



CAN Output Specification - Overview

The MAS-360 series sensor utilises a communications interface in accordance with the SAE J1939 standard. It utilises the standard defined PGNs SSI2 (0xF029) for angle data, and CA (0xFED8) for the user-adjustable Command Address. It also uses the proprietary vendor specific PGN PropB_AA (0xFFAA) to control and configure the device.

Interface

CAN Specification	ISO 11898, Basic and Full CAN 2.0 B
Transceiver	24V-compliant, not isolated
Communication profile	SAE J1939
Bit rate	250Kbps (500 & 50Kbps optional in settings)
Termination resistor	None (factory fit option)
Default address	129 (user configurable)

Name Field

Arbitrary address capable	1	Yes
Industry Group	0	Global
Vehicle System	127	Non specific
System Instance	0	
Function	255	Unspecified
Function Instance	0	
ECU Instance	0	
Manufacturer	664	Manufacturer ID
Identity Number	nnn	Manufacturers Serial Number

PGNs

Sensor Data	PGN 61481 (0xF029) - SSI2 - default transmission rate 100ms
Commanded Address	PGN 65240 (0xFED8) - CA
Sensor Configuration	PGN 65450 (0xFFAA) - PropB_AA - polled



PGN 61481 (F029h) - Slope Sensor Information 2 (SSI2)

The standard SSI2 PGN is defined below. This is transmitted in 100ms intervals by default.

SPN	SPN Name	Function	Data Range	Resolution	Offset	Bit Start	Bit Length	Default (After Scaling)	Units (After Scaling)
	Pitch Angle	Outputs the single axis tilt angle from the sensor	-250 to 250deg	3.0517578 E-05 deg/lb	-250	0	24	-	degrees
	Roll Angle	Not Implemented	-250 to 250deg	3.0517578 E-05 deg/lb	-250	24	24	-250	degrees
	Pitch Angle Compensation	Two bits to indicate pitch angle compensation 0 = Compensation off 1 = Compensation on 2 = Error 3 = Not Available	0 to 3	4 states/2 bit	0	48	2	3	-
	Pitch Angle Figure of Merit	Two bits to indicate fault condition 0 = Fully functional 1 = Reading degraded 2 = Out of range error 3 = Not available	0 to 3	4 states/2 bit	0	50	2	0	-
	Roll Angle Compensation	Two bits to indicate roll angle compensation 0 = Compensation off 1 = Compensation on 2 = Error 3 = Not Available	0 to 3	4 states/2 bit	0	52	2	3	-
	Roll Angle Figure of Merit	Two bits to indicate fault condition 0 = Fully functional 1 = Reading degraded 2 = Out of range error 3 = Not available	0 to 3	4 states/2 bit	0	54	2	3	-
	Roll and Pitch Latency	Latency between sensor measurement and queuing of the data for CAN transmission	0 to 125ms	0.5ms/lb	0	56	8	5	ms



PGN 65450 (FFAAh) - Vendor Specific PGN PropB_AA

The vendor specific PGN PropB_AA is used to control and configure the device as defined below. This PGN is only transmitted on request.

SPN	SPN Name	Function	Data Range	Resolution	Offset	Bit Start	Bit Length	Default (After Scaling)	Units (After Scaling)
	Un-used	None	-	-	-	0	16	-	-
	Polled / Continuous	Determines if PGN SS12 is transmitted continuously, or only when polled 1 = Continuous 0 = Polled	0 to 1	2 states / 1 bit	0	16	1	0	-
	Baud Rate	3 bits (2 used) for CAN baud rate 0 = 250Kbit/s 1 = 500Kbits/s 2 = 50Kbits/s 3 to 7 = unused	0 to 2	3 states / 2 bit (3rd bit not used)	0	17	3	0 (250)	- (Kbps)
	Un-used	None	-	-	-	20	4	-	-
	Transmit Rate	Four bits to indicate transmit period 0 = 10ms 1 = 20ms 2 = 30ms 3 = 40ms 4 = 50ms 5 = 75ms 6 = 100ms 7 = 200ms 8 = 250ms 9 = 500ms 10 = 750ms 11 = 1000ms 12 = 2000ms 13 = 5000ms 14 = Error 15 = Not Available	0 to 15	16 states / 4 bit	0	24	4	6 (100ms)	- (ms)

Continued on next page...



PGN 65450 (FFAAh) - Vendor Specific PGN PropB_AA - (Continued)

SPN	SPN Name	Function	Data Range	Resolution	Offset	Bit Start	Bit Length	Default (After Scaling)	Units (After Scaling)
	Un-used	None	-	-	-	28	4	-	-
	Temperature	Temperature data from on-board temperature sensor	-273 to 273°C	0.03125°C / lsb	-273	32	16	-	°C
	Filter Frequency	Adjustable 2nd order digital filter 0 = 0.1Hz 1 = 0.2Hz 2 = 0.3Hz 3 = 0.4Hz 4 = 0.5Hz 5 = 1Hz 6 = 2Hz 7 = 3Hz 8 = 4Hz 9 = 5Hz 10 = 7Hz 11 = 10Hz 12 = 15Hz 13 = 20Hz 14 = 25Hz 15 = 30Hz 16 = 40Hz 17-255 = Not implemented	0 to 16	17 states / 8 bits	0	48	8	5 (1)	- (Hz)
	Un-used	None	-	-	-	56	8	-	-



PGN 65240 (FED8h) - Commanded Address

The standard Command Address PGN 65240 is used to change the address of a device on the CAN J1939 network. To use PGN 65240 it is necessary to utilise the Broadcast Announce Message (BAM) multi-message protocol because the Commanded Address message is 9 bytes long. The first 8 bytes sent contain the device's Name fields, while the last byte is the new source address for the device. If the packet is successfully received, the device will automatically initiate an address claim procedure.

As an example, to change the address of a device with the serial number 123456 to source address 130, the following data packet should be sent 40 E2 01 53 00 FF FE 80 82. From a user perspective, the Name fields are constructed with byte 9 first (0x82) and byte 1 last (0x40), but should be sent with byte 1 first and byte 9 last. See overleaf for more details about the construction of this example.

Read/Write	Field	Data Range	Resolution	Offset	Byte Location	Bit Length	Default (After Scaling)	Units (After Scaling)
Write	New source address	0 to 253	1	0	Byte 9 Bits 7 to 0	8	-	-
Read	Arbitrary address bit	0 to 1	1	0	Byte 8 Bit 7	1	1	-
Read	Industry group	0 to 255	1	0	Byte 8 Bits 6 to 4	3	0	-
Read	Vehicle system instance	0 to 7	1	0	Byte 8 Bits 3 to 0	4	0	-
Read	Vehicle system	0 to 127	1	0	Byte 7 Bits 7 to 1	7	127	-
Read	Reserved bit	0 (Only)	NA	0	Byte 7 Bit 0	1	0	-
Read	Function	0 to 255	1	0	Byte 6 Bits 7 to 0	8	255	-
Read	Functions Instance	0 to 31	1	0	Byte 5 Bits 7 to 3	5	0	-
Read	ECU Instance	0 to 7	1	0	Byte 5 Bit 2 to 0	3	0	-
Read	Manufacturers code	0 to 2047	1	0	MSB: Byte 4 bits 7 to 0. LSB: Byte 3 bits 7 to 5	11	664	-
Read	Serial number	0 to 2097151	1	0	MSB: Byte 3 Bits 4 to 0. (Middle:) Byte 2 Bits 7 to 0. LSB: Byte 1 Bits 7 to 0	21	[Serial no.]	-



PGN 65240 (FED8h) - Commanded Address - (Continued)

The example shown on the previous page must be transmitted with byte 1 first ("40 E2 01 53 00 FF FE 80 82"), but the fields are constructed in reverse byte order as shown below:

Bit index	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Byte	Byte 9								Byte 8								Byte 7								Byte 6							
Value (hex)	0x82								0x80								0xFE								0xFF							
Function	New Source Address								Arbitrary Address Bit	Industry group			Vehicle system Instance				Vehicle System					Reserved bit	Function									
Binary	1	0	0	0	0	0	1	0		1	0	0	0	0	0	0	0	1	1	1	1		1	1	1	0	1	1	1	1	1	1

...	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
	Byte 5								Byte 4								Byte 3								Byte 2								Byte 1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
	0x00								0x53								0x01								0xE2								0x40																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
	Function Instance					ECU Instance			Manufacturer Code MSB								Manufacturer Code LSB			Serial Number MSB					Serial Number (Middle byte)						Serial Number LSB																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	0	0	0	0	0	1	1	1	1	1	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Field	Length (bits)	Example Values (Binary)	Example Values (Decimal)
New Source Address	8	10000010	130
Arbitrary address bit	1	1	1
Industry group	3	000	0
Vehicle system Instance	4	0000	0
Vehicle system	7	1111111	127
Reserved bit	1	0	0
Function	8	11111111	255
Function Instance	5	00000	0
ECU Instance	3	000	0
Manufacturer Code	11	01010011 000	664
Serial Number	21	00001 11100010 01000000	123456