DATASHEET
MO 450X.H20.PXX.XX

MAKERSAN
Rotary Position Sensor

Product Characteristics

Technology	Contactless Hall measuring principle (Full Redundant)
Lifetime at full stroke	Up to 10 million
Operating Temperature	-40°C ... +85°C
Counterplug	6 way, Delphi Packard Metric Pack 150 12162261 Metri-Pack 150 Sealed Female Connector 12124076-L Metri-Pack 150 Sealed Terminal

Sensor 1: Electrical Data

Supply Voltage	8-32 VDC
Supply Current	10 mA (typical)
Output Voltage	Non Ratiometric Analog Output, Programmable 0-5 V
Output Current	1 mA (max.)
Output Short Circuit Current	15 mA
Output Load	10 kOhm (typical)
Load Capacity	4,7 nF
Output Resolution	12 bit
Total Error	±0.1 V
Linearity	±1 degree
Hysteresis	0.5 %

Sensor 2: Electrical Data

Supply Voltage	8-32 VDC
Supply Current	10 mA (typical)
Output Voltage	Non Ratiometric Analog Output, Programmable 0-5 V
Output Current	1 mA (max.)
Output Short Circuit Current	15 mA
Output Load	10 kOhm (typical)
Load Capacity	4,7 nF
Output Resolution	12 bit
Total Error	±0.1 V
Linearity	±1 degree
Hysteresis	0.5 %

Environment

Chemical Load	ISO 16750-5 : Diesel, engine oil, hydraulic fluid, grease, brake fluid, antifreeze fluid, urea, windscreen washer fluid, vehicle washing chemicals, cola, coffee, NPK fertilizer.
Damp Heat Steady	DIN EN 60068-2-78 : 40°C, 85% RH, 96h
Damp Heat, Cyclic	DIN EN 60068-2-30 : Between 25 / 55°C, 95% RH, 24h/cyc, 6cyc
Cold	DIN EN 60068-2-1 : -40°C, 48h
Dry Heat	DIN EN 60068-2-2 : 85°C, 48h
Change of Temperature	DIN EN 60068-2-14 : Between -40 / 85°C, 8h/cyc, 30cyc
Mechanical Shock	DIN EN 60068-2-27 : 40g, 6ms, 1000 times per plane x, y, z
Vibration Sinusoidal	DIN EN 60068-2-6 : 40g, 0,32m/s, 8h per plane x, y ,z
Vibration Random	DIN EN 60068-2-64 : 5,8g, 10-2000Hz, 8h per plane x, y ,z
Free Fall	DIN IEC 60068-2-32 : 1m free fall to concrete ground, 2 times per plane x, y, z
Water Jet	DIN 40050 Part 9 : Electronic IP 6K9K, Mechanical IP 54
Dust	DIN 40050 Part 9 : Electronic IP 6K9K, Mechanical IP 54
Immersion	DIN 40050 Part 9 : Electronic IP 67
Salt Spray	DIN EN 60068-2-11 : 504 hours

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

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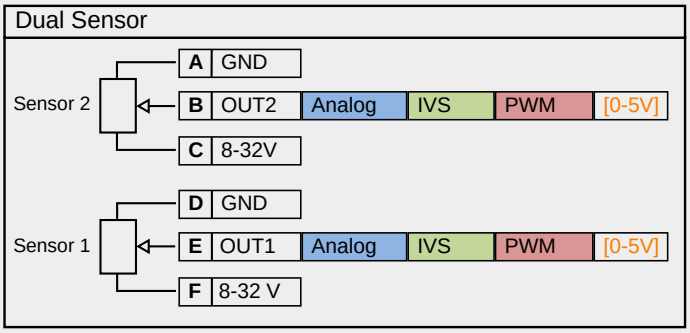
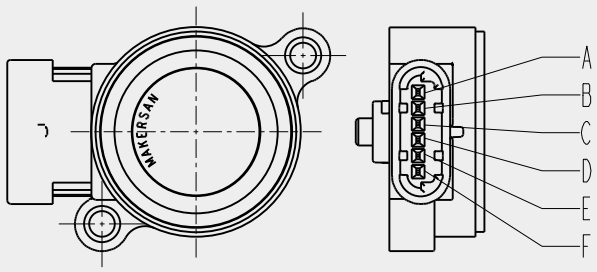
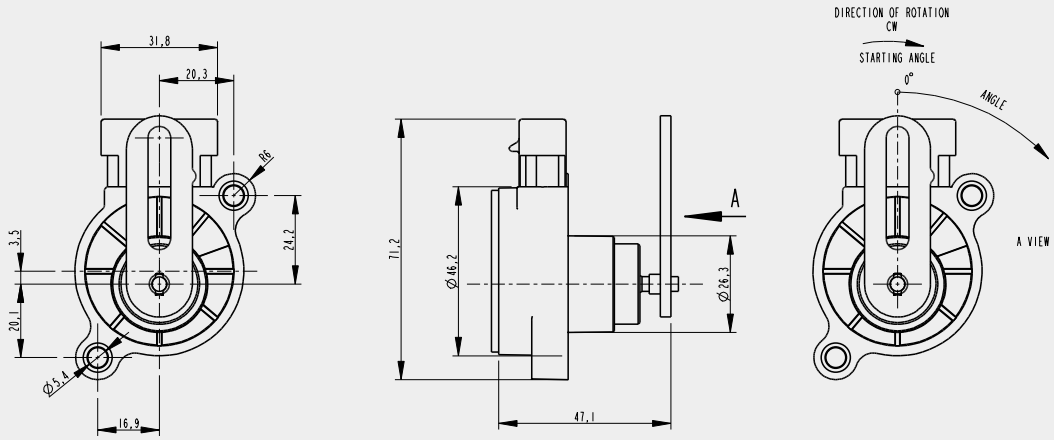
Rotary Position Sensor

Electrical Connection

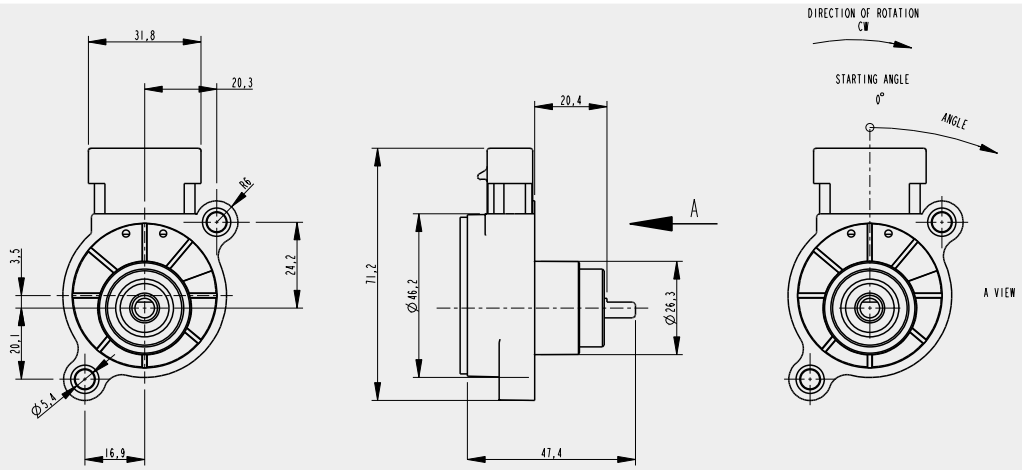




A Type: Technical Drawing



D Type: Technical Drawing



Ordering Code

MO 450X - H20 - PXX - XX

Sensor Type
A Type: MO 450A-H20
D Type: MO 450D-H20

Sensor Program
Custom programmed according to customer request

Angle Config
Custom programmed according to customer request

Safety Instructions

*Do not use sensor in hazardous and explosive environment.

*Keep the sensor away from magnets and radio equipment . Hall sensors are sensitive to external magnetic fields.

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

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

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

*Do not direct the pressure washing jet to sensor.

*Unplug connectors from the sensor during electrical welding operations.

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

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

*In no case Makersan will be liable or responsible for all damages and consequences resulting from the use of this device. The customer accepts all liability and risk in relation to use of this product in the final equipment.

*All the operating conditions specified in this document must not be exceeded during product life in order to ensure part reliability.

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

*Use outside these conditions may result in personal injury, death or damage to machine.

Fault Condition Behaviors

Test Conditions	**450.H20**
Sensor 1:	
Broken Ground (GND) [Pull-down load < 10 kOhm]	< 0.5V
Broken Ground (GND) [Pull-up load > 1kOhm]	> 4V
Broken Supply (Vs) [Pull-down load > 1kOhm]	< 0.1V
Broken Supply (Vs) [Pull-up load > 1kOhm]	-
Short Sensor Signal to Supply (Vs)	Sensor Damage (if Vs > 14V)
Short Sensor Signal to Ground (GND)	< 0.1V
Short Sensor Supply to Ground (GND)	< 0.1V
Sensor 2:	
Broken Ground (GND) [Pull-down load < 10 kOhm]	< 0.5V
Broken Ground (GND) [Pull-up load > 1kOhm]	> 4V
Broken Supply (Vs) [Pull-down load > 1kOhm]	< 0.1V
Broken Supply (Vs) [Pull-up load > 1kOhm]	-
Short Sensor Signal to Supply (Vs)	Sensor Damage (if Vs > 14V)
Short Sensor Signal to Ground (GND)	< 0.1V
Short Sensor Supply to Ground (GND)	< 0.1V

* The fault conditions given above are only valid for full redundant (independent supply/ground for each sensor) operation. In any other case the product must not be used. It is customer's responsibility to ensure that the system transitions to a safe state under each fault condition in the final equipment.

Makersan reserves the right to make corrections, enhancements, improvements and other changes to its products at any time and without notice.

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