iso175 SAE J1939 Specification

Insulation monitoring device for unearthed DC drive systems (IT systems) in electric vehicles

Table of contents

BENDER

1 Operation

1.1 SAE J1939 CAN-ID Structure

By default a SAE J1939 CAN-ID with 29Bit identifier is structured as follows:

ID Byte 0						ID Byte 1									
			Priority			PGN									
						EDP	DP	PDU							
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

ID Byte 2								ID Byte 3							
PGN								Source Adress							
PDU															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Priority: 6 (cyclic), 7 (TP) (*); PGN: see message table; Source Adress: 244 (*)

1.2 User data structure

The messages contain either DataByte, DataWord or DataDWord values. The byte order for the DataWord values is:

Byte order (Intel)				
	DataByte			
	7.....0			
	DataWord			
	LowByte	HighByte		
	7.....0	15.....8		
	DataDWord			
	LowWord		HiWord	
	LowByte	HighByte	LowByte	HighByte
	7.....0	15.....8	23.....16	31.....24

1.3 Messages

1.3.1 DeviceInfo Message

The *DeviceInfo* message is realized a a multi-package telegram and will be automatically send within 2 s after device is powered on. The messages look like the following:

TP.CM_BAM message

CAN-ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x1CECFFF4	0x20 (broadcast)	42 (total number of bytes)		6 (number of packets	0xFF (reserved)	PGN (65280)		

TP.DT message

CAN-ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x1CEBFFF4	packet number	data0 …7						

Data 0…41

Data 0…13	Data 14…27	Data 28…41
device type „iso175“	serial number	part number

1.3.2 Cyclic messages

Communication between the requesting instance in the vehicle environment and the ISOMETER® takes place via the HS-bus. The ISOMETER® can process the following messages:

Message	PGN	Direction	Cycle time
PGN_Info_General	65281 *	Tx	100 ms *
PGN_Info_IsolationDetail	65282 *	Tx	off *
PGN_Info_Voltage	65283 *	Tx	off *
PGN_Info_IT-System	65284 *	Tx	off *

** for customization please contact our local sale representive*

1.4 PGN_Info

PGN_Info_General is sent cyclically every 100 ms (default). All other info messages are deactivated by default, but can be selected as follows for a customer-specific order: 0: no cyclic message, 1...255: Cycle time [100 ms].

	Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7
PGN_Info_General	Isolation: R_iso_corrected (neg. Tolerance shifted)		Isolation: R_iso_status	Isolation: Measurement Counter	Status: Warnings and Alarms		Status: Device Activity	N/A or 0xFF or 0xFF
PGN_Info_Isolation-Detail	Isolation: R_iso_neg		Isolation: R_iso_pos		Isolation: R_iso_original		Isolation: Measu-rement Counter	Isolation: Quality
PGN_Info_Voltage	Voltage: HV system		Voltage: HV_neg to earth		Voltage: HV_pos to earth		Voltage: Measu-rement Counter	N/A or 0xFF
PGN_Info_IT-System	Capacity: Measured Value		Capacity: Measurement Counter	Unbalance: Measured Value	Unbalance: Measure-ment	Voltage: Measured Frequency		N/A or 0xFF

1.5 PGN_Request

1.5.1 Read parameters

Request read out parameters - Standard data format of a request:

PGN	Data 0	
	Bit 7 ... 1	Bit 0
PGN_Request (61184)	Index	0

Response read out parameters - Standard data format of a response:

PGN	Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7
	Byte	Byte	Byte	Byte	Byte	Byte	Byte	Byte
		DataWord1		DataWord2		DataWord3		N/A or 0xFF
		DataWord				N/A or 0xFF	N/A or 0xFF	N/A or 0xFF
PGN_Request (61184)	Index	AA	BB	CC	DD	EE	FF	GG

The parameters data length is always 8 bytes (index + 7 bytes user data). Unused memory locations are filled with 0xFF.

Standard data format of an error meassage:

PGN	Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7
PGN_Request (61428)	0xFF	0x23: unknown/ invalid request	0xXX invalid requested index	0xFF				
		0x24 set command failed, parameter locked	0xXX set command Index which failed	0xFF				

An error message will be returned if either the index is unknown or the write lock is still set for a write command, which is intended to prevent unintended writing.

Overview of all read out parameters:

Note: SNV = Signal not valid

Name	Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	additional information
	(Index)	DataWord1		DataWord2		DataWord 3		Data-Byte	
Bootloader Identification: Build number	0x0A	1…64255 65535: SNV		0xFF	0xFF	0xFF	0xFF	0xFF	
Bootloader Identification: D-Number	0x0C	1…64255 65535: SNV		0xFF	0xFF	0xFF	0xFF	0xFF	

Name	Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	additional information
	(Index)	DataWord1		DataWord2		DataWord 3		Data-Byte	
Bootloader Identification: Version	0x0E	1…64255 65535: SNV		0xFF	0xFF	0xFF	0xFF	0xFF	
Hardware Identification: AH-History	0x10	0…255 per byte							
Hardware Identification: AH-Number	0x12	0…255 per byte							
au8AH_Number-PartB	0x14	0…255 per byte							
au8ArticleNumber-PartA	0x16	0…255 per byte							
au8ArticleNumber-PartB	0x18	0…255 per byte							
Hardware Identification: Serial number	0x1A	0…255 per byte							
au8SerialNumber-PartB	0x1C	0…255 per byte							
Software Identification: Build Number	0x1E	1…64255 65535: SNV		0xFF	0xFF	0xFF	0xFF	0xFF	
Software Identification: D-Number	0x20	1…64255 65535: SNV		0xFF	0xFF	0xFF	0xFF	0xFF	
Software Identification: Version	0x22	1…64255 65535: SNV		0xFF	0xFF	0xFF	0xFF	0xFF	e. g. → 100 V 1.00
Unbalance: Measured value	0x2A	0…100: Measured value [%] 255: SNV	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	(0 % = HV+, 50 % = HV/2, 100 % = HV-)
Unbalance: Measurement Counter	0x2C	0…255	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	counter will be incremented with each new measured unbalance value
Unbalance: Alarm Threshold	0x2E	0: Unbalance alarm deactivated 5…45: Unbalance alarm threshold [%]	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	default: 0

Name	Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	additional information
	(Index)	DataWord1		DataWord2		DataWord 3		Data-Byte	
Self-holding Iso-Alarm: Activation	0x30	0xFC: false = automatic alarm reset 0xFD: true = self-holding alarm (must be reset via command)	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	default: 0xFC
Isolation: Measurement Counter	0x36	0...255	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	counter will be incremented with each new measured isolation resistance value
Isolation: Active Profile	0x38	0: Custom Profile 1: Standard with fast startup 2: Standard 3: High Capacity with fast startup 4: High Capacity 5: Disturbed 6: Service 7: UG	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	default: 1
Isolation: Power-On Profile	0x3A	0: Custom Profile 1: Standard with fast startup 2: Standard 3: High Capacity with fast startup 4: High Capacity 5: Disturbed 6: Service 7: UG	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	default: 1
Isolation: Quality	0x3E	0…100 [%] 255: SNV	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	
Isolation: R_iso_neg	0x40	0…50000: isolation resistance on HV_ne [kΩ] 65535: SNV		0xFF	0xFF	0xFF	0xFF	0xFF	
Isolation: R_iso_pos	0x42	0…50000: isolation resistance on HV_pos [kΩ] 65535: SNV		0xFF	0xFF	0xFF	0xFF	0xFF	

Name	Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	additional information
	(Index)	DataWord1		DataWord2		DataWord 3		Data-Byte	
R_iso_status	0x44	0xFC: estimated isolation value during startup 0xFD: first measured isolation value during startup 0xFE: isolation value in normal operation 0xFF: SNV	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	
Isolation: Threshold Error	0x46	30…2000: isolation error threshold [kΩ]		0xFF	0xFF	0xFF	0xFF	0xFF	default: 100
Isolation: Threshold Timeout Measurement	0x48	0: Alarm deactivated 1 - 64255: Threshold Timeout [s]		0xFF	0xFF	0xFF	0xFF	0xFF	default: 60
Isolation: Threshold Warning	0x4A	30…2000: isolation warning threshold [kΩ]		0xFF	0xFF	0xFF	0xFF	0xFF	default: 500
Isolation: R_iso_corrected (neg. Tolerance shifted)	0x4C	0…35000: corrected isolation value [kΩ] 65535: SNV		0xFF	0xFF	0xFF	0xFF	0xFF	Note: Maximum value depends on the defined tolerance of the current active profile
Isolation: R_iso_original	0x4E	0…50000: original isolation valu [kΩ] 65535: SNV		0xFF	0xFF	0xFF	0xFF	0xFF	
Isolation: Time elapsed since last measurement	0x50	0…64255: Elapsed Time [s]		0xFF	0xFF	0xFF	0xFF	0xFF	
Capacity: Measured value	0x52	1…200: capacity value [0.1µF] 65535: SNV		0xFF	0xFF	0xFF	0xFF	0xFF	
Capacity: Measurement Counter	0x54	0…255	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	counter will be incremented with each new measured capacity value
Self test: Period	0x58	0: automatic selftest deactivated 1…64255: [10 s]		0xFF	0xFF	0xFF	0xFF	0xFF	default: 360 (equals 1h)

Name	Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	additional information
	(Index)	DataWord1		DataWord2		DataWord 3		Data-Byte	
Voltage: Frequency	0x5A	0...5000: Frequency [0.1Hz] 65535: SNV		0xFF	0xFF	0xFF	0xFF	0xFF	
Voltage: Measurement Counter	0x5C	0…255	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	counter will be incremented with each new measured voltage value
Voltage: HV sytem	0x5E	0… 64255: HV system voltage [0.05V] 65535: SNV		0xFF	0xFF	0xFF	0xFF	0xFF	
Voltage: HV_neg to Earth	0x60	0… 64255: HV_neg to Earth voltage [0.05V] 65535: SNV		0xFF	0xFF	0xFF	0xFF	0xFF	Offset: 32128 (1606.4 V) valid range: - 1606.4 V… +1606.35 V
Voltage: HV_pos to Earth	0x62	0… 64255: HV_pos to Earth voltage [0.05V]		0xFF	0xFF	0xFF	0xFF	0xFF	Offset: 32128 (1606.4V) valid range: -1606.4 V …+1606.35 V
Voltage: Mode	0x64	0xFC: AC + DC 0xFD: AC 0xFE: DC				0xFF	0xFF	0xFF	default: 0xFE
Voltage: Threshold Under-voltage	0x66	0: Deactivate 1…1000: Voltage [V]		0xFF	0xFF	0xFF	0xFF	0xFF	default: 0
Status: Device Activity	0x68	0: Initialization 1: Normal operation 2: Self test	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	
Status: Lock	0x6A	0xFC: Parameter Write Enable 0xFD: Parameter Write Disable				0xFF	0xFF	0xFF	default: 0xFC
Status: Warnings and Alarms	0x6C	1)*			0xFF	0xFF	0xFF	0xFF	

Name	Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	additional information
	(Index)	DataWord1		DataWord2		DataWord 3		Data-Byte	
Earthlift: Status	0x70	0xFC: Earth Disconnector closed 0xFD: Earth Disconnector open		0xFF	0xFF	0xFF	0xFF	0xFF	default: 0xFC
Isolation: Threshold_first_reference_ estimation	0x72	1…1000: Threshold voltage for estimation reference [V]		0xFF	0xFF	0xFF	0xFF	0xFF	default: 100
Isolation: Pre_estimation_ max_difference	0x74	0…64255: maximum voltage difference for estimation evaluation [0.01V]		0xFF	0xFF	0xFF	0xFF	0xFF	default: 200

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Bit 0: true = Device error active

Bit 1: true = HV_pos connection failure

Bit 2: true = HV_neg connection failure

Bit 3: true = Earth connection failure

Bit 4: true = Iso Alarm (iso value below threshold error)

Bit 5: true = Iso Warning (iso value below threshold warning)

Bit 6: true = Iso Outdated (value „Time elapsed since lst measurement“ > = „measurement timeout“)

Bit 7: true = Unbalance Alarm (unbalance value below threshold)

Bit 8: true = Undervoltage Alarm

Bit 9: true = Unsafe to Start

Bit 10: true = Earthlift open

1.5.2 Control commands (CTL)

Standard data format of a control command:

PGN	Data 0	Data 1
PGN_Request (61428)	Index	AA

Overview of all available control commands:

Name	Data 0 (Index)	Data 1
Self-holding Iso-Alarm: Reset Alarm	0x33	0: false = No action 1: true = Reset alarm
Self-holding Iso-Alarm: Reset Alarm	0x57	0: SNV = no action 1: offline test 2: offline and communication test
Status: Factory reset	0x6F	0: false = No action 1: true = Factory reset Note: requires Status Lock = 0xFC (Parameter Write Enable)
Earthlift: Status	0x71	0: false = Earth connection closed 1: true = connection open Note: Maximum delay time for execution: 5s *)

***) Caution!** Switching earth connection could be delayed in case of self diagnosis is currently running while user command is send (higher priority as normal user command).*

1.5.3 Set commands

PGN	Data 0	Data 1	Data 2
	DataByte	DataWord1	
PGN_Request (61428)	Index	AA	BB

Parameter = 0xBBAA

Overview off all parameter, which can be changed by the user:

Name	Data 0	Data 1	Data 2	additional information
	(Index)	DataWord1		
Unbalance: Threshold	0x2F	0 = Deactivated 5 - 45: Unbalance alarm threshold [%]		data length = 2
Self-holding Iso-Alarm: Activation	0x31	0xFC: false = automatic Iso-alarm reset 0xFD: true = self-holding Iso-alarm (must be reset via command)		data length = 2

Name	Data 0	Data 1	Data 2	additional information
	(Index)	DataWord1		
Isolation: Active Profile	0x39	0: Custom Profile 1: Standard with fast startup 2: Standard 3: High Capacity with fast startup 4: High Capacity 5: Disturbed 6: Service 7: UG		data length = 2
Isolation: Power-On Profile	0x3B	0: Custom 1: Standard with fast startup 2: Standard 3: High Capacity with fast startup 4: High Capacity 5: Disturbed 6: Service 7: UG		data length = 2
Isolation: Threshold Error	0x47	30…2000: isolation error threshold [kΩ]		data length = 3
Isolation: Threshold Timeout Measurement	0x49	0 = Alarm deactivated 1...64255: Treshold Timeout [s]		data length = 3
Isolation: Threshold Warning	0x4B	30…2000: isolation warning threshold [kΩ]		data length = 3
Self test: Period	0x59	0: automatic selftest deactivated 1…64255: Period [10s]		data length = 3
Voltage: Mode	0x65	0xFC: AC + DC 0xFD: AC 0xFE: DC		data length = 2
Voltage: Threshold Undervoltage	0x67	0 = Deactivated 1...1000: Voltage [V]		data length = 3
Status: Lock	0x6B	0xFC: false = Parameter Write Enable 0xFD: true = Parameter Write Disable		data length = 2
Isolation: Threshold_first_reference_estimation	0x73	1…1000: Threshold voltage for estimation reference [V]		data length = 3
Isolation: Pre_estimation_max_difference	0x75	1...64255: maximum voltage difference for estimation evaluation [0.01 V]		data length = 3

2 Technical data

2.1 Interface protocol

Data transmission rate HS-CAN ..... 125, 250, 500, 666, 800, 1000 kBaud
Terminating resistance HS-CAN ..... 120 Ω (Jumper)

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