SAE J1939 Protocol

For DAS Sensor Products

DAS Co., Ltd.

< J1939 Interface Description >

J1939 Message Format

The J1939 interface uses the 29 bit CAN-ID. The CAN-ID in J1939 is assembled of a Parameter Group Number (PGN) and a source address. A parameter group (PG) consists of various parameters, such as Offset value, direction of rotation, etc. That means, a PGN specifies what's in that data field. The priority field has a width of 3 bits. It indicates the message priority. Priority "0" is the highest and "7" the lowest.

A value of "PDU format" between 0x00 and 0xF0 causes messaging between two specific devices. In this case the field "PDU specific" equals the destination address.

A value of "PDU format" higher than 0xF0 causes broadcast messaging to all devices in a group. "PDU specific" is then interpreted as a "group extension". The device address (node ID) of every individual device in the network has to be unique.

Interpretation of the CAN Identifier

The CAN identifier of a J1939 message contains Parameter Group Number (PGN), source address, priority, data page bit, extended data page bit and a target address (except for broadcast messages).

The identifier is composed as follows:

Priority	Extended data page	Data page	PDU format	PDU Specific (Destination Address)	Source address
3 bit	1 bit	1 bit	8 bit	8 bit	8 bit

The entire telegram contains the identifier and the data section.

** Example for Request PGN

Identifier (29 bit)					**Data Bytes**							
Priority (3 bit)	PGN			Source address (8 bit)	1	2	3	4	5	6	7	8
	Data page (2 bit)	PDU format (8 bit)	Destination address (8 bit)									
0x07	0x00	0xEA	0x80	0x33	Requested PGN			xx	xx	xx	xx	xx
0x1CEA8133												

** Explanation of the 29 bit Identifier as above

Bit	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Byte	4					3 (PDU Format)								2 (Destination address)								1 (Source address)							
Value	1	1	1	0	0	1	1	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0
	0x1	0xC				0xE				0xA				0x8				0x1				0x3				0x3			
	1CEA8133																												

< Address Claiming >

As defined in the J1939 standard the sensor supports the dynamic address claiming. To switch off this function the arbitrary bit in the node name (Parameter-No. 6) should be set to zero. The sensor starts the claiming with the default node address 128 (0x80) (Parameter-No. 1). If an address conflict with a higher prior node occurs the network management will change the node address automatically using his internal address claimed table. In this table the sensor registers all claimed addresses from other nodes. The table will be cleared on a reset. The new claimed address after a conflict will be saved in the parameter set and used on a restart. If the dynamic claiming is not active or no free node address is available the sensor will use the null address 254. The null address is not saved in the parameter set, after a restart the sensor will use the last claimed address. The Parameter Group Number (PGN) 0x00FED8 "Commanded Address" is not supported.

< Process Data >

After the sensor has claimed a node address the measured inclination values will be send automatically with a "Proprietary B" PGN message. The priority, the PGN and the transmission rate are changeable in the parameter mode. It's also possible to request the process data message with the "Request" PGN 0x00EA00.

** Example for Request PGN

Identifier			Data Bytes							
Priority	PGN	Source address	1	2	3	4	5	6	7	8
*	0x00EAnn	*	Requested PGN			xx	xx	xx	xx	xx

Message Content

The process data message contains in the eight data bytes four signals with 2 bytes. The first three values are the X, Y and Z angle values. The last value is representing the sensor internal temperature.

Example for process data message :

Identifier			Data Bytes							
Priority	PGN	Source address	1	2	3	4	5	6	7	8
7	0x00FF00	0x80	X_LSB	X_MSB						

Definition of the Signals (SLOT)

Angle-Values :
Data Length : 2 Bytes
Resolution : 0.022 °/bit
Range : 0~ 360°(±180°)
Offset : 0
Transfer Function : Angle [1°/10] = Data - Offset
1) Only as an example for 360° sensors. For detailed SLOT definitions refer to the data sheet of the individual sensor.

< Parameter Mode >

The parameter mode uses the "Proprietary A" PGN 0x00EF00 for a peer-to-peer communication. Therefor the PGN includes the sensor node address in the last byte. To read and write the parameters the eight data bytes has to contain the following commands. The written parameter values are saved permanent when the parameter mode is left. Then the sensor starts with a complete reset and the new parameter set.

Starting Parameter Mode

Identifier			Data Bytes							
Priority	PGN	Source address	1 CMD	2 P/W	3	4	5	6	7	8
*	0x00EFnn	*	0xCB	0xAA	xx	xx	xx	xx	xx	xx

Leaving Parameter Mode

Identifier			Data Bytes							
Priority	PGN	Source address	1 CMD	2 P/W	3	4	5	6	7	8
*	0x00EFnn	*	0xCE	0x55	xx	xx	xx	xx	xx	xx

Reading Parameters

Identifier			Data Bytes							
Priority	PGN	Source address	1 CMD	2 Parameter No.	3	4	5	6	7	8
*	0x00EFnn	*	0xC0	PP	xx	xx	xx	xx	xx	xx

Writing Parameters

Identifier			Data Bytes							
Priority	PGN	Source address	1 CMD	2 Parameter No.	3 Data	4 Data	5 Data	6 Data	7 Data	8 Data
*	0x00EFnn	*	0xC1	PP	dd	dd	dd	dd	dd	dd

Saving Parameters

Identifier			Data Bytes							
Priority	PGN	Source address	1 CMD	2 Parameter No.	3	4	5	6	7	8
*	0x00EFnn	*	0xC1	0x50	0x73	0x61	0x76	0x65	xx	xx

Reset Parameters (Factory Reset)

Identifier			Data Bytes							
Priority	PGN	Source address	1 CMD	2 Parameter No.	3	4	5	6	7	8
*	0x00EFnn	*	0xC1	0x51	0x6C	0x6F	0x61	0x64	xx	xx

nn : destination address → sensor node address
* : placeholder, necessary
x : unused, bytes optional

pp : the number of the parameter
dd : data to write, LSB in Byte 3

< Parameter Overview >

No.	Name	Range	Default	Size	Access	Description
10	Industry Group	0 ... 7	2	1	RO	Part of the J1939 node name see J1939 standard
11	Vehicle System	0 ... 15	0	1	RO	
12	Vehicle System Instance	0 ... 127	0	1	RO	
13	Function	0 ... 255	0	1	RO	
14	Function Instance	0 ... 31	0	1	RO	
15	ECU Instance	0 ... 7	0	1	RO	
16	Manufacturer		711	2	RO	Manufacturer ID
17	Identity Number			3	RO	Last 21 bit of Serial Number
18	Software Version			4	RO	Software Version
19	Serial Number			4	RO	Manufacture's serial number
20	Node Address	0 ... 253	128 (0x80)	1	RW	Actual node address NULL address will not be saved
21	Bitrate	0 ... 1	0	1	RW	0=250 kbps, 1=500 kbps
22	PD PGN	0x00000 ... 0x3F FFF	0x0FF00	4	RW	PGN for sending process data including the data page and extended data page bits
23	PD Priority	0 ... 7	7	1	RW	Priority of the process data message
24	Arbitrary Address Capable	0 ... 1	0	1	RW	Part of the J1939 node name 0 = address claiming deactivated 1 = address claiming activated
31	Transmit Mode	0 ... 1	0	0	RW	0 = timer mode OFF 1 = timer mode ON
32	PD Interval	0 ... 6,000	10	2	RW	Sending interval of the process data message, multiplied with 10ms 0 = no message will be sent 1 = 10ms … 6000 = 60000ms
34	Offset Angle	-9,999 ... +9,999	0	2	RW	Offset Value for angle
50	Saving Parameters		0x73617665	4	WO	Saving current parameters (SAVE)
51	Reset Parameters		0x6C6F6164	4	WO	Factory-Reset parameters (LOAD)

< Answer Messages >

In the answer message the source address is the address of the sensor (default value 0x80). The destination address is the node ID of the node that has sent the request. The priority is always 6 (0x6). On each parameter message the sensor will send an answer with a code in the first byte of the data bytes section.

**** Example for Answer Message**

Identifier (29 bit)					Data Bytes							
Priority (3 bit)	PGN			Source address (8 bit)	1	2	3	4	5	6	7	8
	Data page (2 bit)	PDU format (8 bit)	Destination address (8 bit)									
0x06	0x00	0xEF	0x64	0x80	Code							
0xEF80												

Code	Description
E0	OK / Password accepted / Parameter successful written or read
E1	Failure
E2	Parameter number out of range
E3	No valid parameter
E4	Unknown command

DAS Co., Ltd.
128 Bibong-ro, Bibong-myeon,
Hwaseong-si, Gyeonggi-do, Korea
Tel. +82 (0) 31 356 3541
E-mail: das@das-co.com

http://das-co.com