclination: Two axis: up to $\pm 80^\circ$; One axis: $\pm 180^\circ$

Acceleration: $\pm 2g$, $\pm 4g$, $\pm 8g$, $\pm 16g$

Gyroscope: $\pm 245dps$, $\pm 500dps$, $\pm 1000dps$, $\pm 2000dps$

Deutsch 4 pin

Connector

Absolute Accuracy

Inclination: $< \pm 0.5^\circ$ ($T_a = 23^\circ C$)

Resolution

Inclination: $< 0.01^\circ$, Acceleration: $< 1mg$, Gyro: $< 0.1dps$

Operating Temp.

$-40^\circ C \dots +85^\circ C$

Protection

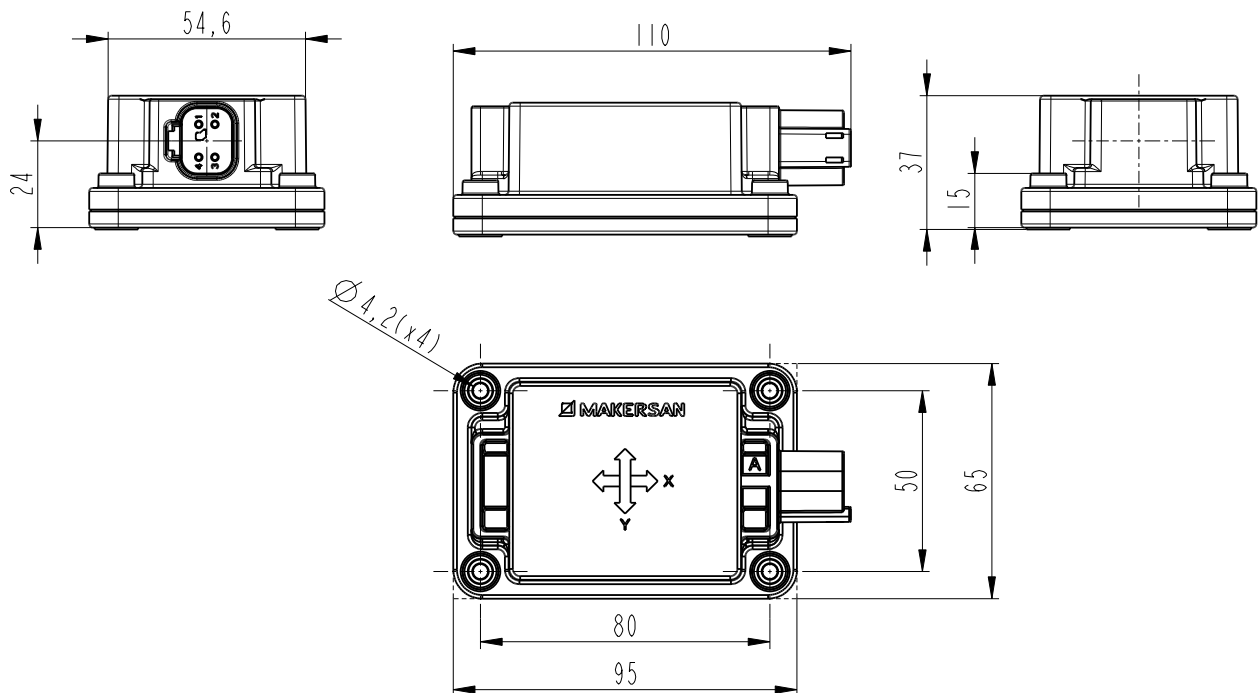
Sealed to IP67

Supply Voltage

8-32V DC

Output

SAE J1939 / CANopen



MO415HXXSXX - P X X X - 000 - XXX

Hardware

H4A: CAN

Inclination Range

- 1: $\pm 80^\circ$ (default)
- 2: $\pm 60^\circ$
- 3: $\pm 45^\circ$
- 4: $\pm 30^\circ$
- 5: $\pm 15^\circ$
- 6: $\pm 180^\circ$ (single axis X)*
- 7: $\pm 180^\circ$ (single axis Y)*

Gyroscope Range

- 1: $\pm 245dps$
- 2: $\pm 500dps$ (default)
- 3: $\pm 1000dps$
- 4: $\pm 2000dps$

Node ID

226: SAE J1939
012: CANopen

Software

S12: SAE J1939
S13: CANopen

Acceleration Range

- 1: $\pm 2g$
- 2: $\pm 4g$ (default)
- 3: $\pm 8g$
- 4: $\pm 16g$

*: For single axis version Sensor Fusion technology not available; only low pass filter used (static type) for inclination output.

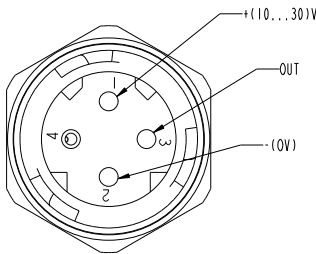
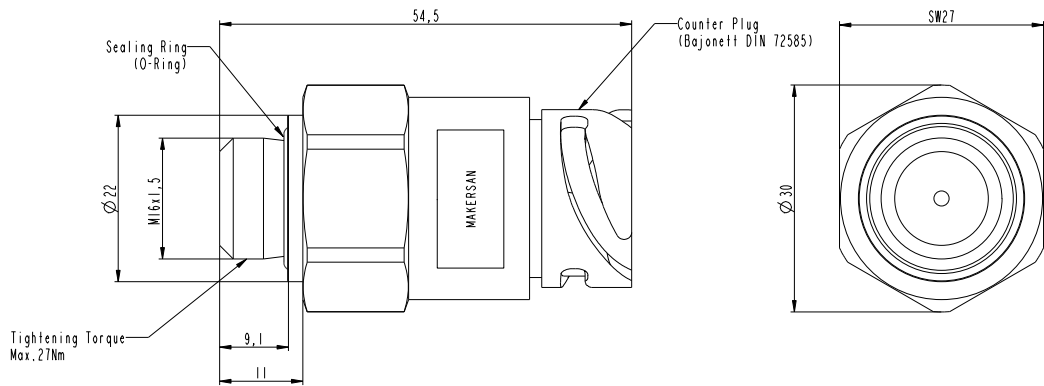
Example 1: MO415H4AS12-P122-000-226 is Inclination $\pm 80^\circ$ XY, Acceleration $\pm 4g$ XYZ, Gyroscope $\pm 500dps$ XYZ SAE J1939 output type of sensor with node ID of 226.

PRESSURE SENSOR
MO 420 H2X



Technical Data

Pressure Range	0 - 6, 10, 12 , 25 , 50 , 100 , 160 Bar
Medium	Air, Water, Oil, Coolants, Fuels
Relative / Absolute	Relative
Protection	IP6K9K
Operating Temp.	-40°C ... +80°C
Supply Voltage	5V or 8-32V
Output signal	Programmable (0.5-4.5V default)
Connector	DIN Bajonett (DIN 72585)
Standart Metric Size	M 16 x 1.5



MO 420 - H2X - PXXX

Supply & Output	
H20 - Supply:	10-30V / Out: 5V
H21 - Supply:	5V / Out: 5V

Pressure	
P006	0-6 Bar
P010	0-10 Bar
P012	0-12 Bar
P025	0-25 Bar
P050	0-50 Bar
P100	0-100 Bar
P160	0-160 Bar

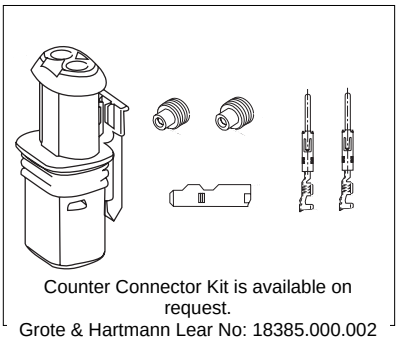
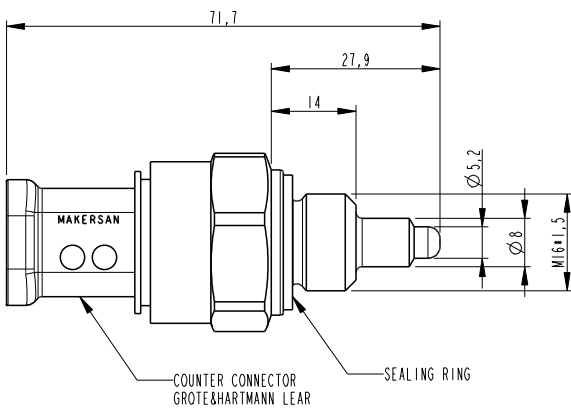
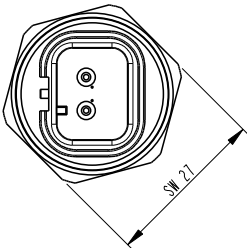
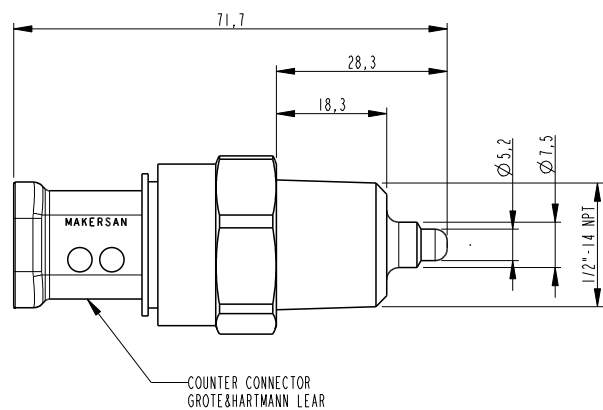
Example: MO420-H21-P006 is pressure sensor , 5V supply voltage, 0-5V output voltage and 6 Bar type.

LIQUID TEMPERATURE SENSOR MO 413



Technical Data

Medium	Water, oil, coolants, fuels
Measurement range	-35°C to +120 °C
Operating pressure	Up to max 400 Bar
Nominal resistance	At 25°C 400 Ohm or 2252 Ohm (different Ohm value on request)
Protection	IP6K9K
Connector	Grothe Hartman
Counter Connector	Counter connector kit is available on request.
Housing material	Brass
Weight	0.076 kg
Thread Size	1/2"-14NPT or M16x1,5 DIN 3852 Form A (Other values are available on request.)
Application	Measurement of liquid temperature



MO 413	-	X	-	X
		└─┘		└─┘
		Connection		Nominal Resistance at 25°C
		A - 1/2" 14 NPT		1 - 400 Ohm
		B - M16x1,5 DIN 3852 Form A		2 - 2252 Ohm

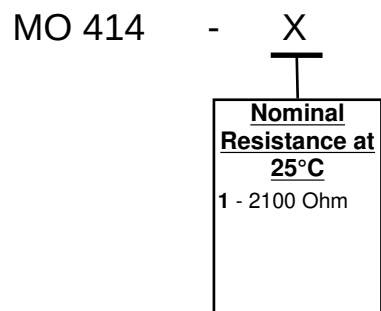
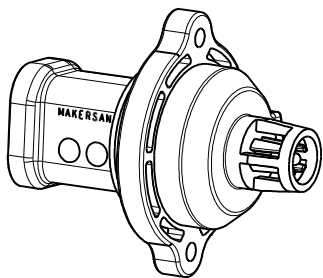
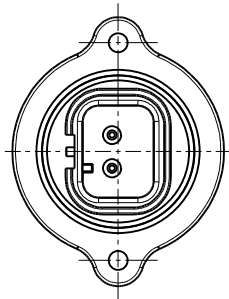
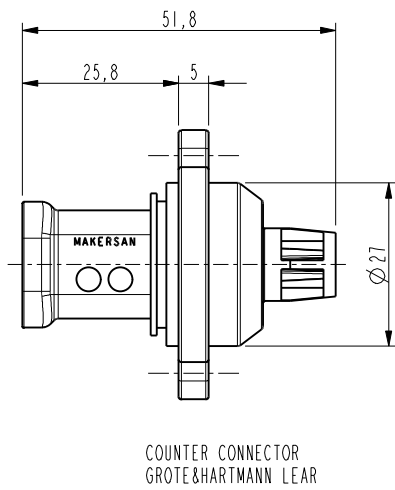
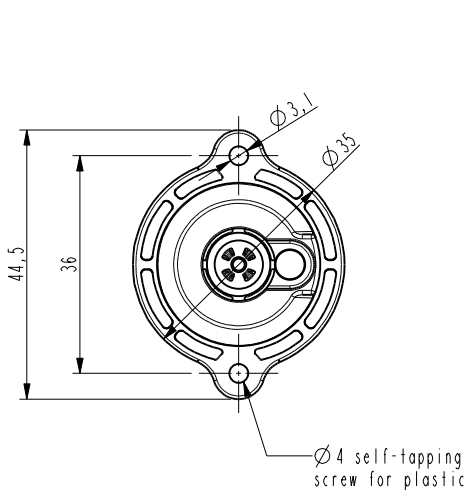
Example: MO 413-A-1 is Temperature Sensor, 1/2 14 NPT, 400 Ohm.

AIR TEMPERATURE SENSOR MO 414



Technical Data

Medium	Air
Measurement range	-40°C to +80°C
Nominal resistance	At 25°C 2100 Ohm (different Ohm value on request)
Protection	IP6K9K
Connector	Grothe Hartman
Counter Connector	Counter Connector kit is available on request.
Housing material	%30 GF reinforced polyamid plastic case
Weight	0.012 kg
Application	Measurement of air temperature for vehicles



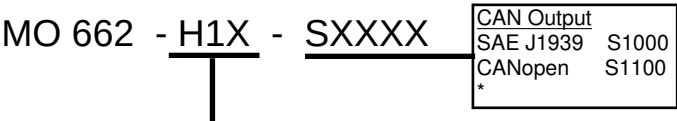
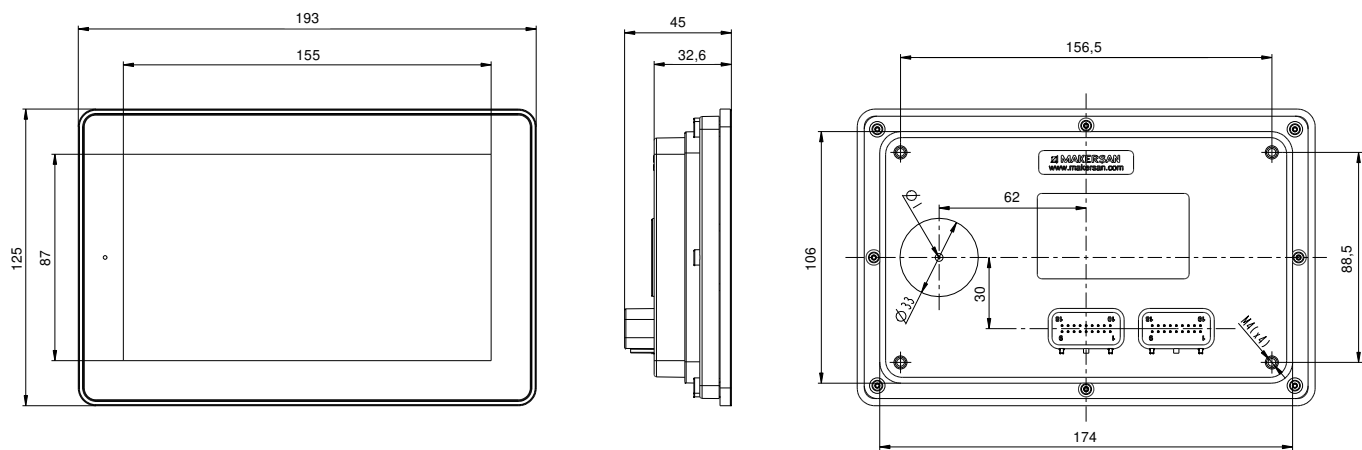
Example: MO 414-1 is Temperature Sensor, 2100 Ohm.

HMI UNIT 7"
MO 662 H1X



Technical Data

Features	User Configurable or Custom Software
Boot Time	USB to CAN interface for device configuration
Type	≤ 2 seconds
Size and Resolution	TFT with LED backlight (optional Optical Bonded)
Brightness	7" TFT, White/Transmissive - 800x480 24 bit RGB
Other specification	1000 nits
I/O	RTC, 85dB configurable piezo-buzzer
	Up to 14 digital inputs
	Up to 2 digital outputs (low/high side)
	Up to 12 voltage/resistive inputs
	Up to 4 frequency inputs (up to 2 active speed sensor)
	Up to 6 current inputs
	Up to 2 CAN interface - SAE J1939 or CANOPEN
Communication	Flush/panel mounting or mounting on stand/arm
Mech. Installation	8-32V
Operating Voltage	24V/300mA -no load and full brightness
Power Consumption	-30°C ... +70°C
Operating Temp.	IP67
Protection Class	18 pin Tyco Seal Connector
Connector	



Hardware Configurations
H10 - 8 Active-Low Inputs, 2 Active-High Inputs, 2 Frequency Inputs, 2 Resistor Inputs, Supply: 8-32V

* Available upon request with minimum order quantity.

Example : MO 662 - H10 - S1000 is 8 Active-Low Inputs, 2 Active-High Inputs, 2 Frequency Inputs, 2 Resistor Inputs HMI Unit with SAE J1939 interface.

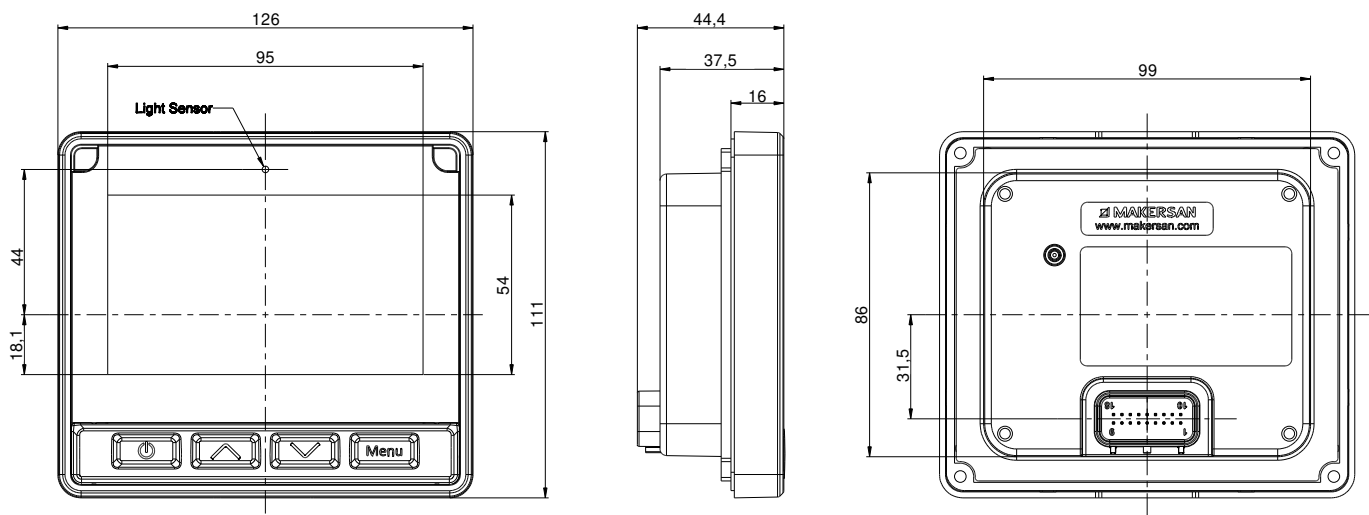
HMI UNIT 4.3"

MO 661 H1X



Technical Data

Features	User Configurable or Custom Software
Boot Time	USB to CAN interface for device configuration
Type	≤ 2 seconds
Size and Resolution	TFT with LED backlight (optional Optical Bonded)
Brightness	4.3" TFT, White/Transmissive - 480x272 24 bit RGB
Other specification	1000 nits
I/O	RTC, 85dB configurable piezo-buzzer
	Up to 14 digital inputs
	Up to 2 digital outputs (low/high side)
	Up to 12 voltage/resistive inputs
	Up to 4 frequency inputs (up to 2 active speed sensor)
	Up to 6 current inputs
	Up to 2 CAN interface - SAE J1939 or CANOPEN
Communication	Flush/panel mounting or mounting on stand/arm
Mech. Installation	8-32V
Operating Voltage	24V/150mA -no load and full brightness
Power Consumption	-30°C ... +70°C
Operating Temp.	IP67
Protection Class	18 pin Tyco Seal Connector
Connector	



MO 661 - H1X - SXXXX

CAN Output	
SAE J1939	S1000
CANopen	S1100
*	

Hardware Configurations

H10 - 8 Active-Low Inputs, 2 Active-High Inputs, 2 Frequency Inputs, 2 Resistor Inputs, Supply: 8-32V

* Available upon request with minimum order quantity.

Example : MO 661 - H10 - S1000 is 8 Active-Low Inputs, 2 Active-High Inputs, 2 Frequency Inputs, 2 Resistor Inputs HMI Unit with SAE J1939 interface.

I/ O MODULE with CAN Bus
MO 692 H1X

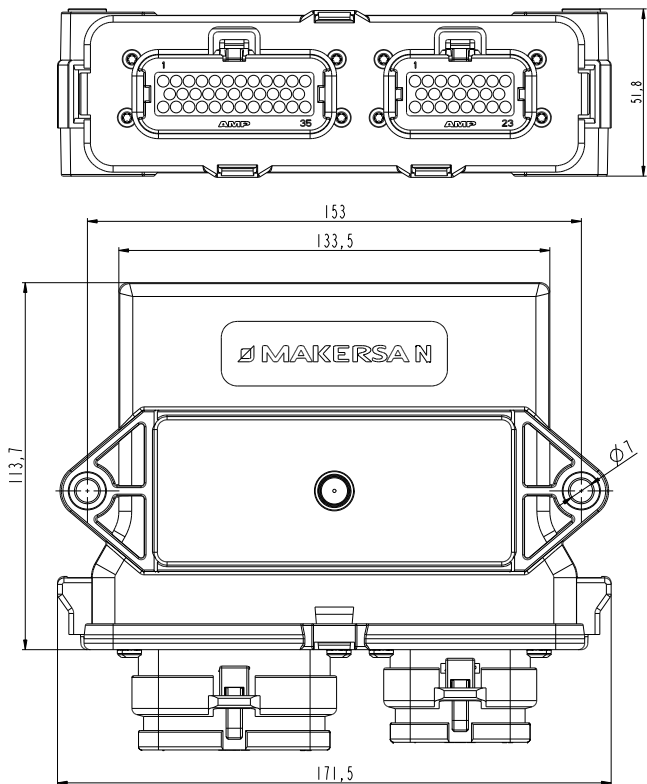


Technical Data

Features	User Configurable or Custom Software USB to CAN interface for device configuration Up to 44 Analog Inputs Up to 4 Resistive Inputs Up to 32 Current Inputs Up to 4 Frequency/PWM inputs Up to 44 Digital Inputs (Active Low or Active High) Up to 20 High Side Outputs (max. 2A/ch resistive load) Up to 20 Low Side Outputs (max. 500mA/ch) Up to 12 Proportional Outputs (max. 500Hz with current sense feedback)
Communication	SAE J1939 or CANopen interface
Casting Material	GF 30 % Polyamid
Protection Sealing	Silicon Rubber
Operating Voltage	8-32V
Power Consumption	100mA typ. (no load)
Operating Temp.	-40°C ... +80°C
Protection Class	IP67
Connector	35 + 23 pin Tyco Seal Connector



CONNECTOR
35 + 23 PIN



MO 692 - H1X - SXXXX	CAN Output
	SAE J1939 S1000
	CANopen S1100
	*

Hardware Configurations
H10 - 16 analog Inputs, 4 Frequency Inputs, 4 Low-Side Outputs, 5V Ref Supply Output, Supply: 8-32V
H11 - 8 analog Inputs, 4 Frequency Inputs, 4 Proportional Outputs, 4 Low-Side Outputs, 5V Ref Supply Output, Supply: 8-32V

* Available upon request with minimum order quantity.

Example : MO 692 - H1000 - S10 is 16 analog Inputs, 4 Frequency Inputs, 4 Low-Side Outputs, 5V Ref Supply Output I/O Module with SAE J1939 interface.

I/ O MODULE with CAN Bus

MO 691 H1X



Technical Data

Features

User Configurable or Custom Software
USB to CAN interface for device configuration
Up to 26 Digital Inputs
Up to 8 Frequency Inputs
Up to 10 Current Inputs
Up to 26 Analog Inputs
Up to 6 Resistive Inputs
Up to 22 Low-Side Outputs (500mA/ch)
Up to 26 High-Side Outputs (2.2A/ch)
Up to 4 Proportional Outputs (max. 2.5 A/ch with current sense feedback)

Communication

SAE J1939 or CANopen interface

Casting Material

GF 30 % Polyamid

Protection Sealing

Silicon Rubber

Operating Voltage

8-32V

Power Consumption

100mA typ. (no load)

Operating Temp.

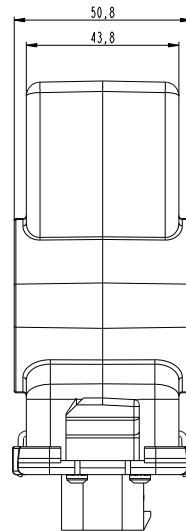
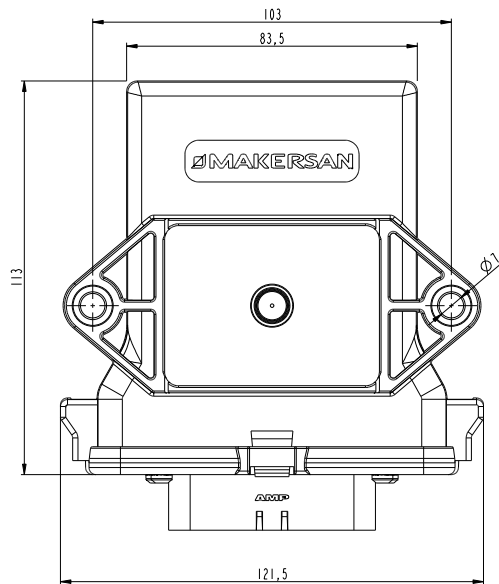
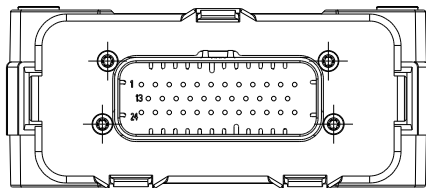
-40°C ... +80°C

Protection Class

IP67

Connector

35 pin Tyco Seal Connector



MO 691 - H1X - SXXXX

CAN Output	
SAE J1939	S1000
CANopen	S1100
*	

Hardware Configurations

H10 - 26 Active-Low Inputs

H11 - 2 Resistive Inputs, 2 Frequency Inputs, 2 Analog Outputs, 20 High-Side Outputs

* Available upon request with minimum order quantity.

Example : MO 691 - H10 - S1000 is 26 Active-Low Inputs I/O Module with SAE J1939 interface.

I/ O MODULE with CAN Bus

MO 691 H2X



Technical Data

Features

User Configurable or Custom Software
USB to CAN interface for device configuration
Up to 24 Analog Inputs
Up to 4 Resistive Inputs
Up to 24 Digital Inputs
Up to 8 Current Inputs
Up to 16 High Side Outputs (max. 2A/ch resistive load)
Up to 8 Low Side Outputs (max. 500mA/ch)
Up to 8 Proportional Outputs (max. 2.5 A/ch with current sense feedback)
5V Reference Output

Communication

SAE J1939 or CANopen interface

Casting Material

GF 30 % Polyamid

Protection Sealing

Silicon Rubber

Operating Voltage

8-32V

Power Consumption

100mA typ. (no load)

Operating Temp.

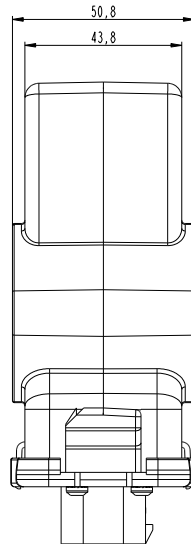
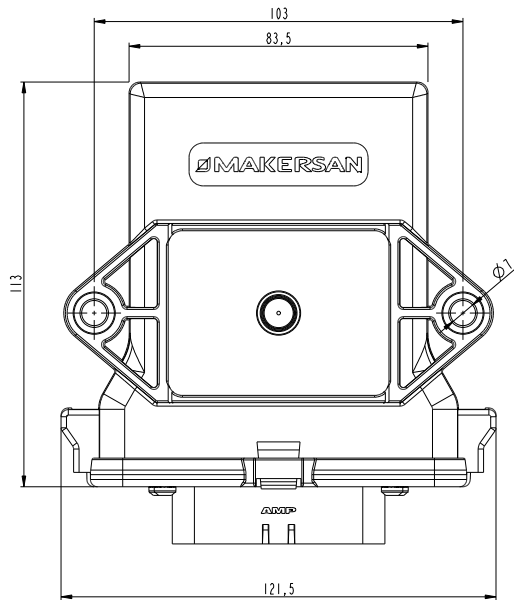
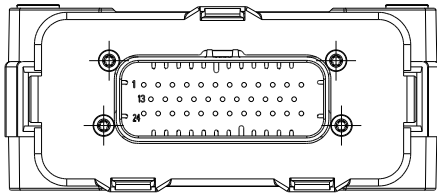
-40°C ... +80°C

Protection Class

IP67

Connector

35 pin Tyco Seal Connector



MO 691 - H2X - SXXXX

CAN Output	
SAE J1939	S1000
CANopen	S1100
*	

Hardware Configurations

H20 - 6 Active-Low Inputs, 4 Analog Inputs, 2 Current Inputs, 2 Frequency Inputs, 2 High-Side Outputs, 8 Proportional Outputs, 5V Ref.
H21 - 8 Analog Inputs, 8 High-Side Outputs, 8 Proportional Outputs, 5V Ref.

* Available upon request with minimum order quantity.

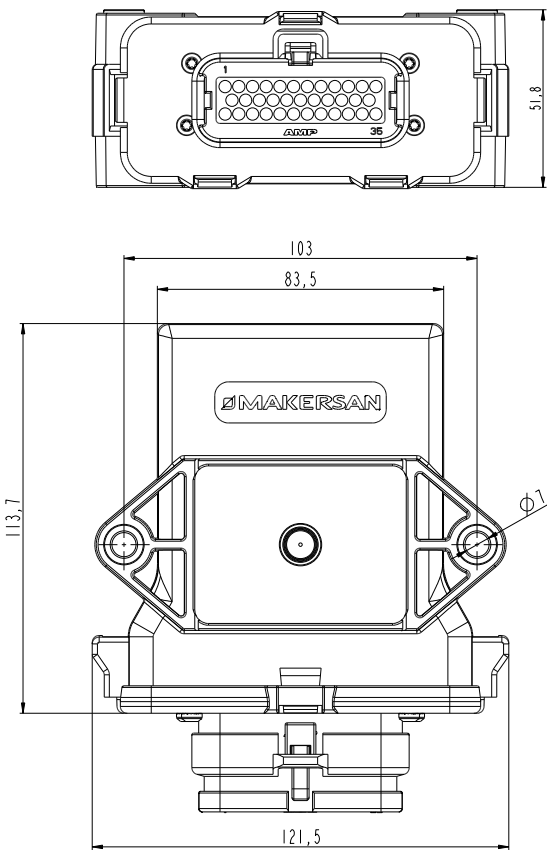
Example : MO 691 - H20 - S1000 is Active-Low Inputs, 4 Analog Inputs, 2 Current Inputs, 2 Frequency Inputs, 2 High-Side Outputs, 8 Proportional Outputs, 5V Ref Output I/O Module with SAE J1939 interface.

I/ O MODULE with CAN Bus
MO 691 H3X



Technical Data

Features	User Configurable or Custom Software USB to CAN interface for device configuration Up to 3 DC Motors Up to 2 BLDC Motors Up to 1 Step Motor Up to 11 Analog Inputs Up to 8 Frequency Inputs Up to 19 Digital Inputs Up to 8 Low Side Outputs (500mA/ch) Up to 4 High Side Outputs (max. 2A/ch)
Communication	SAE J1939 or CANopen interface
Casting Material	GF 30 % Polyamid
Protection Sealing	Silicon Rubber
Operating Voltage	8(12)-32V
Power Consumption	100mA typ. (no load)
Operating Temp.	-40°C ... +80°C
Protection Class	IP67
Connector	35 pin Tyco Seal Connector



MO 691 - H3X - SXXXX

CAN Output	
SAE J1939	S1000
CANopen	S1100
*	

Hardware Configurations

H30 - 2 Active-High Inputs, 6 Frequency Inputs, 3 Analog Inputs, 3 Resistive Inputs, 4 High-Side Outputs, 6 Motor Outputs, 5V Ref.

* Available upon request with minimum order quantity.

Example : 691.H30.S1000 - 2 Active-High Inputs, 6 Frequency Inputs, 3 Analog Inputs, 3 Resistive Inputs, 4 High-Side Outputs, 6 Motor Outputs, 5V Ref. Motor Driver Module with SAE J1939 interface.

I/ O MODULE with CAN Bus
MO 690 H1X



Technical Data

Features

User Configurable or Custom Software
USB to CAN interface for device configuration
Up to 19 Digital Inputs
Up to 18 Analog Inputs
Up to 19 Low-Side Outputs (500mA/ch)
Up to 8 High-Side Outputs (2A/ch)

Communication

SAE J1939 or CANopen protocol

Casting Material

GF 30 % Polyamid

Operating Voltage

8(12)-32V

Power Consumption

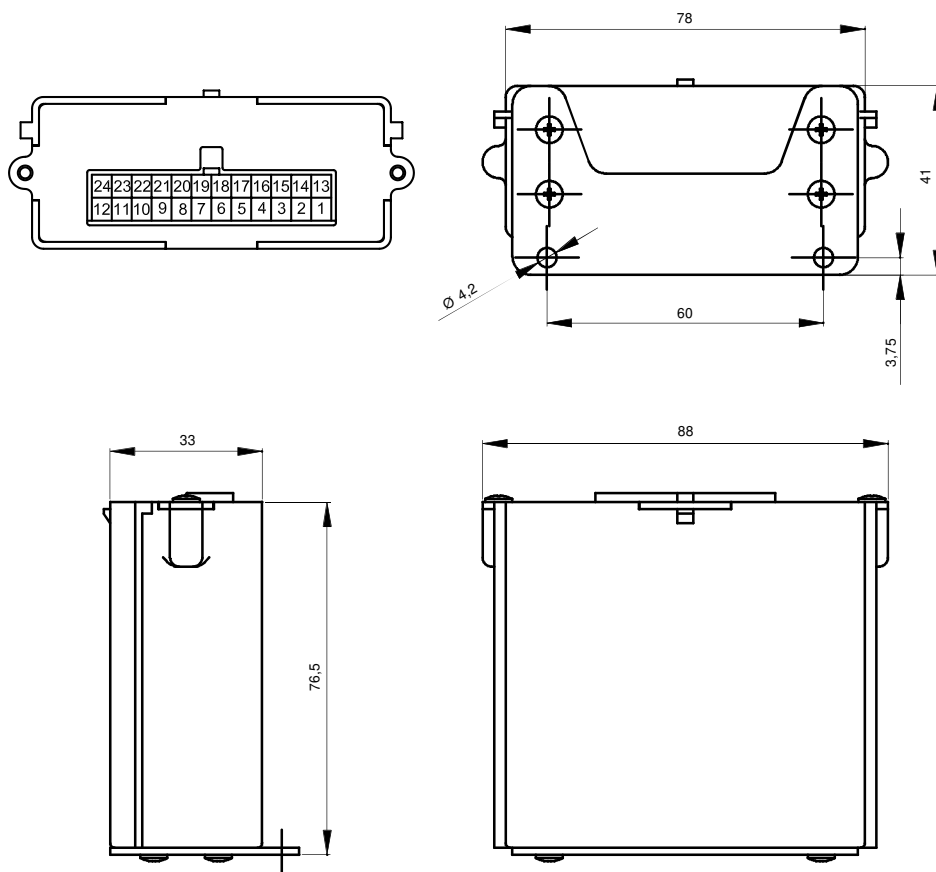
100mA typ. (no load)

Operating Temp.

-40°C ... +80°C

Connector

24 pin connector



MO 690 - H1X - SXXXX

CAN Output	
SAE J1939	S1000
CANopen	S1100
*	

Hardware Configurations

H10 - 2 Analog Inputs, 1 Current Input, 16 Low Side Outputs

H11 - 18 Analog Inputs, 1 Active-Low Input

H12 - 10 Analog Inputs, 1 Digital Input, 8 High Side Outputs

* Available upon request with minimum order quantity.

Example : MO 690 - H10 - S1000 is 2 Analog Inputs, 1 Current Input, 16 Low Side Outputs I/O Module with SAE J1939 interface.

RELAY OUTPUT EXTENSION MODULE MO 690 HAX



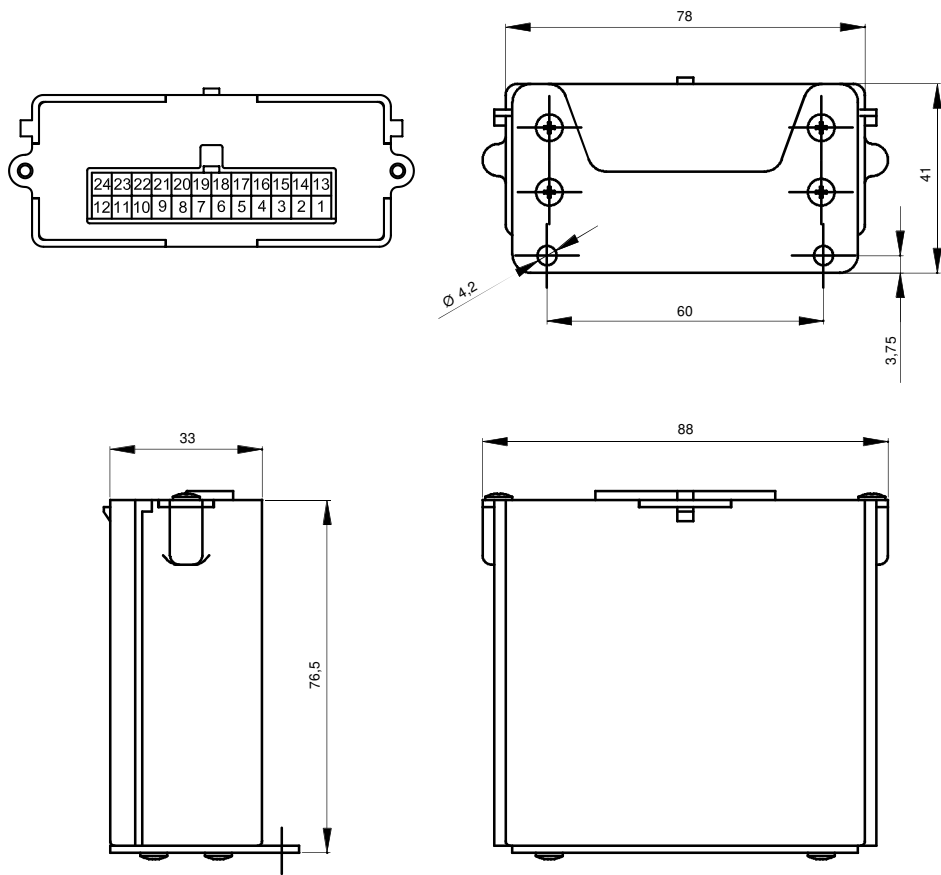
Technical Data

Features

High output current capability (4x10A + 1x15A)
Output protection with automotive mini blade fuse
Reduces EMI and length of high current cables by locating module near to load
Relays can be driven from Low side outputs or switches connected to ground
Enclosure can be easily opened for custom fuse installation and replacement
Low cost compact and versatile relay module

Casting Material
Operating Voltage
Operating Temp.
Connector

GF 30 % Polyamid
12V or 24V
-40°C ... +80°C
24 pin Connector



MO 690 - HAX

Hardware Configurations

HA0 - 4 Relay Outputs 8A, 1 Relay Output 15 A, Supply: 24V
HA1 - 4 Relay Outputs 8A, 1 Relay Output 15 A, Supply: 12V

Example : MO 690 - HA0 is 4 Relay Outputs 8A, 1 Relay Output 15 A, Supply: 24V Relay Output Extension Module.

RELAY OUTPUT EXTENSION MODULE MO 690 HBX



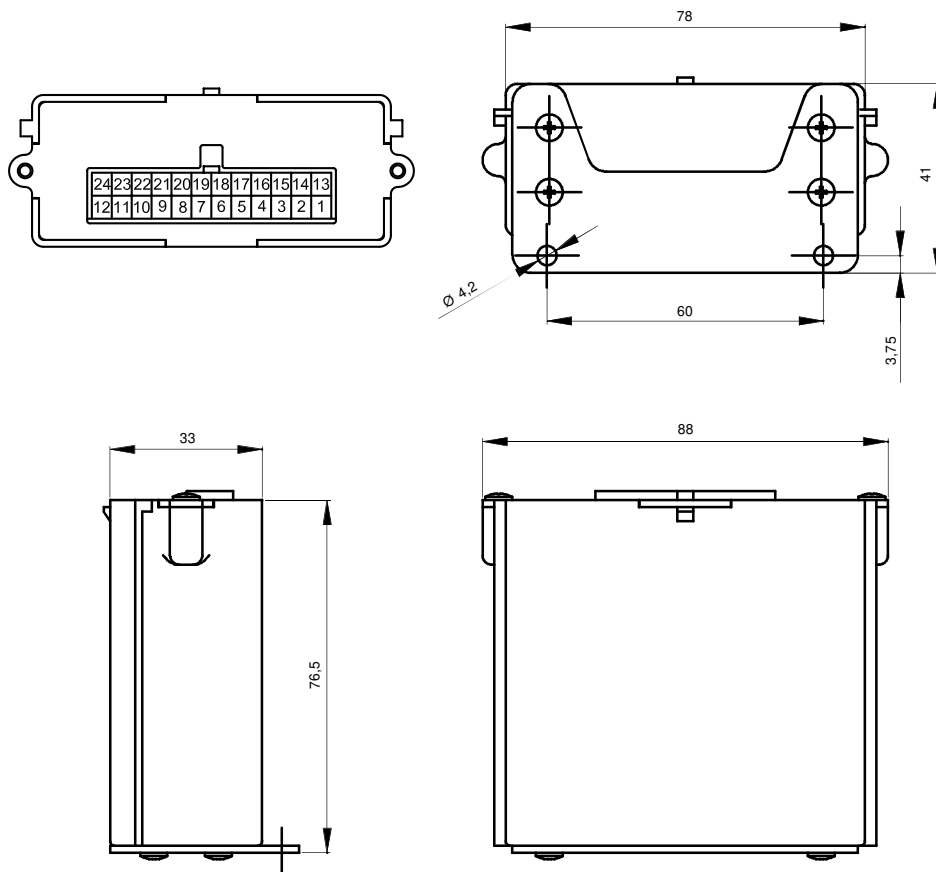
Technical Data

Features

High output current capability (8x5A)
Output protection with automotive mini blade fuse
Reduces EMI and length of high current cables by locating module near to load
Relays can be driven from Low side outputs or switches connected to ground
Enclosure can be easily opened for custom fuse installation and replacement
Low cost compact and versatile relay module

Casting Material
Operating Voltage
Operating Temp.
Connector

GF 30 % Polyamid
12V or 24V
-40°C ... +80°C
24 pin Connector



MO 690 - HBX

Hardware Configurations

HB0 - 8 Relay Outputs 5A, Supply: 24V
HB1 - 8 Relay Outputs 5A, Supply: 12V

Example : MO 690 - HB0 is 8 Relay Outputs 5A, Supply: 24V Relay Output Extension Module.

FET OUTPUT EXTENSION MODULE MO 690 HCX



Technical Data

Features

High output current capability
Smart high-side switches with overcurrent/overtemperature and short circuit protection
Integrated free-wheeling diode for inductive loads
Reduces EMI and length of high current cables by locating module near to load
Controlled by Active High or Active Low inputs
Low cost compact and versatile switch module

Supply Voltage

8-32V

Switch Resistance

30 mΩ

Digital Outputs

Up to 6 High-Side Switches

Output Current

10A for resistive load , 5A for inductive load (max.per ch)

Switching Frequency

100 Hz at 10A, 500 Hz at 5A (max.)

Housing Material

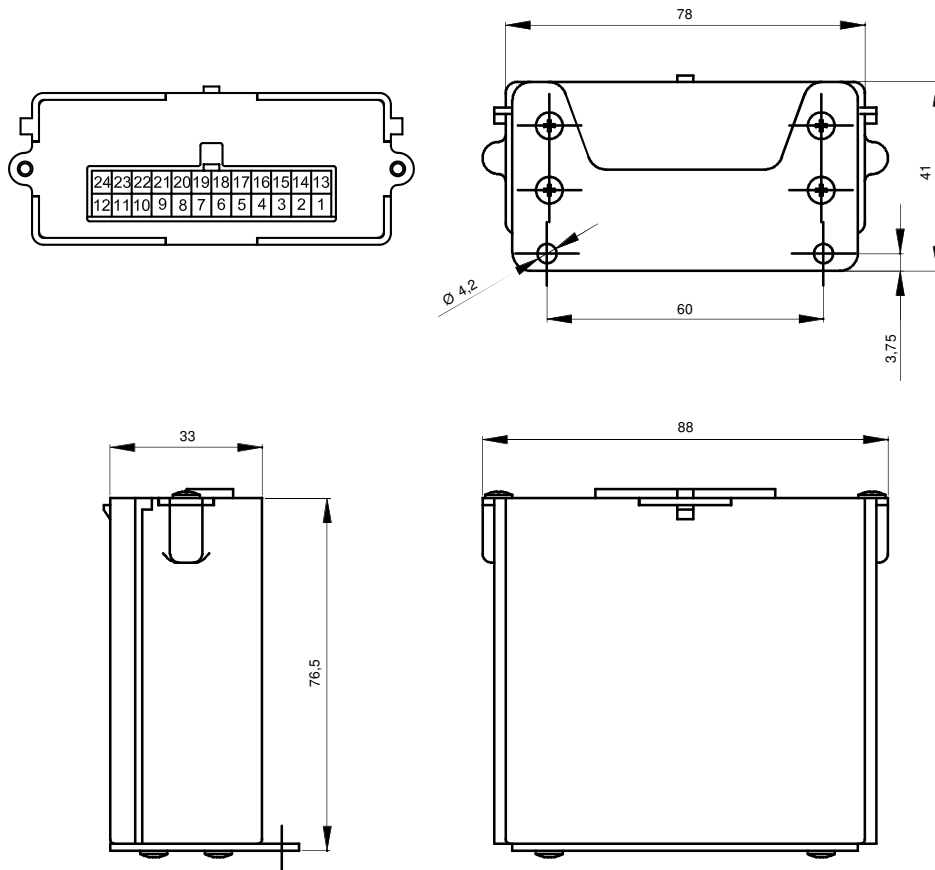
% 30 GF Reinforced Polyamide Plastic Case

Connector

24 Pin MOLEX 39-01-2245 (Terminal: MOLEX 39-00-0038)

Ingress Protection

IP30



MO 690 - HCX

Hardware Configurations

HC0 - 6 High-Side Outputs, 6 Active-Low Inputs, Supply 8-32V
HC1 - 4 High-Side Outputs, 4 Active-Low Inputs, Supply 8-32V
HC2 - 2 High-Side Outputs, 2 Active-Low Inputs, Supply 8-32V
HC3 - 6 High-Side Outputs, 6 Active-High Inputs, Supply 8-32V
HC4 - 4 High-Side Outputs, 4 Active-High Inputs, Supply 8-32V
HC5 - 2 High-Side Outputs, 2 Active-High Inputs, Supply 8-32V

* Available upon request with minimum order quantity.

Example : MO 690 - HC0 is 6 High-Side Outputs, 6 Active-Low Inputs FET Output Extension Module

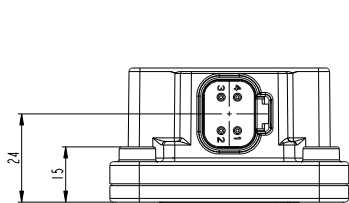
VALVE DRIVER with CAN Bus

MO 699 H1X

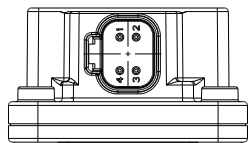
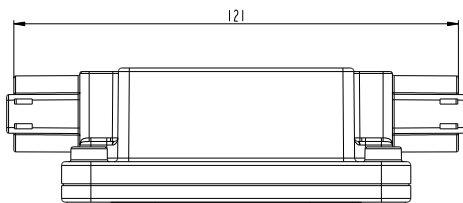


Technical Data

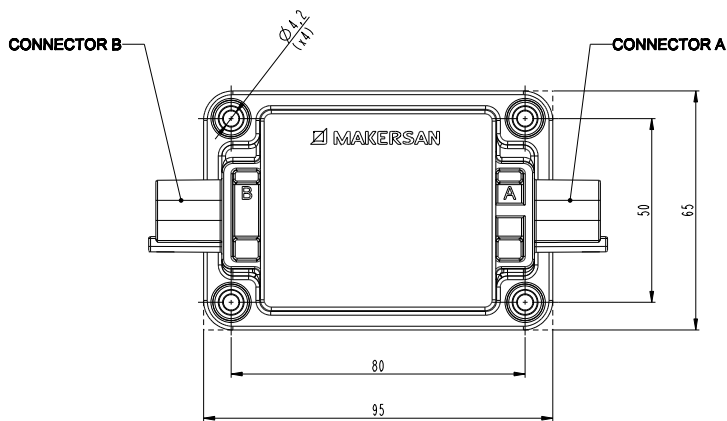
Features	User Configurable or Custom Software
	USB to CAN interface for device configuration
	Software selectable inputs
	Up to 4 Digital Inputs
	Up to 4 analog Inputs
	Up to 2 Frequency Inputs
	Up to 2 resistive Inputs
	Up to 2 current Inputs
	Up to 4 proportional outputs (max. 2.2A/ch, max. with current sense feedback)
Communication	SAE J1939 or CANopen interface
Casting Material	GF 30 % Polyamid
Operating Voltage	8-32V
Power Consumption	80mA typ. (no load)
Operating Temp.	-40°C ... +80°C
Protection Class	IP67
Connector	2 x 4 pin Deutsch DT Connector



VIEW
CONNECTOR B



VIEW
CONNECTOR A



MO 699	- H1X	- SXXXX	
			CAN Output SAE J1939 S1000 CANopen S1100 *

Hardware Configurations

H10 - 2 Software Selectable Analog/Current/Frequency Inputs, 2 Proportional Outputs, Supply: 8-32V

* Available upon request with minimum order quantity.

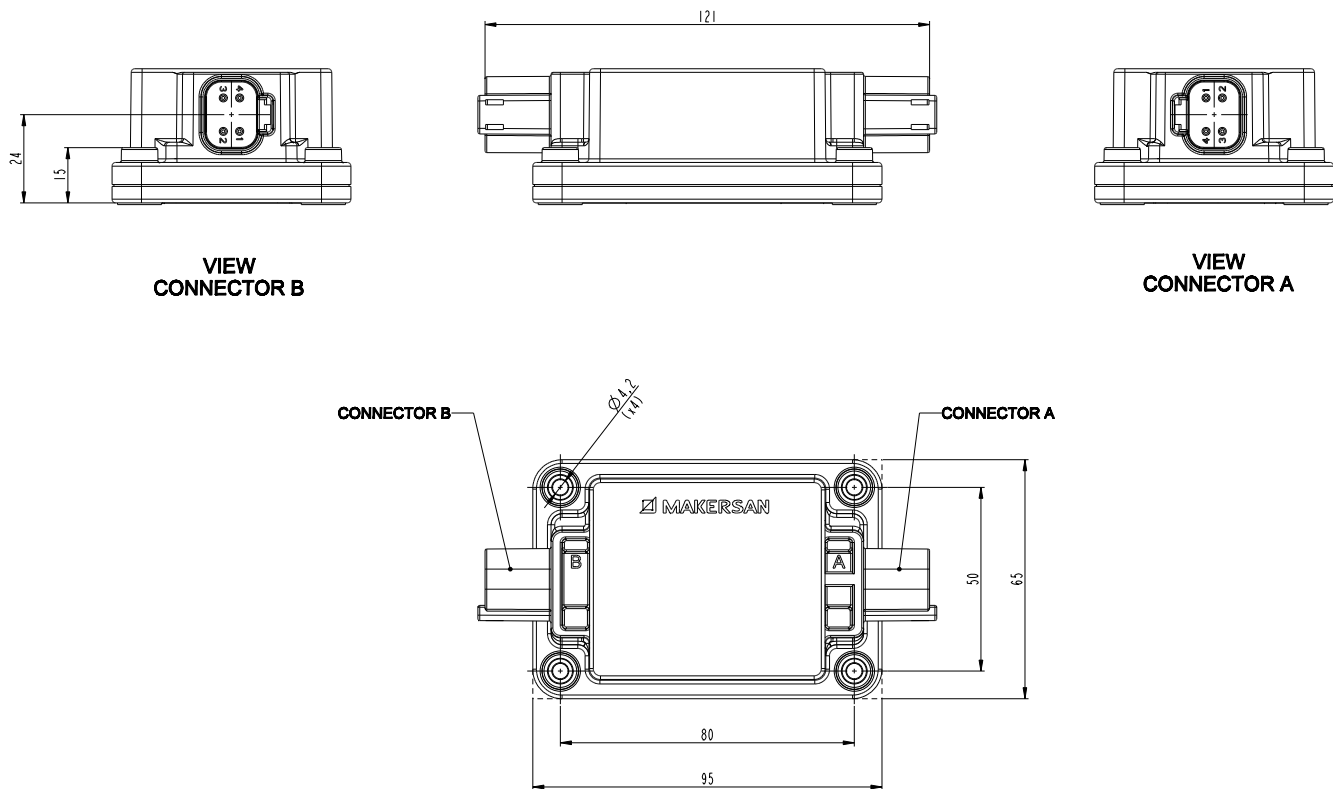
Example : MO 699 - H10 - S1000 is 2 Software Selectable Analog/Current/Frequency Inputs, 2 Proportional Outputs Valve Driver Module with SAE J1939 interface.

MOTOR DRIVER
MO 699 H2X



Technical Data

Features	User Configurable or Custom Software
	USB to CAN interface for device configuration
Communication	Software selectable inputs
	Up to 4 digital inputs
	Up to 4 analog inputs
	Up to 1 frequency/PWM inputs
	Up to 1 resistive inputs
	Up to 1 current inputs
	Up to 1 DC Motor
	Up to 1 BLDC Motor
Casting Material	SAE J1939 or CANopen interface
Operating Voltage	GF 30 % Polyamid
Power Consumption	8-32V
Operating Temp.	80mA typ. (no load)
Protection Class	-40°C ... +80°C
Connector	IP67
	2 x 4 pin Deutsch DT Connector



MO 699 - H2X - SXXXX

CAN Output	
SAE J1939	S1000
CANopen	S1100
*	

Hardware Configurations
H20 - 1 Software Selectable Analog/Current/Frequency Input, 3 Motor Outputs, Supply: 8-32V

* Available upon request with minimum order quantity.

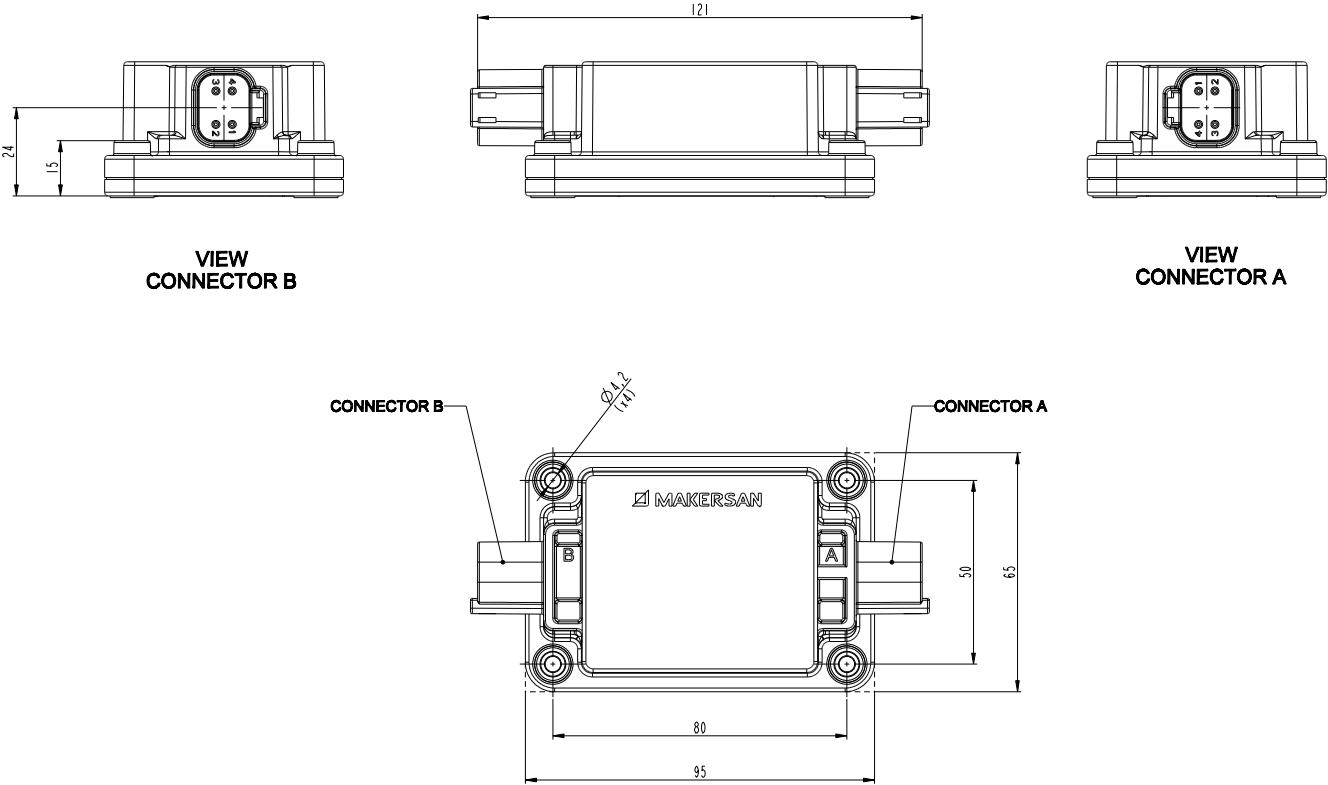
Example : MO 699 - H20 - S10 is 1 Software Selectable Analog/Current/Frequency Input, 3 Motor Outputs Motor Driver Module with SAE J1939 interface.

START STOP Regulator MO 780 H1X



Technical Data

Application	Automotive Start-Stop and Cold Crank
Input Voltage	4.5 - 18 VDC
Output Voltage	9 ± 0.5 VDC
Converter ON:	If input voltage is > 8.5 ± 0.3 V, converter is in Bypass Mode.
Converter OFF (Bypass Mode):	In Bypass Mode: Output voltage = Input Voltage
Output Current	H10: 90 W H11: 150 W
Line Regulation	<%1
Load Regulation	<%2
Switching Frequency	100 kHz (typ.)
Ripple & Noise	250 mV (avg.)
Efficiency	%85 (typ.)
Reverse Battery Protection	Provided
Operating Temperature	-40°C ... +85°C
Casting Material	GF 30 % Polyamid
Protection Class	IP67



MO 780 - H1X

Hardware Configurations
H10 - Standart
H11 - High Current

* Available upon request with minimum order quantity.

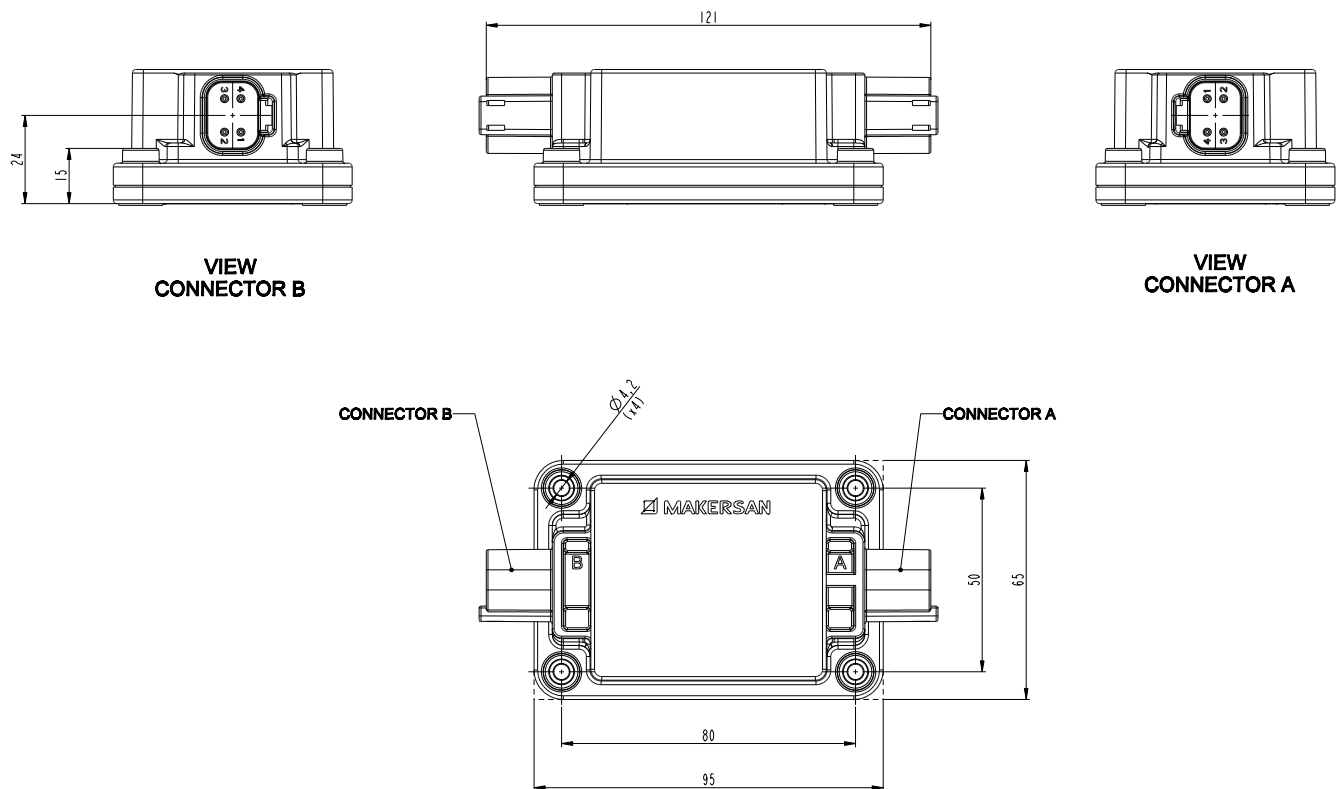
Example : MO 780 - H10 Start-Stop Regulator

DC-DC (60V) Regulator MO 780 H2X



Technical Data

Feature	High efficiency non-isolated solution
Input Voltage	H20: 8 - 54 VDC, H21: 15 - 54 VDC, H22: 27 - 54 VDC
Output Voltage	H20: 5 ± 0.1 V , H21: 12 ± 0.1 V , H22: 24 ± 0.1 V
Output Current	100 W or 200 W
Line Regulation	<%1
Load Regulation	<%1
Switching Frequency	275 kHz (typ.)
Ripple & Noise	300 mV (avg.)
Efficiency	%70 (typ.)
Reverse Battery Protection	Provided
Operating Temperature	-40°C ... +85°C
Casting Material	GF 30 % Polyamid
Protection Class	IP67



MO 780 - H2X

Hardware Configurations
H20 - 5V Output
H21 - 12V Output
H22 - 24V Output

* Available upon request with minimum order quantity.
Example : MO 780 - H20 5V Output DC-DC Regulator

ARMREST



- Fully customizable and programmable
- All data exported via CAN Bus
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