MAKERSAN

STRENGTH +++++

IN EVERY PART,

quality in every detail!

MECHATRONIC PRODUCT CATALOG

Partners

Strong Partnerships & Reliable Solution.

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Our Certifications

CERTIFIED ISO 9001:2015 COMPANY

CERTIFIED ISO 14001:2015 COMPANY

CERTIFIED ISO 45001:2018 COMPANY

nqa. IATF 16949

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

Control Levers & Knobs

Smart Mobile & Field Solutions

Joysticks

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Joystick Grip
MO 394

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Joystick Grip
MO 387

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Joystick Mini
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Joystick Micro
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Single Axis Joystick
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Thumbwheel
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Buttons

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Push Button
MO 392 H1X

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Push Button
MO 392 H2X

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Touch Button
MO 400

Remote Keyless Entry

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RKE Seal (1 Zone)
MO 651 H1X

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RKE Unseal (1 Zone)
MO 651 H4X

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RKE Seal (3 Zone)
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DC Motor Actuator
MO 055

Smart Mobile & Field Solutions

Keypads & Joystick Keypads

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Keypad
MO 405 H1X

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Keypad
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Rotary Position Sensor
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Position Sensor
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Temperature Sensor
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HMI 7"
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HMI 4.3"
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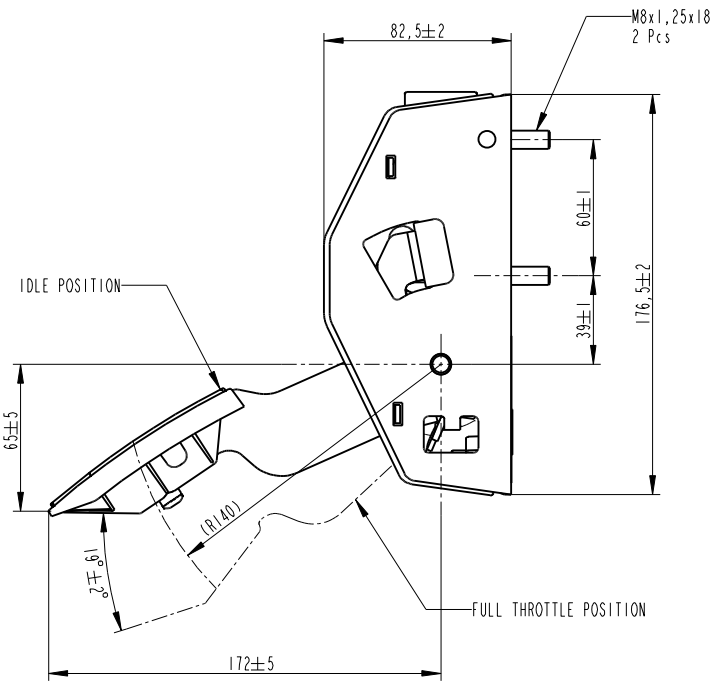
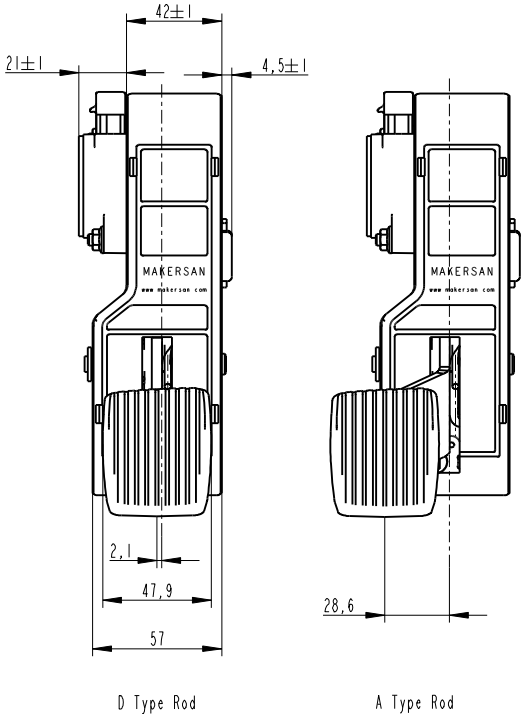
I/O Modules & Controllers

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





MO 126 - X - X - PXXX

X	X	PXXX
Pedal Rod Type **A -** A Type **D -** D Type *	**Kickdown** **0 -** Without Kickdown **1 -** With Kickdown	**Sensor Program** **P009 -** Dual Analog P009 *

* Different types and values can be produced on request.

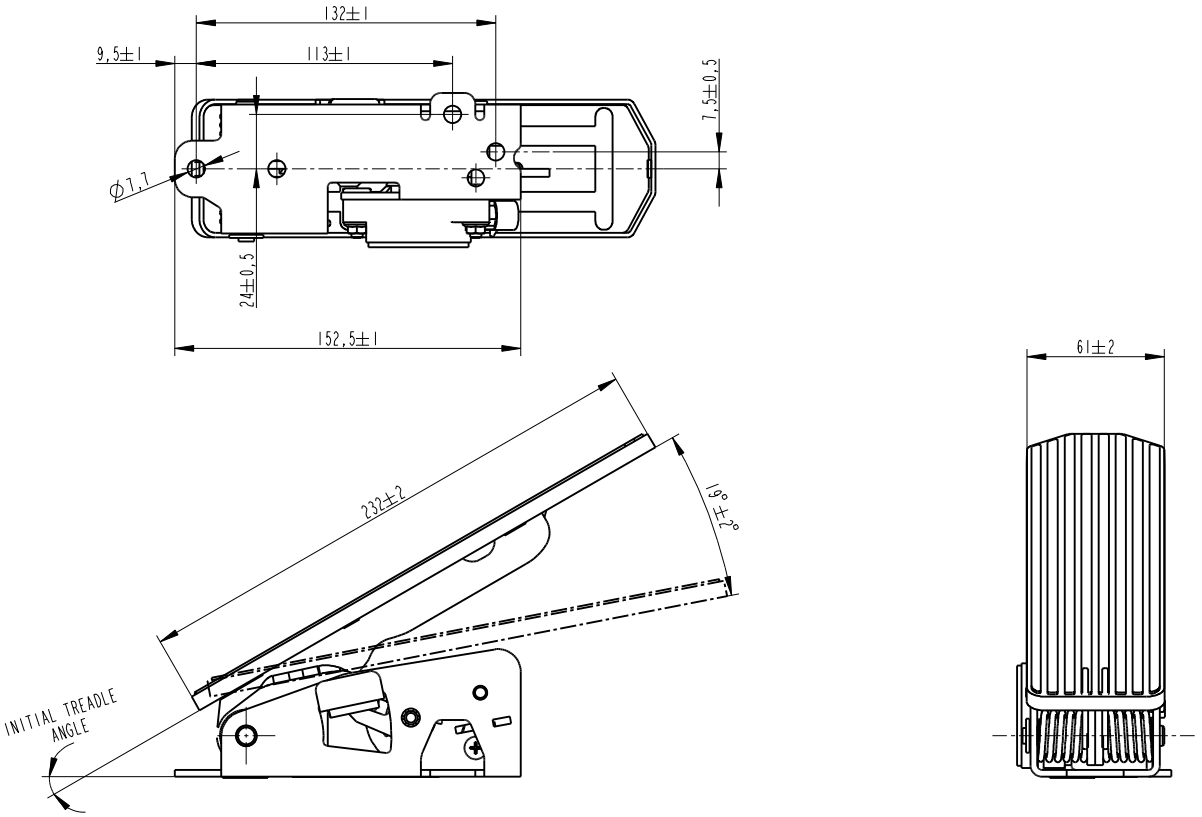
Example: MO 126-D-1-P009 is D type rod, with kickdown, sensor prog. 009(Dual Analog)

ACCELERATOR PEDAL
MO 129L

MAKERSAN

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	Kickdown	Sensor Program
1- 30° **2-** 35° **3-** 40° **4-** 45°	**0 -** Without Kickdown **1 -** With Kickdown	**P009 -** Dual Analog P009 *

* Different types and values can be produced on request.

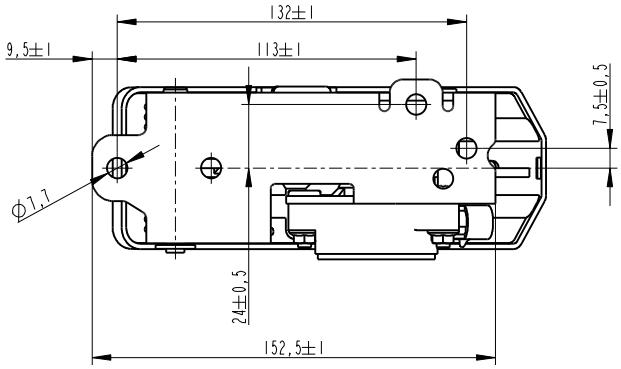
Example: MO 129L-1-1-P009 is 30° initial treadle angle, with kickdown, sensor prog. 009(Dual Analog)

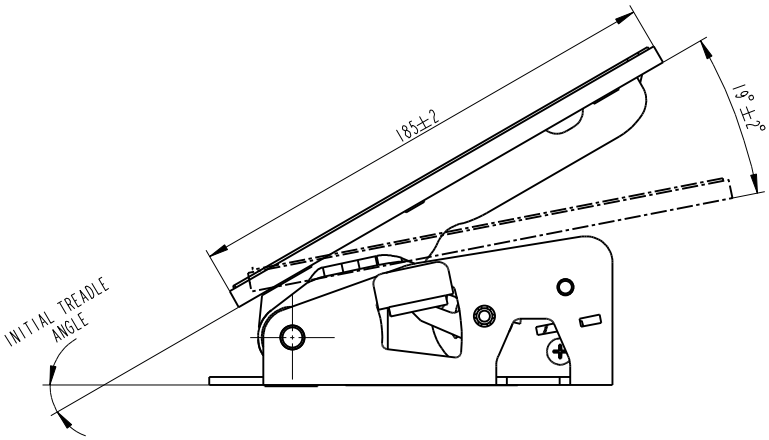
ACCELERATOR PEDAL
MO 129S

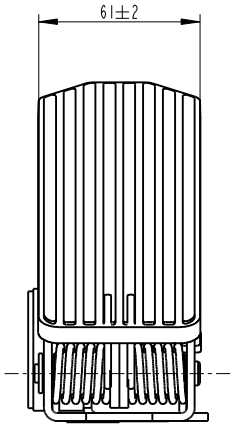
MAKERSAN

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	0.95 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 129S - X - X - PXXX

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.

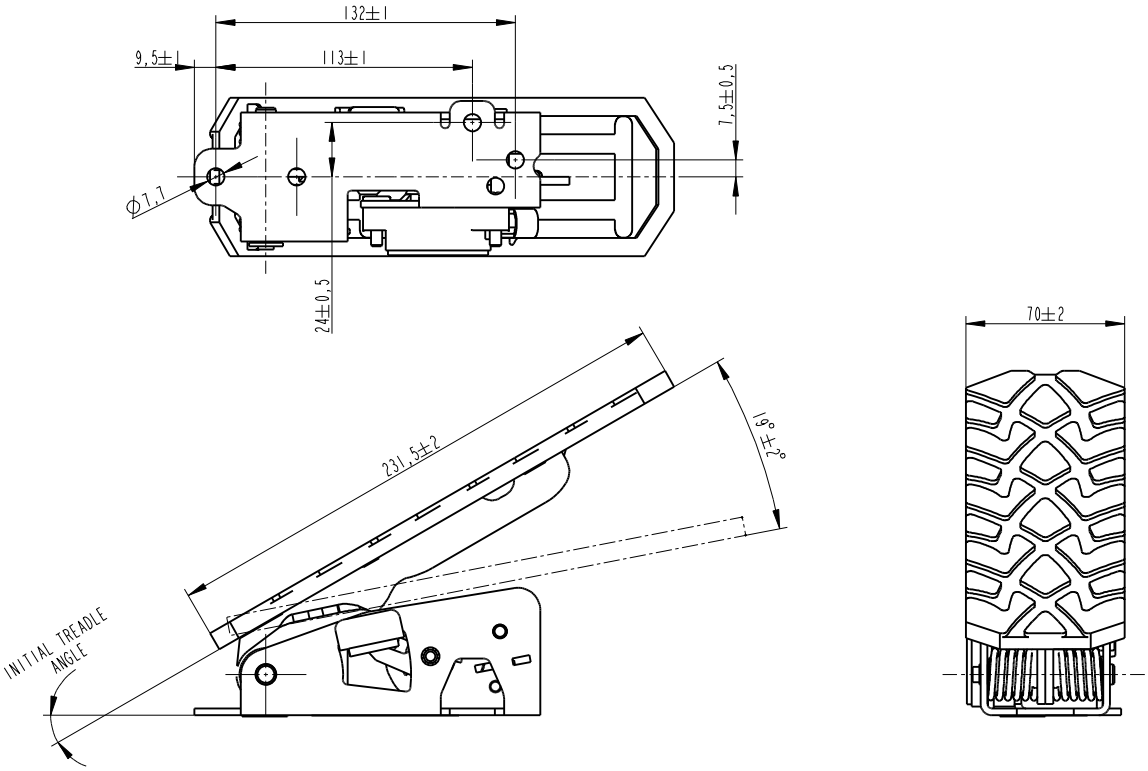
Example: MO 129S-1-1-P009 is 30° initial treadle angle, with kickdown, sensor prog. 009(Dual Analog)

ACCELERATOR PEDAL
MO 129LW

MAKERSAN

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 - X - X - PXXX

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

* Different types and values can be produced on request.

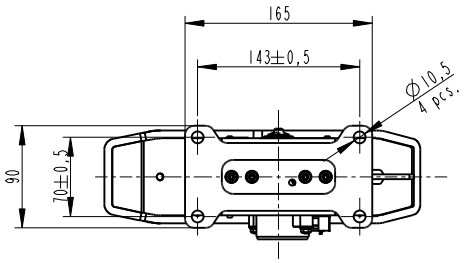
Example: MO 129LW-1-1-P009 is 30° initial treadle angle, with kickdown, sensor prog. 009(Dual Analog)

ACCELERATOR PEDAL
MO 367

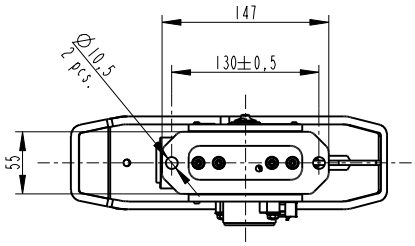
MAKERSAN

Technical Data

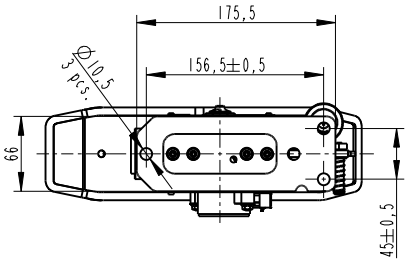
Engines	Suitable for different engine interfaces
Technology	Contactless measuring principle
Output	Single or Double full redundant programmable outputs Single / Dual Analog type : 0-5V / 4-20mA / PWM Analog+IVS type : Analog+Highside or Lowside Switch CAN Type : SAE J1939
Output Type	CAN, Analog, PWM, 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	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



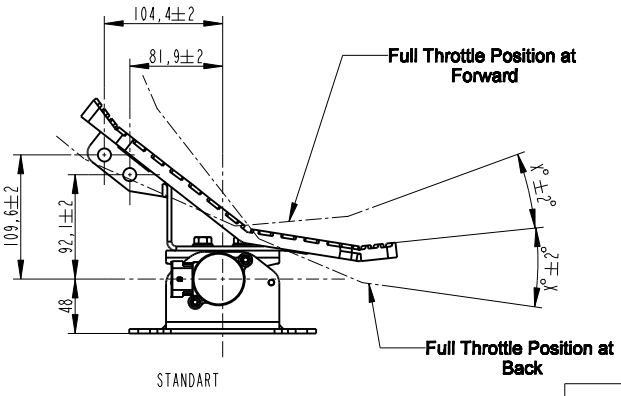
MO 367 - S_1_X_PXXX

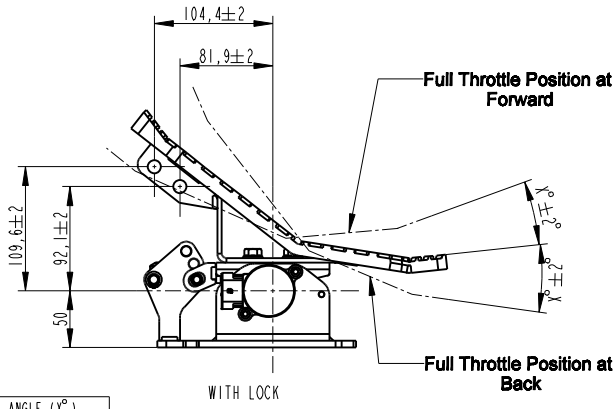


MO 367 - H_1_X_PXXX



MO 367 - L_1_X_PXXX





TRAVEL ANGLE (X°)		
1	10° Forward	10° Back
2	14° Forward	14° Back

MO 367 - X - X - X PXXX

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

* Different types and values can be produced on request.

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

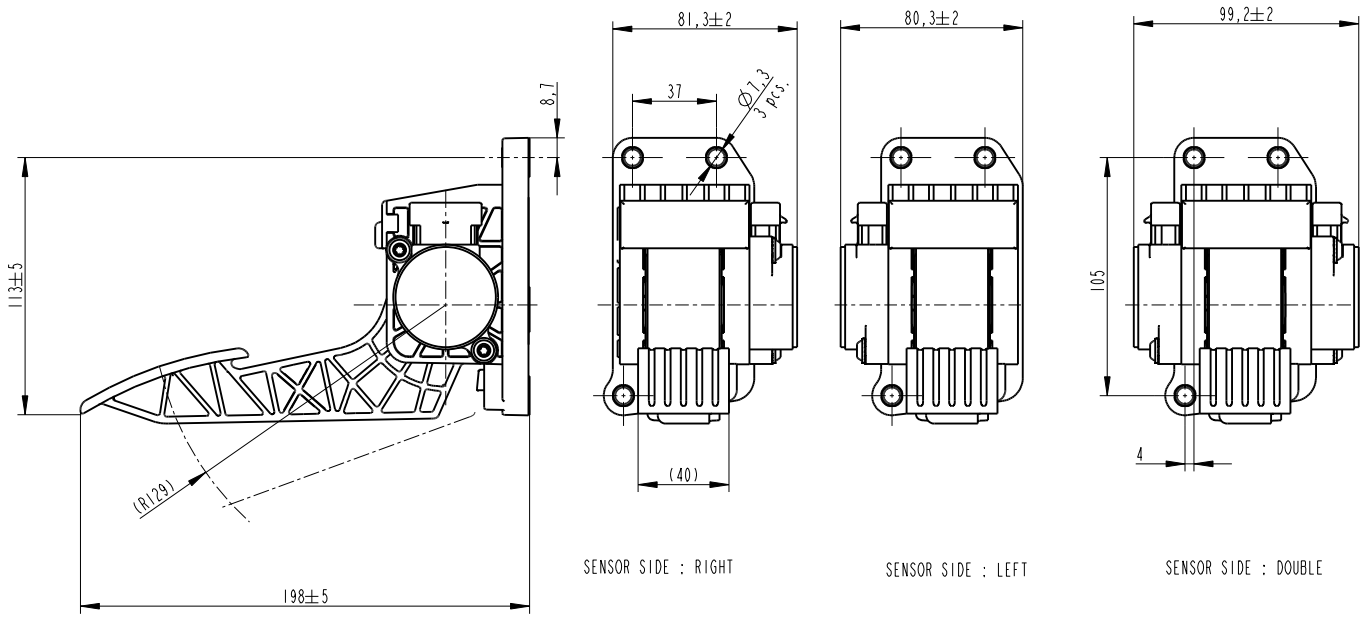
Example: MO 367-S-1-2-P009 is standart connection type, pad type 1, travel angle 14° sensor prog. 009(Dual Analog)

ACCELERATOR PEDAL
MO 370

MAKERSAN

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)



MO 370 - X - X - X - PXXX

Pedal Rod Type
A - Type A

Kickdown
0 - Without Kickdown
1 - With Kickdown

Sensor Side
L - Left
R - Right
D - Double

Sensor Program
P009 - Dual Analog P009
*

* Different types and values can be produced on request.

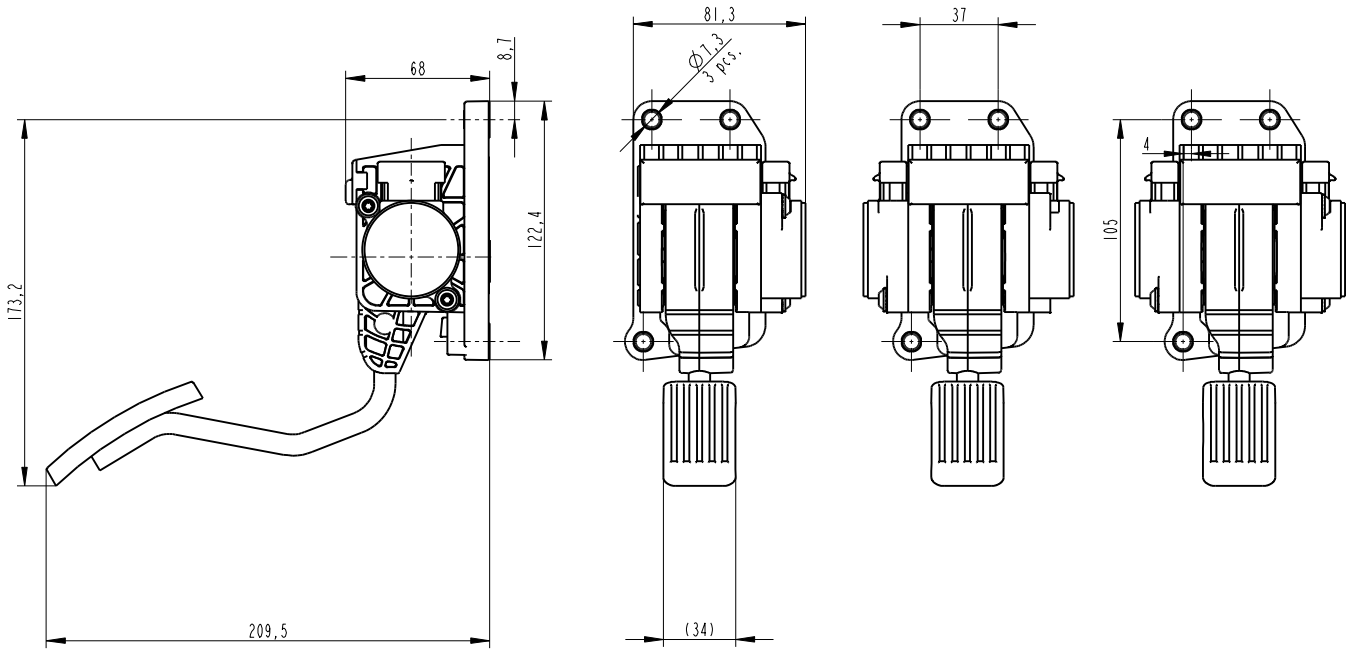
Example: MO 370-A-1-L-P009 is A type rod, with kickdown, left sensor, sensor prog. 009(Dual Analog)

ACCELERATOR PEDAL
MO 372

MAKERSAN

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)



SENSOR SIDE : RIGHT

SENSOR SIDE : LEFT

SENSOR SIDE : DOUBLE

MO 372 - X - X - X - PXXX

Pedal Rod Type
A - Type A
*

Kickdown
0 - Without Kickdown
1 - With Kickdown

Sensor Side
L - Left
R - Right
D - Double

Sensor Program
P009 - Dual Analog P009
*

* Different types and values can be produced on request.

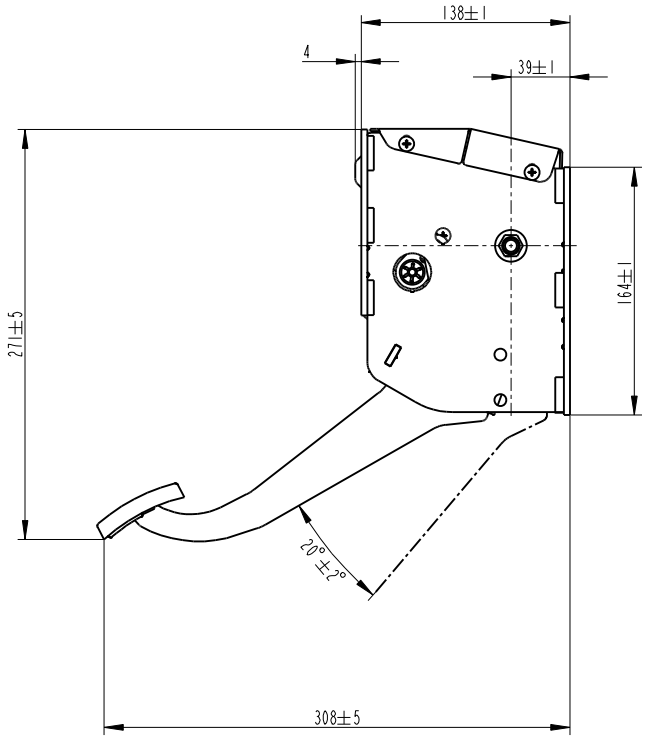
Example: MO 372-A-1-L-P009 is A type rod, with kickdown, left sensor, sensor prog. 009(Dual Analog)

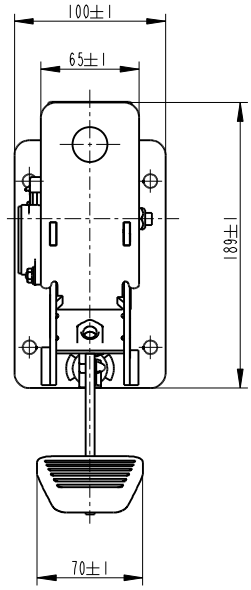
CLUTCH PEDAL
MO 381D

MAKERSAN

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	5 V or 8-32 V
Protective rating	IP6K9K Sensor
Counter connector	6 way, Delphi Packard Metric Pack 150
Mechanic	Two independent springs
Operating Angle	200
Operating Temp.	-40 0C ..... +85 0C
Actuations	Up to 1 million
Weight	3,4 kg
Housing material	Heavy duty metal case
Application	Commercial and off road vehicles





MO 381D - X - PXXX

Pedal Rod Type	Sensor Program
01 - Standart Type	**P009 -** Dual Analog P009
*	*

* Different types and values can be produced on request.

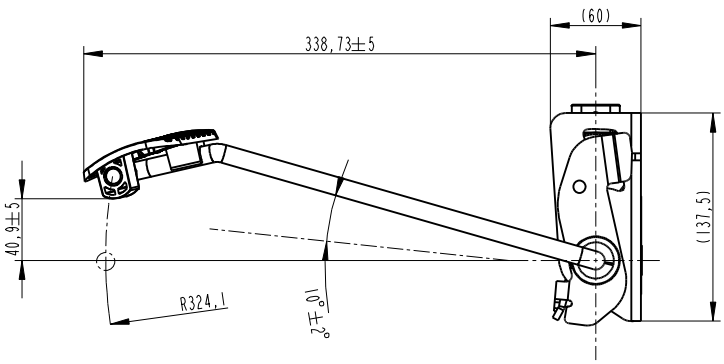
Example: MO 381D-01-P009 is standart type rod, sensor prog. 009(Dual Analog)

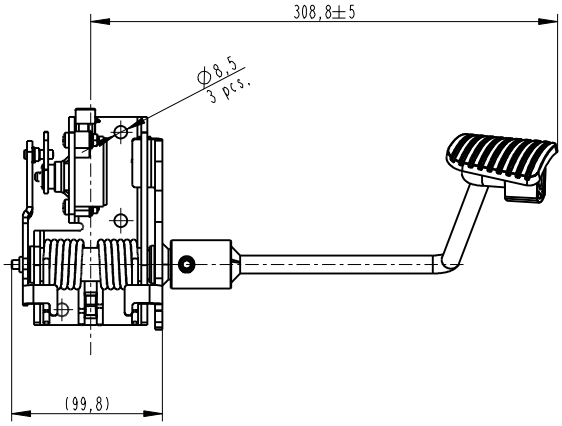
ACCELERATOR PEDAL
MO 382

MAKERSAN

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
Conterplug	6 way, Delphi Packard Metric Pack 150
Mechanic	Two independent springs
Operating Angle	10°
Operating Temp.	-40°C ... +85°C
Actuations	Up to 2 million
Weight	2.25 kg
Housing material	Heavy duty metal case
Application	Agricultural tractors and off road vehicles
Treadle	Spring rotational treadle for max. comfort





MO 382 - X - X - PXXX

Pedal Rod Type	Sensor Position	Sensor Program
C - C Type *	**V -** Vertical **H -** Horizontal	**P009 -** Dual Analog P009 *

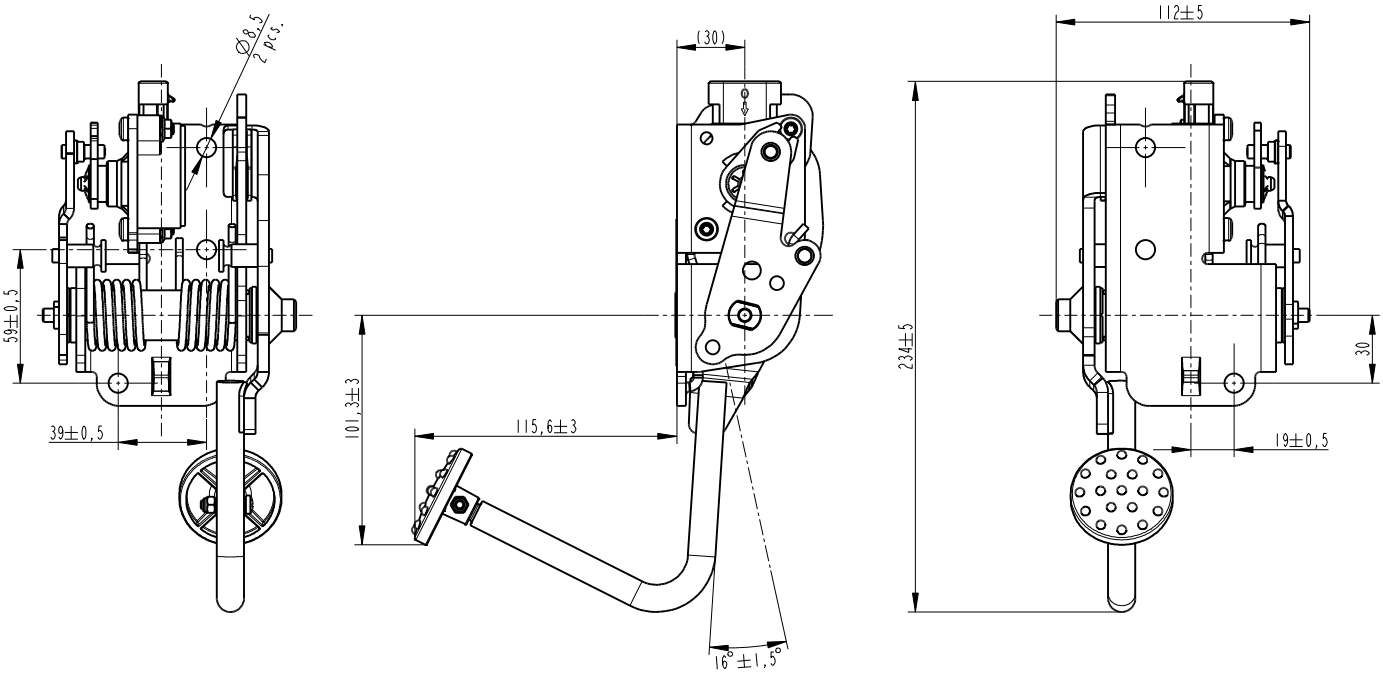
* Different types and values can be produced on request.

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



MO 383B - X - PXXX

X	PXXX
Pedal Rod Type **00 -** Standart Type *	**Sensor Program** **P009 -** Dual Analog P009 *

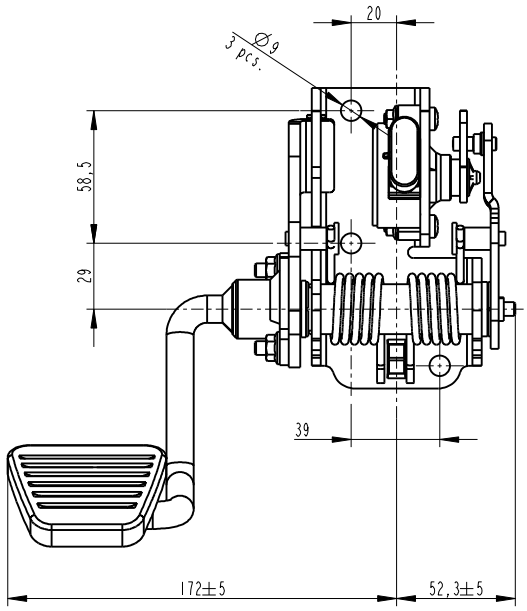
* Different types and values can be produced on request.

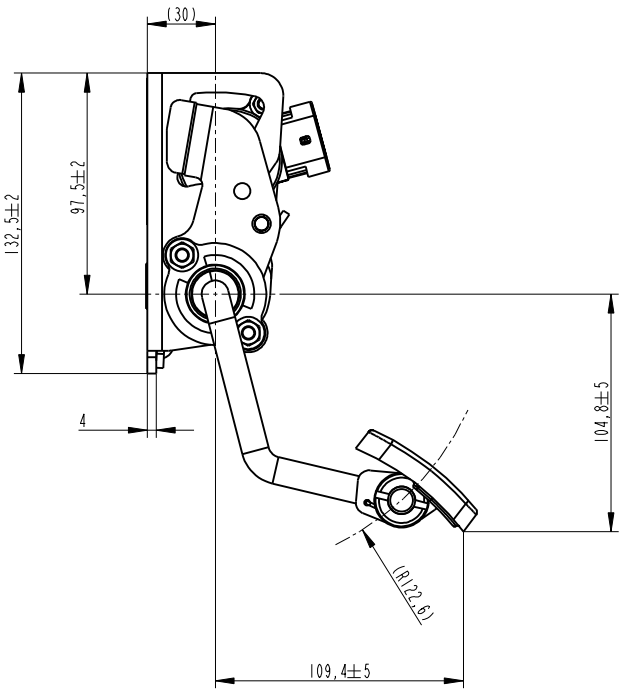
Example: MO 383B-00-P009 is standart type rod, sensor prog. 009(Dual Analog)

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
Output Type	Analog+IVS type : Analog+Highside or Lowside Switch
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	17°
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





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.

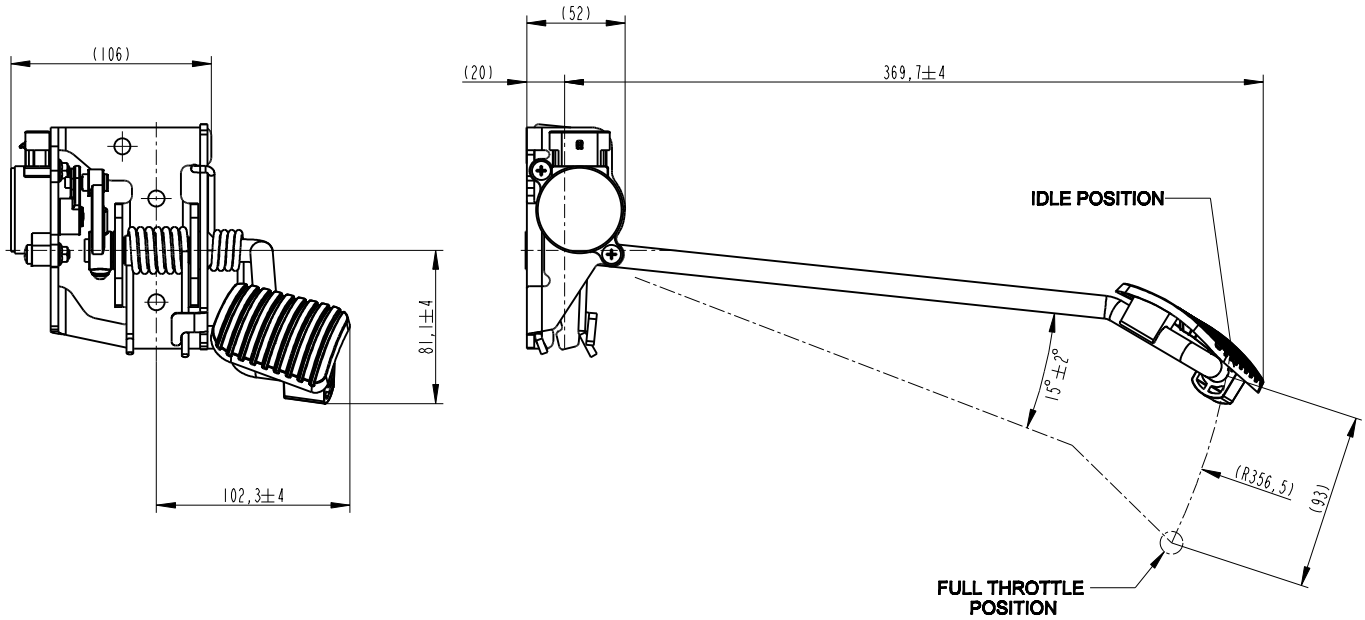
Example: MO 383D-1-H-P009 is with rod, horizontal sensor position, sensor prog. 009(Dual Analog)

ACCELERATOR PEDAL
MO 383T

MAKERSAN

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



MO 383T - X - PXXX

Pedal Rod Type	**Sensor Program**
C - Standart Type	**P009 -** Dual Analog P009
*	*

* Different types and values can be produced on request.

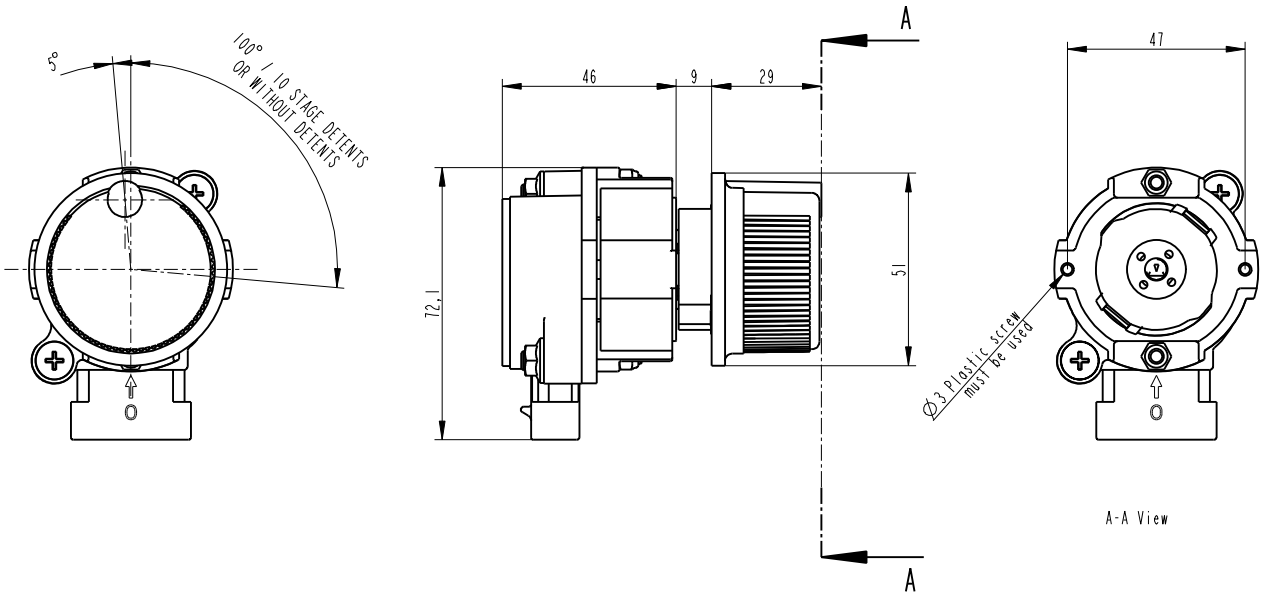
Example: MO 383T-C-P009 is standart type rod, sensor prog. 009(Dual Analog)

CONTROL LEVERS
MO 375A

MAKERSAN

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



MO 375A - X - PXXX

X	PXXX
Detends Y - With 10 Detends N - Without Detends	**Sensor Program** **P009 -** Dual Analog P009 *

* Different types and values can be produced on request.

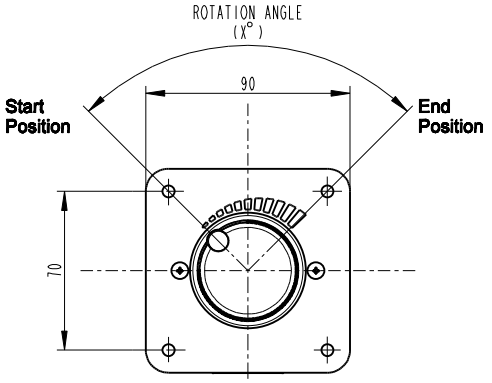
Example: MO 375A-Y-P009 is with 10 detends, sensor prog. 009(Dual Analog)

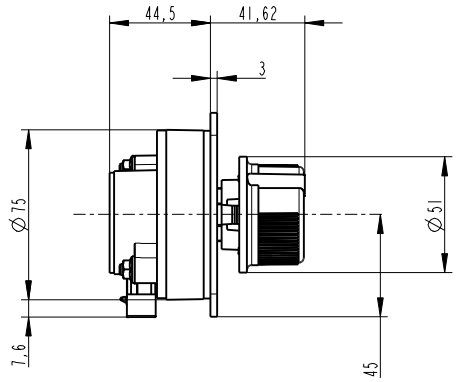
CONTROL LEVERS
MO 376A

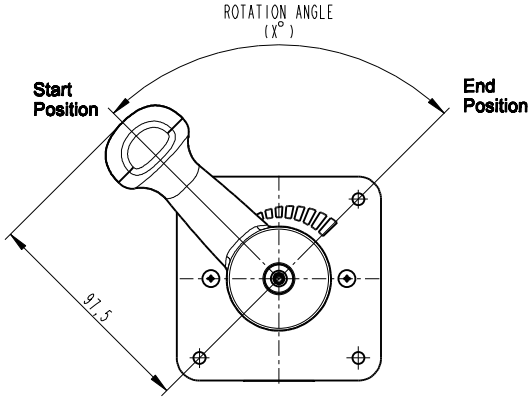
MAKERSAN

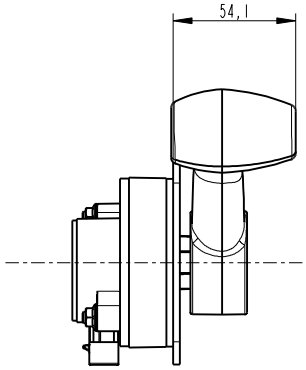
Technical Data

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









MO 376A - X - X - PXXX

Actuator
B - Button
H - Handle

Options
1 - Rotation Angle 90°
2 - Rotation Angle 180°
3 - Rotation Angle 180°, With 3 Detends
5 - Rotation Angle 180°, With 5 Detends
6 - Rotation Angle 90°, With 1 Detends
*

Sensor Program
P009 - Dual Analog P009
*

* Different types and values can be produced on request.

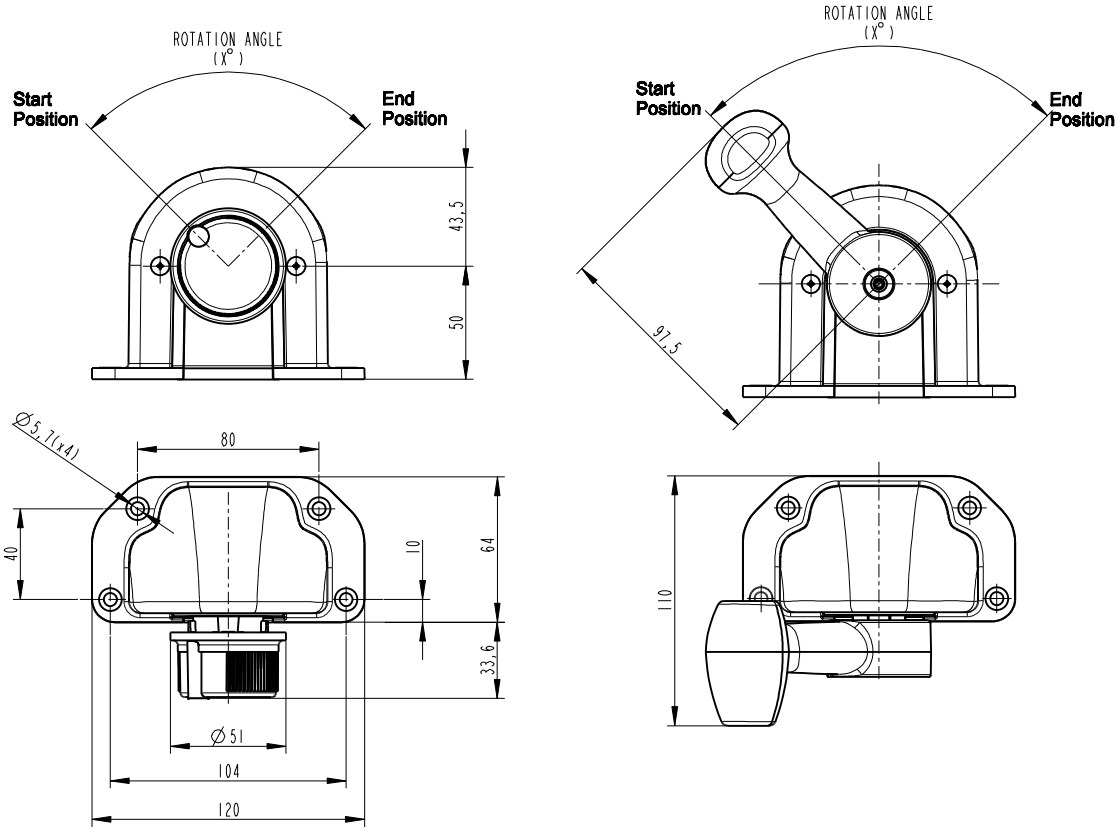
Example: MO 376A-B-1-P009 is button, rotation angle 90°, sensor prog. 009(Dual Analog)

CONTROL LEVERS
MO 376C

MAKERSAN

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



MO 376C - X - X - PXXX

Actuator
B - Button
H - Handle

Options
1 - Rotation Angle 90°
2 - Rotation Angle 180°
3 - Rotation Angle 180°, With 3 Detends
5 - Rotation Angle 180°, With 5 Detends
6 - Rotation Angle 90°, With 1 Detends
*

Sensor Program
P009 - Dual Analog P009
*

* 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

MAKERSAN

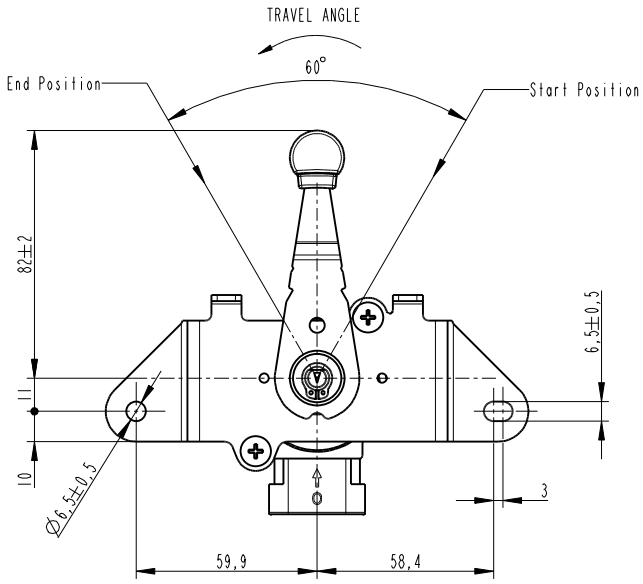
Technical Data

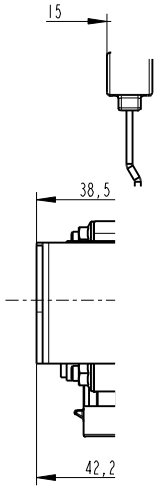
Technology	Contactless / Full redundant double die hall sensor
Angle Range	60° programmable (0.1° resolution)
Connector	6 way, Delphi Packard Metri Pack 150
Protection	Sensor IP6K9K sealed
Operating Temp.	-40°C ... +85°C
Lifetime	2 Million cycles
Supply Voltage	5V or 8-32V
Output	Programmable Outputs - 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	Rod Type	Sensor Program
1 - Front **2 -** Sub **3 -** Opposite	**1 -** Standart Rod *	**P009 -** Dual Analog P009 *

* Different types and values can be produced on request.

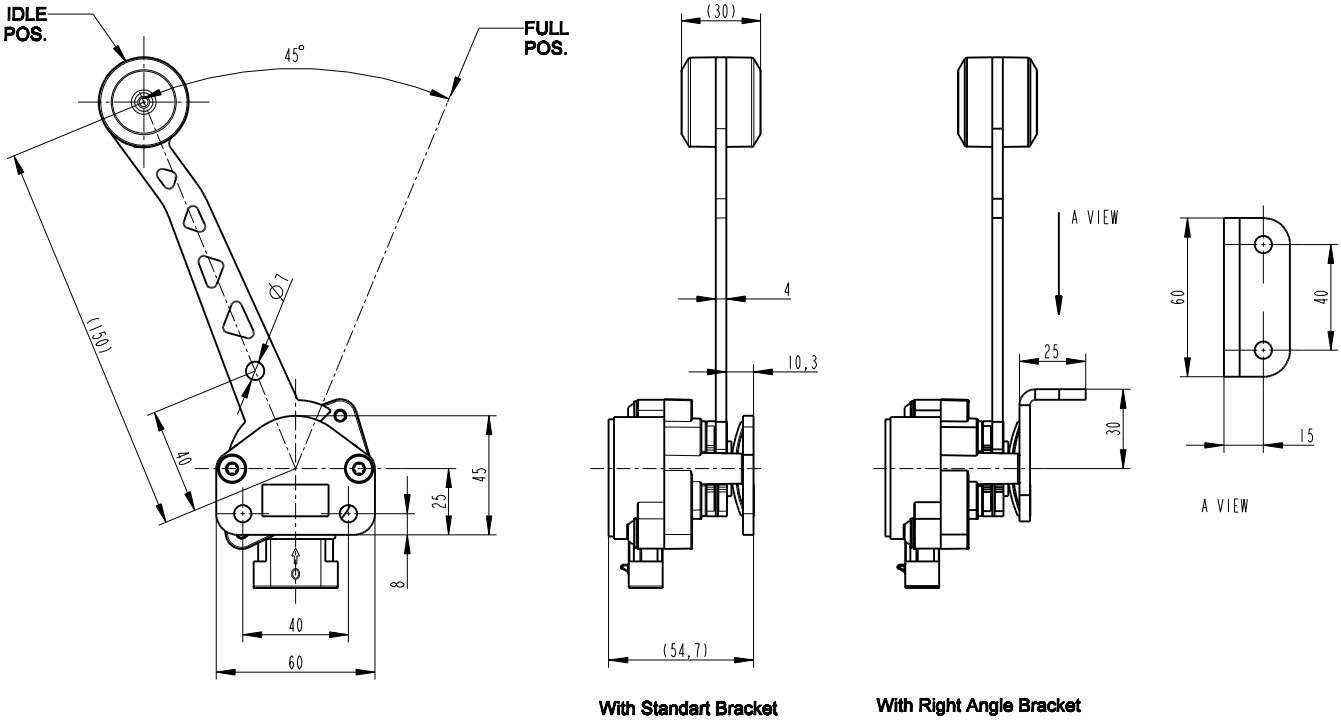
Example: MO 378-1-1-P009 is front mounting, standart rod, sensor prog. 009(Dual Analog)

CONTROL LEVERS
MO 378M

MAKERSAN

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



With Standart Bracket

With Right Angle Bracket

MO 378M - X - X - PXXX

Bracket	Lever Type	Sensor Program
1 - Standart **2 -** Right Angle	**1 -** Standart Lever	**P009 -** Dual Analog P009 *

* Different types and values can be produced on request.

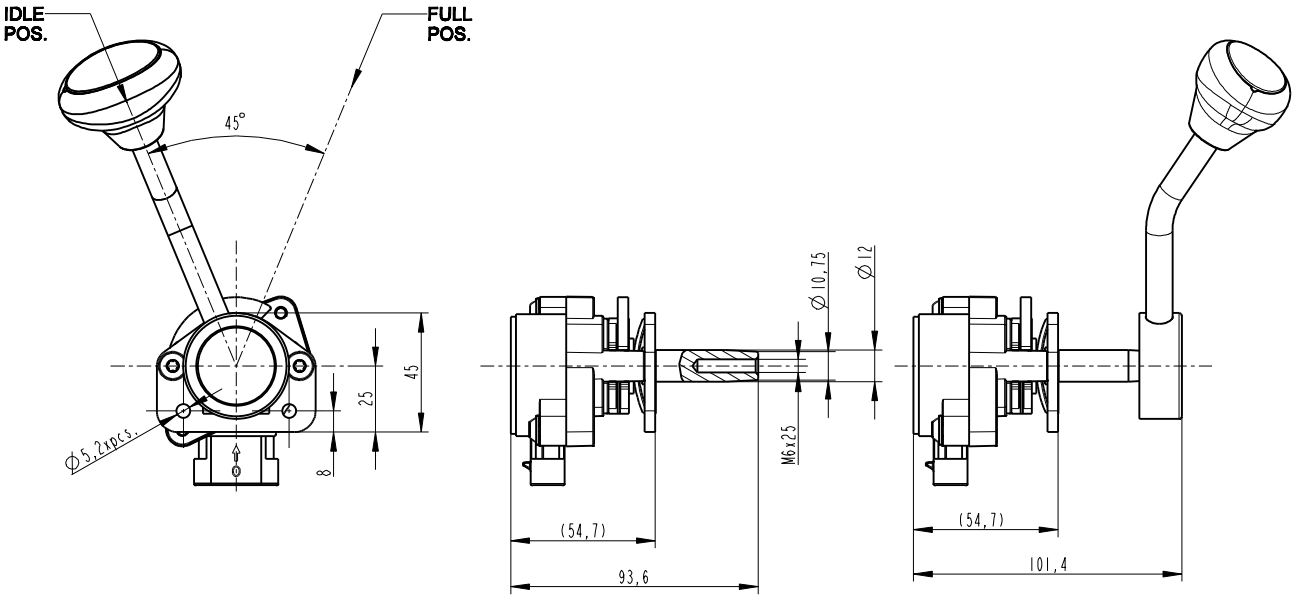
Example: MO 378M-1-1-P009 is standart bracket, standart lever, sensor prog. 009(Dual Analog)

CONTROL LEVERS
MO 378N

MAKERSAN

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



No Rod

With Rod

MO 378N - X - X - PXXX

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.

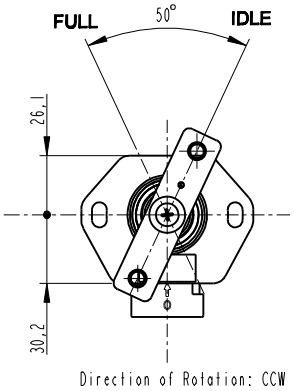
Example: MO 378N-1-1-P009 is standart bracket, with rod, sensor prog. 009(Dual Analog)

CONTROL LEVERS
MO 378S

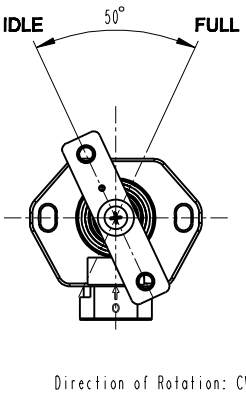
MAKERSAN

Technical Data

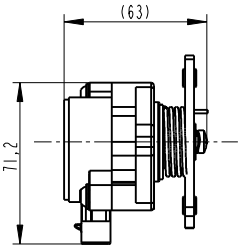
Technology	Contactless / Full redundant double die hall sensor
Angle Range	45° programmable (0.1° resolution)
Connector	6 way, Delphi Packard Metri Pack 150
Protection	Sensor IP6K9K sealed
Operating Temp.	-40°C ... +85°C
Lifetime	2 Million cycles
Supply Voltage	5V or 8-32V
Output	Programmable Outputs - 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

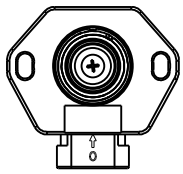


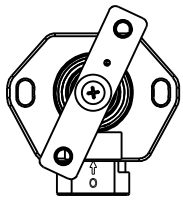
Direction of Rotation: CCW

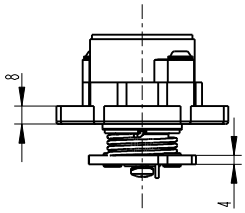


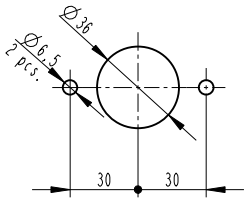
Direction of Rotation: CW



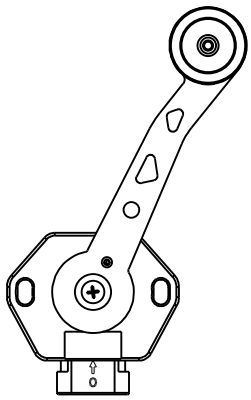

MO379S_0_X_PXXX


MO379S_1_X_PXXX





Mounting Pattern


MO379S_2_X_PXXX

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.

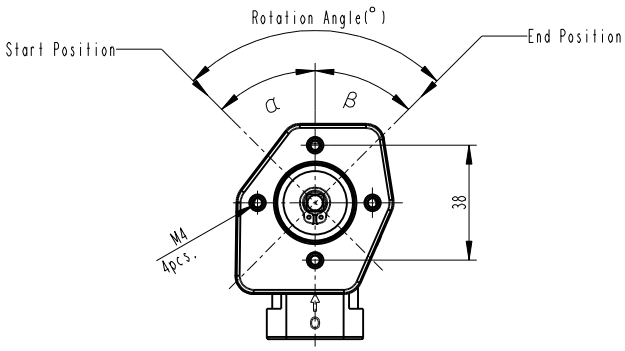
Example: MO 378S-1-1-P009 is double sided bracket, direction of rotation ccw, sensor prog. 009(Dual Analog)

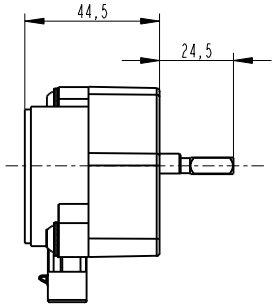
CONTROL LEVERS
MO 379

MAKERSAN

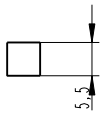
Technical Data

Technology	Contactless / Full redundant double die hall sensor
Angle Range	90°,180° or with detemds 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, 500.000 cycles with detent
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





Shaft Type Square: □5,5



Shaft Type D: ∅6

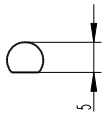
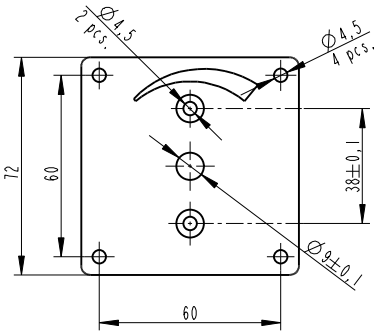
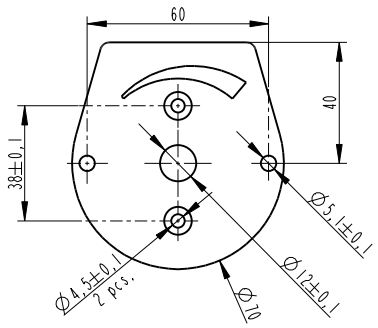
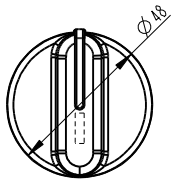


Plate Type 1	Plate Type 2	Knob Type 1
		

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° / ß= 45°)
1 - 180° (α=90° / ß= 90°)
2 - 60° with 3 detents (α=30° / ß= 30°)
3 - 120° with 5 detends (α=60° / ß= 60°)
4 - 90° with 4 detends (α=60° / ß= 30°)

Shaft Type
1 - Type Square
2 - Type D

Sensor Program
P009 - Dual Analog P009
*

* Different types and values can be produced on request.

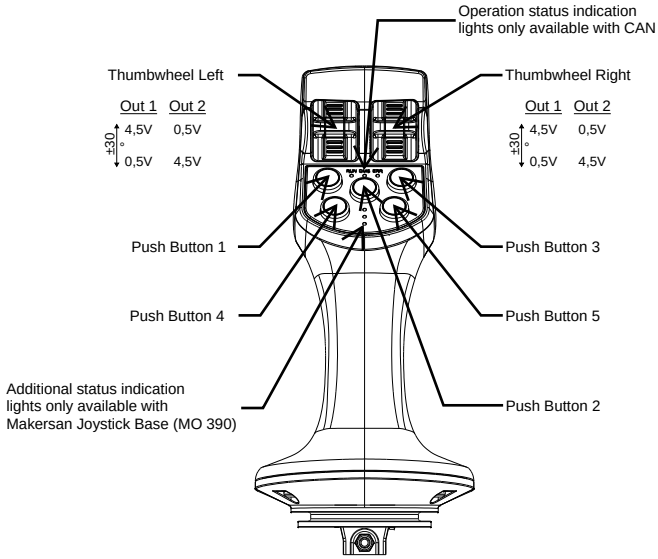
Example: MO 379-1-1-0-1-P009 is plate type 1, with knob, 90° rotation angle, shaft type square,sensor prog. 009(Dual Analog)

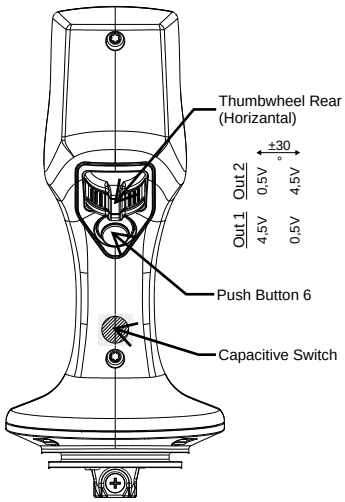
JOYSTICK ANALOG GRIP
MO 394 H1X

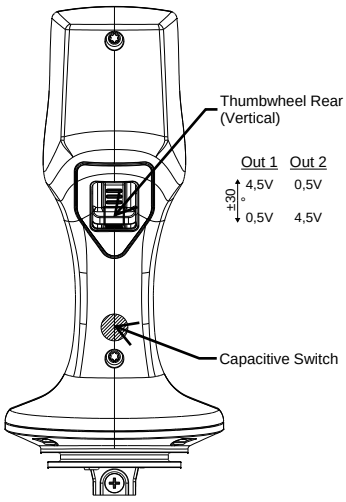
MAKERSAN

Technical Data

Technology	Contactless Hall measuring principle
Output	Double output, full redundant.
Output Type	Analog , PWM options.
Output Voltage	Analog: 0-5V PWM: 5V
Supply Voltage	5V
Protective rating	IP67
Connector	Molex 18 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 6 indication LEDs







MO 394 - X - 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

	J1939	*CANopen*
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

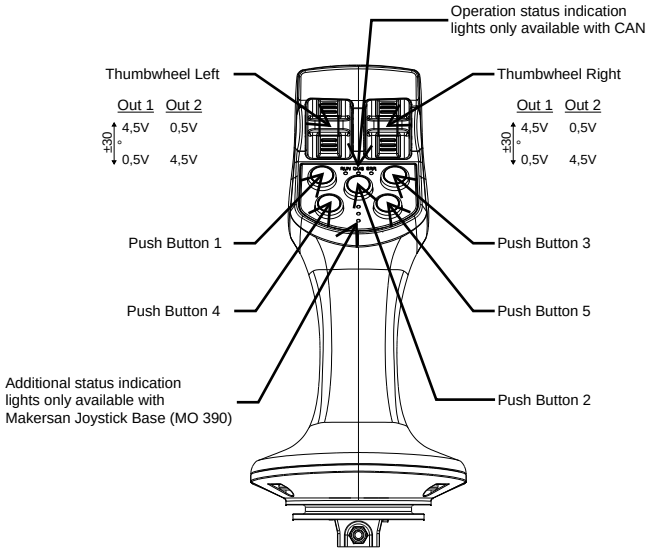
Rear
00- Blank
1A- 1 Push Button
2A- 1 Thumbwheel (Horizontal)
2C- 1 Thumbwheel with Rocker (Horizontal)
2D- 1 Thumbwheel with Toggle (Horizontal)
3A- 1 Thumbwheel (Vertical)
3C- 1 Thumbwheel with Rocker (Vertical)
3D- 1 Thumbwheel with Toggle (Vertical)
4A- 1 Push Button & 1 Thumbwheel
4C- 1 Push Button & 1 Thumbwheel with Rocker
4D- 1 Push Button & 1 Thumbwheel with Toggle

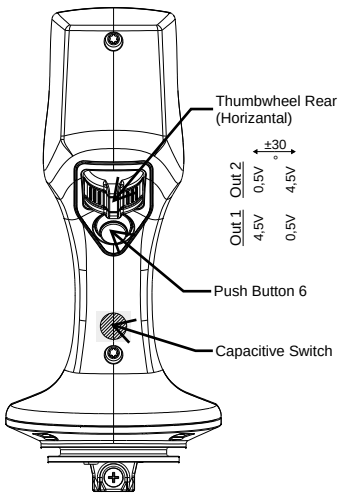
JOYSTICK CAN GRIP
MO 394 H2X

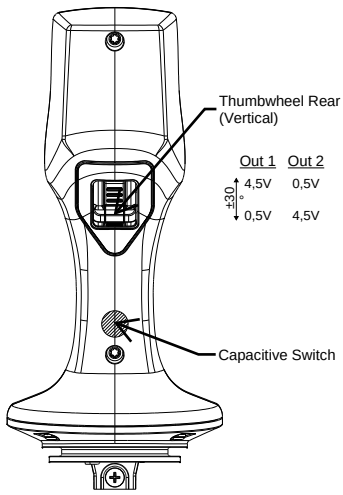
MAKERSAN

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 - 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

	J1939	*CANopen*
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

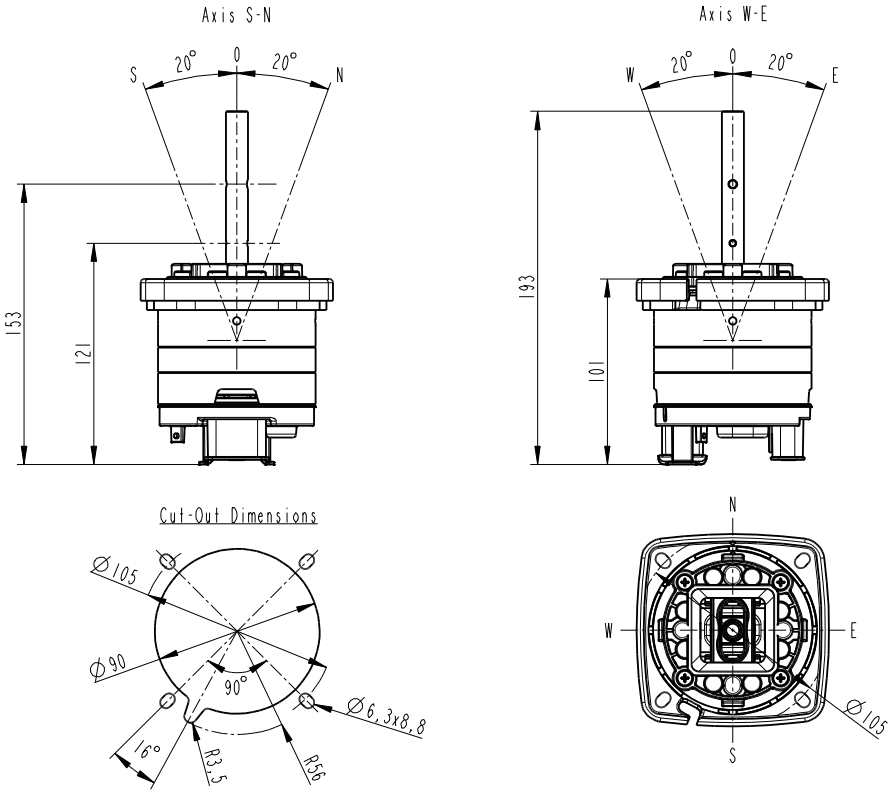
Rear
00- Blank
1A- 1 Push Button
2A- 1 Thumbwheel (Horizontal)
2C- 1 Thumbwheel with Rocker (Horizontal)
2D- 1 Thumbwheel with Toggle (Horizontal)
3A- 1 Thumbwheel (Vertical)
3C- 1 Thumbwheel with Rocker (Vertical)
3D- 1 Thumbwheel with Toggle (Vertical)
4A- 1 Push Button & 1 Thumbwheel
4C- 1 Push Button & 1 Thumbwheel with Rocker
4D- 1 Push Button & 1 Thumbwheel with Toggle

POWER / ANALOG BASE
MO 390 H1X

MAKERSAN

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
*

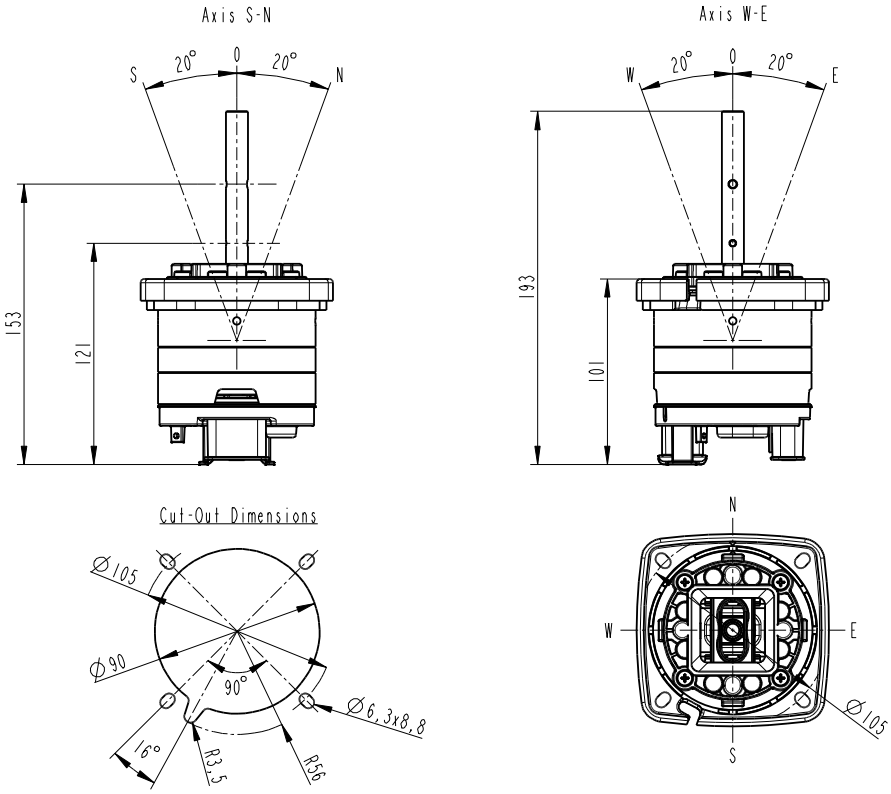
Hardware
H10- S:5V ; O:0-5V Analog Voltage or PWM Output
H11- S:5V ; O:0-32V PWM Low Side Output
H12- S:8-32V ; O:0-5V Analog Voltage or PWM Output
H13- S:8-32V ; O:0-32V PWM Low Side Output
H14- S:12-32V ; O:0-10V Analog Voltage Output
H15- S:12-32V ; O:4-20mA Analog Current Output
H16- S:8-18V ; O:8-18V 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)
*

CAN BASE
MO 390 H2X

MAKERSAN

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 - H20 - SXX - X - X - X - X - XX

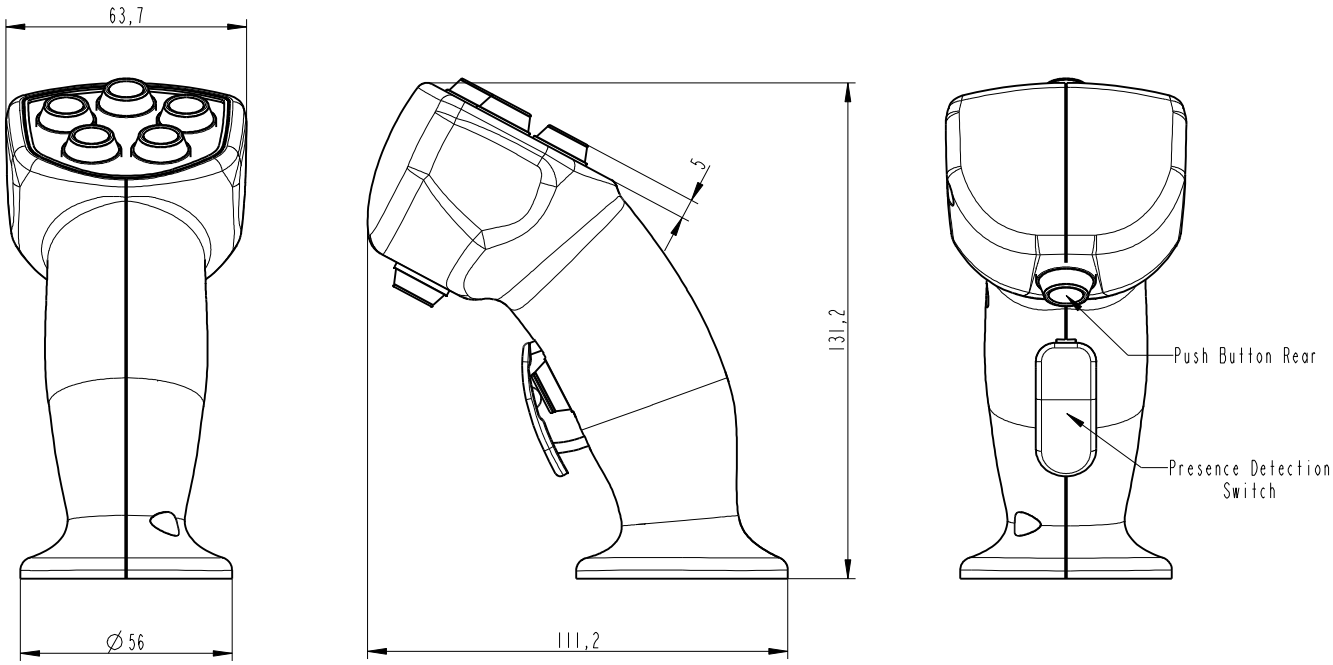
CAN Protocol	Node ID	Axis of Actuation	NS Axis	WE Axis	Lever
S10- CAN SAE J1939 **S11**- CANopen *	*J1939* *CANopen* **A**- 128(80h) 4(04h) **B**- 129(81h) 5(05h) **C**- 130(82h) 6(06h)	**0**- 2 Axis Full **1**- 2 Axis Plus (+) **2**- Single Axis WE **3**- Single Axis NS **4**- Single Axis NS_V **5**- Single Axis NS_V_Em	**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	**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	**00**- Standard *

Joystick Grip
MO 387

MAKERSAN

Tecnical Data

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



MO 387 - X - XX - XX

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

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

*

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

* See the product datasheet for other options.

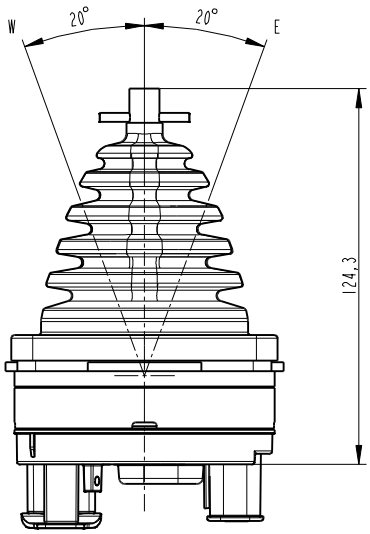
Example : MO 387 - 0 - A0 - 01
Joystick Grip, Without Button and Present Det. Switch, No push button, Molex Micro-Fit Connector

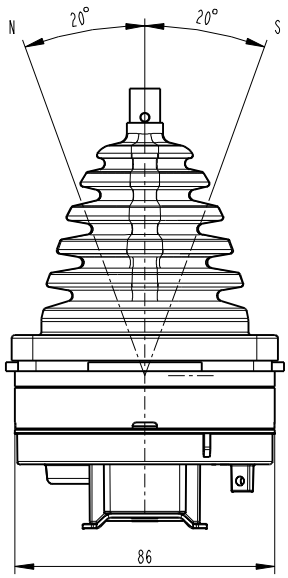
Joystick Base Analog
MO 391 H1X

MAKERSAN

Tecnical Data

Technology	Contactless Hall Measuring Principle (Full Redundant)
Lifetime at full stroke	Up to 5 million
Connector	Deutsch 8 & Tyco 18 Pins
Lever operating angle	± 20°
Lever	Self Centering
Other specification	Two Centering Spring Forces
Operating Temp.	-40C° ~ +85C°
Protection	IP67 Ingress
Axis of Actuation	2 Axis Full
Supply Voltage	5V & 8-18V & 8-32V
Supply Current	30 mA (typical - no load)
Options	Customized Output Signal Program





MO 391 - H1X - X - PXXX - XX

Axis of Actuation	Program	Grip Option
0- 2 Axis Full	**P001**- Dual Cross	**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.

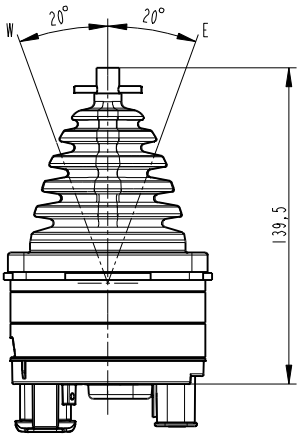
Example : MO 391 - H10 - 0 - P001 - 01
Joystick Base Analog, Supply 5V, Output 0-5V, 2 Axis Full Actuation, Dual Cross Program, Micro-Fit 10 Pins

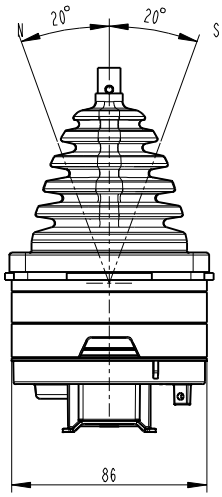
Joystick Base CAN
MO 391 H2X

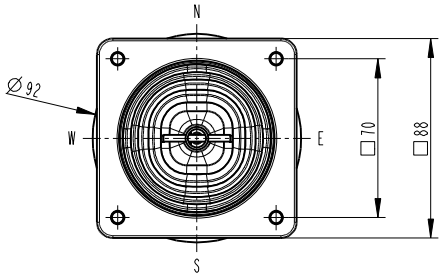
MAKERSAN

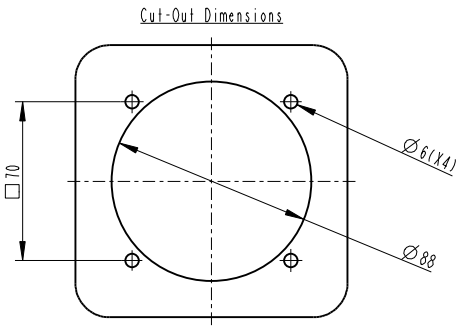
Tecnical Data

Technology	Contactless Hall Measuring Principle (Full Redundant)
Lifetime at full stroke	Up to 5 million
Connector	Deutsch 8 & Tyco 18 Pins
Lever operating angle	± 20°
Lever	Self Centering
Other specification	Two Centering Spring Forces
Operating Temp.	-40C° ~ +85C°
Protection	IP67 Ingress
Axis of Actuation	2 Axis Full
Supply Voltage	8-32V DC
Supply Current	80 mA typ. @12V Supply
CAN	ISO 11898, CAN specification 2.0A - 2.0B
Protocol	SAE J1939 or CANopen
Baud Rate	250 kbit/s (default)
Termination Resistor	External
Programmable Parameters	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

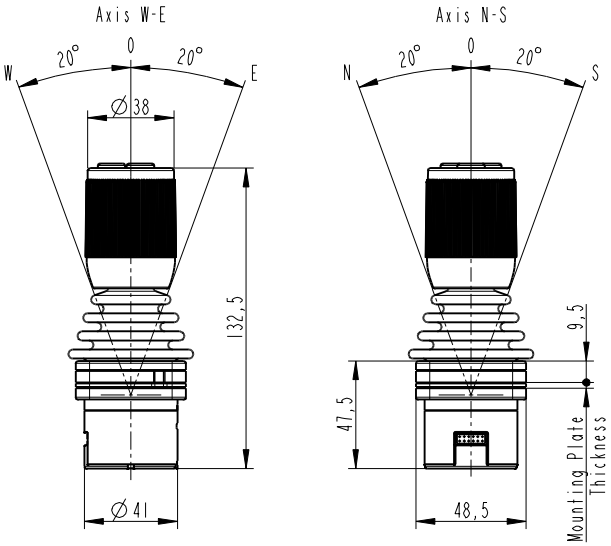
JOYSTICK MINI ANALOG
MO 395 H1X

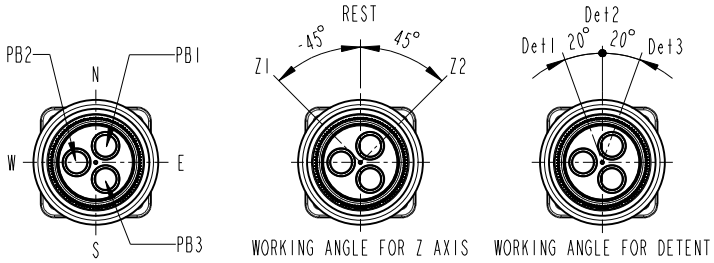
MAKERSAN

Technical Data

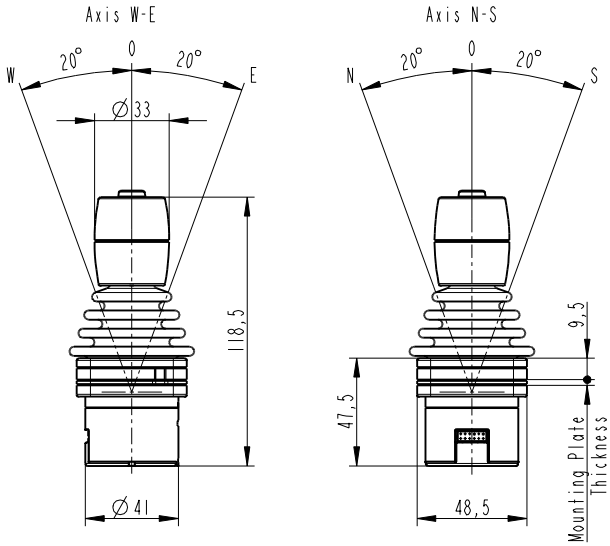
Technology	Contactless Hall measuring principle For safety double sensor output per axis, up to 2 axis
Lever	Self centering
Other Specification	2 axis full square, 2 axis cross, single axis actuation for base
Grip	Up to 3 buttons Z Axis: ± 45° working angle Detent: 40° working angle with 3 detent positions
Operating Temp.	-40°C ... +85°C
Output	Programmable analog voltage or PWM output Analog: 0-5V PWM: 5V/0-32V(LowSide)/8-32V(HiSide) 100Hz...1kHz
Supply Voltage	5V or 8-32V DC

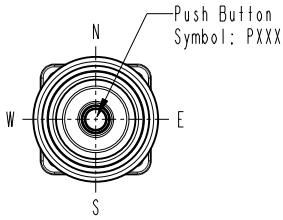
With 388 Grip

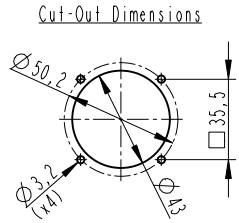




With 388B Grip







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.

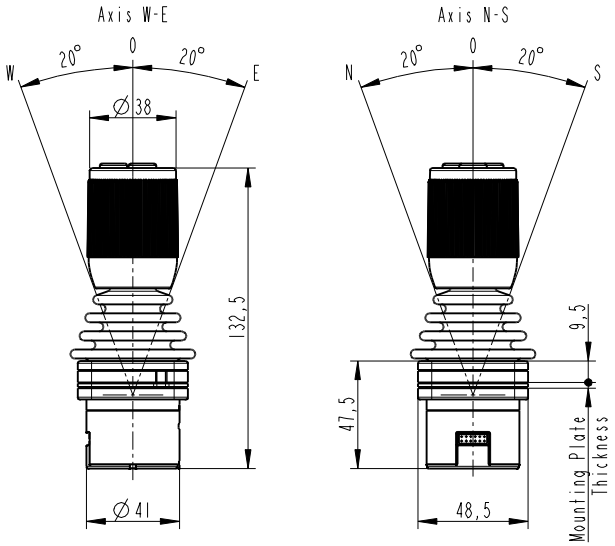
JOYSTICK MINI CAN
MO 395 H2X

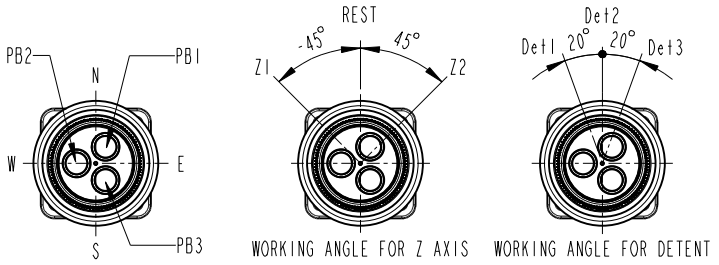
MAKERSAN

Technical Data

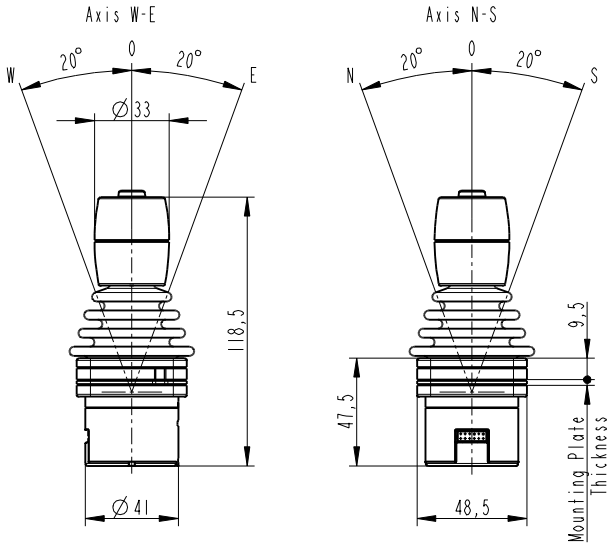
Technology	Contactless Hall measuring principle
	For safety double sensor output per axis, up to 2 axis
Lever	Self centering
Other Specification	2 axis full square, 2 axis cross, single axis actuation for base
Grip	Up to 3 buttons
	Z Axis: ± 45° working angle
	Detent: 40° working angle with 3 detent positions
Operating Temp.	-40°C ... +85°C
Output	CANopen, SAE J1939
Supply Voltage	8-32V DC

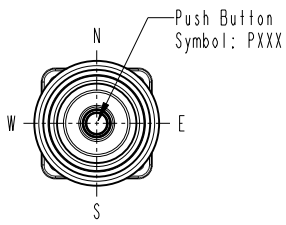
With 388 Grip

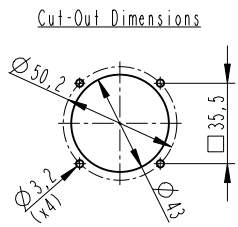




With 388B Grip







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

Hardware	Node ID	Axis of Actuation	Elec. Connection	Grip
395.H20.S10 - S:8-32V ; O: CANJ1939	J1939 CANopen	**0** - 2 Axis Full	**0** - Hirose Conn 6 Pos	**B0** - 388B Grip with No Button
395.H20.S11 - S:8-32V ; O: CANopen	**A** - 134(86h) 10(0Ah)	**1** - 2 Axis Plus		**B1** - 388B Grip with 1 Button
395.H21.S10* - S:8-32V ; O: CANJ1939	**B** - 135(87h) 11(0Bh)	**2** - Single Axis WE		**A2** - 388 Grip with 2 Button
395.H21.S11* - S:8-32V ; O: CANopen	**C** - 136(88h) 12(0Ch)	**3** - Single Axis SN		**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.

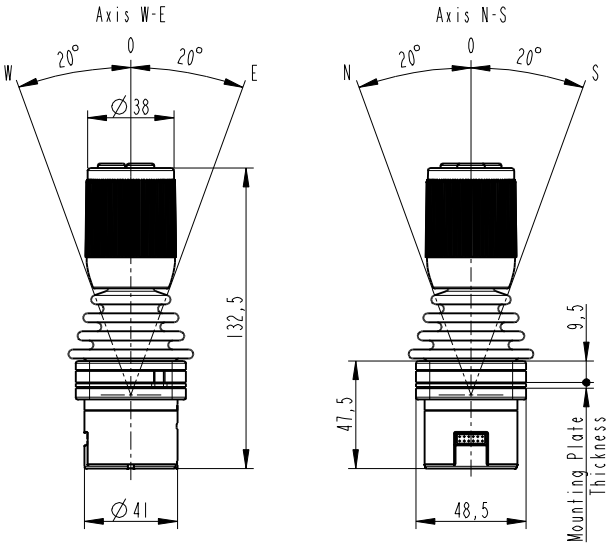
JOYSTICK MINI (USB)
MO 395 H3X

MAKERSAN

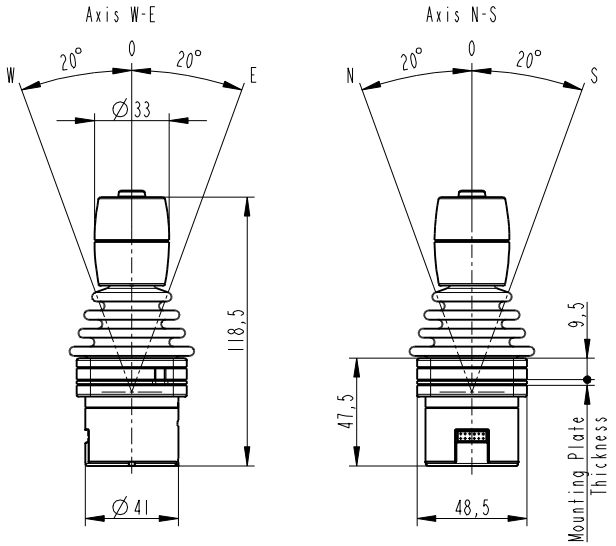
Technical Data

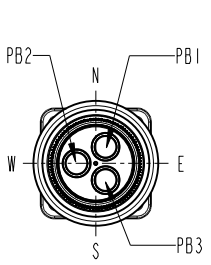
Technology	Contactless Hall measuring principle For safety double sensor output per axis, up to 2 axis
Lever	Self centering
Other Specification	2 axis full square, 2 axis cross, single axis actuation for base
Grip	Up to 3 buttons Z Axis: ± 45° working angle Detent: 40° working angle with 3 detent positions
Operating Temp.	-40°C ... +85°C
Output	USB HID Joystick or Mouse
Supply Voltage	5V DC (Bus powered)

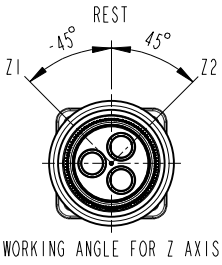
With 388 Grip



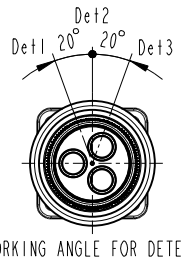
With 388B Grip



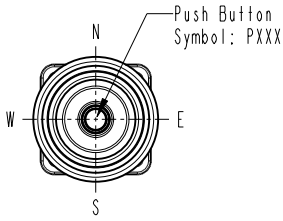


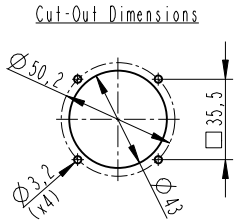


WORKING ANGLE FOR Z AXIS



WORKING ANGLE FOR DETENT





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.

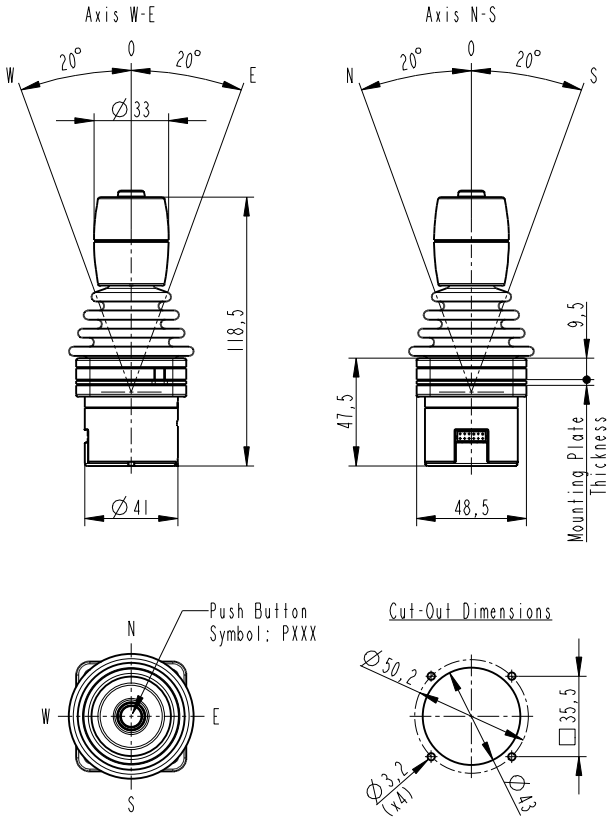
JOYSTICK MINI POWER
MO 395 H4X

MAKERSAN

Technical Data

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

With 388B Grip



MO 395 - H4X - X - X - XX

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 *

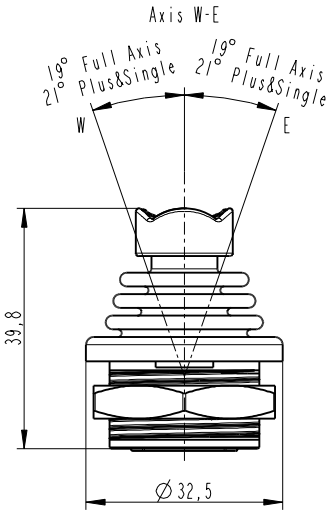
* Available upon request with minimum order quantity.

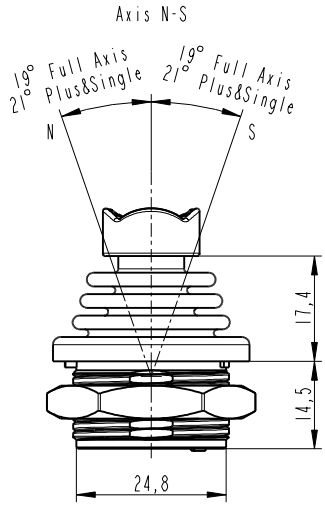
JOYSTICK MICRO
MO 397 H1X

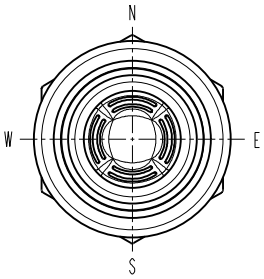
MAKERSAN

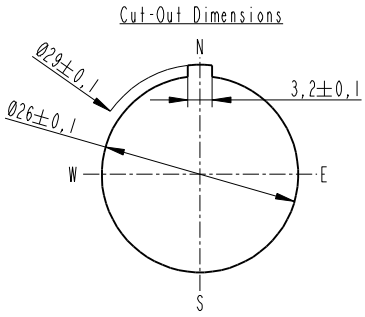
Technical Data

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	± 25°
Lever op. angle Plus&Single	± 21°
Lever	Self centering
Axis of Actuation	2 axis full square, 2 axis plus, Single axis actuation
Precision	±0.1°
Operating Temp.	-40°C ... +85°C
Protection	IP67
Protection with Header	IP65 top of mounting plate
Supply Voltage	5V
Supply Current	<30 mA
Options	Customized output signal program
Output	Programmable analog voltage or PWM output Ratiometric 0-5V analog voltage or PWM:5V Push-Pull 100Hz...1kHz (1mA max.)









MO 397 - HXX - X - X - PXX - XX

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

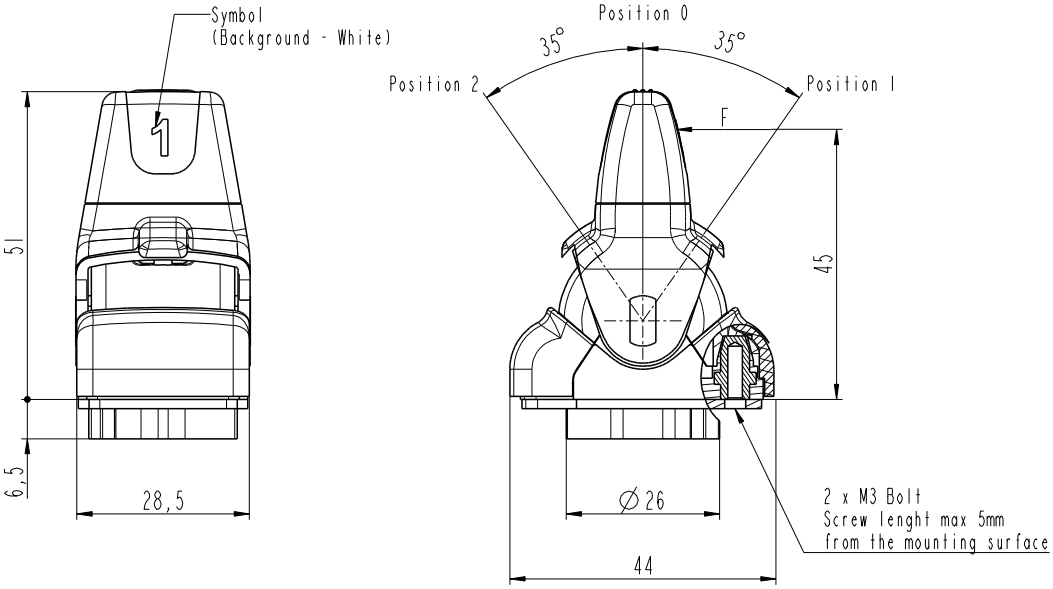
Full Redundant Micro Joystick, 2 Axis Full, No Legend, Dual Cross Program, 250mm Loose Cable

FINGERTIP JOYSTICK
MO 377 H1X

MAKERSAN

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.

THUMBWHEEL
MO 393 H1X

MAKERSAN

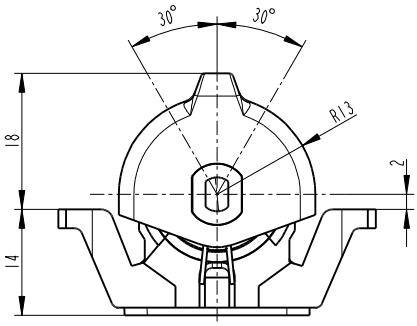
Tecnical Data

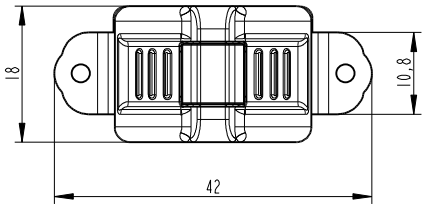
Technology	Contactless Hall measuring principle, Full Redundant
Lifetime at Full Stroke	Up to; 5 million, 500k with Rocker, 1 million with Toggle
Lever Operating Angle	± 30° max.
Lever	Self Centering, Blue illumination
Options	Customized output signal program, customized wire harness, customized actuation cap color options
Actuation	Single Axis
Actuation Type	Spring Return, Rocker, Toggle
Operating Temp.	-40C° ... +85C°
Protection	IP6K9K Electronic / IP54 Mechanical
Supply Voltage	5V / 8-32V
Output	Double output: Analog , PWM options
Output Voltage	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.

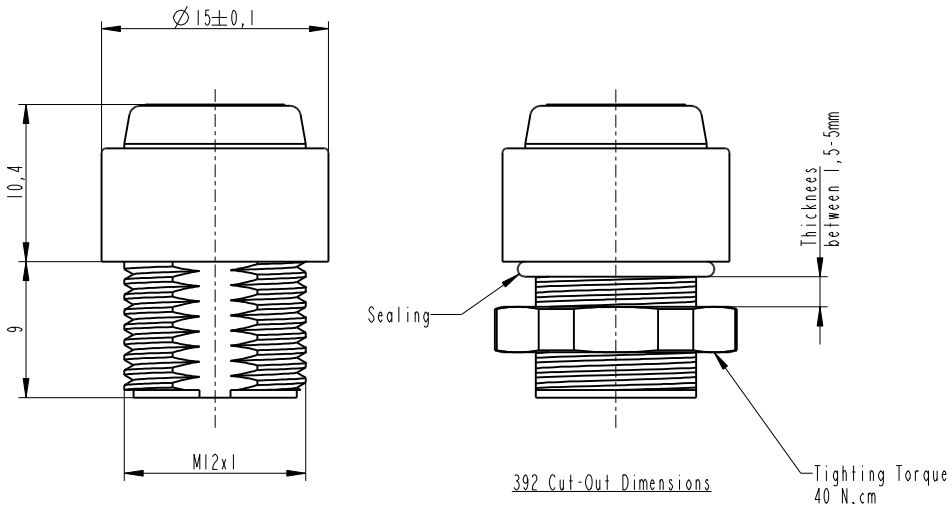
Example: 393-H10-0-1-P001-00 is thumbwheel, H10- 0-5V, Full Redundant, Spring Return, Red, Dual Cross Program, 250mm Loose Cable.

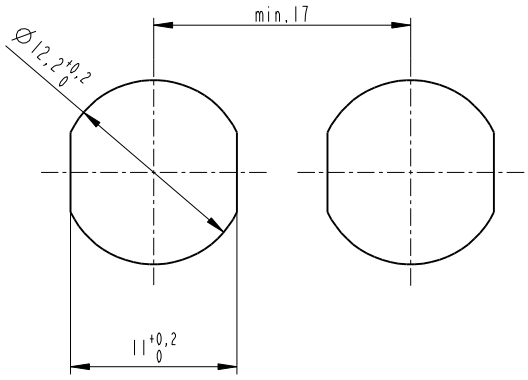
PUSH BUTTON SIGNAL
MO 392 H1X

MAKERSAN

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	Symbol Opt.	Cable
H10 - 5V	**P001-** Signal White	**00-** 250mm loose cable (AWG 24)
H11 - 12V		**01-** Molex Micro-Fit Connector 250mm cable
H12 - 24V		
H1W - 5-24V (no LED)		
*	**	***

* 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.

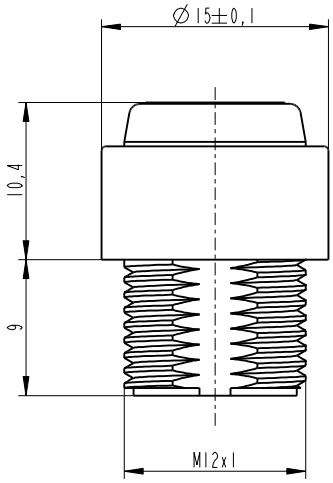
Example: MO 392-H10-P001-00 is push button , 5V supply voltage and blue night / red function light, RAL9003 cap and 250mm loose cable.

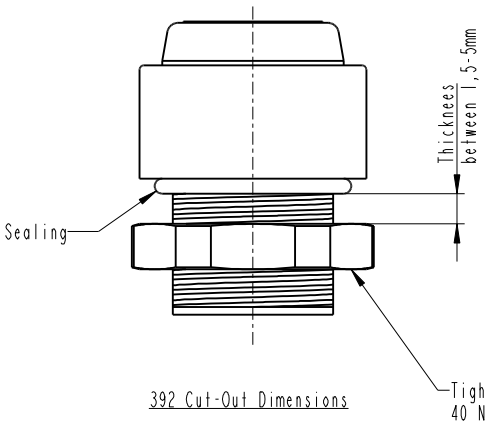
PUSH BUTTON POWER
MO 392 H2X

MAKERSAN

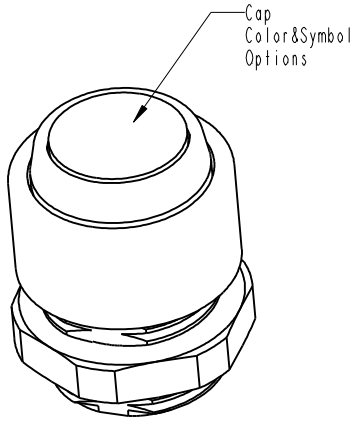
Tecnical Data

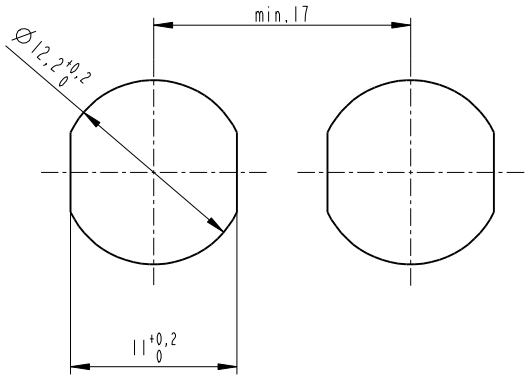
Technology	Non-contact Hall switch
Lifetime at Full Stroke	Up to 2 million cycles
Mounting	M12x1 thread with locking nut
Other specification	Blue night / function illumination, sealed housing (LED is turned off during button press)
Options	Customized color options, customized symbol options
Operating Temp.	-40C° ... +85C°
Protection	IP6K9K electronic / IP54 mechanical
Supply Voltage	5V or 12V or 24V
Output	Low Side switch (NO) , 500mA





392 Cut-Out Dimensions





MO 392 - H2X - PXXX - XX

Hardware Configurations
H20 - 5V
H21 - 12V
H22 - 24V
*1

Symbol Opt.
P001- RAL 9003
*2

Cable
00- 250mm loose cable (AWG 24)
01- Molex Micro-Fit Connector 250mm cable
*3

*1 5V supply voltage and blue night function light is standard, other configs are available upon request with minimum order quantity.

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

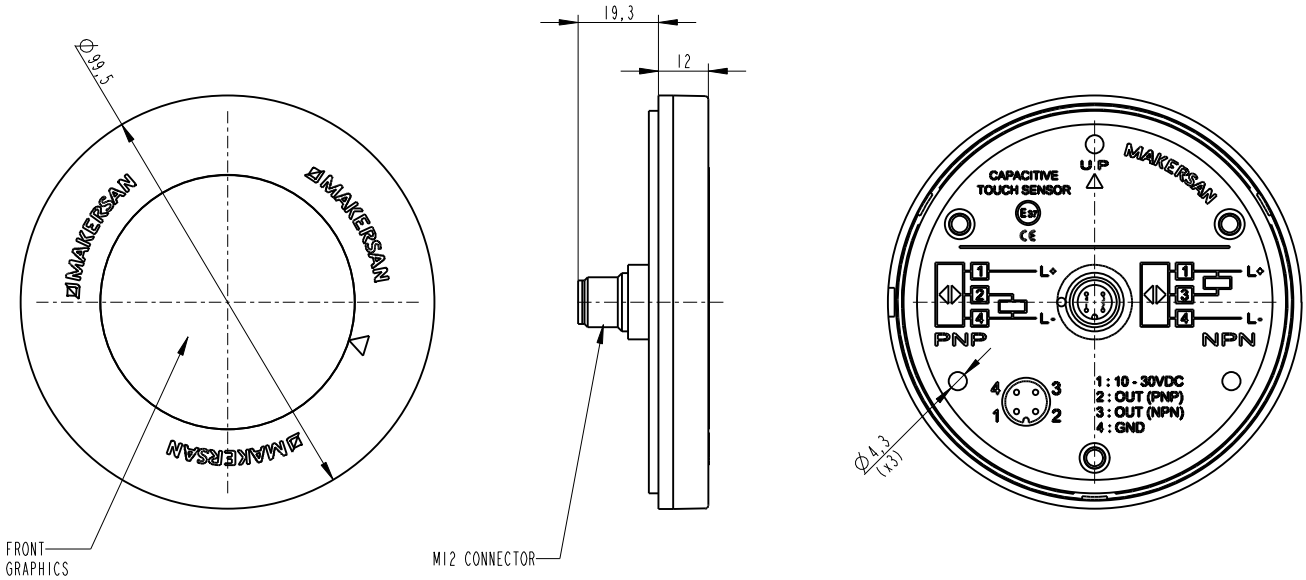
*3 250mm loose cable is standard, other connections are available upon request with minimum order quantity.

Example: MO 392-H20-P001-00 is push button , 5V supply voltage and blue night 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	2-Green	3-Yellow	4-Black	5-Blue	6-Orange	7-Gray
RAL 3001	RAL 6010	RAL 1023	RAL 9005	RAL 5005	RAL 2010	RAL 7043

MO 400 - H1X - X - LXXX - XX

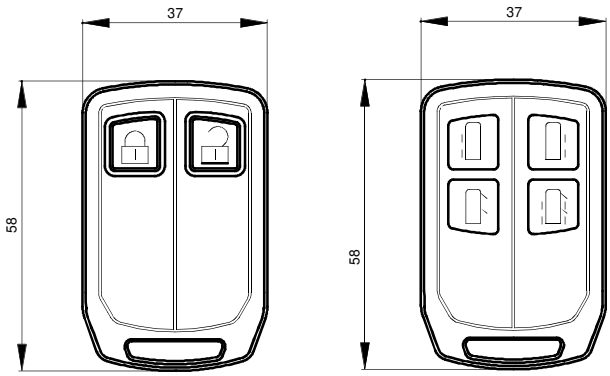
Type	Color	Program	Connection
H10 - Standard	**1 -** Red **2 -** Green **3 -** Yellow **4 -** Black **5 -** Blue **6 -** Orange **7 -** Gray	*See the Legend Table.	**CB -** 250mm Loose Cable (AWG 20) **CN -** M12 Connector (AWG 24)

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

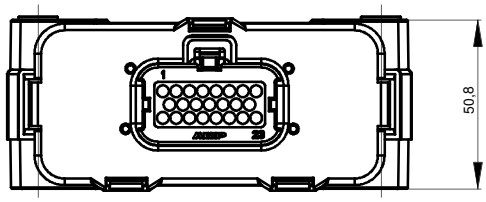
REMOTE KEYLESS ENTRY with CAN Bus
MO 651 H3X

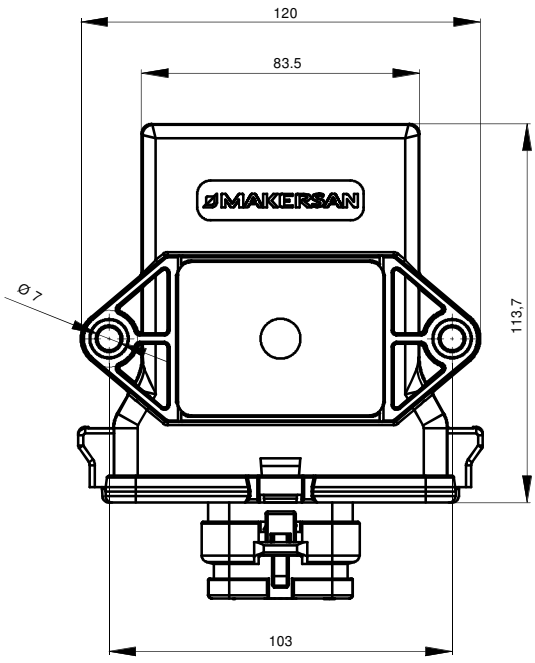
Technical Data

Features	Three zone (with external relays) 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
Supply Voltage	8(12)-32V
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	23 pin Tyco Seal Connector
Application	Suitable for door latches, trunk lids, and lift gates



2 BUTTONS 4 BUTTONS





MO 651 - H3X - SXXXX

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

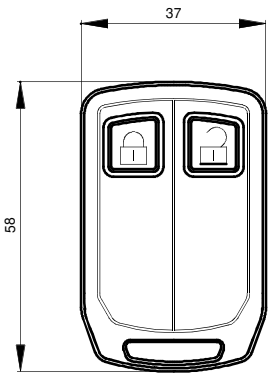
* 1 zone control & CAN
** 1 zone control + 2 zone control with external relays & CAN

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

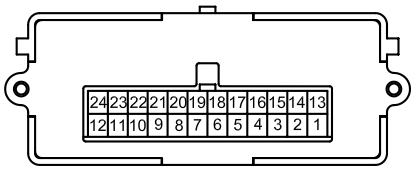
REMOTE KEYLESS ENTRY with CAN Bus
MO 651 H4X

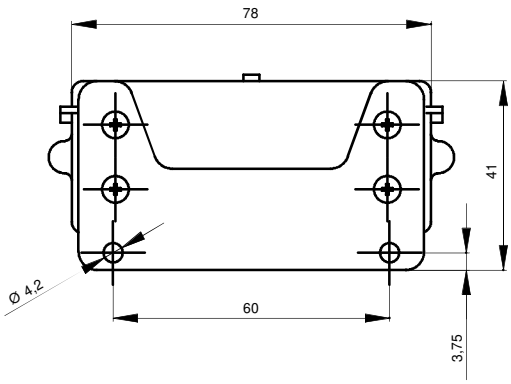
Technical Data

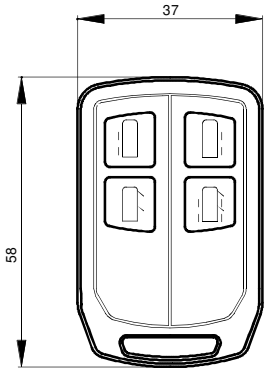
Features	Three zone (with external relays) secure access control
Security	Secure code transmission with code rolling technology that eliminates the risk of code grabbing
Communication	CAN Bus (SAE J1939)
Frequency	433.92 MHz
Supply Voltage	8(12)-32V
Operating Temp.	Receiver : -40°C ... +80°C Transmitter : -30°C ... +70°C
Electrical Protection	Over-voltage protection
Housing Material	% 30 GF reinforced polyamid plastic case
Battery	CR 2032 lithium battery
Connector	24 pin connector
Application	Suitable for door latches, trunk lids, and lift gates



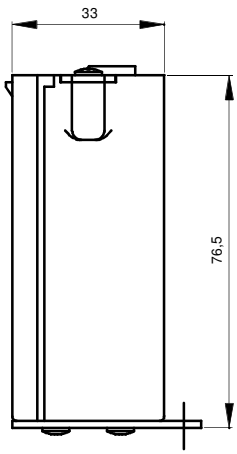
2 BUTTONS

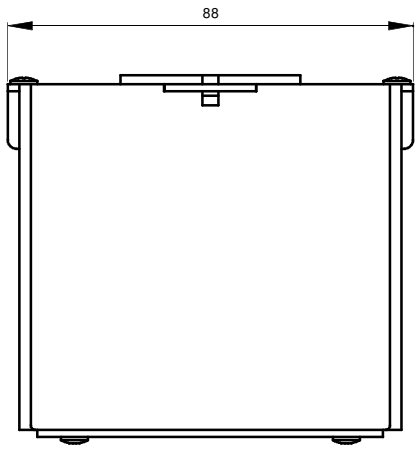






4 BUTTONS





MO 651 . H4X . SXXXX

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

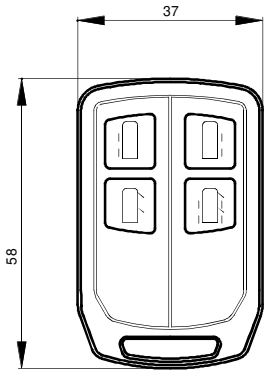
* 1 zone control & CAN
** 1 zone control + 2 zone control with external relays & CAN

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

REMOTE KEYLESS ENTRY with CAN Bus
MO 651 H5X

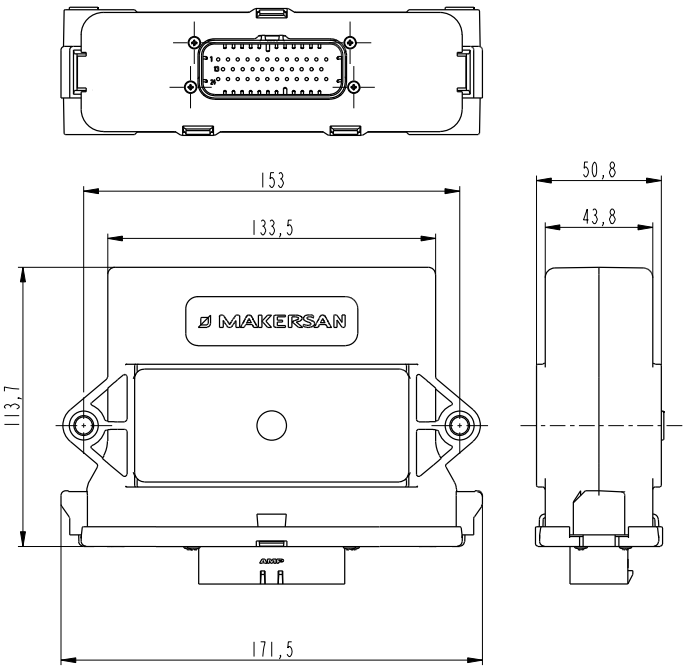
Technical Data

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

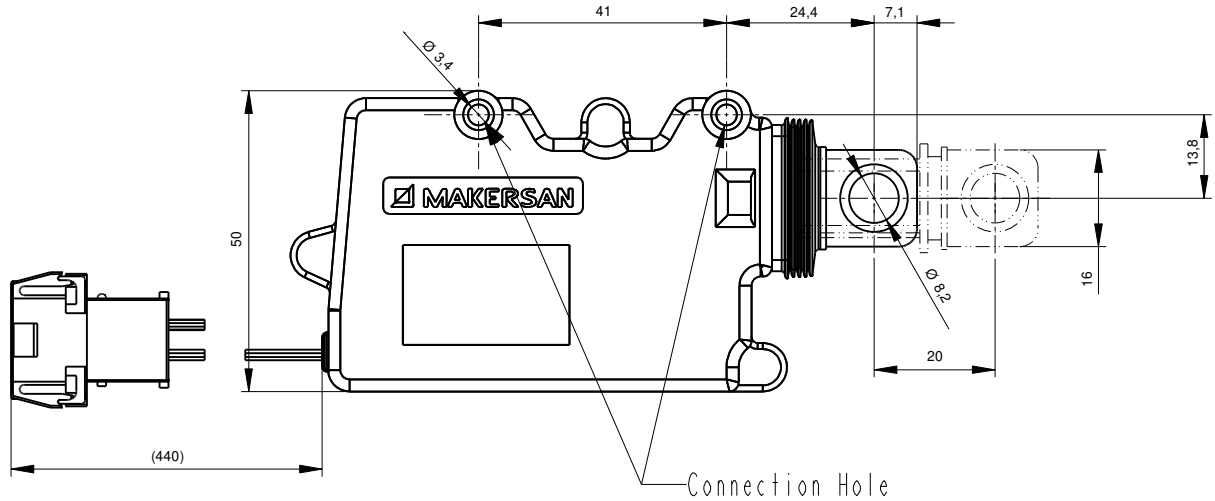
Example : 651.H50.S1000 is 3 zone control RKE module with 12V supply voltage and SAE J1939 interface

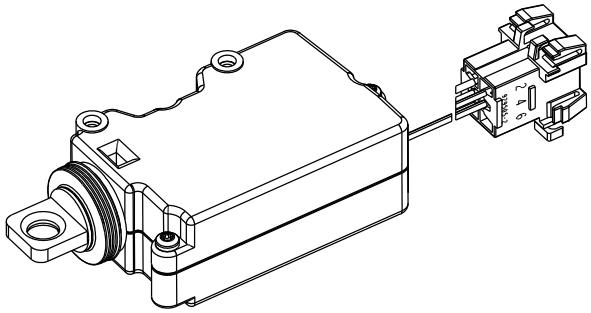
ACTUATOR
MO 055

MAKERSAN

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	Micro Switch Type	Connector Type	Force
12- 12 V **24**- 24 V	**0 -** Without micro switch **1 -** With micro switch	**0 -** Without Connetor **1 -** AMP 928161-2 connector	**-** 25 N **K-** 50 N

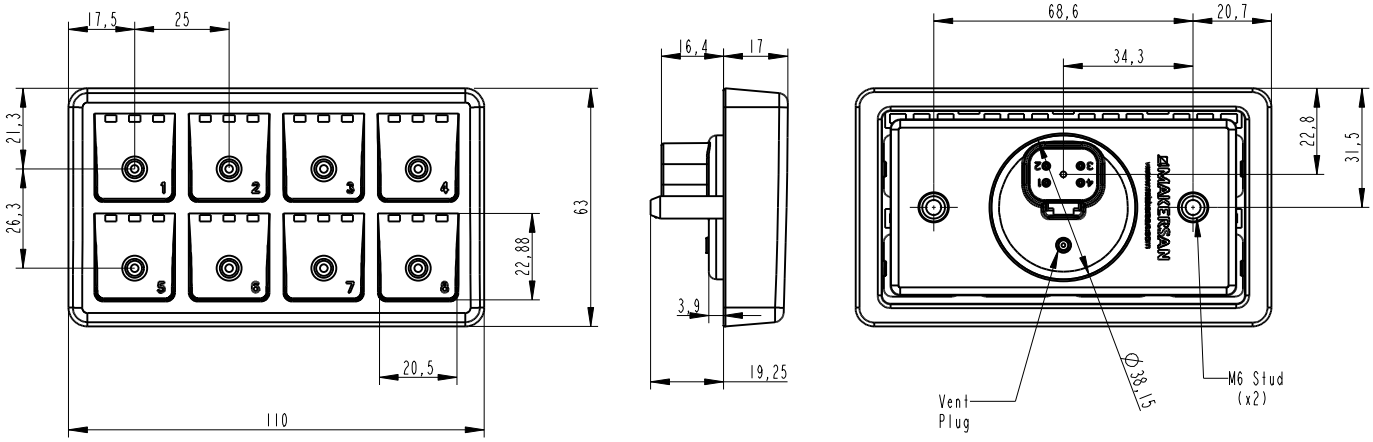
* Different types and values can be produced on request.

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
H11.S10- KP2x4 Supply : 8-32V / Output : CANopen
H11.S12- KP2x4 Supply : 8-32V / Output : Modbus

*** Legend Config**

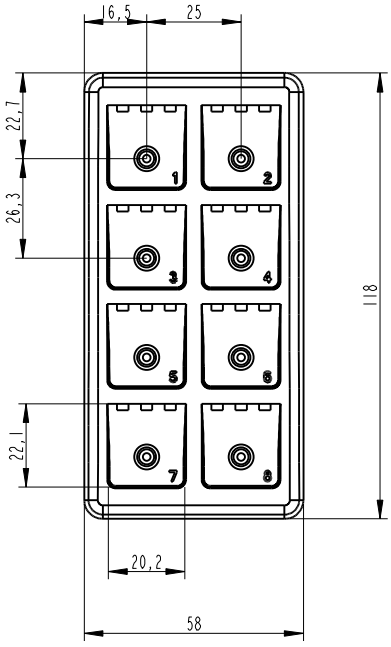
***** Legend L001 is standard, other symbols are available upon request with minimum order quantity.

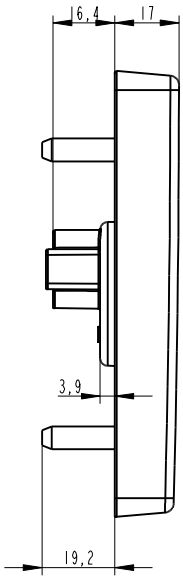
Example: MO 405 - H10S10 - L001 Keypad - KP2x4 S:8 - 32V / O: SAE J1939 - L001 Legend

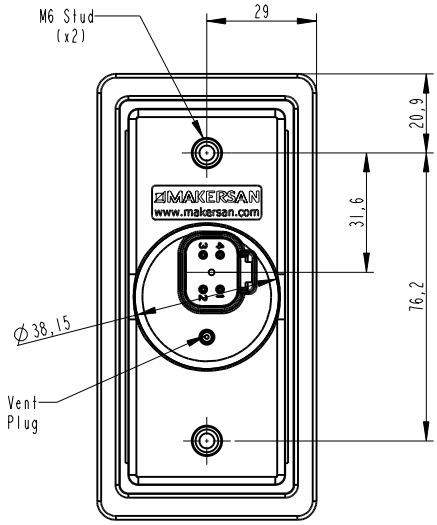
KEYPADS
MO 405 H2X

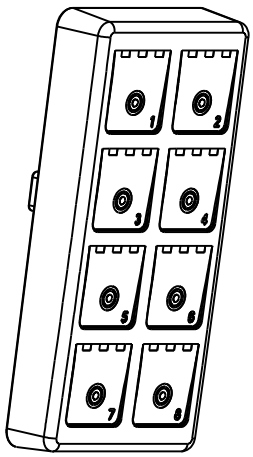
Technical Data

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
H21.S11- KP4x2 Supply : 8-32V / Output : CANopen
H21.S12- KP4x2 Supply : 8-32V / Output : Modbus

*** Legend Config**

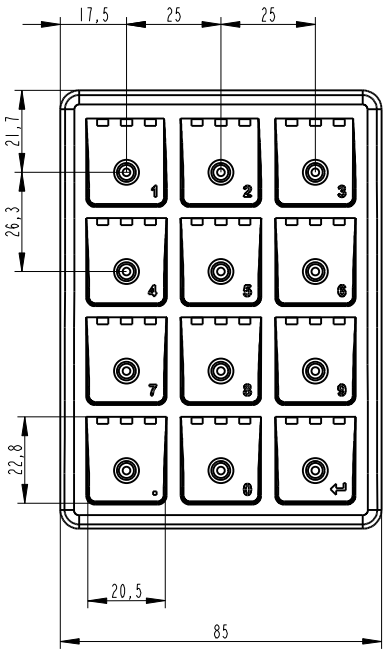
***** Legend L001 is standard, other symbols are available upon request with minimum order quantity.

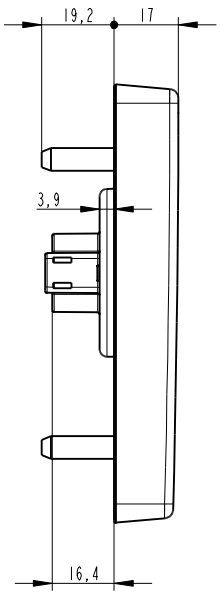
Example: MO 405 - H20S10 - L001 Keypad - KP4x2 S:8 - 32V / O: SAE J1939 - L001 Legend

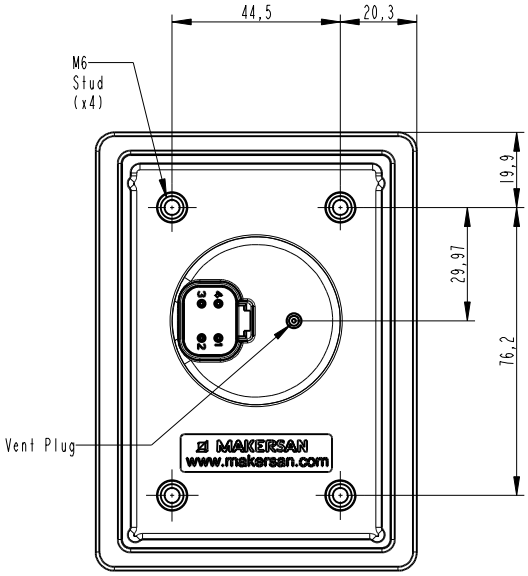
KEYPADS
MO 405 H3X

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)



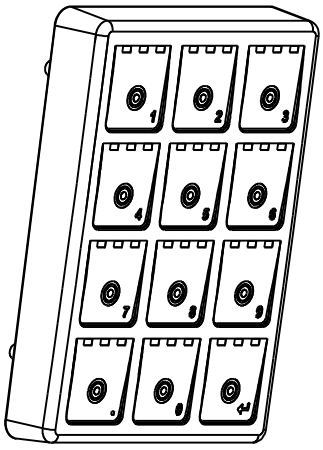




MO 405 - H3XS1X - LXXX

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

*** Legend Config**



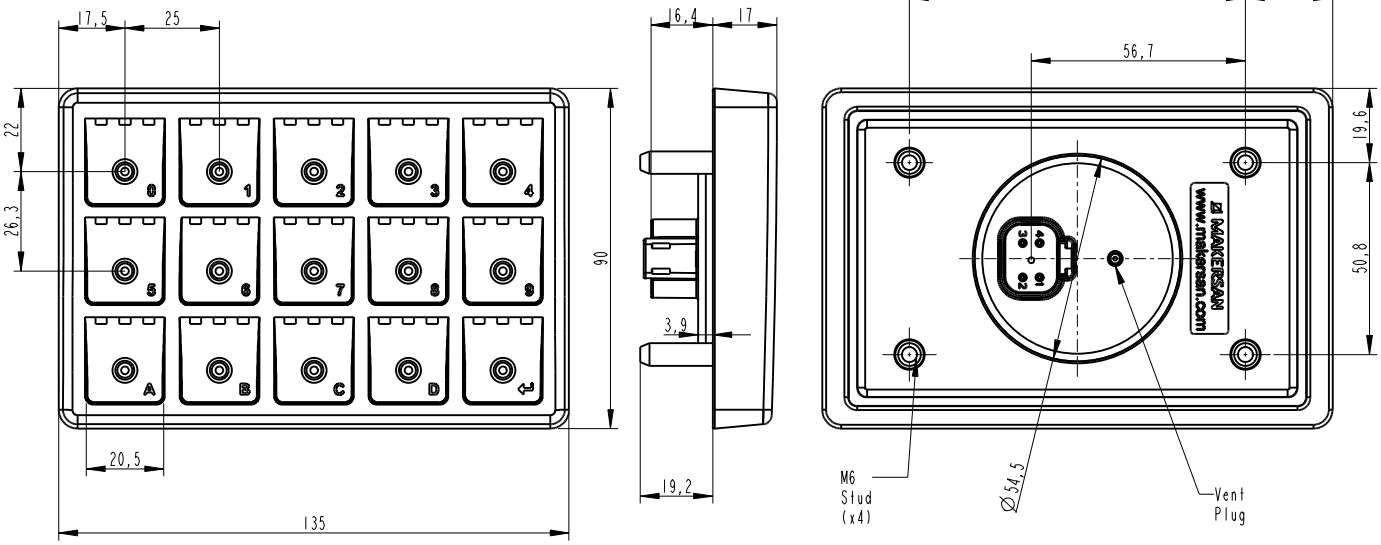
***** Legend L001 is standard, other symbols are available upon request with minimum order quantity.

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

KEYPADS
MO 405 H4X

Technical Data

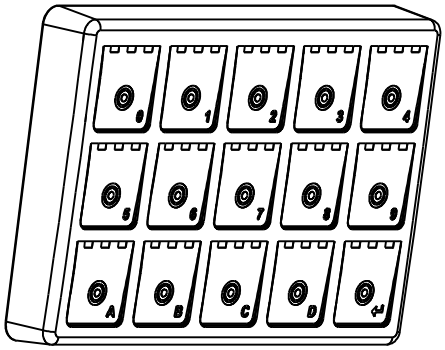
Type	3x5 Key Combination
Lifetime	Up to 1 million cycles per key
Operating Temp.	-40C° ... +85C°
Protection	Sealed to IP67
Supply Voltage	8-32V
Supply Current	80 mA at 24V (typical)
Overvoltage Protect.	Up to 36V
Features	SAE J1939, CANopen and Modbus versions Vibration and impact resistant Dimmable 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 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**



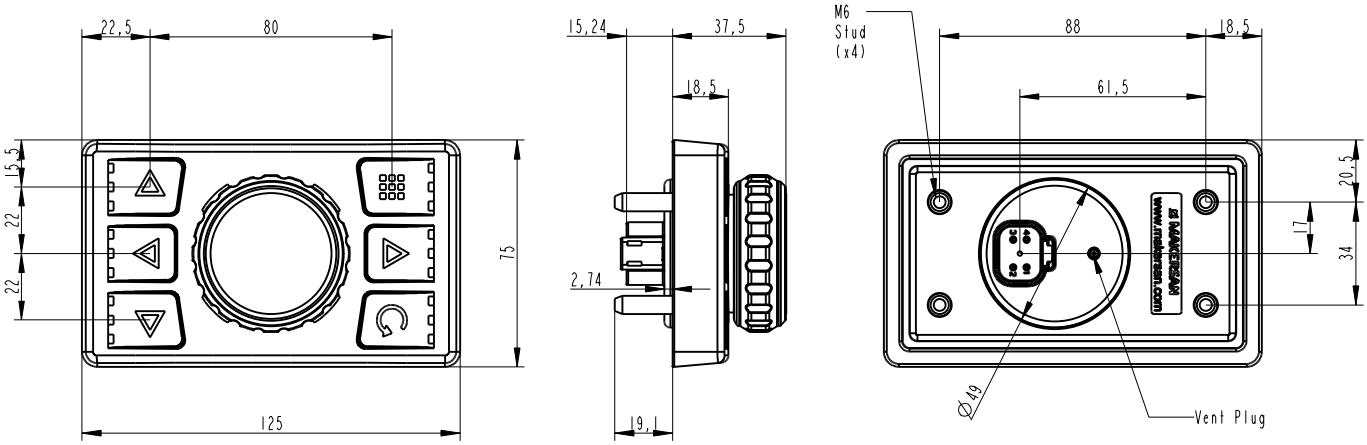
***** Legend L001 is standard, other symbols are available upon request with minimum order quantity.

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
H11.S10- Supply : 8-32V / Output : CANopen
H11.S12- Supply : 8-32V / Output : Modbus

*** Legend Config**

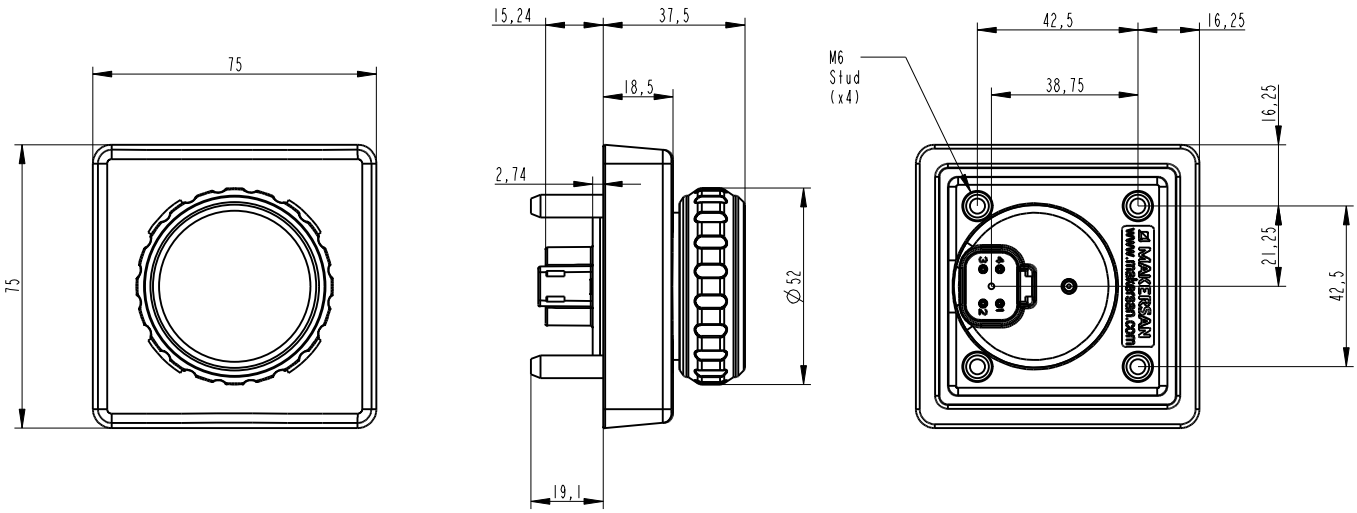
***** Legend L001 is standard, other symbols are available upon request with minimum order quantity.

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

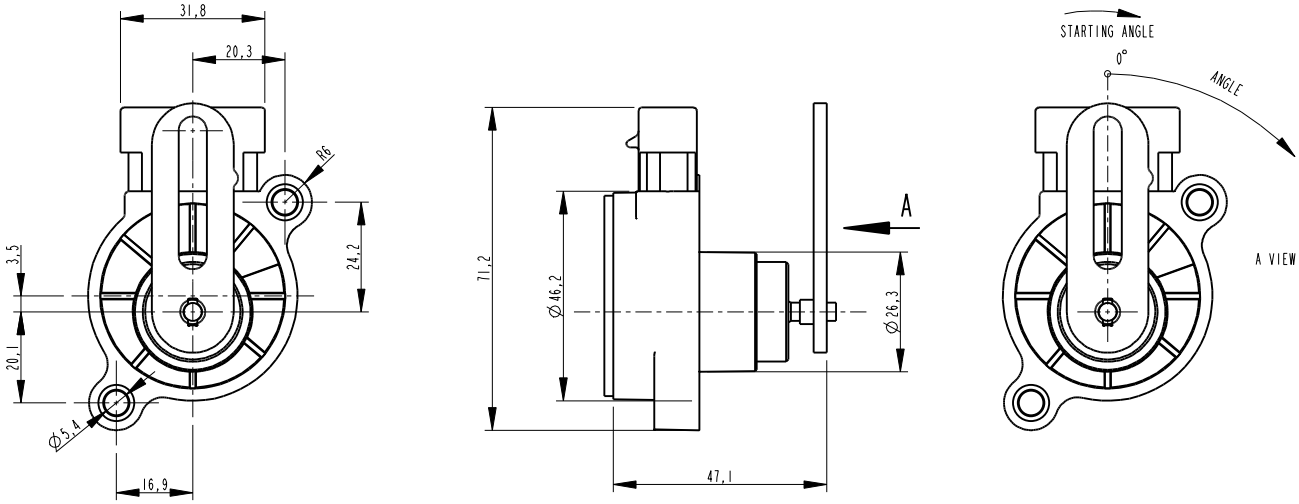
Example: MO 407 - H10S10 Joystick Keypad - S:8 - 32V / O: SAE J1939

ROTARY POSITION SENSOR
MO 450A

MAKERSAN

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

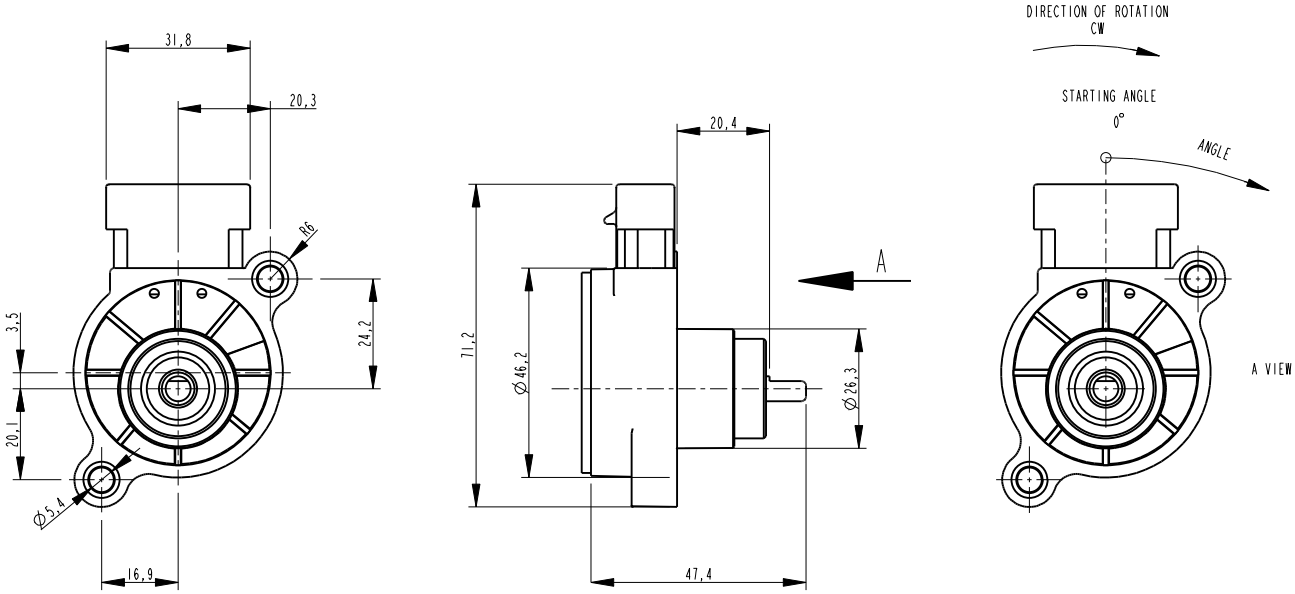
Angle Config
Custom programmed according to customer request

ROTARY POSITION SENSOR
MO 450D

MAKERSAN

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

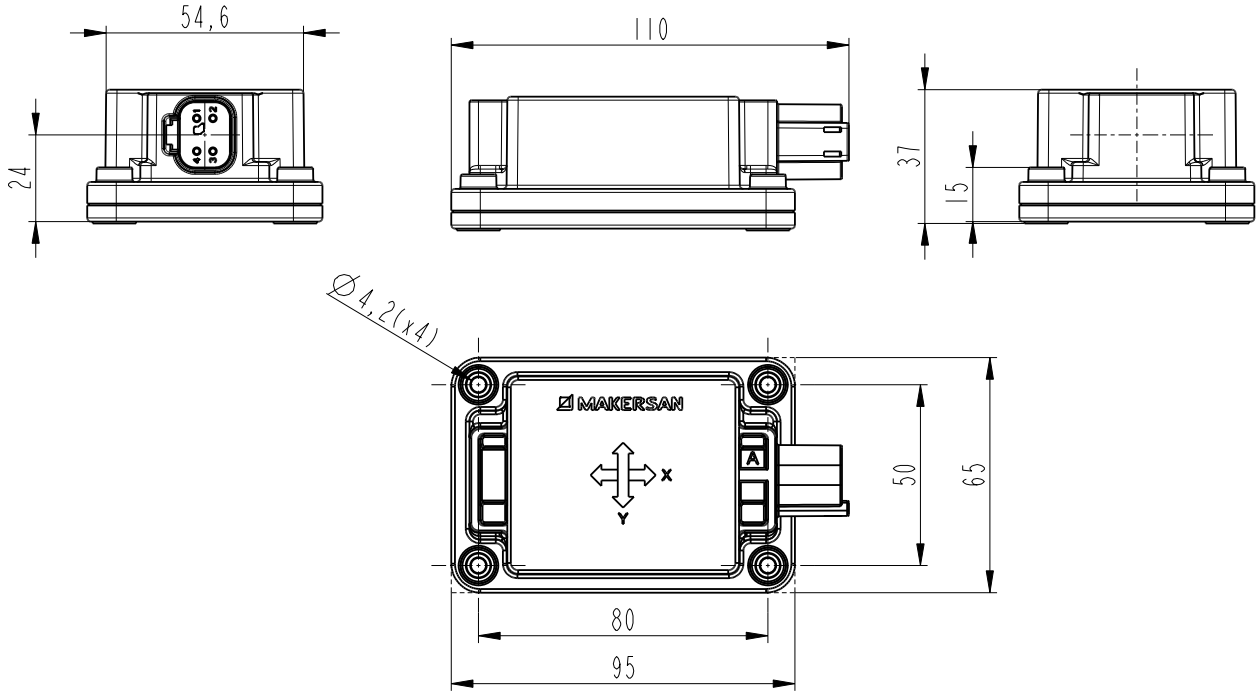
INCLINATION - ACCELERATION - GYRO SENSOR

MO 415

MAKERSAN

Technical Data

Technology	6D IMU (3D Accelerometer + 3D Gyroscope) / Sensor Fusion
Measuring Range	Inclination: Two axis: up to ±80°;One axis: ±180° Acceleration: ±2g, ±4g, ±8g, ±16g Gyroscope: ±245dps, ±500dps, ±1000dps, ±2000dps
Connector	Deutsch 4 pin
Absolute Accuracy	Inclination: < ± 0.5° (Ta = 23°C)
Resolution	Inclination: < 0.01°, Acceleration: < 1mg, Gyro: < 0.1dps
Operating Temp.	-40C° ... +85C°
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: ±80° (default)
2: ±60°
3: ±45°
4: ±30°
5: ±15°
6: ±180° (single axis X)*
7: ±180° (single axis Y)*

Gyroscope Range
1: ±245dps
2: ±500dps (default)
3: ±1000dps°
4: ±2000dps

Node ID
226: SAE J1939
012: CANopen

Software
S12: SAE J1939
S13: CANopen

Acceleration Range
1: ±2g
2: ±4g (default)
3: ±8g
4: ±16g

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

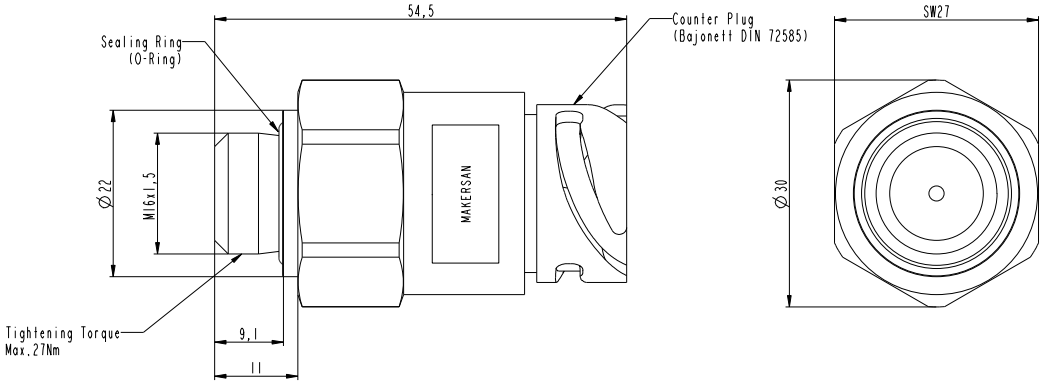
Example 1: MO415H4AS12-P122-000-226 is Inclination ±80° XY, Acceleration ±4g XYZ, Gyroscope ±500dps XYZ SAE J1939 output type of sensor with node ID of 226.

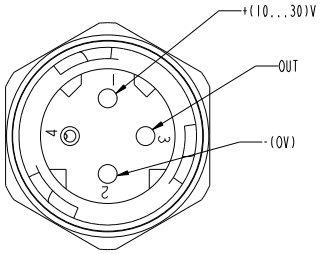
PRESSURE SENSOR
MO 420 H2X

MAKERSAN

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

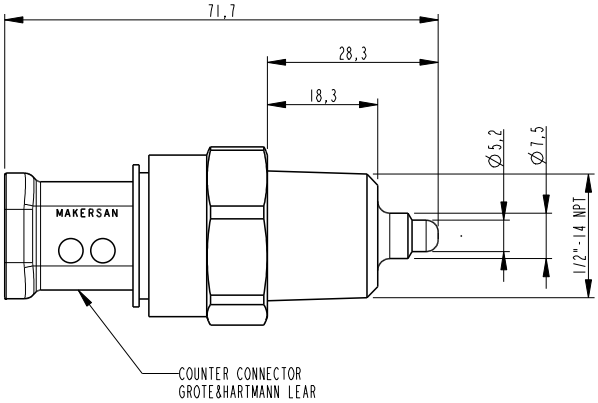
Example: MO420-H21-P006 is pressure sensor , 5V supply voltage, 0-5V output voltage and 6 Bar type.

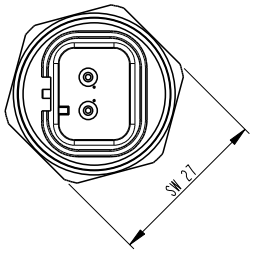
LIQUID TEMPERATURE SENSOR
MO 413

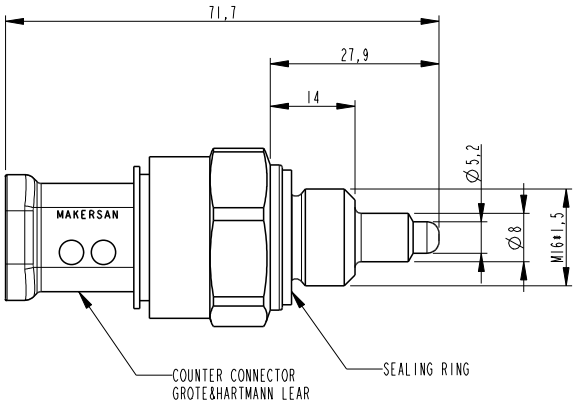
MAKERSAN

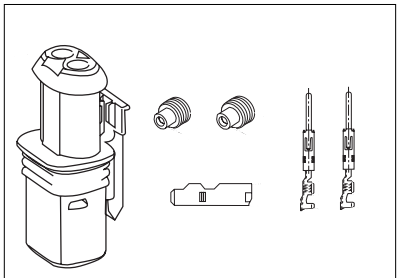
Technical Data

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









Counter Connector Kit is available on request.
Grote & Hartmann Lear No: 18385.000.002

MO 413 - X - X

Connection	Nominal Resistance at 25°C
A - 1/2" 14 NPT **B** - M16x1,5 DIN 3852 Form A	**1** - 400 Ohm **2** - 2252 Ohm

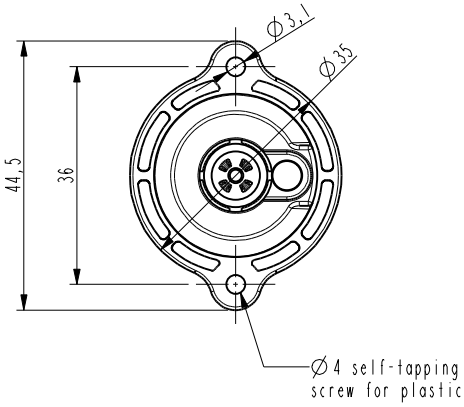
Example: MO 413-A-1 is Temperature Sensor, 1/2 14 NPT, 400 Ohm.

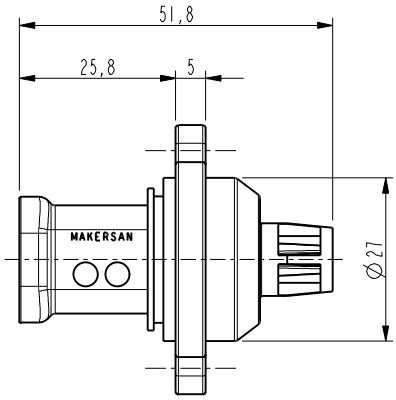
AIR TEMPERATURE SENSOR
MO 414

MAKERSAN

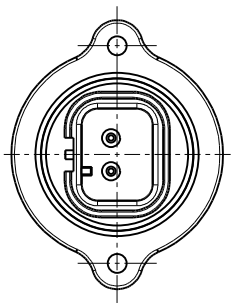
Technical Data

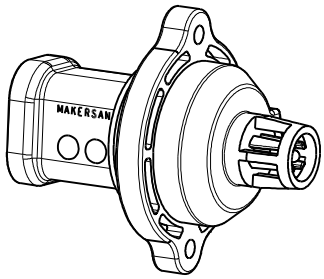
Medium	Air
Measurement range	-40°C to +80°C
Nominal resistance	At 25°C 2100 Ohm (different Ohm value on request)
Protection	IP6K9K
Connector	Grothe Hartman
Counter Connector	Counter Connector kit is available on request.
Housing material	%30 GF reinforced polyamid plastic case
Weight	0.012 kg
Application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





COUNTER CONNECTOR
GROTE&HARTMANN LEAR





MO 414 - X

Nominal Resistance at 25°C

1 - 2100 Ohm

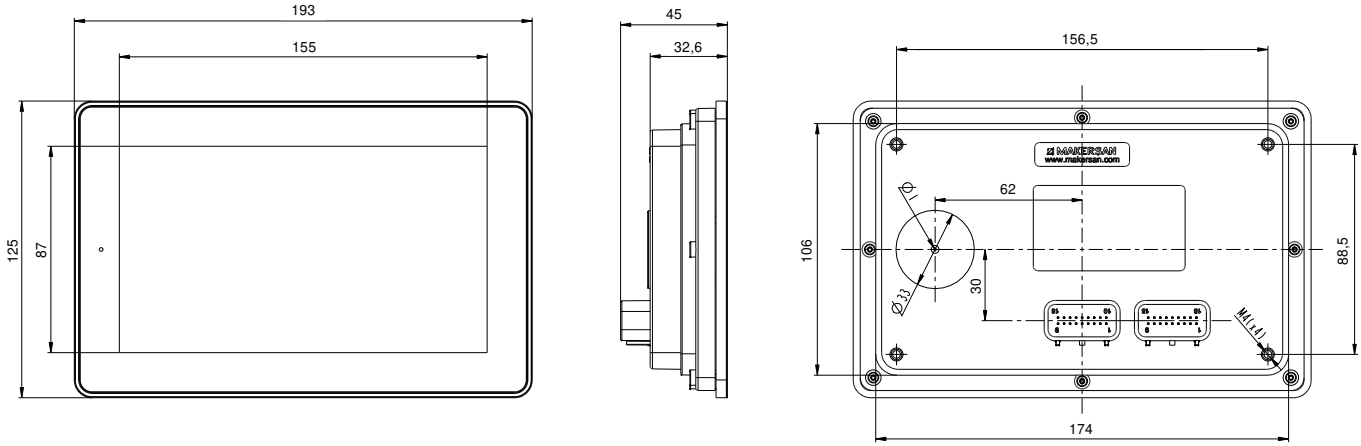
Example: MO 414-1 is Temperature Sensor, 2100 Ohm.

HMI UNIT 7"
MO 662 H1X

MAKERSAN

Technical Data

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



MO 662 - 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

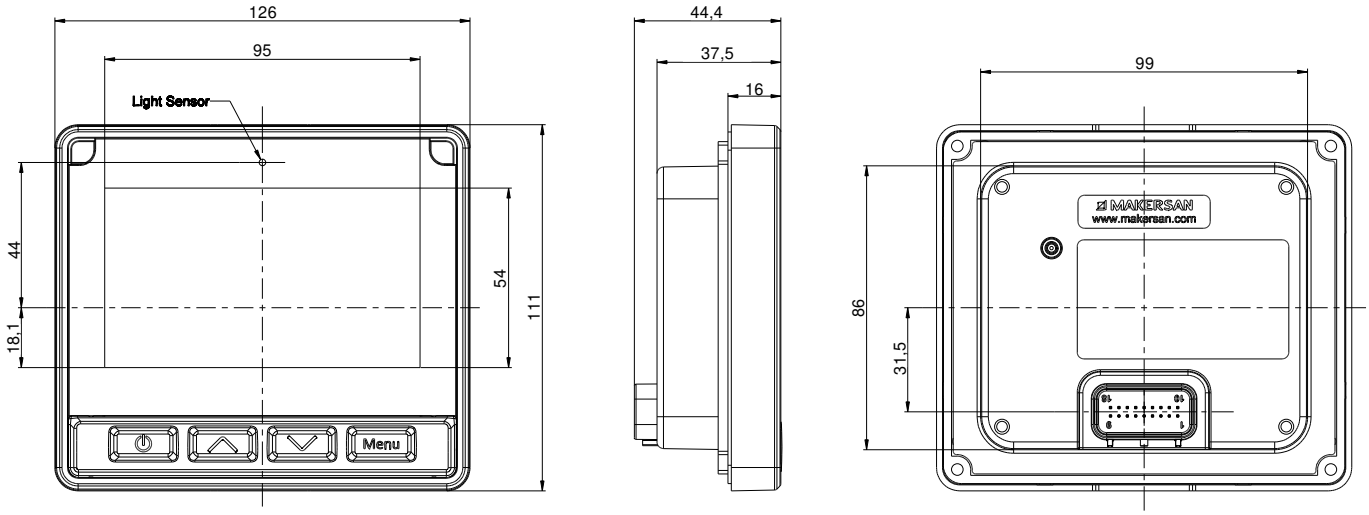
* Available upon request with minimum order quantity.

Example : MO 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 USB to CAN interface for device configuration
Boot Time	≤ 2 seconds
Type	TFT with LED backlight (optional Optical Bonded)
Size and Resolution	4.3" TFT, White/Transmissive - 480x272 24 bit RGB
Brightness	1000 nits
Other specification	RTC, 85dB configurable piezo-buzzer
I/O	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
Communication	Up to 2 CAN interface - SAE J1939 or CANOPEN
Mech. Installation	Flush/panel mounting or mounting on stand/arm
Operating Voltage	8-32V
Power Consumption	24V/150mA -no load and full brightness
Operating Temp.	-30°C ... +70°C
Protection Class	IP67
Connector	18 pin Tyco Seal 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.

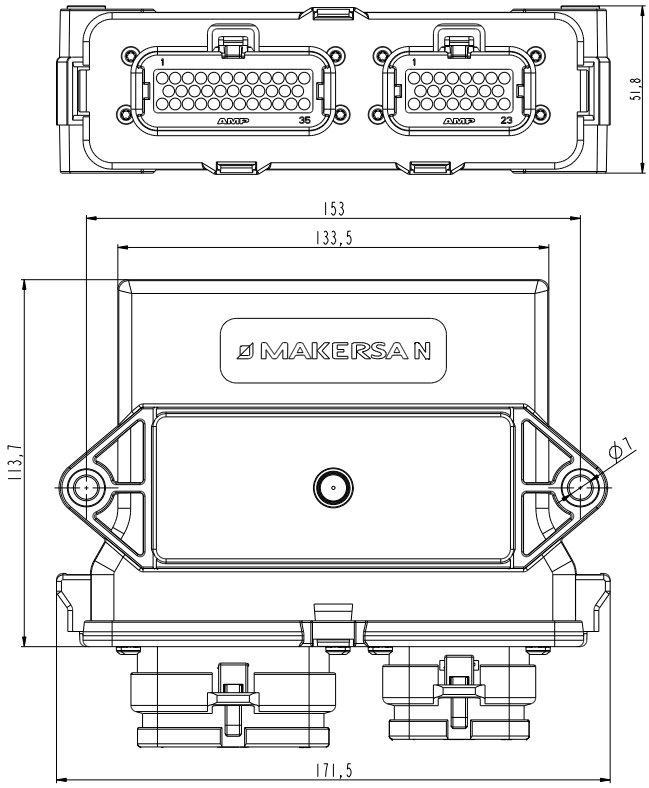
Example : MO 661 - H10 - S1000 is 8 Active-Low Inputs, 2 Active-High Inputs, 2 Frequency Inputs, 2 Resistor Inputs HMI Unit with SAE J1939 interface.

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

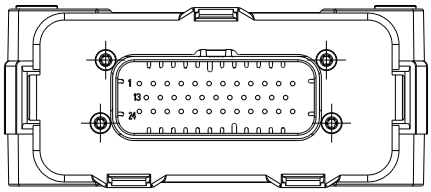
* Available upon request with minimum order quantity.

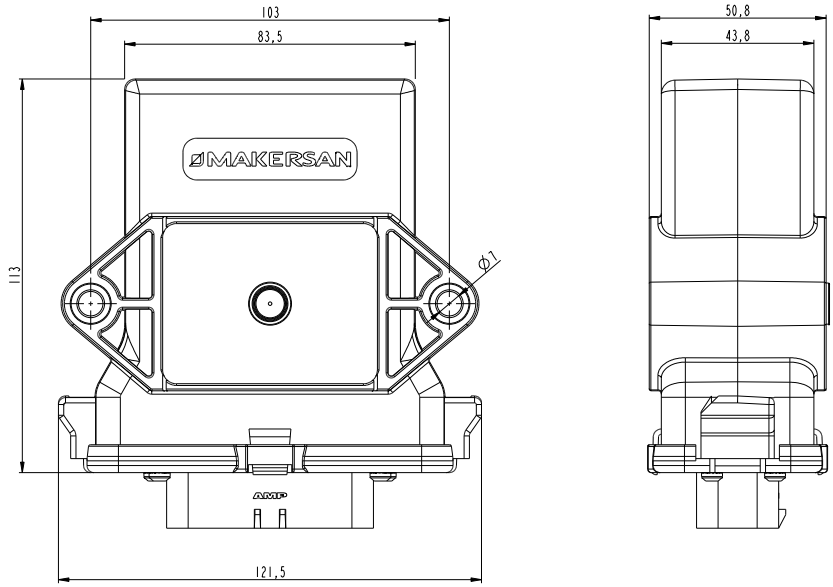
Example : MO 692 - H1000 - S10 is 16 analog Inputs, 4 Frequency Inputs, 4 Low-Side Outputs, 5V Ref Supply Output I/O Module with SAE J1939 interface.

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.

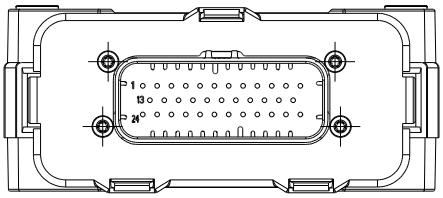
Example : MO 691 - H10 - S1000 is 26 Active-Low Inputs I/O Module with SAE J1939 interface.

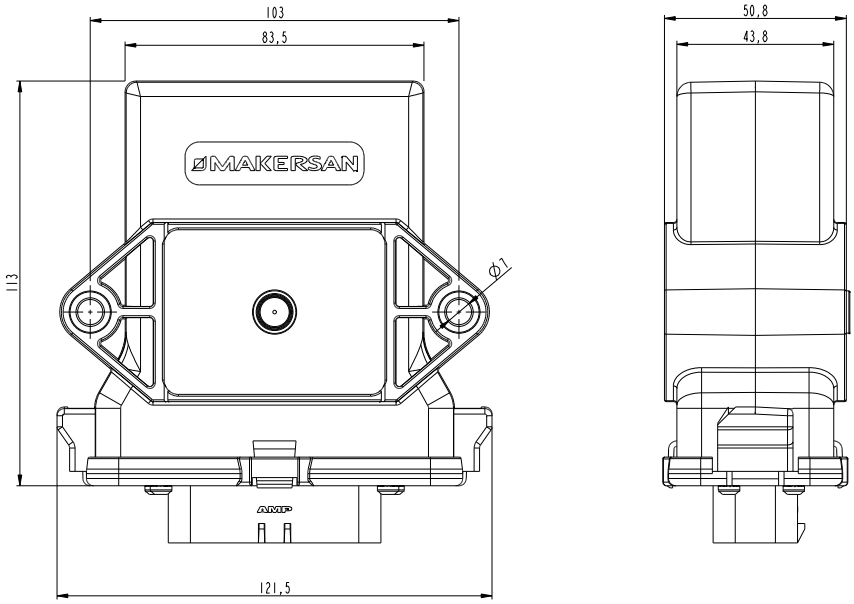
I/O MODULE with CAN Bus
MO 691 H2X

MAKERSAN

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.

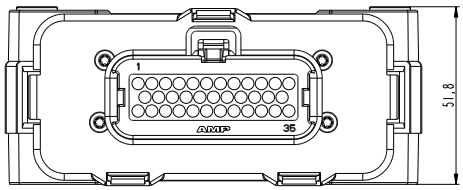
***** Available upon request with minimum order quantity.

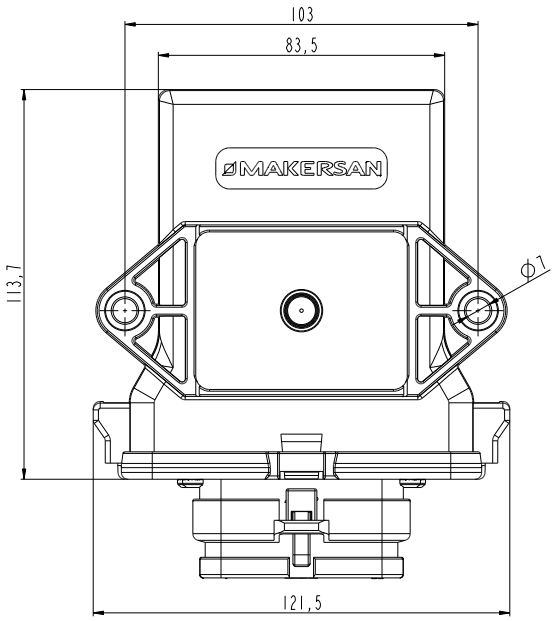
Example : MO 691 - H20 - S1000 is Active-Low Inputs, 4 Analog Inputs, 2 Current Inputs, 2 Frequency Inputs, 2 High-Side Outputs, 8 Proportional Outputs, 5V Ref Output I/O Module with SAE J1939 interface.

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.

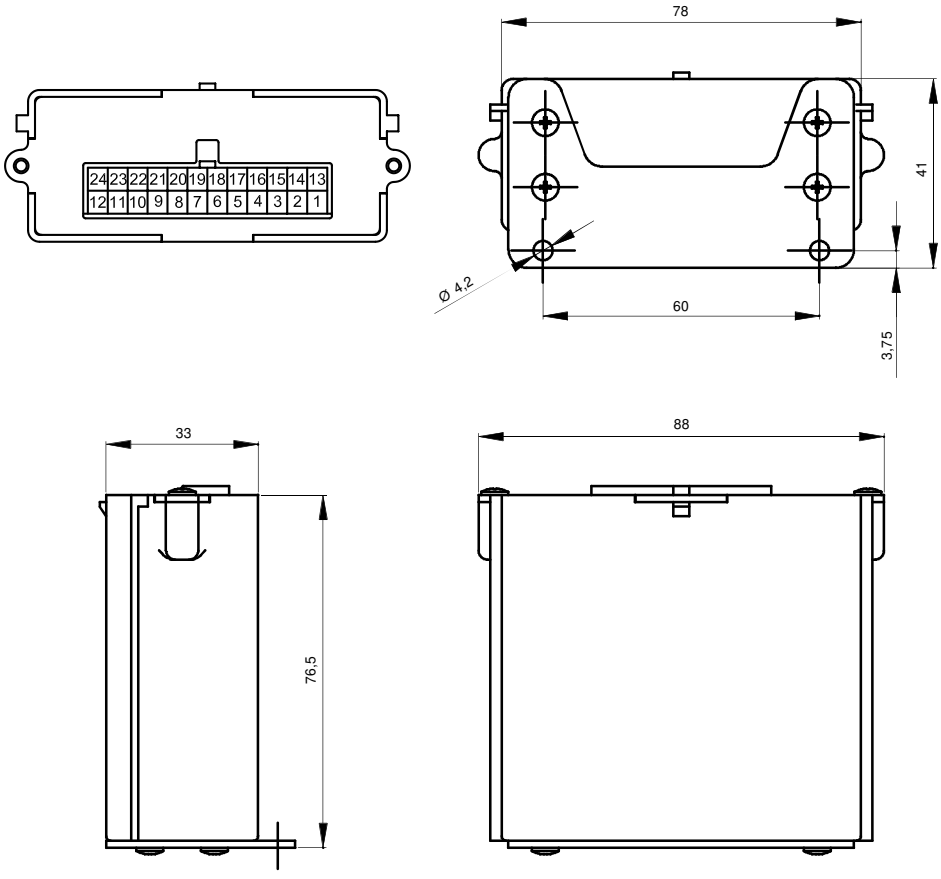
Example : 691.H30.S1000 - 2 Active-High Inputs, 6 Frequency Inputs, 3 Analog Inputs, 3 Resistive Inputs, 4 High-Side Outputs, 6 Motor Outputs, 5V Ref. Motor Driver Module with SAE J1939 interface.

I/O MODULE with CAN Bus
MO 690 H1X

MAKERSAN

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.

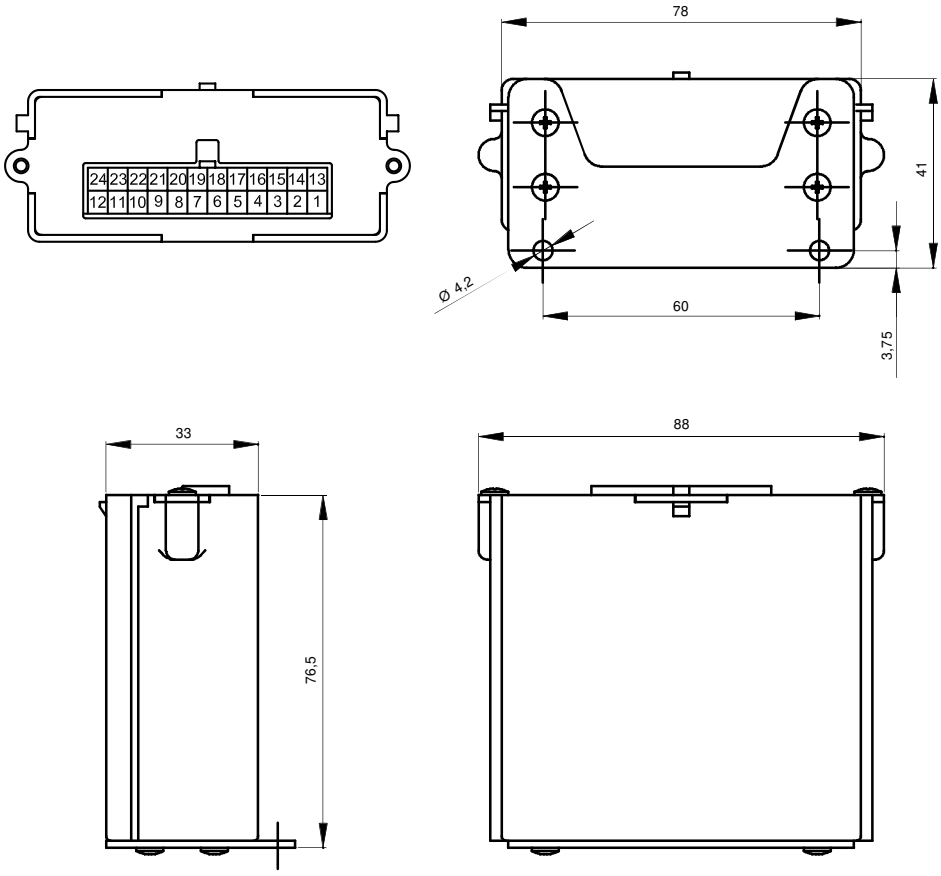
Example : MO 690 - H10 - S1000 is 2 Analog Inputs, 1 Current Input, 16 Low Side Outputs I/O Module with SAE J1939 interface.

RELAY OUTPUT EXTENSION MODULE
MO 690 HAX

MAKERSAN

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

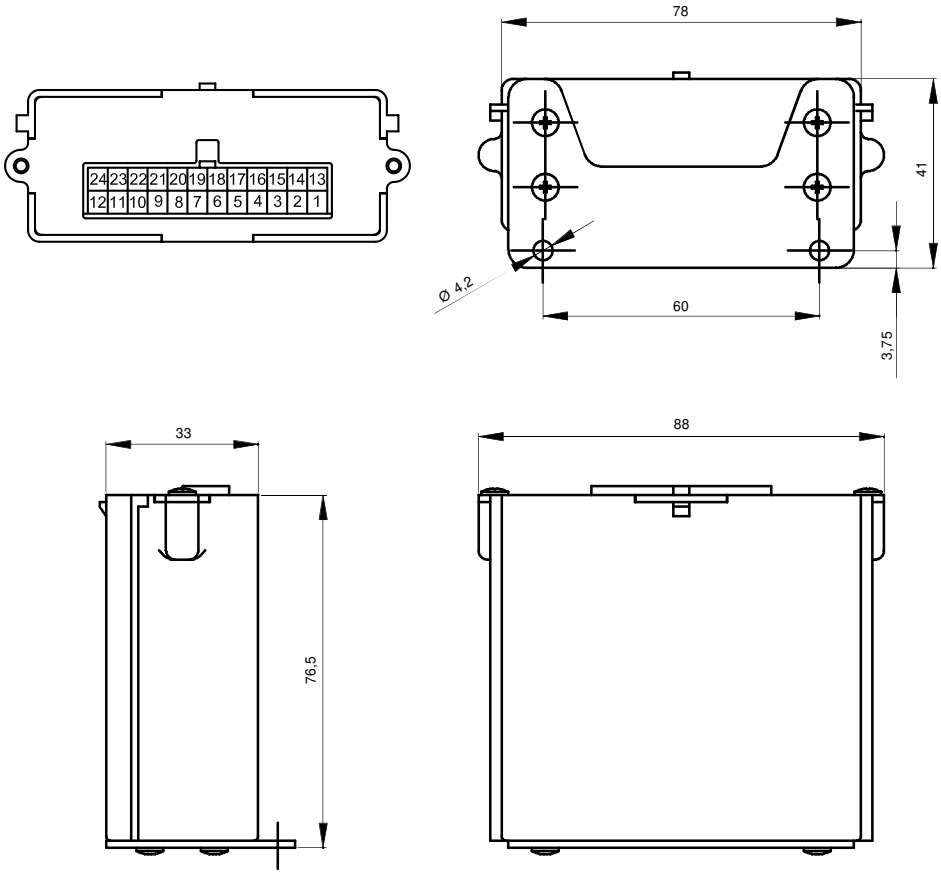
Example : MO 690 - HA0 is 4 Relay Outputs 8A, 1 Relay Output 15 A, Supply: 24V Relay Output Extension Module.

RELAY OUTPUT EXTENSION MODULE
MO 690 HBX

MAKERSAN

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



MO 690 - HBX

Hardware Configurations

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

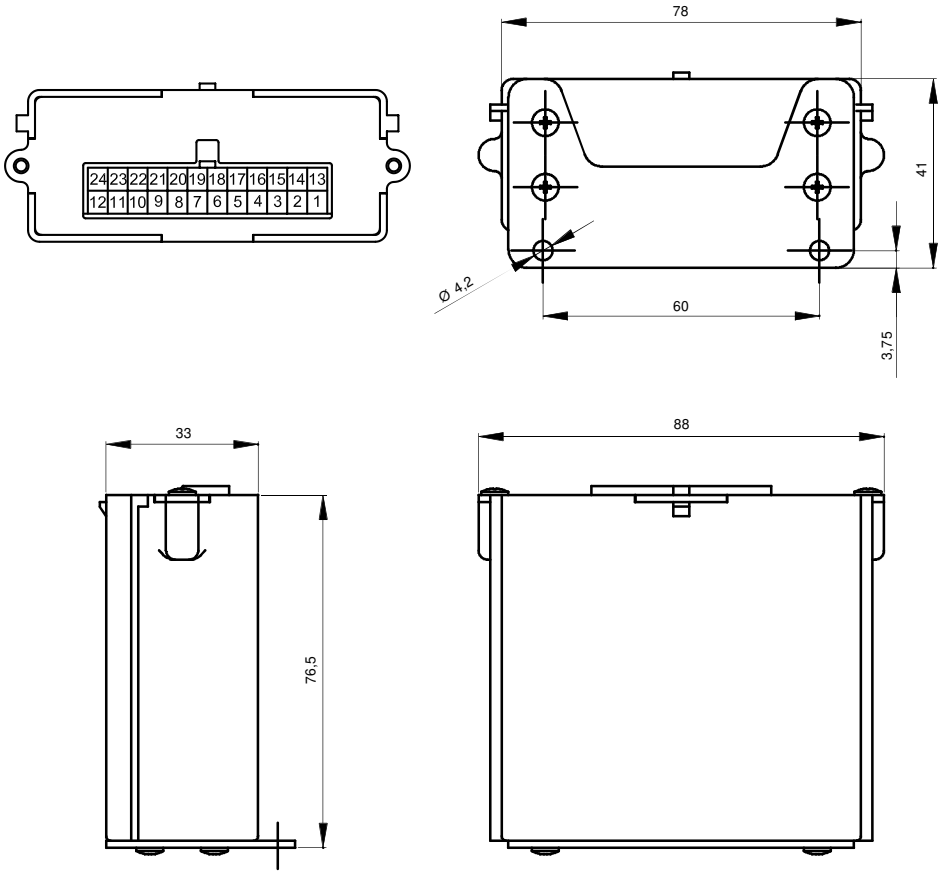
Example : MO 690 - HB0 is 8 Relay Outputs 5A, Supply: 24V Relay Output Extension Module.

FET OUTPUT EXTENSION MODULE
MO 690 HCX

MAKERSAN

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

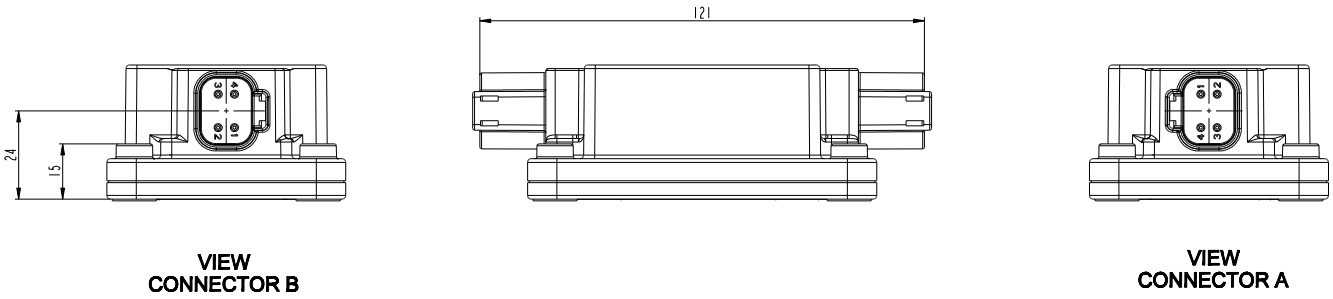
* Available upon request with minimum order quantity.

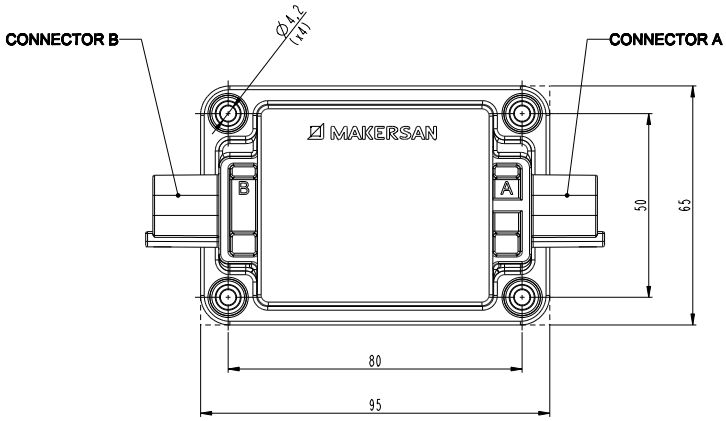
Example : MO 690 - HC0 is 6 High-Side Outputs, 6 Active-Low Inputs FET Output Extension Module

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





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.

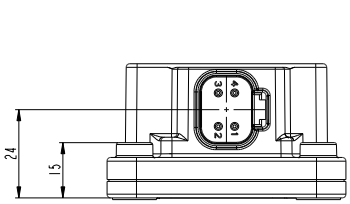
Example : MO 699 - H10 - S1000 is 2 Software Selectable Analog/Current/Frequency Inputs, 2 Proportional Outputs Valve Driver Module with SAE J1939 interface.

MOTOR DRIVER
MO 699 H2X

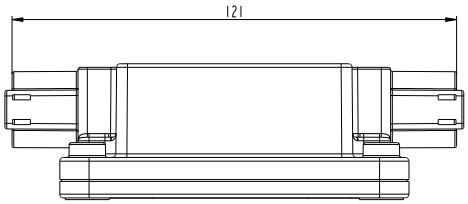
MAKERSAN

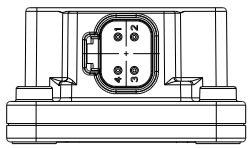
Technical Data

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 1 frequency/PWM inputs Up to 1 resistive inputs Up to 1 current inputs Up to 1 DC Motor Up to 1 BLDC Motor
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

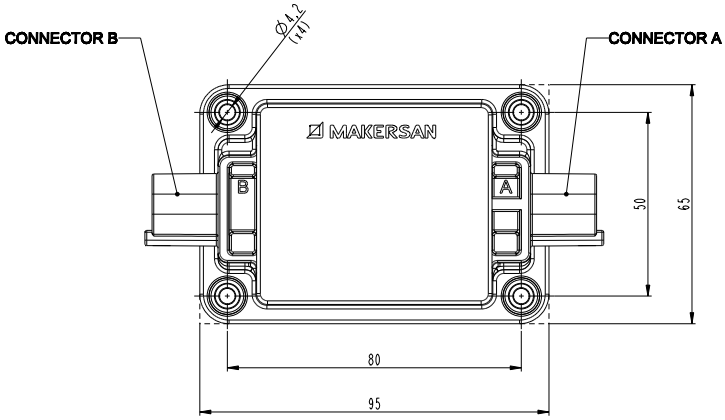


VIEW
CONNECTOR B





VIEW
CONNECTOR A



MO 699 - 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

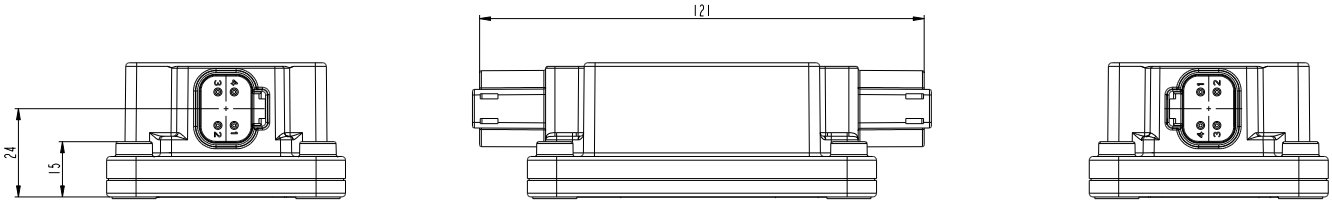
* Available upon request with minimum order quantity.

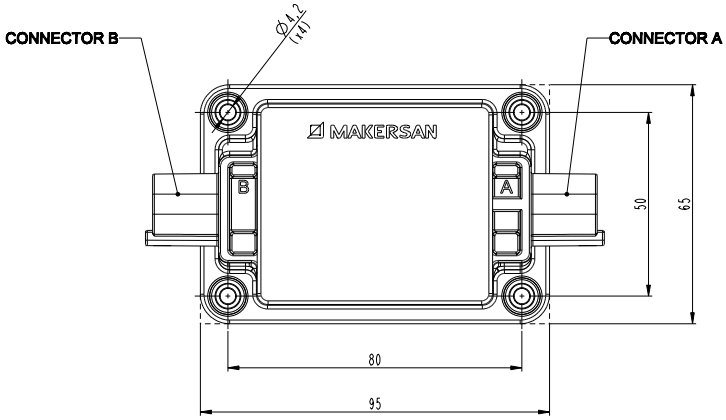
Example : MO 699 - H20 - S10 is 1 Software Selectable Analog/Current/Frequency Input, 3 Motor Outputs Motor Driver Module with SAE J1939 interface.

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

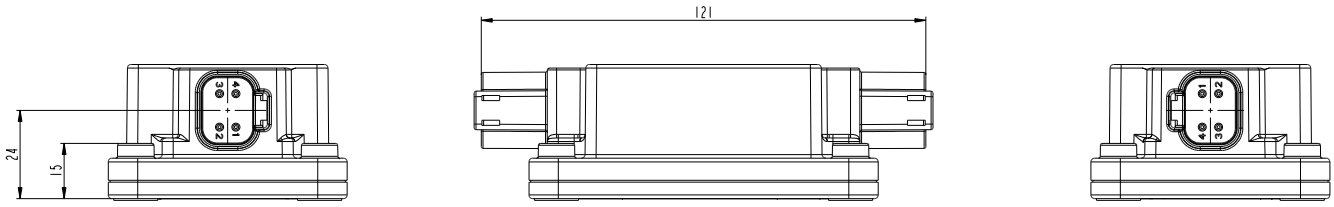
* Available upon request with minimum order quantity.

Example : MO 780 - H10 Start-Stop Regulator

DC-DC (60V) Regulator
MO 780 H2X

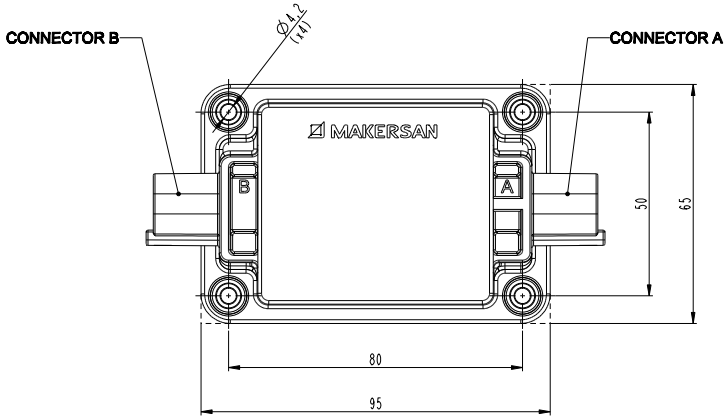
Technical Data

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



VIEW
CONNECTOR B

VIEW
CONNECTOR A



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

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