FischerPanda

Fischer Panda GmbH

SAE J1939 Interface Description

fpCAN

Customer description
Rev. 1.37

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1 Revision history

Revision	Date	Changes
1.1	2021-02-19	- PROPB1B – PGN for Power Control added - Flags in PROPB19 expanded (SPN 520270, new modes for power control added) - Update PROPB1C (PGN 65308): override command 0 = no action
1.2	2021-03-01	- SPN 94 for Engine Fuel Delivery Pressure added to PGN 65263 (EFLP1) - PGN 65266 (LFE1) (SPN 183, Engine Fuel Rate) added - PROPB1B (PGN 65307): Data Type, Resolution and Data Range corrected
1.3	2021-03-04	- PROPB1B (PGN 65307): Data Type, Resolution and Data Range again corrected - PROPB1A (PGN 65306), SPN 520274: Charger output mode »Power« added - PROPB1A (PGN 65306), SPN 520275: Charger output value »Power« and possible units added
1.4	2021-03-11	- PGN 65270, J1939 IC1 – Intake/Exhaust Conditions 1, added - PGN 65309, PROPB1D - AGT 9 Hybrid Charger, added - Assign AGT AC Voltage, AGT AC Frequency, AGT AC Current and AGT AC Power to PGN 65303, PROPB17 - »HYBR Set Voltage« added to PGN 65305, PROPB19 - TSC1, PGN 254, wrong description text removed
1.5	2021-03-18	- For temperatures, the data type on the bus is **uint8** - For AGT DC power battery, SPN 520209, the data type on the bus is **uint32** - For AGT DC power load, SPN 520212, the data type on the bus is **uint32** - For Apparent power in full [VA], SPN 520291, the data type on the bus is **uint32** - For Engine Load, SPN 513, the data type on the bus is **uint8** - For Reactive/Real/Apparent Power the data type on the bus is **uint32** - For Power Factor the data type on the bus is **uint16** - Changed the names of PGNs 65300 and 65301 and changed the names of the SPNs of these PGNs - PROPB1B (PGN 65307): Cycle time and timeout added.
1.6	2021-03-31	- PROPB24 (PGN 65316) Fuel Efficiency added.
1.7	2021-04-01	- RPC-ID 0x009e, remote power on added.
1.8	2021-04-13	- Notice for sending RPC requests added.
1.9	2021-04-19	- Corrected Data Range of Temperatures to -40 … 213 °C.
1.10	2021-04-23	- PROPB1D – AGT 9 (Hybrid Charger): Divided Byte 0 and Byte 1 into two 8-Bit values and provided each with an SPN. - PROPA00 – explanation of the fields within the 29-bit Identifier.
1.11	2021-05-26	- RPCD-ID 0x0012: Notice for iControl2 added. - Note regarding the availability of the temperature values in PGN 65262 (ET1) added.

Revision	Date	Changes
1.12	2021-06-09	- PROPB16: Added HYBR temperatures of IGBT-1, IGBT-2, IGBT-3 and Cabinet as alternative contents.
1.13	2021-06-11	- SPN 520299 (HYBR Set Voltage) moved from PROPB19 Byte 6/7 to PROPB1A Byte 6/7.
1.14	2021-06-16	-
1.15	2021-06-23	- RPC-IDs 0x009f / 0x809f added to customer documentation.
1.15.1	2021-06-25	- Corrected literal error in table »Encoding of Software Version« in PROPB25 (PGN 65317).
1.15.2	2021-08-16	- Resolution for min. / max. value corrected in read response of RPC-IDs 0x020b, 0x020c, 0x020d, 0x020e and 0x020f.
1.16	2021-09-02	- Rename PROPB1D to "PROPB1D – AGT 10 (Hybrid-Charger". - Rename PROPB1C (old) to "PROPB1C - AGT 9 (Reserve)". - Rename PROPB21 (old) and insert the content of "PROPB1C – Torqeedo specific »override command«".
1.17	2021-09-09	- PROPB21: Cycle time must be less than 500 ms, a cycle time of 200 ms is recommended.
1.18	2021-10-07	- RPC-IDs 0x0097 and 0x0098 added to full description.
1.19	2021-12-20	- PROPB01 – System information, Byte 2 - System State: 11 = Service-Mode. - RPC-ID 0x7ffe: Renamed to "FP-Bus-Device App-ID" and new classes for ConverterControl added.
1.20	2022-01-17	- Headings of "Extended Parameters" adapted - PROPB01 and PROPB23: Torqeedo specific adjustments
1.21	2022-01-24	- New service-flags in PROPB1E – Torqeedo specific properties. - PROPB22 and PROPB23: Warning/error bits added.
1.22	2022-02-14	- PROPB02 (PGN 65282): Title changed to »File transfer«. - Added PROPB08 (System Information).
1.23	2022-06-24	- Use of PROPB09 (PGN 65289) added. - PROPB07 (PGN 65287) set to deprecated. - PROPB1F (PGN 65311) added. - RPC-ID 0x0096 (Activate the service run mode) added.
1.24	2023-02-16	- Removed deprecated state 11 from SPN 520192 of PGN 65281.
1.25	2023-03-14	- RPCs for the NMEA2k-Interface added.
1.26	2023-05-03	- PROPB1A (PGN 65306), copy/paste error corrected.
1.27	2024-06-06	- RPC-ID 0x009c – Remote start of Generator: Removed clear errors option in write request param 1.

Revision	Date	Changes
1.28	2024-07-22	- Updated PROPB1C (PGN 65308) for AGT BMS Mode
1.29	2025-09-12	- Correction in preamble.
1.30	2025-09-15	- Changed "Utility" to "Generator" in PGNs 65019, 65020, 65023 and 65026. - Corrected SPNs in PGN 65025 - Changed "Electronic Temperatures 1" to "Engine Temperatures 1" in PGN 65262 - Note in PGN 65262 adjusted.
1.31	2025-12-02	- Changed term "flags for control variable" to "control target value" and removed range 0...7 in PGN 65305, SPN 520270
1.31.1	2025-12-09	- RPCD-ID 0x0214 "Setting AGT charger mode" added
1.31.2	2026-01-14	- PGN 65317 "PROPB25 – fpCAN Device Info" added
1.32	2026-02-02	- RPC-ID 0x008e – Set CPU in Power-Save-Mode (Sleep controller) - changes for param #1: - 1 = Turn off the control - removed 2 (no function)
1.33	2026-03-31	- PROPB03 (PGN 65283), description updated
1.34	2026-05-20	- PGN 64671 "DD2 – Dash Display 2" added
1.35	2026-06-18	- PGN 65295 "PROPB0F– Service Hour Counter" added to customer descriptions - SPN 520223 corrected
1.36	2026-07-23	- PGN 64892 "DPF C1 – Diesel Particulate Filter Control 1" added - PGN 64800 "A1DOC1 - Aftertreatment 1 Diesel Oxidation Catalyst 1" added
1.37	2026-10-15	- PGN 65133 "HTR – Heater Information" added

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2 Preamble

2.1 CAN communication description

The protocol consists of the general ISO 11992 part which is responsible for addressing and arbitration as well as the data flow, the SAE-J1939 portion of usable frames from the automotive and commercial vehicle segment and the special fpCAN containing the part not yet shown in the standards precisely in order to realize until now non-existent features and enhancements.

The fpCAN is ISO / SAE-J1939 / NMEA2000® conform and also uses a bitrate of 250 kbits per second and a 29-bit extended Identifier and can be mixed with NMEA2000®. The orientation of the data is always LSB first unless explicitly defined otherwise.

3 ISO functions

The ISOBUS-Standard describes the main functions process control, data exchange and arbitration that are used in *SAE-J1939*, *NMEA2000®* and *fpCAN*. The structure of data is the same in all these standards.

3.1 ISO Acknowledgement

PGN 59392 (0xE800)
Specification: This message is provided by ISO 11783 for a handshake mechanism between transmitting and receiving devices. This message is the possible response to acknowledge the reception of a “normal broadcast” message or the response to a specific command to indicate compliance or failure. The application layer is responsible for determining when this message is desired, outside of network management requirements specified by this standard (e.g. response to ISO Request message). The destination address of this PGN shall always contain a destination specific address.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	6	0	0	232	0	X
hex	6	0	0	E8	00	X
PGN	leer	59392 (E800)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7

Content:

Byte	Data Type	Data Field
0	DD177	0x00 = Positive Acknowledgment;
	DF52	0x01 = Negative Acknowledgment;
		0x02 = PGN supported but access denied;
		0x03 to 0xFF = Reserved
1	DD177	Group Function of PGN being acknowledged.
	DF52	This field identifies for a device the specific group
		function of a PGN being acknowledged or declined. This
		field is not used if the PGN being acknowledged or
		declined is not a group function PGN.
2	DD001	reserved bits, all set to logic 1
	DF52	
3		reserved bits, all set to logic 1
4		reserved bits, all set to logic 1
5	DD009	Parameter Group Number (PGN) expressed in binary,
		LSB first
	DF52	
6		PGN
7		PGN
	Single Frame	

3.2 ISO Request

PGN 59904 (0xEA00)
Specification: ISO 11783 defines this message to provide a method for *requesting the transmission of a PGN* from a network device or devices. As defined by ISO, this message has a *data length of 3 bytes* with no padding added to complete the single frame. The appropriate response to this message is based on the PGN being requested, and whether the receiver supports the requested PGN. See section 3.4.2 of 11783-3 for the rules governing the response to this PGN.
Note that the destination address must be entered.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	6	0	0	234	0	X
hex	6	0	0	EA	00	X
PGN		59904 (EA00)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	-	-	-	-	-

Content:

Byte	**Data Type**	**Data Field**
DB0	DD009	Parameter Group Number (PGN) expressed
	DF52	in binary, LSB first
DB1		PGN
DB2	DD001	PGN
	Single Frame	

3.3 ISO Transport Protocol – Data Transfer

PGN 60160 (0xEB00)
Specification: ISO 11783 defines this PGN as part of the transport protocol method used for transmitting messages that have 9 or more data bytes. This PGN represents a single packet of a multipack message and is used in conjunction with PGN 60416. Once a connection has been established or a broadcast announcement has been made, this message is transmitted using the timing and handshake requirements in section 3.10 of 11783-3 until all the message's packets are transmitted or the transmission is aborted. Although this PGN is addressable, when used with the Broadcast Announce Message (BAM) method, the destination shall be 255.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	6	0	0	235	0	X
hex	6	0	0	EB	00	X
PGN		60160 (EB00)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7

Content:

Byte	**Data Type**	**Data Field**
0	DD180	0x00 = Positive Acknowledgment;
	DF52	0x01 = Negative Acknowledgment;
		0x02 = PGN supported but access denied;
		0x03 to 0xFF = Reserved
1	DD181	Multipack data:
	DF52	56 bits organized as seven 8-bit bytes, each of the bytes
		is transmitted in the same order as it would in a standard
		(i.e., single frame) message. Unused bytes shall be filled
		with 0xFF.
2		
3		
4		
5		
6		
7		
	Single Frame	

3.4 ISO Transport Protocol – Connection Management

PGN 60416 (0xEC00)
Specification: ISO 11783 defines this group function PGN as part of the transport protocol method used for transmitting messages that have 9 or more data bytes. This PGN's role in the transport process is determined by the group function value found in the first data byte of the PGN.

RTS - When the group function is **R**equest **T**o **S**end (RTS), the PGN is asking a specific node on the network for permission to transmit a larger than 8 byte message to the node. This process is referred to as opening a connection.

CTS - If the group function is **C**lear **T**o **S**end (CTS), the PGN is notifying the transmitter of a multipack message how many packets the node is ready to receive and which packets have been received successfully. This group function is the proper response to an RTS group function to start the transmission of the multipack data and allows the receiver to control the flow of data throughout the multipack transmission.

EOM - When the group function is **E**nd **O**f **M**essage (EOM), the PGN is notifying the transmitter of a multipack message that all packets were received successfully. This group function signals the successful conclusion of a transmission started with the RTS group function thus closing the connection.

ABORT - When the group function is Abort, the PGN is notifying the transmitter or receiver of the multipack message that the other partner is terminating the connection without completing the transfer of the message. This group function can also be used to refuse the connection when the RTS group function is initially received.

BAM - When the group function is **B**roadcast **A**nnounce **M**essage (BAM), the PGN is notifying all network nodes that a multipack message is about to be transmitted on the network. Because the BAM group function is broadcast, no further handshake is required.

For a complete description of this PGN's usage and timing requirements see section 3.10 of 11783-3.

3.5 ISO Transport Protocol – Connection Management, RTS group function

PGN 60416 (0xEC00)

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	6	0	0	236	0	X
hex	6	0	0	EC	00	X
PGN		60416 (EC00)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7

Content:

Byte	Data Type	Data Field	Values	Default
0	DD179	0x10 = Request to Send;	0x01	RTS (0x10)
	DF52	0x11 = Clear to Send;	-	
		0x13 = End of Message;	0xFF	
		0x20 = Broadcast Announce Message;		
		0xFF = Abort;		
		0x00 to 0xF, 0x12, 0x14 to 0x1F,		
		0x21 to 0xFE = Reserved		
1	DD007	Number of routes, waypoint, event,	9	
	DF54	mark, etc.	-	
			1785	
2				
3	DD180	Multi-packet frame counter	0x01	
	DF52		-	
			0xFF	
4	DD001	reserved bits, all set to logic 1		
	DF52			
5	DD009	Parameter Group Number (PGN) expressed		
	DF52	in binary, LSB first		
6		PGN		
7		PGN		
	Single Frame			

3.6 ISO Transport Protocol – Connection Management, CTS group function

PGN 60416 (0xEC00)

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	6	0	0	236	0	X
hex	6	0	0	EC	00	X
PGN		60416 (EC00)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7

Content:

Byte	**Data Type**	**Data Field**	**Values**	**Default**
0	DD179	0x10 = Request to Send;	0x01	CTS (0x11)
	DF52	0x11 = Clear to Send;	-	
		0x13 = End of Message;	0xFF	
		0x20 = Broadcast Announce Message;		
		0xFF = Abort;		
		0x00 to 0xF, 0x12, 0x14 to 0x1F,		
		0x21 to 0xFE = Reserved		
1	DD180	Number of frames that can be sent	0x01	
	DF52	Multi-packet frame counter, valid	-	
		range 0x01 to 0xFF	0xFF	
2	DD180	Number of next frames to be transmitted	0x01	
	DF52	Multi-packet frame counter, valid	-	
		range 0x01 to 0xFF	0xFF	
3	DD001	reserved bits, all set to logic 1		
	DF52			
4		reserved bits, all set to logic 1		
5	DD009	Parameter Group Number (PGN) expressed		
	DF52	in binary, LSB first		
6		PGN		
7		PGN		
	Single Frame			

3.7 ISO Transport Protocol – Connection Management, EOM group function

PGN 60416 (0xEC00)

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	6	0	0	236	0	X
hex	6	0	0	EC	00	X
PGN		60416 (EC00)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7

Content:

Byte	**Data Type**	**Data Field**	**Values**	**Default**
0	DD179	0x10 = Request to Send;	0x01	EOM (0x13)
	DF52	0x11 = Clear to Send;	-	
		0x13 = End of Message;	0xFF	
		0x20 = Broadcast Announce Message;		
		0xFF = Abort;		
		0x00 to 0xF, 0x12, 0x14 to 0x1F,		
		0x21 to 0xFE = Reserved		
1	DD007	Total message size, bytes	9	
	DF54		-	
			1785	
2				
3	DD180	Total number of frames received	0x01	
	DF52		-	
			0xFF	
4	DD001	reserved bits, all set to logic 1		
	DF52			
5	DD009	Parameter Group Number (PGN) expressed		
	DF52	in binary, LSB first		
6		PGN		
7		PGN		
	Single Frame			

3.8 ISO Transport Protocol – Connection Management, BAM group function

PGN 60416 (0xEC00)

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	6	0	0	236	0	X
hex	6	0	0	EC	00	X
PGN		60416 (EC00)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7

Content:

Byte	**Data Type**	**Data Field**	**Values**	**Default**
0	DD179	0x10 = Request to Send;	0x01	BAM (0x20)
	DF52	0x11 = Clear to Send;	-	
		0x13 = End of Message;	0xFF	
		0x20 = Broadcast Announce Message;		
		0xFF = Abort;		
		0x00 to 0xF, 0x12, 0x14 to 0x1F,		
		0x21 to 0xFE = Reserved		
1	DD007	Total message size, bytes	9	
	DF54		-	
			1785	
2				
3	DD180	Total number of frames to be transmitted	0x01	
	DF52		-	
			0xFF	
4	DD001	reserved bits, all set to logic 1		
	DF52			
5	DD009	Parameter Group Number (PGN) expressed		
	DF52	in binary, LSB first		
6		PGN		
7		PGN		
	Single Frame			

3.9 ISO Transport Protocol – Connection Management, Abort group function

PGN 60416 (0xEC00)

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	6	0	0	236	0	X
hex	6	0	0	EC	00	X
PGN		60416 (EC00)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7

Content:

Byte	**Data Type**	**Data Field**	**Values**	**Default**
0	DD179	0x10 = Request to Send;	0x01	Abort (0xFF)
	DF52	0x11 = Clear to Send;	-	
		0x13 = End of Message;	0xFF	
		0x20 = Broadcast Announce Message;		
		0xFF = Abort;		
		0x00 to 0xF, 0x12, 0x14 to 0x1F,		
		0x21 to 0xFE = Reserved		
1	DD001	reserved bits, all set to logic 1		
	DF52			
2				
3				
4				
5	DD009	Parameter Group Number (PGN) expressed		
	DF52	in binary, LSB first		
6		PGN		
7		PGN		
	Single Frame			

3.10 ISO Address Claim

PGN 60928 (0xEE00)
Specification: This network management message is used to claim network address, reply to devices requesting the claimed address, and to respond with device information (NAME) requested by the ISO Request (PGN 059904) or Complex Request Group Function (PGN 126208).
If a Complex Request Group Function (PGN 126208) requesting this PGN is received, the receiving device shall respond in the following manner:
If no request able fields have been included with the Complex Request, then the response is to return this PGN, just like responding to the ISO Request (PGN 059904) described above.
If the Complex Request (PGN 126208) includes one or more request able fields, then the response shall be filtered by the one or more fields and field values contained within the request.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	6	0	0	238	0	X
hex	6	0	0	EE	00	X
PGN		60928 (EE00)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7

Content:

Bits	Data Type	Data Field	Length	Values	Default
0-20	DD173	NMEA2000® Unique Number assigned	21		0
	DF52	by manufacturer to ensurethat the			
		NAME field for each manufactured			
		device is unique.			
21-31	DD172	NMEA2000® Manufacturer Code	11		0
	DF52				
32-34	DD201	Device Instance Lower	3		
	DF52	(ISO ECU Instance)			
35-39	DD174	Device Instance Upper	5		
	DF52	(ISO Function Instance)			
40-47	DD171	NMEA2000® Function Code	8		
	DF52				
48	DD175	Dominant Bits	1		
	DF52				
49-55	DD170	NMEA2000® Device Class	7		
	DF52				
56-59	DD169	System Instance (ISO Device	4	0	
	DF52	Class Instance)		-	
				15	
60-62	DD168	Industry Group	3		4
	DF52				Marine
63	DD001	reserved bit, all set to logic 1	1		
	DF52				
	Single Frame				

3.11 ISO Commanded Address

PGN 65240 (0xFED8)
Specification: ISO 11783 defined this message to provide a mechanism for assigning a network address to a node. The NAME information in the data portion of the message must match the name information of the node whose network address is to be set. ISO 11783-5 requires this message to be sent using the BAM Transport Protocol method. The appropriate response to this message is defined in section 5.2.3 of 11783-5.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	254	216	X
hex	X	0	0	FE	D8	X
PGN		65240 (FED8)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7

Content:

Bits	Data Type	Data Field	Length	Values	Default
0-20	DD173	NMEA2000® Unique Number assigned	21		0
	DF52	by manufacturer to ensurethat the			
		NAME field for each manufactured			
		device is unique.			
21-31	DD172	NMEA2000® Manufacturer Code	11		0
	DF52				
32-34	DD201	Device Instance Lower	3		
	DF52	(ISO ECU Instance)			
35-39	DD174	Device Instance Upper	5		
	DF52	(ISO Function Instance)			
40-47	DD171	NMEA2000® Function Code	8		
	DF52				
48	DD175	Dominant Bits	1		
	DF52				
49-55	DD170	NMEA2000® Device Class	7		
	DF52				
56-59	DD169	System Instance (ISO Device	4	0	
	DF52	Class Instance)		-	
				15	
60-62	DD168	Industry Group	3		4
	DF52				Marine
63	DD001	reserved bit, all set to logic 1	1		
	DF52				
64-71	DD176	New Source Address:	8		
	DF52	0x00 to 0xFB (0 to 251)=Claimable			
		NMEA 2000 network address space			
		0xFC (252) = Reserved			
		0xFD (253) = Reserved			
		0xFE (254) = Null address			
		0xFF (255) = Global address			
	BAM				

4 SAE-J1939 functions

4.1 TSC1 – Torque/Speed Control #1

PGN 254 (0x00FE)
Type: Single frame
Description:

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	0	254	X
hex	X	0	0	00	FE	X
PGN		254 (00FE)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN								

Content:

Byte	**SPN**	**Data Length**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0		8 bits	uint8	0xE9 if status is running	1 / bit	0 … 255
				0xE8 for all the other states	0 offset	
1		8 bits	uint8	Engine Speed [LSB]	1 / bit	0 … 255
					0 offset	
2		8 bits	uint8	Engine Speed [MSB]	1 / bit	0 … 255
					0 offset	
3		8 bits	uint8	0x7D	1 / bit	0 … 255
					0 offset	
4		8 bits	uint8	0x07	1 / bit	0 … 255
					0 offset	
5		8 bits	uint8	0xFF	1 / bit	0 … 255
					0 offset	
6		8 bits	uint8	0xFF	1 / bit	0 … 255
					0 offset	
7		8 bits	uint8	0xFF	1 / bit	0 … 255
					0 offset	

4.2 J1939 EEC1 – Electronic Engine Controller #1

PGN 61444 (0xF004)
Type: Broadcast all 100ms
Description: Contains the engine load and the engine speed from the engine control unit (e.g. Hatz)

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	240	4	X
hex	X	0	0	F0	04	X
PGN		61444 (F004)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits			SPN513	SPN190				

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0		8	uint8	not used	X	X
1		8	uint8	not used	X	X
2	513	8	uint8	Engine Load (from ECU)	1 % / -125	-125 … 125
3	190	16	uint16	Engine Speed (from ECU)	1/8 rpm	0 … 8031.8
4						
5		8	uint8	not used	X	X
6		8	uint8	not used	X	X
7		8	uint8	not used	X	X

4.3 DD2 – Dash Display 2

64671 (0xFC9F)
Type: Broadcast cyclic single frame (1000ms).
Description: Fuel level – ratio of volume of fuel to the total volume of fuel storage container.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	252	159	X
hex	X	0	0	FC	9F	X
PGN		64671 (FC9F)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN			6642					

Content:

Byte	**SPN**	**Data Length**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0		8 bits	uint8	0xFF		
1		8 bits	uint8	0xFF		%
2	6642	8 bits	uint8	Engine Fuel 2 Tank 1 Level	0,4 % / bit gain 0 offset	0 … 100 %
3		8 bits	uint8	0xFF		
4		8 bits	uint8	0xFF		
5		8 bits	uint8	0xFF		
6		8 bits	uint8	0xFF		
7		8 bits	uint8	0xFF		

4.4 J1939 A1DOC1 - Aftertreatment 1 Diesel Oxidation Catalyst 1

PGN 64800 (0xFD20)
Type: Broadcast all 500 ms
Description: Handles diagnostic and operational data from the diesel oxidation catalyst.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	6	0	0	253	32	X
hex	6	0	0	FD	20	X
PGN		64800 (FD20)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 4765							

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	4765	16	uint16	Intake Temperature	0,03125 °C/bit	-273 … 1734,96875 °C
1					-273 offset	
2						
3						
4						
5						
6						
7						

4.5 J1939 DPF C1 – Diesel Particulate Filter Control 1

PGN 64892 (0xFD7C)
Type: Broadcast cyclic single frame (1000ms)
Description: The engine Electronic Control Unit (ECU) uses DPF C1 to broadcast regeneration statuses, filter conditions, and active DPF lamp commands.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	253	124	X
hex	X	0	0	FD	7C	X
PGN		64892 (FD7C)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN		3700, 3701	3703	3708	3710		3698	

Content:

Byte	SPN	Data Length	Data Type	Parameter	Resolution / Offset	Data Range
1	3700	Bit 2-3		Active Regeneration Status	0 … 3	0 … 3
				0 = Not Active		
				1 = Active		
				2 = Regeneration Needed		
				3 = Not Available		
1	3701	Bit 4-6		DPF Status	0 … 7	0 … 7
				0 = Regeneration not needed		
				1 = Regen. needed, lowest level		
				2 = Regen. needed, moderate level		
				3 = Regen. needed, highest level		
				4-6 = reserved for SAE assignm.		
				7 = not available		
2	3703	Bit 2-3		DPF Regeneration Inhibited	0 … 3	0 … 3
				due to Inhibit Switch		
				0 = Not Inhibited		
				1 = Inhibited		
				2 = Reserved for SAE assignment		
				3 = Not Available		
3	3708	Bit 4-5		DPF Regeneration Inhibited	0 … 3	0 … 3
				due to Neutral Gear Switch		
				0 = Not Inhibited		
				1 = Inhibited		
				2 = Reserved for SAE assignment		
				3 = Not Available		
4	3710	Bit 0-1		DPF Regeneration Inhibited	0 … 3	0 … 3
				due to Parking Brake		
				0 = Not Inhibited		
				1 = Inhibited		
				2 = Reserved for SAE assignment		
				3 = Not Available		
6	3698	Bit 2-4		Exhaust Gas High Temperature	0 … 7	0 … 7
				0 = Off		
				1 = On - solid		
				2-6 = reserved for SAE assignm.		
				7 = not available		

4.6 J1939 GTACPP – Generator Total AC Percent Power

PGN 64911 (0xFD8F)
Type: Broadcast all 250 ms
Description: This PGN contains quantities for the instantaneous AC power from the generator, as percentages of rated power.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	6	0	0	253	143	X
hex	6	0	0	FD	8F	X
PGN		64911 (FD8F)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 3590		SPN 3591		SPN 3592			

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	3590	16	uint16	Generator total percent	0,0078125 %/bit	-251 … 250,99 %
1				kW (real power)	-251 offset	
2	3591	16	uint16	Generator total percent	0,0078125 %/bit	-251 … 250,99 %
3				kVA (apparent power)	-251 offset	
4	3592	16	uint16	Generator total percent	0,0078125 %/bit	-251 … 250,99 %
5				kvar (reactive power)	-251 offset	
6						
7						

4.7 J1939 UPCACR – Utility Phase C AC Reactive Power (3-Phase Module)

PGN 65006 (0xFDEE)
Type: Broadcast cyclic single frame (100ms)
Description: Reactive power, power factor and power factor lagging of utility phase C.

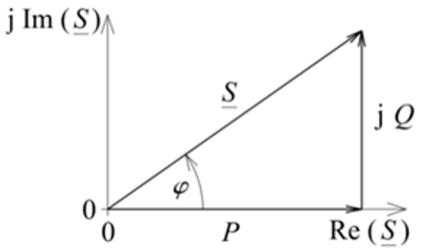


Figure 1: Power Triangle

$\sqrt[2]{P^2 + Q^2}$
Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	253	238	X
hex	X	0	0	FD	EE	X
PGN		65006 (FDEE)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 2493				SPN 2501		SPN 2525	

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2493	32	uint32	Utility Phase C	1 var/bit	-2E9 … 2E9
1				Reactive Power	-2E9 var offset	
2						
3						
4	2501	16	uint16	Utility Phase C	$\frac{1}{16384}$/bit	-1 … +1
				Power factor		
5				($\frac{TruePowerP}{ApparentPowerS}$)		
6	2525	16	uint16	Utility Phase C	4 states/2 bit	00 = Leading
				Power factor	0 offset	01 = Lagging
7				lagging		10 = Error
						11 = Not Available
						or Not Installed

4.8 J1939 UPCACP – Utility Phase C AC Power (3-Phase Module)

PGN 65007 (0xFDEF)
Type: Broadcast cyclic single frame (100ms)
Description: Real power and apparent power of utility phase C.

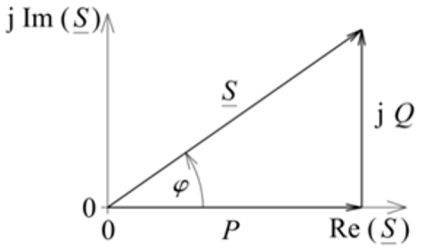


Figure 2: Power Triangle

$\sqrt[2]{P^2 + Q^2}$
Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	253	239	X
hex	X	0	0	FD	EF	X
PGN		65007 (FDEF)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 2489				SPN 2497			

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2489	32	uint32	Utility Phase C	1 W/bit	-2E9 … 2E9
1				Real Power	-2E9 W offset	
2						
3						
4	2497	32	uint32	Utility Phase C	1 VA/bit	-2E9 … 2E9
5				Apparent Power	-2E9 VA offset	
6						
7						

4.9 J1939 UPCAC – Utility Phase C Basic AC Quantities (3-Phase Module)

PGN 65008 (0xFDF0)
Type: Broadcast cyclic single frame (100ms)
Description: Output utility phase C, Line-Line AC RMS voltage, Line-N AC RMS voltage, AC frequency and AC current.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	3	0	0	253	240	X
hex	3	0	0	FD	F0	X
PGN		65008 (FDF0)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 2477		SPN 2481		SPN 2473		SPN 2485	

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2477	16	uint16	Utility Phase C	1 V/bit	0 … 65535 V
				Line-Line AC	0 offset	
1				RMS Voltage		
2	2481	16	uint16	Utility Phase C	1 V/bit	0 … 65535 V
				Line-N AC	0 offset	
3				RMS Voltage		
4	2473	16	uint16	Utility Phase C	$\frac{1}{128}$ Hz/bit	0 … 501,9921875 Hz
				AC Frequency	0 offset	
5						
6	2485	16	uint16	Utility Phase C	1 A/bit	0 … 65535 A
				AC RMS Current	0 offset	

4.10 J1939 UPBACR – Utility Phase B AC Reactive Power (3-Phase Module)

PGN 65009 (0xFDF1)
Type: Broadcast cyclic single frame (100ms)
Description: Reactive power, power factor and power factor lagging of utility phase B.

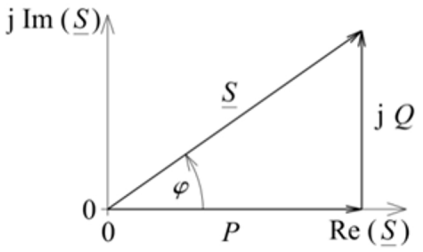


Figure 3: Power Triangle

$\sqrt[2]{P^2 + Q^2}$
Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	3	0	0	253	241	X
hex	3	0	0	FD	F1	X
PGN		65009 (FDF1)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 2492				SPN 2500		SPN 2524	

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2492	32	uint32	Utility Phase B	1 var/bit	-2E9 … 2E9
1				Reactive Power	-2E9 var offset	
2						
3						
4	2500	16	uint16	Utility Phase B	$\frac{1}{16384}$/bit	-1 … +1
				Power factor		
5				($\frac{TruePowerP}{ApparentPowerS}$)		
6	2524	16	uint16	Utility Phase B	4 states/2 bit	00 = Leading
				Power factor	0 offset	01 = Lagging
7				lagging		10 = Error
						11 = Not Available
						or Not Installed

4.11 J1939 UPBACP – Utility Phase B AC Power (3-Phase Module)

PGN 65010 (0xFDF2)
Type: Broadcast cyclic single frame (100ms)
Description: Real power and apparent power of utility phase B.

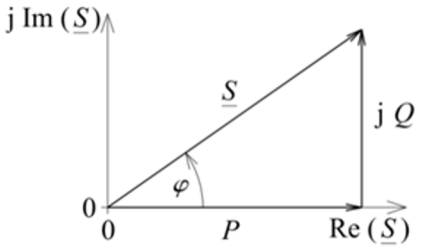


Figure 4: Power Triangle

$\sqrt[2]{P^2 + Q^2}$
Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	3	0	0	253	242	X
hex	3	0	0	FD	F2	X
PGN		65010 (FDF2)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 2488				SPN 2496			

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2488	32	uint32	Utility Phase B	1 W/bit	-2E9 … 2E9
1				Real Power	-2E9 W offset	
2						
3						
4	2496	32	uint32	Utility Phase B	1 VA/bit	-2E9 … 2E9
5				Apparent Power	-2E9 VA offset	
6						
7						

4.12 J1939 UPBAC – Utility Phase B Basic AC Quantities (3-Phase Module)

PGN 65011 (0xFDF3)
Type: Broadcast cyclic single frame (100ms)
Description: Output utility phase B, Line-Line AC RMS voltage, Line-N AC RMS voltage, AC frequency and AC current.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	3	0	0	253	243	X
hex	3	0	0	FD	F3	X
PGN		65011 (FDF3)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 2476		SPN 2480		SPN 2472		SPN 2484	

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2476	16	uint16	Utility Phase B	1 V/bit	0 … 65535 V
				Line-Line AC	0 offset	
1				RMS Voltage		
2	2480	16	uint16	Utility Phase B	1 V/bit	0 … 65535 V
				Line-N AC	0 offset	
3				RMS Voltage		
4	2472	16	uint16	Utility Phase B	$\frac{1}{128}$ Hz/bit	0 … 501,9921875 Hz
				AC Frequency	0 offset	
5						
6	2484	16	uint16	Utility Phase B	1 A/bit	0 … 65535 A
				AC RMS Current	0 offset	

4.13 J1939 UPACCR – Utility Phase A AC Reactive Power

PGN 65012 (0xFDF4)
Type: Broadcast cyclic single frame (100ms)
Description: Reactive power, power factor and power factor lagging of utility phase A.

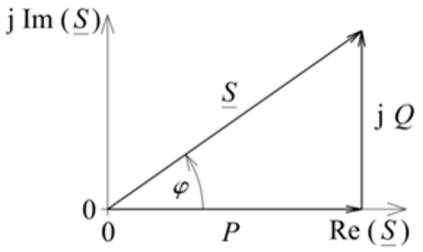


Figure 5: Power Triangle

$\sqrt[2]{P^2 + Q^2}$
Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	3	0	0	253	244	X
hex	3	0	0	FD	F4	X
PGN		65012 (FDF4)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 2491				SPN 2499		SPN 2523	

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2491	32	uint32	Utility Phase A	1 var/bit	-2E9 … 2E9
1				Reactive Power	-2E9 var offset	
2						
3						
4	2499	16	uint16	Utility Phase A	$\frac{1}{16384}$/bit	-1 … +1
				Power factor		
5				($\frac{TruePowerP}{ApparentPowerS}$)		
6	2523	16	uint16	Utility Phase A	4 states/2 bit	00 = Leading
				Power factor	0 offset	01 = Lagging
7				lagging		10 = Error
						11 = Not Available
						or Not Installed

4.14 J1939 UPBACP – Utility Phase A AC Power

PGN 65013 (0xFDF5)
Type: Broadcast cyclic single frame (100ms)
Description: Real power and apparent power of utility phase A.

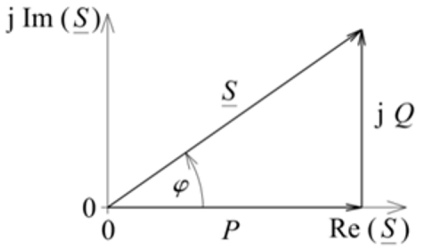


Figure 6: Power Triangle

$\sqrt[2]{P^2 + Q^2}$
Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	3	0	0	253	245	X
hex	3	0	0	FD	F5	X
PGN		65013 (FDF5)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 2487				SPN 2495			

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2487	32	uint32	Utility Phase A	1 W/bit	-2E9 … 2E9
1				Real Power	-2E9 W offset	
2						
3						
4	2495	32	uint32	Utility Phase A	1 VA/bit	-2E9 … 2E9
5				Apparent Power	-2E9 VA offset	
6						
7						

4.15 J1939 UPCAC – Utility Phase A Basic AC Quantities

PGN 65014 (0xFDF6)
Type: Broadcast cyclic single frame (100ms)
Description: Utility Phase A, Line-Line AC RMS voltage, Line-N AC RMS voltage, AC frequency and AC current.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	3	0	0	254	3	X
hex	3	0	0	FD	F6	X
PGN		65014 (FDF6)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 2475		SPN 2479		SPN 2471		SPN 2483	

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2475	16	uint16	Utility Phase A	1 V/bit	0 … 65535 V
				Line-Line AC	0 offset	
1				RMS Voltage		
2	2479	16	uint16	Utility Phase A	1 V/bit	0 … 65535 V
				Line-N AC	0 offset	
3				RMS Voltage		
4	2471	16	uint16	Utility Phase A	$\frac{1}{128}$ Hz/bit	0 … 501,9921875 Hz
5				AC Frequency	0 offset	
6	2483	16	uint16	Utility Phase A	1 A/bit	0 … 65535 A
7				AC RMS Current	0 offset	

4.16 J1939 GPCACR – Generator Phase C AC Reactive Power (3-Phase Module)

PGN 65019 (0xFDFB)
Type: Broadcast cyclic single frame (100ms)
Description: Reactive power, power factor and power factor lagging of generator phase C.

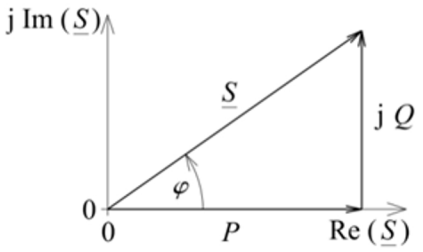


Figure 7: Power Triangle

$\sqrt[2]{P^2 + Q^2}$
Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	3	0	0	253	251	X
hex	3	0	0	FD	FB	X
PGN		65012 (FDF4)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 2459				SPN 2467		SPN 2521	

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2459	32	uint32	Generator Phase C	1 var/bit	-2E9 … 2E9
1				Reactive Power	-2E9 var offset	
2						
3						
4	2467	16	uint16	Generator Phase C	$\frac{1}{16384}$/bit	-1 … +1
				Power factor		
5				($\frac{TruePowerP}{ApparentPowerS}$)		
6	2521	16	uint16	Generator Phase C	4 states/2 bit	00 = Leading
				Power factor	0 offset	01 = Lagging
7				lagging		10 = Error
						11 = Not Available
						or Not Installed

4.17 J1939 GPCACP – Generator Phase C AC Power (3-Phase Module)

PGN 65020 (0xFDFC)
Type: Broadcast cyclic single frame (100ms)
Description: Real power and apparent power of generator phase C.

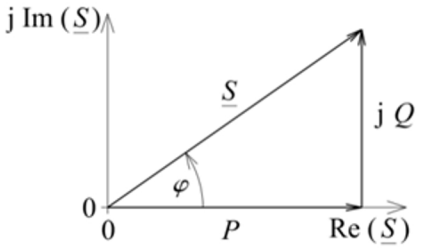


Figure 8: Power Triangle

$\sqrt[2]{P^2 + Q^2}$
Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	3	0	0	253	252	X
hex	3	0	0	FD	FC	X
PGN		65020 (FDFC)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 2455				SPN 2463			

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2455	32	uint32	Generator Phase C	1 W/bit	-2E9 … 2E9
1				Real Power	-2E9 W offset	
2						
3						
4	2463	32	uint32	Generator Phase C	1 VA/bit	-2E9 … 2E9
5				Apparent Power	-2E9 VA offset	
6						
7						

4.18 J1939 GPCAC – Generator Phase C Basic AC Quantities (3-Phase Module)

PGN 65021 (0xFDFD)
Type: Broadcast cyclic single frame (100ms)
Description: Generator Phase C, Line-Line AC RMS voltage, Line-N AC RMS voltage, AC frequency and AC current.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	3	0	0	253	253	X
hex	3	0	0	FD	FD	X
PGN		65021 (FDFD)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 2443		SPN 2447		SPN 2439		SPN 2451	

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2443	16	uint16	Generator AC Voltage C	1 V/bit	0 … 65535 V
1				RMS Line to Line	0 offset	
2	2447	16	uint16	Generator AC Voltage C	1 V/bit	0 … 65535 V
3				RMS Line to Neutral	0 offset	
4	2439	16	uint16	Generator AC Frequency	$\frac{1}{128}$ Hz/bit	0 … 501,9921875 Hz
5				phase C	0 offset	
6	2451	16	uint16	Generator AC Current	1 A/bit	0 … 65535 A
7				RMS phase C	0 offset	

4.19 J1939 GPBACRP – Generator Phase B AC Reactive Power (3-Phase Module)

PGN 65022 (0xFDFE)
Type: Broadcast cyclic single frame (100ms)
Description: Reactive power, power factor and power factor lagging of generator phase B.

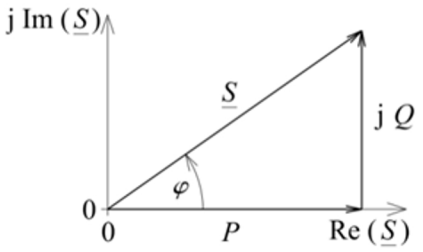


Figure 9: Power Triangle

$\sqrt[2]{P^2 + Q^2}$
Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	3	0	0	253	254	X
hex	3	0	0	FD	FE	X
PGN		65022 (FDFE)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 2458				SPN 2466		SPN 2520	

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2458	32	uint32	Generator Phase B	1 var/bit	-2E9 … 2E9
1				Reactive Power	-2E9 var offset	
2						
3						
4	2466	16	uint16	Generator Phase B	$\frac{1}{16384}$/bit	-1 … +1
				Power factor		
5				($\frac{TruePowerP}{ApparentPowerS}$)		
6	2520	16	uint16	Generator Phase B	4 states/2 bit	00 = Leading
				Power factor	0 offset	01 = Lagging
7				lagging		10 = Error
						11 = Not Available
						or Not Installed

4.20 J1939 GPBACP – Generator Phase B AC Power (3-Phase Module)

PGN 65023 (0xFDFF)
Type: Broadcast cyclic single frame (100ms)
Description: Real power and apparent power of generator phase B.

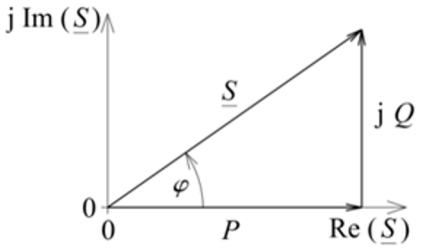


Figure 10: Power Triangle

$\sqrt[2]{P^2 + Q^2}$
Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	3	0	0	253	255	X
hex	3	0	0	FD	FF	X
PGN		65023 (FDFF)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 2454				SPN 2462			

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2454	32	uint32	Generator Phase B	1 W/bit	-2E9 … 2E9
1				Real Power	-2E9 W offset	
2						
3						
4	2462	32	uint32	Generator Phase B	1 VA/bit	-2E9 … 2E9
5				Apparent Power	-2E9 VA offset	
6						
7						

4.21 J1939 GPBAC – Generator Phase B Basic AC Quantities (3-Phase Module)

PGN 65024 (0xFE00)
Type: Broadcast cyclic single frame (100ms)
Description: Generator Phase B, Line-Line AC RMS voltage, Line-N AC RMS voltage, AC frequency and AC current.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	3	0	0	254	0	X
hex	3	0	0	FE	00	X
PGN		65024 (FE00)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 2442		SPN 2446		SPN 2438		SPN 2450	

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2442	16	uint16	Generator AC Voltage B	1 V/bit	0 … 65535 V
1				RMS Line to Line	0 offset	
2	2446	16	uint16	Generator AC Voltage B	1 V/bit	0 … 65535 V
3				RMS Line to Neutral	0 offset	
4	2438	16	uint16	Generator AC Frequency	$\frac{1}{128}$ Hz/bit	0 … 501,9921875 Hz
5				phase B	0 offset	
6	2450	16	uint16	Generator AC Current	1 A/bit	0 … 65535 A
7				RMS phase B	0 offset	

4.22 J1939 GPAACR – Generator Phase A AC Reactive Power

PGN 65025 (0xFE01)
Type: Broadcast cyclic single frame (100ms)
Description: Reactive power, power factor and power factor lagging of generator phase A.

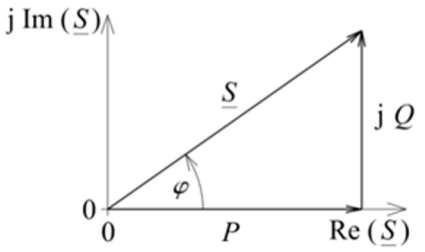


Figure 11: Power Triangle

$\sqrt[2]{P^2 + Q^2}$
Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	3	0	0	254	1	X
hex	3	0	0	FE	01	X
PGN		65025 (FE01)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 2457				SPN 2465		SPN 2519	

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2457	32	uint32	Generator Phase A	1 var/bit	-2E9 … 2E9
1				Reactive Power	-2E9 var offset	
2						
3						
4	2465	16	uint16	Generator Phase A	$\frac{1}{16384}$/bit	-1 … +1
				Power factor		
5				($\frac{TruePowerP}{ApparentPowerS}$)		
6	2519	16	uint16	Generator Phase A	4 states/2 bit	00 = Leading
				Power factor	0 offset	01 = Lagging
7				lagging		10 = Error
						11 = Not Available
						or Not Installed

4.23 J1939 GPAACP – Generator Phase A AC Power

PGN 65026 (0xFE02)
Type: Broadcast cyclic single frame (100ms)
Description: Real power and apparent power of generator phase A.

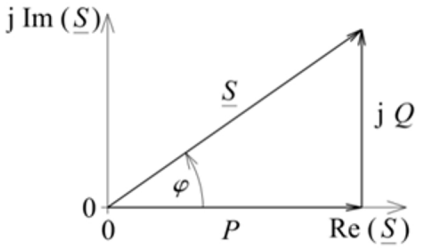


Figure 12: Power Triangle

$\sqrt[2]{P^2 + Q^2}$
Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	3	0	0	254	2	X
hex	3	0	0	FE	02	X
PGN		65026 (FE02)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 2453				SPN 2461			

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2453	32	uint32	Generator Phase A	1 W/bit	-2E9 … 2E9
1				Real Power	-2E9 W offset	
2						
3						
4	2461	32	uint32	Generator Phase A	1 VA/bit	-2E9 … 2E9
5				Apparent Power	-2E9 VA offset	
6						
7						

4.24 J1939 GPAAC – Generator Phase A Basic AC Quantities

PGN 65027 (0xFE03)
Type: Broadcast cyclic single frame (100ms)
Description: Generator Phase A, Line-Line AC RMS voltage, Line-N AC RMS voltage, AC frequency and AC current A.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	3	0	0	254	3	X
hex	3	0	0	FE	03	X
PGN		65027 (FE03)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 2441		SPN 2445		SPN 2437		SPN 2449	

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2441	16	uint16	AC Voltage A	1 V/bit	0 … 65535 V
1				RMS Line to Line	0 offset	
2	2445	16	uint16	AC Voltage A	1 V/bit	0 … 65535 V
3				RMS Line to Neutral	0 offset	
4	2437	16	uint16	AC Frequency	$\frac{1}{128}$ Hz/bit	0 … 501,9921875 Hz
5				phase A	0 offset	
6	2449	16	uint16	AC Current	1 A/bit	0 … 65535 A
7				RMS phase A	0 offset	

4.25 J1939 GAAC – Generator Average Basic AC Quantities

PGN 65030 (0xFE06)
Type: Broadcast cyclic single frame (100 ms)
Description: Generator Average Line-Line AC RMS Voltage, Generator Average Line-Neutral AC RMS Voltage, Generator Average AC Frequency and Generator Average AC RMS Current.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	3	0	0	254	6	X
hex	3	0	0	FE	06	X
PGN		65030 (FE06)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	2440		2444		2436		2448	

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	2440	16	uint16	Generator Average	1 V/bit	0 … 65535 V
1				Line-Line AC	0 offset	
				RMS Voltage		
2	2444	16	uint16	Generator Average	1 V/bit	0 … 65535 V
3				Line-Neutral	0 offset	
				AC RMS Voltage		
4	2436	16	uint16	Generator Average	$\frac{1}{128}$ Hz/bit	0 … 501,9921875 Hz
5				AC Frequency	0 offset	
6	2448	16	uint16	Generator Average	1 A/bit	0 … 65535 A
7				AC RMS Current	0 offset	

4.26 HTR – Heater Information

65133 (0xFE6D)
Type: Broadcast cyclic single frame (1000ms).
Description: Status and temperature data of vehicle auxiliary or parking heaters.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	254	109	X
hex	X	0	0	FE	6D	X
PGN		65133 (FE6D)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN				1677				

Content:

Byte	**SPN**	**Data Length**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0		8 bits	uint8	0xFF		
1		8 bits	uint8	0xFF		%
2		8 bits	uint8	0xFF		
3	1677	Bit 0-3	uint8	Auxiliary Heater Mode	1 / bit	0 … 15
				0x00 = Heater not active	0 offset	
				0x01 = Off due to ADR		
				0x02 = Economy mode		
				0x03 = Normal mode		
				0x04 = Heater pump up-keep		
				0x0E = Error		
				0x0F = Not available		
4		8 bits	uint8	0xFF		
5		8 bits	uint8	0xFF		
6		8 bits	uint8	0xFF		
7		8 bits	uint8	0xFF		

4.27 J1939 HOURS – Engine Hours

PGN 65253 (0xFEE5)
Type: Broadcast cyclic single frame (100 ms)
Description: Operating hour counter.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	254	229	X
hex	X	0	0	FE	E5	X
PGN		65253 (FEE5)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	247				249			

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	247	32	uint32	Operating Hours	3 min ($\frac{1}{20}$ h)	0 … 214748364,75 h
1				(motor running)	0 offset	
2						
3						
4	249	32	uint32	Not used	-	-
5						
6						
7						

4.28 J1939 ET1 – Engine Temperatures 1

PGN 65262 (0xFEEE)
Type: Broadcast cyclic single frame (1000 ms)
Description: Generator Temperatures.

NOTE
The engine fuel temperature and the engine oil temperature are only available with engines with engine control unit (ECU) and when this ECU is in operation / when the diesel engine is running.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	254	238	X
hex	X	0	0	FE	EE	X
PGN		65262 (FEEE)				

Data Bytes:

Bits	8	8	16		16		8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 110	SPN 174	SPN 175		SPN 176		SPN 52	SPN 1134

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	110	8	uint8	Engine coolant temp.	1 °C/bit	-40 … 213 °C
				0xFE = short circuit	offset -40	
				0xFF = not available		
1	174	8	uint8	Engine fuel temp.	1 °C/bit	-40 … 213 °C
				0xFE = short circuit	offset -40	
				0xFF = not available		
2	175	16	uint16	Engine oil temp.	$\frac{1}{32}$ °C/bit	-273 … 1735 °C
3				0xFE = short circuit	offset -273	
				0xFF = not available		
4	176	16	uint16	Not used	-	-
5						
6	52	8	uint8	Not used	-	-
7	1134	8	uint8	Not used	-	-

4.29 J1939 EFLP1 – Engine Fluid Level/Pressure 1

PGN 65263 (0xFEEF)
Type: Broadcast cyclic single frame (100 ms)
Description: Used for engine fuel delivery pressure and engine oil pressure.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	254	239	X
hex	X	0	0	FE	EF	X
PGN		65263 (FEEF)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
Bits	SPN 94			SPN 100				

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	94	8	uint8	Engine Fuel Delivery Pressure	4 kPa/bit 0 offset	0 … 1000 kPa
1	-	8	uint8	Not used	X	X
2	-	8	uint8	Not used	X	X
3	100	8	uint8	Engine Oil Pressure	4 kPa/bit 0 offset	0 … 1000 kPa
4	-	8	uint8	Not used	X	X
5	-	8	uint8	Not used	X	X
6	-	8	uint8	Not used	X	X
7	-	8	uint8	Not used	X	X

4.30 J1939 LFE1 – Fuel Economy (Liquid)

PGN 65266 (0xFEF2)
Type: Broadcast cyclic single frame (100 ms)
Description: Used for Engine Fuel Rate.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	3	0	0	254	242	X
hex	3	0	0	FE	F2	X
PGN		65266 (FEF2)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	183							

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	183	16	uint16	Engine Fuel Rate	0,05 l/h /bit	0 … 3212,75 l/h
1					0 offset	
2		16	uint16			
3						
4		16	uint16			
5						
6		8	uint8			
7		8	uint8			

4.31 J1939 IC1 – Intake/Exhaust Conditions 1

PGN 65270 (0xFEF6)
Type: Broadcast cyclic single frame (500ms)
Description: Intake and Exhaust Conditions of the Diesel Engine.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	254	246	X
hex	X	0	0	FE	F6	X
PGN		65270 (FEF6)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	3609	102	105	106	107	173		112

Content:

Byte	**SPN**	**Data Length**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	3609	8 bits	uint8	Aftertreatment 1 Diesel Particulate Filter Intake Pressure	0,5 kPa / bit 0 offset	0 … 125 kPa
1	102	8 bits	uint8	Engine Intake Manifold #1 Pressure	2 kPa / bit 0 offset	0 … 500 kPa
2	105	8 bits	uint8	Engine Intake Manifold 1 Temperature	1 °C / bit -40 offset	-40 … 210 °C
3	106	8 bits	uint8	Engine Intake Air Pressure	2 kPa / bit 0 offset	0 … 500 kPa
4	107	8 bits	uint8	Engine Air Filter 1 Differential Pressure	0,05 kPa / bit 0 offset	0 … 12,5 kPa
5 6	173	16 bits	uint16	Engine Exhaust Temperature	0,03125 °C / bit -273 offset	-273 … 1734,96875 °C
7	112	8 bits	uint8	Engine Coolant Filter Differential Pressure	0,5 kPa / bit 0 offset	0 … 125 kPa

4.32 DD1 – Dash Display 1

65276 (0xFEFC)
Type: Broadcast cyclic single frame (1000ms).
Description: Fuel level – ratio of volume of fuel to the total volume of fuel storage container.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	254	252	X
hex	X	0	0	FE	FC	X
PGN		65276 (FEFC)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN		96						

Content:

Byte	**SPN**	**Data Length**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0		8 bits	uint8	0xFF		
1	96	8 bits	uint8	Fuel Level 1	0,4 % / bit gain 0 offset	0 … 100 %
2		8 bits	uint8	0XFF		
3		8 bits	uint8	0xFF		
4		8 bits	uint8	0xFF		
5		8 bits	uint8	0xFF		
6		8 bits	uint8	0xFF		
7		8 bits	uint8	0xFF		

5 Special functions - Proprietary PGNs

5.1 PROPA00 – Remote Procedure Request

PGN 61184 (0xEF00)
Type: Single frame, target oriented, partially routed via »fpControl CAN Interface – SAE J1939« (fpControl CI-SAE J1939) [1]
Description: Special function for parameter request and for producing special operation. Using PROPA00 a remote procedure request is sent to a device which acknowledges with a PROPB00 message (PGN 65280) as described in 5.2 as broadcast. The possible requests are displayed in the chapter "RPC-Requests". An RPC-ID and up to 3 parameters (3 x 16 bits) can be transferred. **Unlike most of the standard PGNs the RPC-ID and parameters are big endian encoded.**

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	239	XX	X
hex	X	0	0	EF	XX	X
PGN		61184 (EF00)				

NOTE: »XX« in field PS must be replaced with the destination address. Refer to 5.1.1.

Data Bytes:

Bits	16	16	16	16
Name	RPD-ID	Param 1	Param 2	Param 3
SPN				

Content:

Byte	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	16	uint16	Request RPC-ID	-	0…65535
1					
2	16	uint16	Request Parameter 1	-	0…65535
3					
4	16	uint16	Request Parameter 2	-	0…65535
5					
6	16	uint16	Request Parameter 3	-	0…65535
7					

[1] »fpControl CAN Interface – SAE J1939«: https://knowledgebase.fischerpanda.de/?p=4052

5.1.1 The fields within the 29-bit Identifier

Field		Meaning	Description	Comment
Prio		Priority	Priority of the message on the CAN bus. Messages of higher importance are sent before those of lower priority.	»0« has the highest priority.
Parameter Group Number	EDP DP	Extended Data Page Data Page	With EDP and DP, four different data pages can be selected for J1939 messages (Parameter Group).	EDP = 0 and DP = 0: SAE J1939 Parameter Groups
	PF	PDU Format	Protocol Data Unit Format – defines whether the message is intended for a specific device in the CAN bus or for the entire network.	**1 … 239:** A specific device in the CAN bus should be addressed by this CAN message. The PS field contains the destination address. **240 … 255:** All devices in the CAN bus should be addressed by this CAN message. The PS field contains a Group Extension.
	PS	PDU Specific	Protocol Data Unit Specific – based on the value of the PF field	If the message is intended for a specific device (PF <= 239), PS is the destination address of this device. **»XX« must be replaced with a destination address != 0.** If the message is intended for all devices (PF > = 240), PS is the group extension field and enables a higher number of possible broadcast messages.
SA		Source Address	Address of the device sending the current message.	»X« must be replaced with the source address.

NOTE: The destination address in the PS field must always be a value != 0. The destination address »0« isn´t used by any Fischer Panda device.

5.2 PROPB00 – Response for PROPA00 RPC-request

PGN 65280 (0xFF00)
Type: Broadcast single frame, partially routed via »fpControl CAN Interface – SAE J1939« (fpControl CI-SAE J1939) [2]
Description: RPC-Response frame for PROPA00 (refer to 5.1) and for file transfer. In case of an error the RPC-ID and 0xFFFF$_{hex}$ in parameter fields 1-3 will be transferred.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	0	X
hex	X	0	0	FF	00	X
PGN		65280 (FF00)				

Data Bytes:

Bits	16	16	16	16
Name	Function	Param 1	Param 2	Param 3
Bits				

Content:

Byte	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	16	uint16	Requested RPC-ID	-	0…65535
1					
2	16	uint16	Request Parameter 1	-	0…65535
3					
4	16	uint16	Request Parameter 2	-	0…65535
5					
6	16	uint16	Request Parameter 3	-	0…65535
7					

[2] »fpControl CAN Interface – SAE J1939«: https://knowledgebase.fischerpanda.de/?p=4052

5.3 PROPB01 – Generator System Information

PGN 65281 (0xFF01)
Type: Broadcast cyclic single frame (250 ms)
Source: fpControl
Description: This frame is sent cyclic from generator controller to the panel. Different states and display messages are contained which can also be evaluated from extern.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	1	X
hex	X	0	0	FF	01	X
PGN		65281 (FF01)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520200		520192	520195	520193	520201	520202	520203

Content:

Byte	**SPN**	**Data Length**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	520200	16 bits	uint16	System battery voltage	$\frac{1}{10}$ V / bit	0…6553,5
1					0 offset	
2	520192	8 bits	uint8	**System state**	0 – 255	0...255
				0 = Standby (Generator is stopped)		
				1 = Self-test		
				2 = Preheat		
				3 = Starting (Starter on)		
				4 = Starting		
				5 = Start-up phase (Starter off)		
				6 = Override phase		
				(Frequency control)		
				7 = Warm-up phase		
				(Switching to voltage		
				control with checking		
				oil pressure)		
				8 = Normal mode		
				(Generator is running)		
				9 = Stopping phase		
				possibly with turbo lag		
				10 = Error occurred		
				11 to 255 are unused		

Byte	SPN	Data Length	Data Type	Parameter	Resolution / Offset	Data Range
3	520195	8 bits	uint8	Error code if in error state	0 – 255	0...255
4	520193	8 bits	uint8	Delay until next state	0 – 255	0...255
5	520201	8 bits	uint8	Cyclic recurring unacknowledged warnings. Warnings are toggled per cycle, that means every 500 ms for example 1, 6, 3, 4, 1, 6, 3, 4… and so on. If a warning has been acknowledged Show Warning=0 until the next warning	0 – 255	0...255
6	520202	8 bits	uint8	Cyclic recurring all active warnings. Warning is active if <> 0. A warning is active if it is acknowledged and no longer displayed but still present. This warning is displayed cyclic.	0 – 255	0...255
7	520203	8 bits	uint8	Special config bits:	0 – 255	0...255
		Bit 0		1 = automatic start active, 0 = automatic start inactive		
		Bit 1		1 = automatic start requested, genset will try to start		
		Bit 2		Not used		
		Bit 3		Not used		
		Bit 4		1 = teach start request		
		Bit 5		1 = Actuator max position test		
		Bit 6		1 = Actuator teaching OK		
		Bit 7		1 = Actuator teaching failed	0 – 255	0...255

5.4 PROPB03 – Generator System RPM

PGN 65283 (0xFF03)
Type: Broadcast cyclic single frame (100 ms)
Source: fpControl or Inverter
Description: Generator RPM. In case of iSeries generators the RPM is sent by the inverter. PROPB03 is required for the "Start without inverter" function.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	3	X
hex	X	0	0	FF	03	X
PGN		65283 (FF03)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520230							

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	520230	16	uint16	Engine Speed	1 rpm / bit	0 … 65535
1				(sent from inverter)	0 offset	
2		8			-	-
3		8			-	-
4		8			-	-
5		8			-	-
6		8			-	-
7		8			-	-

5.5 PROPB05 – Generator System Temperatures

PGN 65285 (0xFF05)
Type: Broadcast cyclic single frame (100 ms)
Source: fpControl
Description: Temperature Information about the system.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	5	X
hex	X	0	0	FF	05	X
PGN		65285 (FF05)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520204	520205	520206					

Content:

Byte	**SPN**	**Data Length**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	520204	8 bits	uint8	Temperature Winding	1 °C / bit	-40 … 213 °C
				0xFE = short circuit	-40 offset	
				0xFF = not available		
1	520205	8 bits	uint8	Temperature Exhaust	1 °C / bit	-40 … 213 °C
				0xFE = short circuit	-40 offset	
				0xFF = not available		
2	520206	8 bits	uint8	Temperature MCU	1 °C / bit	-40 … 213 °C
				0xFE = short circuit	-40 offset	
				0xFF = not available		
3		8 bits	uint8			
4		8 bits	uint8			
5		8 bits	uint8			
6		8 bits	uint8			
7		8 bits	uint8			

5.6 PROPB06 – Generator System Synchronisation

PGN 65286 (0xFF06)
Type: Single frame
Source / Destination:
Description: Synchronisation frame (zero-crossing).

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	6	X
hex	X	0	0	FF	06	X
PGN		65286 (FF06)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520268							

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	520268	8	uint8	Synchronisation ADC		
1		8	uint8			
2		8	uint8			
3		8	uint8			
4		8	uint8			
5		8	uint8			
6		8	uint8			
7		8	uint8			

5.7 PROPB08 – System Information

PGN 65288 (0xFF08)
Type: Broadcast cyclic single frame (5 s)
Description: Transmits the system information consisting of Generator Type and Nominal Genset Power.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	8	X
hex	X	0	0	FF	08	X
PGN		65288 (FF08)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520302		520303					

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	520302	16	uint16	Generator Type	1 / bit	0…65535
1					0 Offset	
2	520303	16	uint16	Nominal Genset Power	1 kW / bit	0…65535 kW
3				[kW]	0 Offset	
4					-	
5						
6					-	
7						

Type codes for Marine VS DC Generators

Generator Type Code	**Generator Type**
3001	20-VS
3002	35-VS
3003	45-VS
3004	75-VS
3005	100-VS

5.8 PROPB0A – Inverter Errors, Warnings and servo position request

PGN 65290 (0xFF0A)
Type: Broadcast cyclic single frame (100 ms)
Description: Errors and warnings represented by their event codes, and the servo position request which corresponds to the load level are transmitted by the inverter via this PGN.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	A	X
hex	X	0	0	FF	0A	X
PGN		65290 (FF0A)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520232		520233		520234			

Content:

Byte	**SPN**	**Data Length (bits)**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	520232	16	uint16	Error (FP bus	1 / bit	0 … 65535
1				event code)	0 offset	
2	520233	16	uint16	Warning (FP bus	1 / bit	0 … 65535
3				event code)	0 offset	
4	520234	8	uint8	Servo position request	1 / bit	0 … 100 %
				(corresponds to the	0 offset	
				load level)		
5		8	uint8		1 / bit	0 … 255
6		8	uint8			
7		8	uint8			

5.9 PROPB0B – Temperatures Inverter

PGN 65291 (0xFF0B)
Type: Broadcast cyclic single frame (100ms)
Description: Temperatures of the Inverter (L1 … L3 and DC link).

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	B	X
hex	X	0	0	FF	0B	X
PGN		65291 (FF0B)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520217	520224	520225	520235				

Content:

Byte	**SPN**	**Data Length**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	520217	8 bits	uint8	Inverter Temp. L1	1 °C / bit	-40 … 213 °C
				0xFE = short circuit	-40 offset	
				0xFF = not available		
1	520224	8 bits	uint8	Inverter Temp. L2	1 °C / bit	-40 … 213 °C
				0xFE = short circuit	-40 offset	
				0xFF = not available		
2	520225	8 bits	uint8	Inverter Temp. L3	1 °C / bit	-40 … 213 °C
				0xFE = short circuit	-40 offset	
				0xFF = not available		
3	520235	8 bits	uint8	Inverter Temp. DC link	1 °C / bit	-40 … 213 °C
				0xFE = short circuit	-40 offset	
				0xFF = not available		
4		8 bits	uint8			
5		8 bits	uint8			
6		8 bits	uint8			
7		8 bits	uint8			

5.10 PROPB0F – Service Hour Counter

PGN 65295 (0xFF0F)
Type: Broadcast cyclic single frame (100 ms)
Description: Service Hour Counter.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	15	X
hex	X	0	0	FF	0F	X
PGN		65295 (FF0F)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520223							

Content:

Byte	**SPN**	**Data Length**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	520223	32 bits	uint32	Service Hour Counter [LSB]	3 min (1/20 h)	0 … 214748364,75 h
1				[second byte]	0 offset	
2				[third byte]		
3				[MSB]		
4		8 bits	uint8	-	-	-
5		8 bits	uint8	-	-	-
6		8 bits	uint8	-	-	-
7		8 bits	uint8	-	-	-

5.11 PROPB14 – AGT 1 (Generator DC Output)

PGN 65300 (0xFF14)
Type: Broadcast cyclic single frame (100 ms)
Description: AGT DC Voltage, DC Current and DC Power of Generator DC Output.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	20	X
hex	X	0	0	FF	14	X
PGN		65300 (FF14)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520207		520208		520209			

Content:

Byte	**SPN**	**Data Length**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	520207	16 bits	uint16	AGT Gen-Out DC Voltage	0,1 V / bit	0 … 6553,5 V
1					0 offset	
2	520208	16 bits	uint16	AGT Gen-Out DC Current	0,1 A / bit	-3000,0 A … 3553,5 A
3					-3000,0 A offset	
4	520209	32 bits	uint32	AGT Gen-Out DC Power	1 W / bit	-2E9 … 2E9 W
5					-2E9 W offset	
6						
7						

5.12 PROPB15 – AGT 2 (DC Load)

PGN 65301 (0xFF15)
Type: Broadcast cyclic single frame (100 ms)
Description: AGT DC Voltage, DC Current and DC Power of Load.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	21	X
hex	X	0	0	FF	15	X
PGN		65301 (FF15)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520210		520211		520212			

Content:

Byte	**SPN**	**Data Length**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	520210	16 bits	uint16	AGT Load DC Voltage	0,1 V / bit	0 … 6553,5 V
1					0 offset	
2	520211	16 bits	uint16	AGT Load DC Current	0,1 A / bit	-3000,0 A … 3553,5 A
3					-3000,0 A offset	
4	520212	32 bits	uint32	AGT Load DC Power	1 W / bit	-2E9 … 2E9 W
5					-2E9 W offset	
6						
7						

5.13 PROPB16 – AGT 3 (temperatures)

PGN 65302 (0xFF16)
Type: Broadcast cyclic single frame (100ms)
Description: AGT temperatures of heatsink, rail+, rail- and MCU. / HYBR temperatures of IGBT-1, IGBT-2, IGBT-3 and Cabinet.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	22	X
hex	X	0	0	FF	16	X
PGN		65302 (FF16)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520226	520227	520228					520229

Content:

Byte	SPN	Data Length	Data Type	Parameter	Resolution / Offset	Data Range
0	520226	8 bits	uint8	AGT Temp. heatsink / HYBR Temp. IGBT-1 0xFE = short circuit 0xFF = not available	1 °C / bit -40 offset	-40 … 213 °C
1	520227	8 bits	uint8	AGT Temp. rail+ / HYBR Temp. IGBT-2 0xFE = short circuit 0xFF = not available	1 °C / bit -40 offset	-40 … 213 °C
2	520228	8 bits	uint8	AGT Temp. rail- / HYBR Temp. IGBT-3 0xFE = short circuit 0xFF = not available	1 °C / bit -40 offset	-40 … 213 °C
3		8 bits				
4		8 bits				
5		8 bits				
6		8 bits				
7	520229	8 bits	uint8	AGT Temp. electr. (MCU) / AGT HYBR Temp. Cabinet 0xFE = short circuit 0xFF = not available	1 °C / bit -40 offset	-40 … 213 °C

5.14 PROPB17 – AGT 4 (Proprietary AC Generator Values)

PGN 65303 (0xFF17)
Type: Broadcast cyclic single frame (100 ms)
Description: Proprietary AC Generator Values for Debug and Visualization (AGT AC Voltage, Current, Frequency and Power).

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	23	X
hex	X	0	0	FF	17	X
PGN		65303 (FF17)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520277		520278		520231		520280	

Content:

Byte	**SPN**	**Data Length**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	520277	16 bits	uint16	AGT AC Voltage	0,1 V / bit	0 … 6553,5 V
1					0 offset	
2	520278	16 bits	uint16	AGT AC Current	0,1 A / bit	0 … 6553,5 A
3					0 offset	
4	520231	16 bits	uint16	AGT AC Frequency	$\frac{1}{128}$ Hz / bit	0 … 501,9921875 Hz
5					0 offset	
6	520280	16 bits	uint16	AGT AC Power	0,1 kW / bit	0 … 6553,5 kW
7					0 offset	

5.15 PROPB18 – AGT 5 (Battery charge)

PGN 65304 (0xFF18)
Type: Broadcast cyclic single frame (250 ms)
Description: This PGN contains the battery charge in [%]. It is sent cyclically from generator control if an AGT type is configured. The cyclic transmission of the PGN 65304 can be deactivated / activated via the RPC-ID 0x0213. If the PGN 65304 is sent cyclically, the panel shows a battery symbol with a charging bar instead of the load on the generator.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	24	X
hex	X	0	0	FF	18	X
PGN		65304 (FF18)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520269							

Content:

Byte	**SPN**	**Data Length**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	520269	16 bits	uint16	AGT Battery charge	0,0078125 % / bit	-251 … 250,99%
1					-251 offset	
2		8 bits	uint8	-	-	-
3		8 bits	uint8	-	-	-
4		8 bits	uint8	-	-	-
5		8 bits	uint8	-	-	-
6		8 bits	uint8	-	-	-
7		8 bits	uint8	-	-	-

5.16 PROPB19 – AGT 6 (Battery charger control target value and limiter)

PGN 65305 (0xFF19)
Type: Broadcast cyclic single frame (250ms). If the message is not sent cyclically, the AGT goes to idle for safety reasons (timeout: 250 ms).
Description: The control for voltage or current is selected via the control target value in SPN 520270. This PGN is also used to code whether the other size is to be used as limiter.

When regulating to voltage without limitation the current is ignored. If the limitation is active, the voltage is regulated as long as the battery current is below its limit value. When the battery current reaches its limit, the system switches to current control. The battery management system delivers the input values.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	25	X
hex	X	0	0	FF	19	X
PGN		65305 (FF19)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520270	520271	520272		520273			

Content:

Byte	SPN	Data Length	Data Type	Parameter	Resolution / Offset	Data Range
0	520270	8 bits	uint8	**control target value** (voltage or current), **type of limiter** and if the **limiter is active or not**	1 / bit 0 offset	0 = U 1 = U with I limit 2 = I 3 = I with U limit 4 = P 5 = P with U limit 6 = P with I limit 7 = P with U and I limit
1	520271	8 bits	uint8	**Battery capacity** (current state of charge of the battery)	1 % / bit 0 offset	0 … 100 %
2	520272	16 bits	uint16	**Battery voltage** (control variable when ctrl. voltage or voltage limiter when controlling current)	0,1 V / bit 0 offset	0 … 6553,5 V
3						
4	520273	16 bits	uint16	**Battery current** (control variable when ctrl. current or current limiter when controlling voltage)	0,1 A / bit 0 offset	0 … 6553,5 A
5						
6						
7						

5.17 PROPB1A – AGT 7 (Charger output mode and value)

PGN 65306 (0xFF1A)
Type: Broadcast cyclic single frame (100ms).
Description: This message is sent from the battery charger and it informs cyclic about the mode, the output value, and the state of the charger.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	26	X
hex	X	0	0	FF	1A	X
PGN		65306 (FF1A)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520274		520275		520276		520299	

Content:

Byte	SPN	Data Length	Data Type	Parameter	Resolution / Offset	Data Range
0	520274	16 bits	uint16	**Charger output mode**	1 / bit	0 … 4
1					0 offset	0 = none
						1 = voltage
						2 = current
						3 = percent
						4 = power
2	520275	16 bits	uint16	**Charger output value**		
3				**dependent on** the		
				output mode it is the		
				voltage,	0,1 V / bit	0 … 6553,5 V
				current,	0,1 A / bit	0 … 6553,5 A
				percent	0,1 % / bit	0 … 100,0 %
				or **power**.	0,1 kVA / bit	0 … 6553,5 kVA
					0 offset	
4	520276	16 bits	uint16	**Charger state**	1 / bit	0 … 2
5					0 offset	0 = bulk
						1 = absorption
						2 = float
						0xffff = not available
6	520299	16 bits	uint16	HYBR Set Voltage	0,1 V / bit	0 … 6553,5 V
7					0 offset	

5.18 PROPB1B – AGT 8 (Power Control)

PGN 65307 (0xFF1B)
Type: Broadcast cyclic single frame (250ms). If the message is not sent cyclically, the AGT goes to idle for safety reasons (timeout: 250 ms).
Description: PGN to support power control. Power specification of the apparent power in full VA.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	27	X
hex	X	0	0	FF	1B	X
PGN		65307 (FF1B)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520291							

Content:

Byte	**SPN**	**Data Length**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	520291	32 bits	uint32	Apparent power	1 VA / bit	0 … 327.670 VA
1				in full [VA]	0 offset	
2						
3						
4		8 bits	uint8	-	-	-
5		8 bits	uint8	-	-	-
6		8 bits	uint8	-	-	-
7		8 bits	uint8	-	-	-

5.19 PROPB1C – AGT BMS Mode

PGN: 65308 (0xFF1C)
Type: Broadcast cyclic single frame (1000 ms).
Description: Maximal possible voltage and current.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	28	X
hex	X	0	0	FF	1C	X
PGN		65308 (FF1C)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520307		520308					

Content:

Byte	**SPN**	**Data Length**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	520307	16 bits	uint16	**max. voltage**	0,1 V / bit	0 … 6553,5 V
1					0 offset	
2	520308	16 bits	uint16	**max. current**	0,1 A / bit	0 … 6553,5 A
3					0 offset	
4						
5						
6						
7						

5.20 PROPB1D – AGT 10 (Hybrid Charger)

PGN: 65309 (0xFF1D)
Type: Broadcast cyclic single frame (100 ms)
Description: States, Modes and Errors of the Hybrid Charger (HYBR).

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	29	X
hex	X	0	0	FF	1D	X
PGN		65309 (FF1D)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520294	520301	520295		520296	520297	520298	

Content:

Byte	**SPN**	**Data Length**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	520294	8 bits	uint8	HYBR Error Bit Field	1 / bit 0 offset	0 … 255
1	520301	8 bits	uint8	HYBR Warning Bit Field	1 / bit 0 offset	0 … 255
2 3	520295	16 bits	uint16	HYBR States (to be done in future)	1 / bit 0 offset	0 … 65535
4	520296	8 bits	uint8	HYBR Servo Control Mode	1 / bit 0 offset	0 … 255
5	520297	8 bits	uint8	HYBR Servo Position Request	1 % / bit 0 offset	0 … 100 %
6 7	520298	16 bits	uint16	HYBR Precharge - DC Bus Voltage	0,1 V / bit 0 offset	0 … 6553,5 V

5.20.1 HYBR Error Bit Field (SPN 520294)

Error messages from the Hybrid Charger are displayed in the first 8 Bits (SPN 520294). The error messages are a summary for visualization for the user and for the quick reaction of a higher-level control system and the fpControl. Different error messages can appear at the same time.

Bit	Error Name	Error Description
0	HYBR-General-Error	System Emergency Shutdown
1	Over-Temperature Power-Switch	Over Temperature in Power-Switch or Environment
2	Power-Switch	Power Switch (IGBT) Driver Interrupt
3	AC-Input Error	AC Current/Voltage Error in 3-Phase Generator Input
4	DC-Out-Voltage	Positive or negative DC-Out Voltage Error
5	DC-Out-Current	Positive or negative DC-Output Current Error
6	DC-Precharge-Voltage	Positive or negative DC-Precharge/Battery-Voltage Error
7		

In some cases, the error messages are evaluated by fpControl and mapped into customer- or generator-specific error messages.

NOTE: An error message directly leads to a shutdown of the system. An acknowledgment or reset is required.

5.20.2 HYBR Warning Bit Field (SPN 520301)

Warning messages from the Hybrid Charger are displayed in the second 8 Bits (SPN 520301). The error messages are a summary for visualization for the user and for the quick reaction of a higher-level control system and the fpControl. Different warning messages can appear at the same time.

Bit	Warning Name	Warning Description
0	PCB-Undervoltage	PCB Supply Voltage to low. For example, at engine start
1	Over Temperature Environment	Over Temperature Environment
2	Time-Out DC Relays HV+ switch on	Cannot achieve DC-Precharge Voltage, Enable Signal Missing
3		
4		
5	Time-Out fpControl	CAN-Communication fpControl lost (only in Hybrid Charger Operation Mode: Generator-State-Machine-Mode)
6	Time-Out DC-Out-Charger-Control	CAN-Communication DC-Out-Charger-Control lost (only in Hybrid Charger DC-Out control mode: CAN Control-Mode)
7	Wrong Parameter	If some Parameter is wrong or irrational

In the event of warning messages, the system is not switched off. In some cases, the system does not work correctly, so that the user automatically becomes aware of the problem. The warning message can be used to quickly identify the problem. But there are also warning messages in which the system continues to run or starts normally or in an emergency mode. These warnings should be communicated to the user by a higher-level control unit so that the user can correct errors, or a service technician can be called in.

NOTE: A warning does not necessarily lead to a shutdown. However, it can be the reason for a shutdown if there is a HYBR general error (Bit 0 of SPN 520294 (HYBR general error) is set.

5.20.3 HYBR States (SPN 520295)

Status messages from the Hybrid Charger are displayed in SPN 520295). The status messages are a summary for the visualization of the system. There is no need to react to the status message on the customer side. Different status messages can appear at the same time.

Bit	State Name	State Description
0	Relay HV+ On	Relay HV+ closed
1	Relay HV- On	Relay HV- closed
2	Relay HV+ Enable	Extern relay HV+ enable state
3	Precharge Check Active	Relay HV+ switch only if DC-Link-Voltage and Precharge-Voltage are nearly equal
4	Vector Control Active	AC-DC-Converter control loop active
5	IGBT-Driver/ PWM Active	Driver and PWM active
6	Set-Value Overwrite Active	For powerless switching a overwrite of the DC out Set value is necessary, if set value is overwrite this bit is active
7	DC-Out-CAN Control Active	If DC-Out is controlled by CAN-Bus this Bit is active. If DC-Out is fix-value this bit is reset.
8	Hybrid Charger Generator-Operation-Mode Active	This Bit is active if the operation state will be controlled by generator state.

5.21 PROPB24 – Fuel Efficiency

PGN 65316 (0xFF24)
Type: Broadcast cyclic single frame (100 ms)
Description: Torqeedo property »Fuel Efficiency« [g/kWh]

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	36	X
hex	X	0	0	FF	24	X
PGN		65316 (FF24)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520300							

Content:

Byte	**SPN**	**Data Length**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	520300	16 bits	uint16	Fuel Efficiency	1 g/kWh / bit	0 … 65535 g/kWh
1					0 offset	
2						
3						
4						
5						
6						
7						

5.22 PROPB25 – fpCAN Device Info

PGN 65317 (0xFF25)
Type: Broadcast cyclic single frame (1 s).
Description:

- Sends Bus ID, Module ID, Software Version and Serial Number of each detected fpCAN device.
- Cycles through the detected fpCAN devices on each transmit.

Structure of the 29-bit identifier:

Bits	3	1	1	8	8	8
Name	Prio	EDP	DP	PF	PS	SA
dec	X	0	0	255	37	X
hex	X	0	0	FF	25	X
PGN		65317 (FF25)				

Data Bytes:

Bits	8	8	8	8	8	8	8	8
Name	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
SPN	520243	520244	520245		520246			

Content:

Byte	**SPN**	**Data Length**	**Data Type**	**Parameter**	**Resolution / Offset**	**Data Range**
0	520243	8 bits	uint8	**Bus ID**	1 / bit 0 offset	0 … 255
1	520244	8 bits	uint8	**Module ID**	1 / bit 0 offset	0 … 255
2	520245	16 bits	uint16	**Software Version**	1 / bit 0 offset	0 … 65535
3						
4	520246	32 bits	uint32	**Serial Number**	1 / bit 0 offset	0 … 4.294.967.296
5						
6						
7						

Encoding of »Software Version«

Upper nibble MSB	**Lower nibble MSB**	**LSB**
Release Candidate 0-15	Major Version 0-15	Minor Version 0-255

6 Remote Procedure Requests

6.1 Introduction to the topic

Although basic runtime information will be made available on the J1939/NMEA2000® bus it is not possible to map all functionality to the standard PGNs. Because of the necessity to make those unmapped parameters/functions accessible the FP-Bus supports a simplified RPC-mechanism.

6.2 Functionality

It is possible to request/set specific data and/or request the execution of a function on a FP-Bus device. Therefore, the RPC-mechanism uses the proprietary Fischer Panda Messages PGNs PropA00 (PGN 61184) and PropB00 (PGN 65280). PropA00 is used to send the request and due to its definition as address oriented PGN the request can either be sent to an individual device (unicast) or to all devices (multicast). The device processing the request will check if the requested RPC-ID is known to it. If so, it will acknowledge it with sending the answer on PropB00, if not it will not respond anything. In case of an error while processing a request the parameter fields 1-3 of the corresponding response would be set to $0xFFFF_{hex}$. PropB00 will always be broadcasted, so that every device on the bus is able to process it (if necessary).

6.3 Request types

The RPC-ID is a unique identifier for individual functions on FP-Bus devices. The identifier itself is 15 bits wide and is represented by the lower 15 bits of the first word of an RPC-Request/-Response. The MSB (bit 15) categorizes it into *»read- and write-requests«*. The MSB set to 1 indicates a *»write-request«* (e.g. write something into a register, execute a function that changes parameters, conditions etc.), whereas the MSB set to 0 indicates a read-request (e.g. request of a special parameter, condition etc.).

6.4 Endianness of the RPC-PGNs

Unlike most of the standard PGNs the content of the RPC-PGNs is **big endian** encoded.

6.5 Notice for sending RPC requests

NOTICE
Property damage to the generator control due to cyclic remote procedure requests.
Most remote procedure requests write to the EEPROM.
Frequent writing to the EEPROM can lead to the rapid destruction of this component.
Send remote procedure requests only once, never cyclically.

6.6 RPC-ID 0x000d – Clear errors/warnings

Type: R / W

Description: This RPC clears errors/warnings. If the generator ran into an error - after clearing it resets the generator-status to 0 (standby).
ATTENTION: If the generator-control is in automatic-start mode and there is still an active start request (e.g. by digital input or RPC-ID 0x809c) the generator will try to start again after clearing an error.

Read Request	Parameter definition	Resolution / Offset	Data Range
RPC-ID	-	-	-
param #1	-	-	-
param #2	-	-	-
param #3	-	-	-

Read Response	Parameter definition	Resolution / Offset	Data Range
RPC-ID	-	-	-
param #1	-	-	-
param #2	-	-	-
param #3	-	-	-

Write Request	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x800d	-	-
param #1	0xffff: clears all warnings	1 / bit	0 … 65535
	0x0000 – 0x00ff clears	0 offset	
	individual warning		
param #2	0xffff: clears error	1 / bit	0 … 65535
		0 offset	
param #3	-	-	-

Write Response	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x800d	-	-
param #1	echoed value of request	1 / bit	0 … 65535
		0 offset	
param #2	echoed value of request	1 / bit	0 … 65535
		0 offset	
param #3	-	-	-

6.7 RPC-ID 0x0012 – Automatic start mode

Type: R / W

Description: This RPC informs about the status of the automatic start mode (Read Request) and is used to activate/deactivate the automatic start mode (Write Request).

NOTE

At the **iControl2 system** activating the automatic start is only possible using the control panel.

Read Request	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x0012	-	-
param #1	-	-	-
param #2	-	-	-
param #3	-	-	-

Read Response	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x0012	-	-
param #1	0: automatic start-mode off	1 / bit	0 … 1
	1: automatic start-mode on	0 offset	
param #2	minimum value	1 / bit	0 … 1
		0 offset	
param #3	maximum value	1 / bit	0 … 1
		0 offset	

Write Request	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x8012	-	-
param #1	0: automatic start-mode off	1 / bit	0 … 1
	1: automatic start-mode on	0 offset	
param #2	-	-	-
param #3	-	-	-

Write Response	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x8012	-	-
param #1	0: automatic start-mode off	1 / bit	0 … 1
	1: automatic start-mode on	0 offset	
param #2	-	-	-
param #3	-	-	-

6.8 RPC-ID 0x008b – Service done

Type: W

Description: Resetting the service interval to the number of operating hours defined for the relevant generator type.

Write Request	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x808b	-	-
param #1	0x0001 = service done	1 / bit	0 … 1
		0 offset	
param #2	-	-	-
param #3	-	-	-

Write Response	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x808b	-	-
param #1	0x0001 = service done	1 / bit	0 … 1
		0 offset	
param #2	-	-	-
param #3	-	-	-

6.9 RPC-ID 0x008e – Set CPU in Power-Save-Mode (Sleep controller)

Type: W

Description: Remote Power Off.
The panel sends this RPC frame with the first payload word set to “1” which turns off the control.

Write Request	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x808e	-	-
param #1	0 = Running	1 / bit	0 … 1
	1 = Turn off the control	0 offset	
param #2	-	-	-
param #3	-	-	-

Write Response	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x808e	-	-
param #1	echoed value of request	1 / bit	0 … 1
		0 offset	
param #2	-	-	-
param #3	-	-	-

6.10 RPC-ID 0x0093 – Read software release

Type: R

Description: Being requested this RPC delivers the software release of the device.

Read Request	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x0093	-	-
param #1	[MSB] = server address	1 / bit	0 … 65535
	[LSB] = client address	0 offset	
param #2	-	-	-
param #3	-	-	-

Read Response	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x0093	-	-
param #1	[MSB] = Bus address	1 / bit	0 … 65535
	[LSB] = Module ID	0 offset	
param #2	Software Release	1 / bit	0 … 65535
	format [xx].[yy]	0 offset	
param #3	-	-	-

6.11 RPC-ID 0x0094 – Read serial number

Type: R

Description: Being requested this RPC delivers the serial number of the addressed device.

Read Request	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x0094	-	-
param #1	Client address	1 / bit	0 … 65535
		0 offset	
param #2	-	-	-
param #3	-	-	-

Read Response	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x0094	-	-
param #1	[MSB] = Bus address	1 / bit	0 … 65535
	[LSB] = Modul ID	0 offset	
param #2	Serial number, [MSW]	1 / bit	0 … 65535
		0 offset	
param #3	Serial number, [LSW]	-	-

How does an RPC request for the serial number work in practice? Let's dive into it:
In this example we will request the serial number of two communication interfaces using PROPA00 (PGN 61184) (refer to **??**). A remote procedure request for RPC ID 0x0094 is sent to each device which acknowledges with PROPB00 (PGN 65280) (refer to **??**) as broadcast. Parameter #1 (Payload1) contains the bus address of the subscriber whose serial number is to be requested. In this example it is address »234« (hex. 0xEA). This request must be carried out separately for each bus subscriber whose serial number is required.

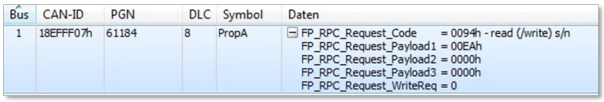


Figure 13: Example for an RPC request for the serial number

In our example, we also request the serial number of the second communication interface with the address »235«. Below you can see the acknowledgements (PROPB00) of both interfaces to our requests.

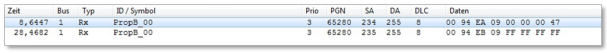


Figure 14: Acknowledgements (PROPB00) of both interfaces to the request for the serial number

The contents of the acknowledgement messages in detail:

Read Response	**Acknowledgement of the first request**	**Acknowledgement of the second request**
RPC-ID	**0x0094**	**0x0094**
param #1	[MSB] = Bus address = **0xEA** = 234 dec,	[MSB] = Bus address = **0xEB** = 235 dec,
	[LSB] = Modul ID = **0x09** (Com. Interface)	[LSB] = Modul ID = **0x09** (Com. Interface)
param #2	Serial number, [MSW] = **0x0000**	Serial number, [MSW] = **0xFFFF** = 65535 dec *)
param #3	Serial number, [LSW] = **0x0047** = 71 dec	Serial number, [LSW] = **0xFFFF** = 65535 dec

*) The second interface requested in this example is a development hardware and does not have a valid serial number, therefore 0xFFFF.

6.12 RPC-ID 0x009c – Remote start of Generator

Type: R / W

Description: The functionality of this RPC is based on the remote-start feature using the dedicated digital input on the generator control unit. A switch closing the circuit between this digital input and GND would request a generator remote start-procedure. Analogously sending a write request with payload 1 will do. Sending 0 would be the equivalent of opening the switch again. Thinking of a virtual switch (e.g. in a remote application's GUI) the answer Frames of either 0x809c or 0x009c will contain the position (0/1) of this switch. **So that the generator can be started receiving this message the automatic-start mode must be activated.**

Read Request	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x009c	-	-
param #1	-	-	-
param #2	-	-	-
param #3	-	-	-

Read Response	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x009c	-	-
param #1	position of remote GUI's switch	1 / bit 0 offset	0 … 1
param #2	-	-	-
param #3	-	-	-

Write Request	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x809c	-	-
param #1	1 = start 0 = stop	1 / bit 0 offset	0 … 1
param #2	-	-	-
param #3	-	-	-

Write Response	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x809c	-	-
param #1	position of remote GUI's switch	1 / bit 0 offset	0 … 1
param #2	-	-	-
param #3	-	-	-

6.13 RPC-ID 0x009e – Power on via RPC

Type: W

Description: With this RPC ID, the controller can be switched on via a bus command (remote power on).

Write Request	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x809e	-	-
param #1	0x0001 = remote power on	1 / bit	0 … 1
		0 offset	
param #2	don't care	-	-
param #3	don't care	-	-

Write Response	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x809e	-	-
param #1	echoed value of request	-	-
param #2	-	-	-
param #3	-	-	-

Note: The system can be **switched off** again using **RPC-ID 0x008e**.

Note: If there are several CAN interfaces in the fpCAN bus (several generator systems) you can "wake up" individual systems instead of all together (destination address DA: FF). In this case, the destination address of the corresponding CAN interface must be selected in the PROPA00 message (PGN 61184).

6.14 RPC-ID 0x009f – Switching utility relay output

Type: W

Description: Switching the utility relay output on / off.
Note: Without a release, for example by a sync module, independent switching is not possible.

Read Request	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x809f	-	-
param #1	0 = requests **switching off**	1 / bit	0 … 1
	the relay contact	0 offset	
	1 = requests **switching on**		
	the relay contact		
param #2	-	-	-
param #3	-	-	-

Read Response	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x809f	-	-
param #1	echoed value of request	1 / bit	0 … 1
param #2	-	-	-
param #3	-	-	-

6.15 RPC-ID 0x0214 – Setting AGT charger mode

Type: R / W

Description: With this RPC-ID the charger can be set into its different modes: BMS, UIU Charger or Hybrid Charger.

Read Request	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x0214	-	-
param #1	-	-	-
param #2	-	-	-
param #3	-	-	-

Read Response	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x0214	-	-
param #1	**Mode**	1 / bit	0 … 1 (AGT)
	0 = BMS	0 offset	10 (Hybrid Charger)
	1 = UIU Charger (this		
	is the default value)		
	10 = Hybrid Charger		
param #2	min. value: 0	1 / bit	0
		0 offset	
param #3	max. value: number of	1 / bit	0 … 2
	available modes - 1	0 offset	

Write Request	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x8214	-	-
param #1	**Mode**	1 / bit	0 … 1 (AGT)
	0 = BMS	0 offset	10 (Hybrid Charger)
	1 = UIU Charger (this		
	is the default value)		
	10 = Hybrid Charger		
param #2	-	-	-
param #3	-	-	-

Write Response	Parameter definition	Resolution / Offset	Data Range
RPC-ID	0x8214	-	-
param #1	echoed value of request:	1 / bit	0 … 1 (AGT)
	Mode	0 offset	10 (Hybrid Charger)
param #2	-	-	-
param #3	-	-	-

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