



User Manual

Code 80525 Edition 02-2024

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1. INTRODUCTION

The GEFTRAN KHC J1939 transducer is a Digital Pressure Sensor with J1939 interface. It implements the J1939 communication protocol defined by SAE (Society of Automotive Engineers).

The SAE specifications supported by the device are listed in the following table.

SAE standard	Description	Revision date
J1939/21	Data Link Layer	03/2016
J1939/71	Vehicle Application Layer	06/2015
J1939/73	Application Layer – Diagnostics	01/2016
J1939/74	Application – Configurable Messaging	09/2015
J1939/81	Network Management	02/2016
J1939DA	J1939 DA – Digital Annex of Serial Control and Communication. Heavy Duty Vehicle Network Data	03/2016

Table 1 - Supported SAE J1939 specifications

The GEFTRAN KHC J1939 transducer is compliant to the SAE J1939 Standard requirements described in the following SAE document.

SAE standard	Description	Revision date
J1939/82	Compliance	06/2015

This document describes the J1939 implementation on the GEFTRAN KHC J1939 device. It is addressed to J1939 network system integrators and to J1939 device designers who already know the content of the above-mentioned standards defined by SAE. The details of aspects defined by the J1939 standard do not pertain to the purpose of this text.

For further information on the SAE J1939 standard see www.sae.org

2. GET STARTED PROCEDURE

- The KHC J1939 sensor operates on a CAN BUS network working at 250 kbps, using the extended 29-bit CAN Identifier.
- When the KHC J1939 sensor is powered up, it sends an Address Claimed message, as shown below

CAN-ID	DLC	DATA
18EEFF00	8	24 00 81 5B 00 00 00 80

Figure 1 - Address Claim Message Example (Source Address=0)

- After the sensor has acquired a valid address, it starts sending the Data Record message.

Using specific commands, described in this document, it is possible to:

- Change the NAME of the device (see “Network Management” and “Application Configurable messages – Configure NAME”)
- Change the Preferred Address used at power on (see “Address Configuration – Commanded Address section”)
- Configure the Data Record message (see “Data Record message” and “Supported PGNs” sections)

3. NETWORK MANAGEMENT

3.1. NAME

The NAME of a device on a SAE J1939 network is a 64-bit identifier composed of 10 fields, as illustrated in the following figure.

Arbitrary Address Capable	Industry Group	Vehicle System Instance	Vehicle System	Reserved	Function	Function Instance	ECU Instance	Manufacturer Code	Identity Number
1 bit	3 bit	4 bit	7 bit	1 bit	8 bit	5 bit	3 bit	11 bit	21 bit

Figure 2 – NAME fields

Each device operating on the network must have a unique NAME. This is assured by the fact that the “Identity Number” field value, assigned by the manufacturer of the device, is unique. The “Manufacturer Code” field value, assigned by SAE, is also unique. The “Manufacturer Code” and the “Identity Number” fields cannot be changed. The other fields, except the “Reserved” field, are freely programmable by the user, depending on the final application of the KHC J1939 sensor.

The “Manufacturer Code” for GEFTRAN is 732, as shown in the following table.

NAME field	Value	Description
Manufacturer Code	732	Manufacturer code assigned by SAE to Gefran S.p.A., Provaglio d’Iseo (Italy)
Identity Number	“unique”	Programmed by GEFTRAN

Table 1 - Manufacturer Code and Identity Number NAME fields

The NAME of a device is used to identify the device on the J1939 network, and its functionality.

Arbitrary Address Capable field (AAC)

This 1-bit field indicates whether a device is able to resolve an address claim conflict.

AAC	Description
0	The device is configured as Single Address Capable device - Command Configurable Address device. The device is not capable of selecting an alternate source address itself.
1	The device is configured as Arbitrary Address Capable device. The device is capable of selecting an alternate source address itself, if needed during address arbitration, in the range of 128 to 247 inclusive.

Table 2 - AAC field description

For the other NAME fields, see SAE J1939 documentation.

3.2. ADDRESS

An address is a one-byte value identifying a particular device in the network.

The address of a device is incorporated in the lower byte of the 29-bit CAN-ID of every message sent by that device, allowing to identify the source of the messages on the network.

29 bit CAN-ID					
3 bit	1 bit	1 bit	8 bit	8 bit	8 bit
Priority	Res.	Data Page	PDU Format	PDU Specific	Source Address

Each device must use a unique address on the network. For this purpose, Address Claiming rules are defined.

3.3. ADDRESS CLAIMING

After power on, the KHC J1939 sensor sends an Address Claimed message, a global message received by any other device on the network. It contains the NAME of the device. The first time the message is sent, the Preferred Address of the device is used as Source Address. The Preferred Address is stored in nonvolatile memory, and is comprised in the range 0 to 127 and 248 to 253.

Example

The KHC J1939, whose NAME is 800000005B810024h and with a Preferred Address of 16 (10h), when powered on sends the message in the figure.

CAN-ID	DLC	DATA
18EEFF10	8	24 00 81 5B 00 00 00 80

Figure 3 - Address Claim Message Example

If the KHC J1939 does not receive any Address Claimed message with the same Source Address before 250ms has elapsed, it begins regular network communications, as the transmission of the Data Record message. If the device receives an Address Claimed message, it compares its own NAME with the NAME of the other device, contained in the received Address Claimed message. The device loses arbitration when the NAME of the other device is numerically lower than its own. If the arbitration is won, the device sends the Address Claimed message again and begins regular network communications. If the arbitration is lost the behavior is different, depending on the addressing capability of the device:

- The device is configured as Single Address Capable device (AAC = 0): the device sends the Cannot Claim Address message using the NULL address (254), with a pseudo-random delay between 0 and 153ms. The device cannot send any other messages other than the Cannot Claim Address message. Regular network communications are suspended.
- The device is configured as Arbitrary Address Capable device (AAC = 1): the device can claim other addresses, sending the Address Claimed message with the source address in the range of 128 to 247 inclusive. If no other Address Claimed message with the same Source Address is received, or if the arbitration is won, the device uses that address and begins regular network communications with that address. If no address in the range of 128 to 247 is available (arbitration always lost), the device sends the Cannot Claim Address message using the NULL address (254), with a pseudo-random delay between 0 and 153ms. The device cannot send any other messages other than the Cannot Claim Address message. Regular network communications are suspended.

Example

The KHC J1939, whose NAME is 000000005B810024h (Single Address Capable device) and with a Preferred Address equal to 1 (01h) receives an Address Claim Message with the same Source Address and a lower NAME. It loses the arbitration, obtaining the NULL address (254). The Cannot Claim Address message sent is the following.

CAN-ID	DLC	DATA
18EEFFFE	8	24 00 81 5B 00 00 00 00

Figure 4 - Cannot Claim Address Message Example

NOTE

An Arbitrary Address Capable device has always a lower priority than a not Arbitrary Address Capable one, since its NAME is greater (the most significant bit is 1)

3.3.1. Address Claimed / Cannot Claim Address message

Address Claimed / Cannot Claim Address message	
Data length	8 bytes
Data Page	0
PDU Format	238 (EEh)
PDU Specific	255 (FFh) – Global Address
Default Priority	6
PGN	60928 (00EE00h)

Figure 5 – Address Claimed Message Specification

Address Claimed / Cannot Claim Address message		
Byte D0	Bits 8-1	Identity Number (low byte)
Byte D1	Bits 8-1	Identity Number (mid byte)
Byte D2	Bits 8-6	Manufacturer Code (least significant 3 bits)
	Bits 5-1	Identity Number (most significant 5 bits)
Byte D3	Bits 8-1	Manufacturer Code (most significant 8 bits)
Byte D4	Bits 8-4	Function Instance
	Bits 3-1	ECU Instance
Byte D5	Bits 8-1	Function
Byte D6	Bits 8-2	Vehicle System
	Bit 1	Reserved
Byte D7	Bit 8	Arbitrary Address Capable
	Bits 7-5	Industry Group
	Bits 4-1	Vehicle System Instance

Figure 6 – Address Claimed / Cannot Claim Address Message Data Fields

Address Claimed message: Source Address in the range of 0 to 253

Cannot Claim Address message: Source Address equal to 254 (NULL address)

Example – Address Claimed (NAME = 000000005B810024h, Source Address = 16)

CAN-ID	DLC	DATA
18EEFF10	8	24 00 81 5B 00 00 00 00

Figure 7 - Address Claimed Message Example

The Address Claimed message is sent by the KHC J1939 sensor after:

- Every power-on
- Receiving an Address Claimed message with the same Source Address and a higher numerical value of NAME
- A Request for Address Claimed command, if its address is in the range of 0 to 253
- Receiving a Configure NAME message and successfully programming the new NAME
- Receiving a message, other than the Address Claimed message, which uses its own Source Address (attempt to resolve address violation). The Address Claimed message is sent no more often than every 5 seconds

Example – Cannot Claimed Address (NAME = 000000005B810024h, Source Address = 254)

CAN-ID	DLC	DATA
18EEFFFE	8	24 00 81 5B 00 00 00 00

Figure 8 - Cannot Claim Address Message Example

The Cannot Claim Address message is sent by the KHC J1939 sensor after:

- Receiving an Address Claimed message with the same Source Address and a lower numerical value of NAME and if
 - it is configured as Single Address Capable device (AAC=0, in the device NAME)
 - it is configured as Arbitrary Address Capable device (AAC=1, in the device NAME), and a valid address in the range of 128 to 247 cannot be obtained.
- A Request for Address Claimed command, if its address is the NULL address (254)

3.4. ADDRESS CONFIGURATION

When the KHC J1939 is powered on, it sends the Address Claimed message using its Preferred Address.

The Preferred Address of the KHC J1939 can be changed using the Commanded Address message. Valid values for the preferred address are in the range of 0 to 127 and 248 to 253. Addresses in the range of 128 to 247 are not configurable because they can be used by Arbitrary Address Capable devices when they cannot use the Preferred Address after losing the address arbitration contention.

If the Commanded Address message is accepted, the device uses the specified address and sends an Address Claimed message. The new value is saved in the nonvolatile memory.

Address configuration must be used to solve address conflicts with devices configured as Single Address - Command Configurable device, since they are not capable of selecting another address by themselves.

3.4.1. Commanded Address

The Commanded Address message is sent using the Broadcast Announce Message (BAM) of the Transport Protocol (SAE J1939/21), since it contains 9 bytes of data. The NAME of the device whose address has to be changed, and the new Source Address to be configured, are transmitted in the 9 data bytes. The message is sent to the global address (255).

In order to broadcast a multi-packet message, the device must first send the Broadcast Announce Message (BAM). The Broadcast Announce Message is embedded in the Transport Protocol – Connection Management (TP.CM).

Transport Protocol – Connection Management (TP.CM)	
Data length	8 bytes
Data Page	0
PDU Format	236 (ECh)
PDU Specific	DA (Destination Address)
Default Priority	7
PGN	60416 (00EC00h)

Figure 9 - Transport Protocol - Connection Management (TP.CM) Specification

Broadcast Announce Message (TP.CM_BAM)	
Byte D0	Control byte = 32 (20h)
Byte D1	Total message size, number of bytes (low byte)
Byte D2	Total message size, number of bytes (high byte)
Byte D3	Total number of packets
Byte D4	Reserved (FFh)
Byte D5	PGN of the packeted message (low byte)
Byte D6	PGN of the packeted message (mid byte)
Byte D7	PGN of the packeted message (high byte)

Figure 10 - Broadcast Announce Message (TP.CM_BAM) data fields

After sending the Broadcast Announce Message, the device uses the Transport Protocol – Data Transfer (TP.DT) to send the original message, using a sequence of messages to send all the required data bytes.

Transport Protocol – Data Transfer (TP.DT)	
Data length	8 bytes
Data Page	0
PDU Format	235 (EBh)
PDU Specific	DA (Destination Address)
Default Priority	7
PGN	60160 (00EB00h)

Figure 11 - Transport Protocol - Data Transfer (TP.DT) Specification

Transport Protocol – Data Transfer (TP.DT)	
Byte D0	Sequence number (1 to 255)
Byte D1	Data of original message
Byte D2	Data of original message
Byte D3	Data of original message
Byte D4	Data of original message
Byte D5	Data of original message
Byte D6	Data of original message
Byte D7	Data of original message

Figure 12 - Transport Protocol - Data Transfer (TP.DT) data fields

The last packet sent through the Transport Protocol Data Transfer, may require less than eight data bytes. All unused data bytes in the last packet must be set to 255 (FFh).

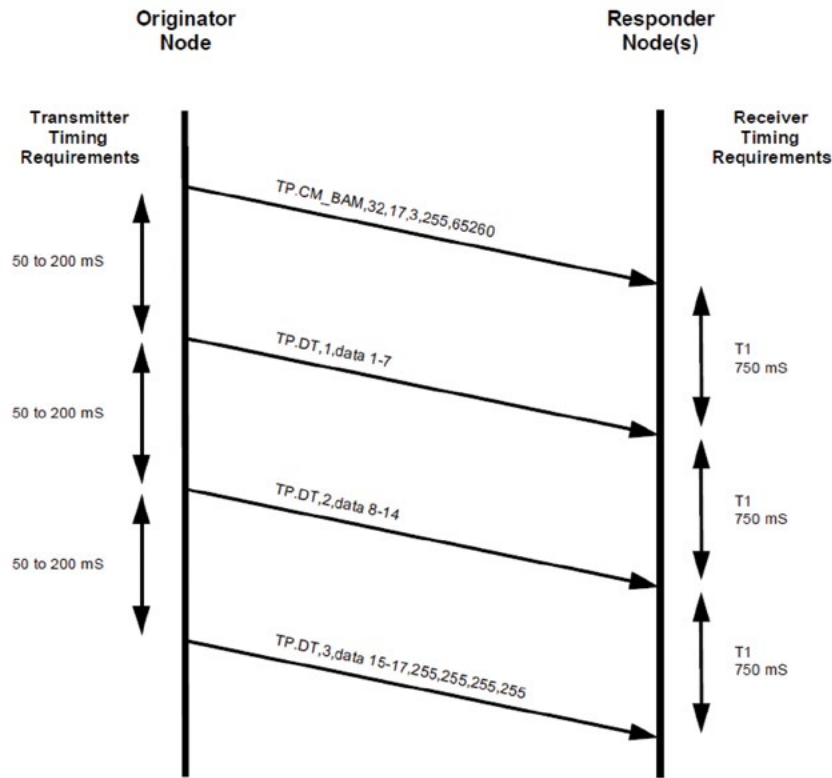


Figure 13 - Broadcast Data Transfer

A delay from 50 to 200ms must be used for sending the packets of the sequence.
 The connection is closed by the originator (sender) when the last packet is sent, or by the responder (receiver) when a time greater than 750ms elapsed from the last packet received.
 The Commanded Address message specification and its data fields are defined in the following figure.

Commanded Address Message	
Data length	9 bytes
Data Page	0
PDU Format	254 (FEh)
PDU Specific	216 (D8)
Default Priority	6
PGN	65240 (00FED8h)

Figure 14 - Commanded Address Message Specification

NAME of Commanded Address Target		
Byte D0	Bits 8-1	Identity Number (low byte)
Byte D1	Bits 8-1	Identity Number (mid byte)
Byte D2	Bits 8-6	Manufacturer Code (least significant 3 bits)
	Bits 5-1	Identity Number (most significant 5 bits)
Byte D3	Bits 8-1	Manufacturer Code (most significant 8 bits)
Byte D4	Bits 8-4	Function Instance
	Bits 3-1	ECU Instance
Byte D5	Bits 8-1	Function
Byte D6	Bits 8-2	Vehicle System
	Bit 1	Reserved
Byte D7	Bit 8	Arbitrary Address Capable
	Bits 7-5	Industry Group
	Bits 4-1	Vehicle System Instance
Address assignment		
Byte D8	Bits 8-1	New Source Address (0 to 127 and 248 to 253)

Figure 15 - Commanded Address Message data fields (Target NAME)

If the command is accepted, the configured Address gets immediately active. The new Preferred Address value is saved in the nonvolatile memory of the KHC J1939 device, being available at next power on.

After successfully programming, an Address Claimed message is sent with the new Source Address.

Example

CAN-ID	DLC	Data							
		D0	D1	D2	D3	D4	D5	D6	D7
1CECFFSah	8	20h	09h	00h	02h	FFh	D8h	FEh	00h

Figure 16 – TP.CM_BAM message

CAN-ID	DLC	Data							
		D0	D1	D2	D3	D4	D5	D6	D7
1CEBFFSah	8	01h	NAME of Commanded Address Target Commanded Address Data fields (bytes D0 to D6)						

Figure 17 - TP.DT Packet 1

CAN-ID	DLC	Data							
		D0	D1	D2	D3	D4	D5	D6	D7
1CEBFFSah	8	02h	NAME of Commanded Address Target Commanded Address Data fields (byte D7)	Address assignment Commanded Address Data fields (byte D8)	FFh	FFh	FFh	FFh	FFh

Figure 18 - TP.DT Packet 2

Sa - Source Address: Master Source Address (the sender of the message)

4. SUPPORTED PGNS

The PGN (Parameter Group Number) identifies the Parameter Group transmitted in the message.

The KHC J1939 sensor can be configured for the transmission of one of the PGNs listed in the following tables.

The SPN (Suspect Parameter Number) identifies the Parameter transmitted inside a specific PGN.

For the configuration of the desired PGN, and the SPN transmitted inside that PGN, the “Configure Data Record PGN/SPN” message must be used (see Application Configurable Messages).

4.1. SAE STANDARD PGNS

PGN	PG Label	TRR (ms)	Def. Prio.	SPN	SPN Name	SPN Position in PGN	SLOT name
1792	General Purpose Valve Pressure	100	6	4086	Valve Load Sense Pressure	1-2	SAEpr12
				4087	Valve Pilot Pressure	3	SAEpr14
				4088	Valve Assembly Load sense Pressure	4-5	SAEpr12
				4089	Valve Assembly Supply Pressure	6-7	SAEpr12
61448	Hydraulic Pressure Governor Info	50	6	1762	Hydraulic Pressure	1-2	SAEpr08
61538	Electronic Transmission Controller #12	10	2	6583	Transmission Hydrostatic Loop 1 Pressure	1-2	SAEpr22
				6584	Transmission Hydrostatic Loop 2 Pressure	3-4	SAEpr22
61701	Hydraulic Pressure Displacement	20	3	7939	Hydraulic Line Pressure	1-2	SAEpr22
61702	Well Stimulation Pump System 1	50	6	8155	Well Stimulation Pump Discharge Pressure	3-4	SAEpr12
61703	Well Stimulation Pump System 2	50	6	8156	Well Stimulation Pump Gear Box Oil Pressure	1-2	SAEpr03
64500	Aftertreatment 2 Diesel Oxidation Catalyst 2	500	6	8163	Aftertreatment 2 Diesel Oxidation Catalyst Intake Pressure	1-2	SAEpr03
				8164	Aftertreatment 2 Diesel Oxidation Catalyst Outlet Pressure	3-4	SAEpr03
64501	Aftertreatment 1 Diesel Oxidation Catalyst 2	500	6	8160	Aftertreatment 1 Diesel Oxidation Catalyst Intake Pressure	1-2	SAEpr03
				8161	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Pressure	3-4	SAEpr03
64528	Ambient Conditions 3	1000	6	7781	Barometric Absolute Pressure 2	1-2	SAEpr03
64557	Alternate Fuel 5	500	6	6787	LNG Tank 1 Vapor Pressure	1-2	SAEpr03
				6788	LNG Tank 2 Vapor Pressure	3-4	SAEpr03
64559	Fire Suppression Agent Status	1000	7	7350	Fire Suppression Compressed Air Foam System Air Pressure	4	SAEpr13
64564	Engine Fuel Injector Metering Rail Pressure Information 2	500	5	7096	Engine Fuel 1 Injector Metering Rail 1 Pressure 1 (Extended Range)	1-2	SAEpr12
				7097	Engine Fuel 1 Injector Metering Rail 1 Pressure 2 (Extended Range)	3-4	SAEpr12
				7098	Engine Fuel 1 Injector Metering Rail 2 Pressure 1 (Extended Range)	5-6	SAEpr12
				7099	Engine Fuel 1 Injector Metering Rail 2 Pressure 2 (Extended Range)	7-8	SAEpr12
64569	Gaseous Fuel Supply Pressure 2	500	5	7067	Plant Gaseous Fuel Supply Outlet Pressure	1-2	SAEpr06
				7068	Plant Inert Gas Supply Outlet Pressure	3-4	SAEpr06

PGN	PG Label	TRR (ms)	Def. Prio.	SPN	SPN Name	SPN Position in PGN	SLOT name
64570	Gaseous Fuel Supply Pressure 1	500	5	7063	Engine Gaseous Fuel Supply Pressure 2	1-2	SAEpr06
				7064	Engine Gaseous Fuel Supply Unit Intake Pressure	3-4	SAEpr06
				7065	Engine Gaseous Fuel Supply Shutoff Valve 1 Intake Pressure	5-6	SAEpr06
				7066	Engine Gaseous Fuel Supply Shutoff Valve 2 Intake Pressure	7-8	SAEpr06
64576	Engine Hydraulic Fuel 2 Pump Status	500	6	7019	Engine Fuel 2 Pump Hydraulic Pressure	4-5	SAEpr08
64577	Alternate Fuel 4	500	6	7021	Engine Fuel 2 Injector Metering Rail 1 Pressure	1-2	SAEpr08
				7022	Engine Fuel 2 Injector Metering Rail 2 Pressure	3-4	SAEpr08
				7513	Engine Fuel 2 Injector Metering Rail 1 Pressure 2	7-8	SAEpr08
64578	Tire Condition Message 2	10000	6	6988	Tire Pressure (Extended Range)	2-3	SAEpr22
64579	Tire Configuration Status Information	On request	6	6980	Cold Inflation Pressure	2-3	SAEpr22
64589	Aftertreatment 2 SCR Dosing System Information 3	500	6	6876	Aftertreatment 2 Diesel Exhaust Fluid Doser Pressure	1	SAEpr10
				8153	Aftertreatment 2 Diesel Exhaust Fluid Doser 2 Pressure	2	SAEpr13
64590	Aftertreatment 1 SCR Dosing System Information 3	500	6	6875	Aftertreatment 1 Diesel Exhaust Fluid Doser Pressure	1	SAEpr10
				8152	Aftertreatment 1 Diesel Exhaust Fluid Doser 2 Pressure	4	SAEpr10
64595	Engine Gaseous Leakage Information	500	6	6837	Gas Leakage Detection 1 Pressure	4	SAEpr10
				6838	Gas Leakage Detection 2 Pressure	5	SAEpr10
				6839	Gas Leakage Detection 3 Pressure	6	SAEpr10
64600	Turbocharger Information 7	1000	6	6811	Engine Turbocharger 2 Lube Oil Pressure	1	SAEpr10
				6812	Engine Turbocharger 3 Lube Oil Pressure	2	SAEpr10
				6813	Engine Turbocharger 4 Lube Oil Pressure	3	SAEpr10
64662	Engine Information 2	100	6	6384	Engine Exhaust Pressure 1 (Extended Range)	1-2	SAEpr04
				7470	Engine Oil Filter Intake Pressure (High Resolution/Extended Range)	3-4	SAEpr03
				7720	Engine Common Rail Oil Pressure	5	SAEpr10
64705	Transmission Fluids 3	1000	6	5937	Transmission Clutch 2 Pressure	1	SAEpr14
64735	Engine Fluid Level/ Pressure 12	500	6	5579	Engine Filtered Fuel Delivery Pressure	2	SAEpr10
64739	Engine Exhaust Brake Control	100	4	5541	Engine Turbocharger 1 Turbine Outlet Pressure	1	SAEpr07
				5544	Engine Turbocharger 2 Turbine Outlet Pressure	4	SAEpr07
64751	Engine Fluid Level/ Pressure 11	500	5	7468	Engine Oil Pressure (High Resolution/ Extended Range)	5-6	SAEpr03
				7469	Engine Fuel Delivery Pressure (High Resolution/Extended Range)	7-8	SAEpr03
64752	Engine Fuel/lube systems 2	500	6	7395	Fuel Tank Transfer Pump Pressure	4-5	SAEpr03

PGN	PG Label	TRR (ms)	Def. Prio.	SPN	SPN Name	SPN Position in PGN	SLOT name
64768	Engine Fluid Level/ Pressure 10	500	6	5253	Engine Exhaust Gas Recirculation 2 Intake Pressure	3	SAEpr07
				5708	Engine Coolant Pressure 2	8	SAEpr07
64817	Fan Drive #2	1000	6	1707	Hydraulic Fan 2 Motor Pressure	5-6	SAEpr06
64836	Aftertreatment 2 Fuel Control 2	500	6	4303	Aftertreatment 2 Fuel Pressure 2	1-2	SAEpr03
64869	Aftertreatment 1 Fuel Control 2	500	6	4077	Aftertreatment 1 Fuel Pressure 2	1-2	SAEpr03
64876	Aftertreatment 2 Air Control 2	500	6	3838	Aftertreatment 2 Secondary Air Pressure	7-8	SAEpr03
64877	Aftertreatment 1 Air Control 2	500	6	3837	Aftertreatment 1 Secondary Air Pressure	7-8	SAEpr03
64900	Engine Fluid Level/ Pressure 9	500	6	3640	Engine Intake Valve Actuation Oil Pressure for Cylinder #17	1-2	SAEpr03
				3641	Engine Intake Valve Actuation Oil Pressure for Cylinder #18	3-4	SAEpr03
				3642	Engine Intake Valve Actuation Oil Pressure for Cylinder #19	5-6	SAEpr03
				3643	Engine Intake Valve Actuation Oil Pressure for Cylinder #20	7-8	SAEpr03
64901	Engine Fluid Level/ Pressure 8	500	6	3636	Engine Intake Valve Actuation Oil Pressure for Cylinder #13	1-2	SAEpr03
				3637	Engine Intake Valve Actuation Oil Pressure for Cylinder #14	3-4	SAEpr03
				3638	Engine Intake Valve Actuation Oil Pressure for Cylinder #15	5-6	SAEpr03
				3639	Engine Intake Valve Actuation Oil Pressure for Cylinder #16	7-8	SAEpr03
64902	Engine Fluid Level/ Pressure 7	500	6	3632	Engine Intake Valve Actuation Oil Pressure for Cylinder #9	1-2	SAEpr03
				3633	Engine Intake Valve Actuation Oil Pressure for Cylinder #10	3-4	SAEpr03
				3634	Engine Intake Valve Actuation Oil Pressure for Cylinder #11	5-6	SAEpr03
				3635	Engine Intake Valve Actuation Oil Pressure for Cylinder #12	7-8	SAEpr03
64903	Engine Fluid Level/ Pressure 6	500	6	3628	Engine Intake Valve Actuation Oil Pressure for Cylinder #5	1-2	SAEpr03
				3629	Engine Intake Valve Actuation Oil Pressure for Cylinder #6	3-4	SAEpr03
				3630	Engine Intake Valve Actuation Oil Pressure for Cylinder #7	5-6	SAEpr03
				3631	Engine Intake Valve Actuation Oil Pressure for Cylinder #8	7-8	SAEpr03
64904	Engine Fluid Level/ Pressure 5	500	6	3624	Engine Intake Valve Actuation Oil Pressure for Cylinder #1	1-2	SAEpr03
				3625	Engine Intake Valve Actuation Oil Pressure for Cylinder #2	3-4	SAEpr03
				3626	Engine Intake Valve Actuation Oil Pressure for Cylinder #3	5-6	SAEpr03
				3627	Engine Intake Valve Actuation Oil Pressure for Cylinder #4	7-8	SAEpr03
64907	Aftertreatment 2 Gas Parameters	500	6	3611	Aftertreatment 2 Diesel Particulate Filter Intake Pressure	1-2	SAEpr03
				3612	Aftertreatment 2 Diesel Particulate Filter Outlet Pressure	3-4	SAEpr03

PGN	PG Label	TRR (ms)	Def. Prio.	SPN	SPN Name	SPN Position in PGN	SLOT name
64908	Aftertreatment 1 Gas Parameters	500	6	3609	Aftertreatment 1 Diesel Particulate Filter Intake Pressure	1-2	SAEpr03
				3610	Aftertreatment 1 Diesel Particulate Filter Outlet Pressure	3-4	SAEpr03
64926	Aftertreatment 2 Air Control 1	500	6	3499	Aftertreatment 2 Supply Air Pressure	1-2	SAEpr03
				3500	Aftertreatment 2 Purge Air Pressure	3-4	SAEpr03
64927	Aftertreatment 1 Air Control 1	500	6	3485	Aftertreatment 1 Supply Air Pressure	1-2	SAEpr03
				3486	Aftertreatment 1 Purge Air Pressure	3-4	SAEpr03
64928	Aftertreatment 2 Fuel Control 1	500	6	3494	Aftertreatment 2 Fuel Pressure 1	1-2	SAEpr03
64929	Aftertreatment 1 Fuel Control 1	500	6	3480	Aftertreatment 1 Fuel Pressure 1	1-2	SAEpr03
64938	Engine Fluid Level/ Pressure 4	500	6	3340	Engine Charge Air Cooler 1 Intake Pressure	1	SAEpr07
				3341	Engine Charge Air Cooler 2 Intake Pressure	2	SAEpr07
64961	Engine Fluid Level/ Pressure 3	500	6	3358	Engine Exhaust Gas Recirculation 1 Intake Pressure	3	SAEpr07
				5019	Engine Exhaust Gas Recirculation 1 Outlet Pressure	6	SAEpr07
64976	Intake/Exhaust Conditions 2	500	6	3562	Engine Intake Manifold #2 Pressure	4	SAEpr07
64993	Cab A/C Climate System Information	1000	6	2609	Cab A/C Refrigerant Compressor Outlet Pressure	1	SAEpr14
64998	Hydraulic Braking System	100	3	2580	Hydraulic Brake Pressure Circuit 1	1	SAEpr15
				2581	Hydraulic Brake Pressure Circuit 2	2	SAEpr15
65112	Air Suspension Control 4	100	6	1725	Bellow Pressure Front Axle Left	1-2	SAEpr03
				1726	Bellow Pressure Front Axle Right	3-4	SAEpr03
				1727	Bellow Pressure Rear Axle Left	5-6	SAEpr03
				1728	Bellow Pressure Rear Axle Right	7-8	SAEpr03
65130	Engine Fuel/Lube Systems	500	6	3549	Engine Oil Filter Outlet Pressure	5	SAEpr10
				7104	Engine Fuel Supply Pump Intake Pressure	8	SAEpr07
65143	Auxiliary Pressures	On request	7	136	Auxiliary Vacuum Pressure Reading	1-2	SAEpr06
				137	Auxiliary Vacuum Pressure Reading	3-4	SAEpr06
65146	Tire Pressure Control Unit Current	On request	7	144	Trailer, Tag Or Push Channel Tire Pressure	1-2	SAEpr06
				145	Drive Channel Tire Pressure	3-4	SAEpr06
				146	Steer Channel Tire Pressure	5-6	SAEpr06
65164	Auxiliary Analog Information	On request	7	1387	Auxiliary Pressure #1	3	SAEpr14
				1388	Auxiliary Pressure #2	4	SAEpr14
65167	Supply Pressure 2	1000	6	1320	Engine External Shutdown Air Supply Pressure	1-2	SAEpr06
65170	Engine Information 1	100	7	1208	Engine Oil Filter Intake Pressure	1	SAEpr10
65172	Engine Auxiliary Coolant	500	6	1203	Engine Auxiliary Coolant Pressure	1	SAEpr10
				2435	Sea Water Pump Outlet Pressure	3	SAEpr07
				20	Engine Coolant Pressure 1 (Extended Range)	4	SAEpr10
				7313	Engine Coolant Pressure 2 (Extended Range)	5	SAEpr10
65174	Turbocharger Wastegate	100	6	1192	Engine Turbocharger Wastegate Actuator Control Air Pressure	5	SAEpr10

PGN	PG Label	TRR (ms)	Def. Prio.	SPN	SPN Name	SPN Position in PGN	SLOT name
65179	Turbocharger Information 1	1000	7	1168	Engine Turbocharger Lube Oil Pressure 2	1	SAEpr10
65190	Intake Manifold Information 1	500	6	1127	Engine Turbocharger 1 Boost Pressure	1-2	SAEpr04
				1128	Engine Turbocharger 2 Boost Pressure	3-4	SAEpr04
				1129	Engine Turbocharger 3 Boost Pressure	5-6	SAEpr04
				1130	Engine Turbocharger 4 Boost Pressure	7-8	SAEpr04
65197	Wheel Application Pressure High Range Information	500	6	1091	Brake Application Pressure High Range, Front Axle, Left Wheel	1	SAEpr11
				1092	Brake Application Pressure High Range, Front Axle, Right Wheel	2	SAEpr11
				1093	Brake Application Pressure High Range, Rear Axle #1, Left Wheel	3	SAEpr11
				1094	Brake Application Pressure High Range, Rear Axle #1, Right Wheel	4	SAEpr11
				1095	Brake Application Pressure High Range, Rear Axle #2, Left Wheel	5	SAEpr11
				1096	Brake Application Pressure High Range, Rear Axle #2, Right Wheel	6	SAEpr11
				1097	Brake Application Pressure High Range, Rear Axle #3, Left Wheel	7	SAEpr11
				1098	Brake Application Pressure High Range, Rear Axle #3, Right Wheel	8	SAEpr11
65198	Air Supply Pressure	1000	6	46	Pneumatic Supply Pressure	1	SAEpr13
				1086	Parking and/or Trailer Air Pressure	2	SAEpr13
				1087	Service Brake Circuit 1 Air Pressure	3	SAEpr13
				1088	Service Brake Circuit 2 Air Pressure	4	SAEpr13
				1089	Auxiliary Equipment Supply Pressure	5	SAEpr13
				1090	Air Suspension Supply Pressure	6	SAEpr13
				6305	Powertrain Circuit Air Supply Pressure	8	SAEpr13
65213	Fan Drive #1	1000	6	4211	Hydraulic Fan Motor Pressure	5-6	SAEpr06
65245	Turbocharger	1000	6	104	Engine Turbocharger Lube Oil Pressure 1	1	SAEpr10
65246	Engine Air Start Pressure	On request	6	82	Engine Air Start Pressure	1	SAEpr10
				6831	Engine Air Start Pressure (Extended Range)	2	SAEpr14
				6832	Engine Air Stop Pressure	3	SAEpr10
65263	Engine Fluid Level/ Pressure 1	500	6	94	Engine Fuel Delivery Pressure	1	SAEpr10
				100	Engine Oil Pressure	4	SAEpr10
				109	Engine Coolant Pressure 1	7	SAEpr07
65268	Tire Condition Message 1	10000	6	241	Tire Pressure	2	SAEpr10
65269	Ambient Conditions	1000	6	108	Barometric Pressure	1	SAEpr05
65270	Intake/Exhaust Conditions 1	500	6	81	Aftertreatment 1 Diesel Particulate Filter Intake Pressure (use SPN 3609)	1	SAEpr05
				102	Engine Intake Manifold #1 Pressure	2	SAEpr07
				106	Engine Intake Air Pressure	4	SAEpr07
65272	Transmission Fluids 1	1000	6	123	Clutch Pressure	1	SAEpr14
				127	Transmission Oil Pressure	4	SAEpr14
65273	Axle Information	1000	6	579	Drive Axle Lift Air Pressure	3	SAEpr10
				2613	Drive Axle Lube Pressure	5	SAEpr10
				2614	Steering Axle Lube Pressure	8	SAEpr10

PGN	PG Label	TRR (ms)	Def. Prio.	SPN	SPN Name	SPN Position in PGN	SLOT name
65274	Brakes	1000	6	116	Brake Application Pressure	1	SAEpr10
				117	Brake Primary Pressure	2	SAEpr10
				118	Brake Secondary Pressure	3	SAEpr10
65275	Retarder fluids	1000	6	119	Hydraulic Retarder Pressure	1	SAEpr14
65277	Alternate Fuel 1	500	6	159	Engine Gaseous Fuel Supply Pressure 1	2-3	SAEpr06
				6814	Engine Gaseous Fuel Vent Pressure	4-5	SAEpr06
				7581	Engine Gaseous Fuel Pressure Regulator Intake Pressure	7-8	SAEpr22
65278	Auxiliary Water Pump Pressure	1000	6	73	Auxiliary Pump Pressure	1	SAEpr14

4.2. MANUFACTURER SPECIFIC PGNS

PGN	PG Label	Def.	Def. Prio.	SPN	SPN Name	SPN Position in PGN	SLOT name**
65280	GEFRAN Specific BAR #1	100	6	516096	General Purpose 4 BAR	1-2	GEFpr01
65281	GEFRAN Specific BAR #2	100	6	516097	General Purpose 6 BAR	1-2	GEFpr02
65282	GEFRAN Specific BAR #3	100	6	516098	General Purpose 10 BAR	1-2	GEFpr03
65283	GEFRAN Specific BAR #4	100	6	516099	General Purpose 16 BAR	1-2	GEFpr04
65284	GEFRAN Specific BAR #5	100	6	516100	General Purpose 20 BAR	1-2	GEFpr05
65285	GEFRAN Specific BAR #6	100	6	516101	General Purpose 25 BAR	1-2	GEFpr06
65286	GEFRAN Specific BAR #7	100	6	516102	General Purpose 40 BAR	1-2	GEFpr07
65287	GEFRAN Specific BAR #8	100	6	516103	General Purpose 60 BAR	1-2	GEFpr08
65288	GEFRAN Specific BAR #9	100	6	516104	General Purpose 100 BAR	1-2	GEFpr09
65289	GEFRAN Specific BAR #10	100	6	516105	General Purpose 160 BAR	1-2	GEFpr10
65290	GEFRAN Specific BAR #11	100	6	516106	General Purpose 200 BAR	1-2	GEFpr11
65291	GEFRAN Specific BAR #12	100	6	516107	General Purpose 250 BAR	1-2	GEFpr12
65292	GEFRAN Specific BAR #13	100	6	516108	General Purpose 400 BAR	1-2	GEFpr13
65293	GEFRAN Specific BAR #14	100	6	516109	General Purpose 600 BAR	1-2	GEFpr14
65294	GEFRAN Specific BAR #15	100	6	516110	General Purpose 1000 BAR	1-2	GEFpr15
65295	GEFRAN Specific PSI #1	100	6	516111	General Purpose 60 PSI	1-2	GEFpr16
65296	GEFRAN Specific PSI #2	100	6	516112	General Purpose 100 PSI	1-2	GEFpr17
65297	GEFRAN Specific PSI #3	100	6	516113	General Purpose 150 PSI	1-2	GEFpr18
65298	GEFRAN Specific PSI #4	100	6	516114	General Purpose 250 PSI	1-2	GEFpr19

65299	GEFRAN Specific PSI #5	100	6	516115	General Purpose 300 PSI	1-2	GEFpr20
65300	GEFRAN Specific PSI #6	100	6	516116	General Purpose 400 PSI	1-2	GEFpr21
65301	GEFRAN Specific PSI #7	100	6	516117	General Purpose 600 PSI	1-2	GEFpr22
65302	GEFRAN Specific PSI #8	100	6	516118	General Purpose 1000 PSI	1-2	GEFpr23
65303	GEFRAN Specific PSI #9	100	6	516119	General Purpose 1500 PSI	1-2	GEFpr24
65304	GEFRAN Specific PSI #10	100	6	516120	General Purpose 2500 PSI	1-2	GEFpr25
65305	GEFRAN Specific PSI #11	100	6	516121	General Purpose 3000 PSI	1-2	GEFpr26
65306	GEFRAN Specific PSI #12	100	6	516122	General Purpose 4000 PSI	1-2	GEFpr27
65307	GEFRAN Specific PSI #13	100	6	516123	General Purpose 6000 PSI	1-2	GEFpr28
65308	GEFRAN Specific PSI #14	100	6	516124	General Purpose 10000 PSI	1-2	GEFpr29
65309	GEFRAN Specific PSI #15	100	6	516125	General Purpose 15000 PSI	1-2	GEFpr30
65310	GEFRAN Specific BAR #16	100	6	516126	General Purpose -1..3 BAR	1-2	GEFpr31
65311	GEFRAN Specific BAR #17	100	6	516127	General Purpose -1..4 BAR	1-2	GEFpr32
65312	GEFRAN Specific BAR #18	100	6	516128	General Purpose -1..6 BAR	1-2	GEFpr33
65313	GEFRAN Specific BAR #19	100	6	516129	General Purpose -1..10 BAR	1-2	GEFpr34
65314	GEFRAN Specific BAR #20	100	6	516130	General Purpose -1..16 BAR	1-2	GEFpr35
65315	GEFRAN Specific BAR #21	100	6	516131	General Purpose -1..20 BAR	1-2	GEFpr36
65316	GEFRAN Specific BAR #22	100	6	516132	General Purpose -1..25 BAR	1-2	GEFpr37
65317	GEFRAN Specific BAR #23	100	6	516133	General Purpose -1..40 BAR	1-2	GEFpr38
65318	GEFRAN Specific BAR #24	100	6	516134	General Purpose -1..60 BAR	1-2	GEFpr39

*The default value of 100ms of the TRR (Transmission Repetition Rate) of a Manufacturer Specific PGN can be changed using the "Configure Transmission Repetition Rate" command (see Application Configurable Messages) in the range of 0 (On Request) to 65535 ms.

** The name is not standardized by SAE. It is used as reference for the GEFRAN Specific SLOTS table entries.

5. SLOTS SPECIFICATIONS

The SLOT specifies the Scaling, Limit, Offset and Transfer Function for a specific SPN (Suspect Parameter Number)

5.1. SAE STANDARD SLOTS

Standardized SLOTS defined by SAE

SLOT name	Scaling (bar/bit)	Range (bar)	Offset (bar)	Length (bytes)
SAEpr03	0,001	0 to 64,255	0	2
SAEpr04	0,00125	0 to 80,31875	0	2
SAEpr05	0,005	0 to 1,25	0	1
SAEpr06	0,005	0 to 321,275	0	2
SAEpr07	0,02	0 to 5	0	1
SAEpr08	0,02	0 to 1285,1	0	2
SAEpr10	0,04	0 to 10	0	1
SAEpr11	0,05	0 to 12,5	0	1
SAEpr12	0,05	0 to 3212,75	0	2
SAEpr13	0,08	0 to 20	0	1
SAEpr14	0,16	0 to 40	0	1
SAEpr15	1	0 to 250	0	1
SAEpr22	0,01	0 to 642,55	0	2

Table 3 - SAE Standard SLOTS

5.2. GEFran SPECIFIC SLOTS

Not standardized SLOTS defined and used by GEFran

SLOT name**	Scaling (bar/bit)	Range (bar)	Offset (bar)	Length (bytes)
GEFpr01	0,0001	0 to 6,426	0	2
GEFpr02	0,00015	0 to 9,638	0	2
GEFpr03	0,00025	0 to 16,064	0	2
GEFpr04	0,0004	0 to 25,702	0	2
GEFpr05	0,0005	0 to 32,128	0	2
GEFpr06	0,000625	0 to 40,159	0	2
GEFpr07	0,001	0 to 64,255	0	2
GEFpr08	0,0015	0 to 96,383	0	2
GEFpr09	0,0025	0 to 160,638	0	2
GEFpr10	0,004	0 to 257,020	0	2
GEFpr11	0,005	0 to 321,275	0	2
GEFpr12	0,00625	0 to 401,594	0	2
GEFpr13	0,01	0 to 642, 550	0	2
GEFpr14	0,015	0 to 963,825	0	2
GEFpr15	0,025	0 to 1606,375	0	2
GEFpr31	0,0001	-1 to 5,426	-1	2
GEFpr32	0,000125	-1 to 7,032	-1	2
GEFpr33	0,000175	-1 to 10,245	-1	2
GEFpr34	0,000275	-1 to 16,670	-1	2
GEFpr35	0,000425	-1 to 26,308	-1	2
GEFpr36	0,000525	-1 to 32,734	-1	2
GEFpr37	0,000650	-1 to 40,766	-1	2
GEFpr38	0,0010248	-1 to 64,849	-1	2
GEFpr39	0,0015246	-1 to 96,963	-1	2

SLOT name**	Scaling (psi/bit)	Range (psi)	Offset (psi)	Length (bytes)
GEFpr16	0,0015	0 to 96,383	0	2
GEFpr17	0,0025	0 to 160,638	0	2
GEFpr18	0,00375	0 to 240,956	0	2
GEFpr19	0,00625	0 to 401,594	0	2
GEFpr20	0,0075	0 to 481,913	0	2
GEFpr21	0,01	0 to 642,550	0	2
GEFpr22	0,015	0 to 963,825	0	2
GEFpr23	0,025	0 to 1606,375	0	2
GEFpr24	0,0375	0 to 2409,563	0	2
GEFpr25	0,0625	0 to 4015,938	0	2
GEFpr26	0,075	0 to 4819,125	0	2
GEFpr27	0,1	0 to 6425,5	0	2
GEFpr28	0,15	0 to 9638,25	0	2
GEFpr29	0,25	0 to 16063,75	0	2
GEFpr30	0,375	0 to 24095,625	0	2

Table 4 - Manufacturer Specific SLOTS (GEFRAN)

** The name is not standardized by SAE. It is used as reference for the Manufacturer Specific PGNs table entries.

6. PARAMETER RANGES

The following table defines the ranges used to determine the validity of a signal.

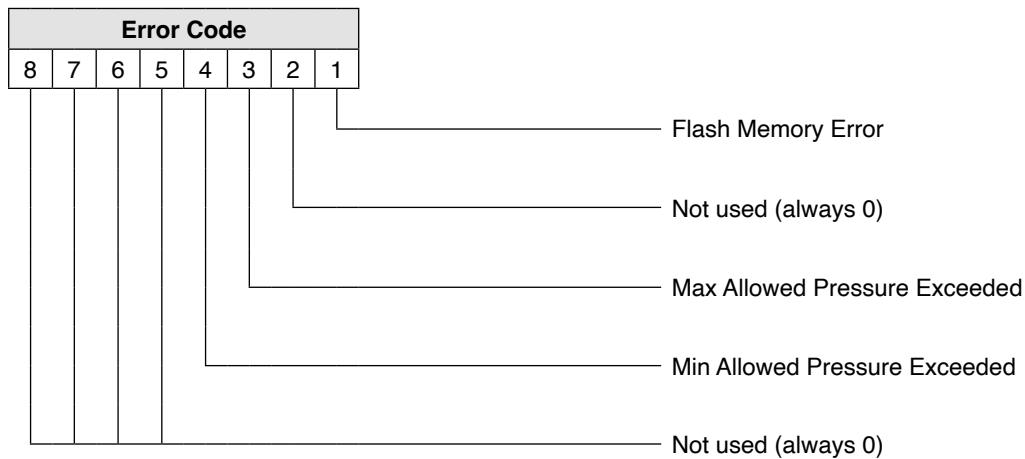
The values in the range "Error Indicator" indicate that the signal is not currently available due to some type of error in the sensor (overpressure, underpressure or flash error).

The values in the range "Not Available" indicate that the parameter is not available or supported.

Range Name	Data length	
	1 byte	2 bytes
Valid Signal	0...250 00h...FAh	0...64255 0000h...FAFFh
Error Indicator*	254 FEh	65024...65279 (*) FExxh (*)
Not Available	255 FFh	65280...65535 FFxxh

Table 5 - Transmitted Signal Ranges

(*) The low byte contains the Error Code, as illustrated in the figure below



NOTE

If the measured or calculated data has yielded a value that is valid, yet exceeds the defined parameter range, the error indicator is not used. The data is transmitted using the appropriate minimum or maximum parameter value inside the Valid Signal range.

7. DATA RECORD MESSAGE

The Data Record message contains the pressure information of the KHC J1939 sensor. Error conditions are also coded in the pressure data value (see section “Parameters Ranges”)

The transmission of the Data Record message starts automatically at power on, after the acquisition of a valid address. The Transmission Repetition Rate (TRR) is defined by the configured SPN. If TRR is “On request”, the PGN is not cyclically transmitted, but can be requested with the Request PGN/SPN message. If the configured PGN is manufacturer specific, the TRR can also be configured to a specific value.

Depending on the specific application, the Data Record message can be configured for the transmission of the required PGN. Available PGNs are listed in section “Supported PGNs”. The type of SPN configured defines the SLOT of the parameter inside the PGN.

Example

The KHC J1939 is configured with the PGN 65268 (Tire Condition Message 1) and the SPN 241 (Tire Pressure).

The specifications of the PGN/SPN is the following (see Supported PGNs and SLOTS Specifications)

PGN	PG Label	TRR (ms)	Def. Prio.	SPN	SPN Name	SPN Position in PGN	SLOT name
65268	Tire Condition Message 1	10000	6	241	Tire Pressure	2	SAEpr10

SLOT name	Scaling (bar/bit)	Range (bar)	Offset (bar)	Length (bytes)
SAEpr10	0,04	0 to 10	0	1

Figure 19 - PGN/SPN and SLOT of PGN 65268 / SPN 241

The KHC J1939, whose address is 0x80, sends every 10s (10000ms) the following Data Record message:

CAN-ID	DLC	Data							
		D0	D1	D2	D3	D4	D5	D6	D7
18FEF480h	8	FFh	3Ch	FFh	FFh	FFh	FFh	FFh	FFh

Figure 20 – Data Record message example

The raw pressure data, transmitted in byte #2 of the Data fields, is 3Ch=60. The Scaling is 0.04 bar/bit and the Offset is 0, so the resulting scaled pressure value is the following:

$$\text{Pressure Value (bar)} = 60 \times 0.04 \text{ bar/bit} = 2.4 \text{ bar}$$

When the pressure value is in error condition (see Parameter Ranges section), the KHC J1939 activates the error indicator (FEh for 1-byte data) inside the pressure field (byte #2), sending the following Data Record message:

CAN-ID	DLC	Data							
		D0	D1	D2	D3	D4	D5	D6	D7
18FEF480h	8	FFh	FEh	FFh	FFh	FFh	FFh	FFh	FFh

Figure 21 – Data Record message example

8. APPLICATION CONFIGURABLE MESSAGES

These messages are implemented as Destination Specific Proprietarily Configurable messages 1 to 3.

8.1. CONFIGURE NAME

The NAME of the KHC J1939 can be changed using this command. The NAME fields can be set to specific values depending on the specific user requirements (see Network Management).

The NAME can be configured through the Destination Specific – Proprietarily Configurable Message 1.

Destination Specific Proprietarily Configurable Message 1	
Data length	8 bytes
Data Page	0
PDU Format	177 (B1h)
PDU Specific	DA (Destination Address)
Default Priority	6
PGN	45312 (00B100h)

Figure 22 - Destination Specific Proprietarily Configurable Message 1 Specification

Destination Specific Proprietarily Configurable Message 1		
Byte D0	Bits 8-1	“g”
Byte D1	Bits 8-1	“e”
Byte D2	Bits 8-1	“f”
Byte D3	Bits 8-1	“r”
Byte D4	Bits 8-4	Function Instance
	Bits 3-1	ECU Instance
Byte D5	Bits 8-1	Function
Byte D6	Bits 8-2	Vehicle System
	Bit 1	Don't care
Byte D7	Bit 8	Arbitrary Address Capable
	Bits 7-5	Industry Group
	Bits 4-1	Vehicle System Instance

Figure 23 - Destination Specific Proprietarily Configurable Message 1 Data Fields

If the command is not correct, the device returns a NACK message, indicating that the configuration is refused.

When the command is accepted, the configured NAME gets immediately active. The new NAME value is saved in the nonvolatile memory of the KHC J1939 device, being available at next power on.

After successfully programming, an Address Claimed message, containing the new NAME, is sent.

NOTE

By default, the fields “Function Instance”, “ECU Instance”, “Function”, “Vehicle System”, “Industry Group” and “Vehicle System Instance”, are all set to 0. The field Arbitrary Address Capable is set to 1.

Example

The NAME has to be configured with the following field values: Arbitrary Address Capable: 1, Industry Group: 2, Vehicle System Instance: 0, Vehicle System: 4, Function: 137, Function Instance: 0, ECU Instance: 0.

The message addressed to the KHC J1939 sensor is the following:

CAN-ID	DLC	Data							
		D0	D1	D2	D3	D4	D5	D6	D7
18B1DaSah	8	67h	65h	66h	72h	00h	89h	08h	A0h

Figure 24 - Configuring NAME Example

Da - Destination Address: KHC J1939 Address

Sa - Source Address: Master Source Address (the sender of the message)

8.2. CONFIGURE TRANSMISSION REPETITION RATE

If the Data Record message is configured with one of the Manufacturer Specific PGNs, the TRR (Transmission Repetition Rate) of the Manufacturer specific PGN can be changed using this command. The value can be set in the range of 0 (transmission on request) to 65535, permitting to adapt the TRR to the specific application.

The Transmission Repetition Rate can be configured through the Destination Specific – Propriarily Configurable Message 2.

Destination Specific Propriarily Configurable Message 2	
Data length	8 bytes
Data Page	0
PDU Format	178 (B2h)
PDU Specific	DA (Destination Address)
Default Priority	6
PGN	45568 (00B200h)

Figure 25 - Destination Specific Propriarily Configurable Message 2 Specification

Destination Specific Propriarily Configurable Message 2	
Byte D0	"g"
Byte D1	"e"
Byte D2	"f"
Byte D3	"i"
Byte D4	TRR (low byte)
Byte D5	TRR (high byte)
Byte D6	Don't care
Byte D7	Don't care

Figure 26 - Destination Specific Propriarily Configurable Message 2 Data Fields

If the current PGN set for the transmission of the Data Record is not Manufacturer Specific, the TRR cannot be changed. In this case, if the KHC J1939 receive a "Configure Transmission Repetition Rate" command, the device returns a NACK message, indicating that the command is refused.

If the command is accepted, the configured TRR gets immediately active. The new TRR value is saved in the nonvolatile memory of the KHC J1939 device, being available at next power on.

NOTE

The configured TRR value is set and used for all the Manufacturer Specific PGNs.

Example

The TRR of the Manufacturer Specific PGN has to be configured to 10ms. The message addressed to the KHC J1939 sensor is the following:

CAN-ID	DLC	Data							
		D0	D1	D2	D3	D4	D5	D6	D7
18B2DaSah	8	67h	65h	66h	72h	0Ah	00h	00h	00h

Figure 27 - Configuring Transmission Repetition Rate Example

Da - Destination Address: KHC J1939 Address

Sa - Source Address: Master Source Address (the sender of the message)

8.3. CONFIGURE DATA RECORD PGN/SPN

The PGN (Parameter Group Number) and the SPN (Suspect Parameter Number) transmitted inside the Data Record message can be configured through the Destination Specific – Proprietary Configurable Message 3.

Valid combinations of PGN/SPNs are listed in the section “Supported PGNs”.

Destination Specific Proprietary Configurable Message 3	
Data length	8 bytes
Data Page	0
PDU Format	179 (B3h)
PDU Specific	DA (Destination Address)
Default Priority	6
PGN	45824 (00B300h)

Figure 28 - Destination Specific Proprietary Configurable Message 3 Specification

Destination Specific Proprietary Configurable Message 3	
Byte D0	“g”
Byte D1	“e”
Byte D2	“f”
Byte D3	PGN (low byte)
Byte D4	PGN (mid byte)
Byte D5	SPN (low byte)
Byte D6	SPN (mid byte)
Byte D7	SPN (high byte)

Figure 29 - Destination Specific Proprietary Configurable Message 3 Data Fields

If the combination is not valid, the device returns a NACK message, indicating that the command is refused.

If the command is accepted, the configured PGN/SPN gets immediately active. The new PGN and SPN values are saved in the nonvolatile memory of the KHC J1939 device, being available at next power on.

Example

The Data Record must be configured for the transmission of PGN 65268 (Tire Condition Message 1) and SPN 241 (Tire Pressure). The message addressed to the KHC J1939 sensor is the following:

CAN-ID	DLC	Data							
		D0	D1	D2	D3	D4	D5	D6	D7
18B3DaSah	8	67h	65h	66h	F4h	FEh	F1h	00h	00h

Figure 30 - Configuring Data Record PGN/SPN Example

Da - Destination Address: KHC J1939 Address

Sa - Source Address: Master Source Address (the sender of the message)

NOTE

Only SPNs with a data range equal or higher than the Full Scale of the specific KHCJ transducer should be used, otherwise the data could exceed the defined parameter range, yielding to interpretation errors (see SLOTS specifications).

9. REQUEST MESSAGES

All request messages have the following message format.

Request message	
Data length	3 bytes
Data Page	0
PDU Format	234 (EAh)
PDU Specific	DA (Destination Address)
Default Priority	6
PGN	59904 (00EA00h)

Figure 31 - Request Message specification

Request message	
Byte D0	PGN requested (low byte)
Byte D1	PGN requested (mid byte)
Byte D2	PGN requested (high byte)

Figure 32 - Request Message Data Fields

9.1. REQUEST MESSAGE FOR ADDRESS CLAIMED

The Request Message for Address Claimed (PGN 60928) message is used to request the NAMEs and addresses of devices on the J1939 network. Upon receipt of this message, each device transmits an Address Claimed message, or a Cannot Claim Address message depending on their actual Source Address.

Request message for Address Claimed message	
Byte D0	PGN 60928 (low byte)
Byte D1	PGN 60928 (mid byte)
Byte D2	PGN 60928 (high byte)

Figure 33 - Request Message for Address Claimed data fields

Example

An Address Claimed message or a Cannot Claim Address message is sent after the reception of the following message:

CAN-ID	DLC	Data		
		D0	D1	D2
18EADaSaH	3	00h	EEh	00h

Figure 34 - Request Message for Address Claimed Example

Da - Destination Address: KHC J1939 Address

Sa - Source Address: Master Source Address (the sender of the message)

9.2. REQUEST DATA RECORD PGN

The Request Data Record PGN message is used to force the KHC J1939 to send the Data Record PGN. The requested PGN must be the same configured for the transmission of the Data Record.

The Request Data Record PGN is the only way to receive a Data Record message when the Transmission Repetition Rate (TRR) of the PGN configured is defined as "On request".

Request Data Record PGN	
Byte D0	Data Record PGN (low byte)
Byte D1	Data Record PGN (mid byte)
Byte D2	Data Record PGN (high byte)

Figure 35 - Request Data Record PGN message data fields

If the requested PGN is not the PGN actually configured for the transmission of the Data Record, the KHC J1939 send a NACK message.

Example

The PGN 1792 (General Purpose Valve Pressure) is actually configured for the Data Record. The transmission of the PGN can be forced sending the following message.

CAN-ID	DLC	Data		
		D0	D1	D2
18EADaSaH	3	00h	07h	00h

Figure 36 - Request Data Record PGN message Example

Da - Destination Address: KHC J1939 Address

Sa - Source Address: Master Source Address (the sender of the message)

9.3. REQUEST SOFTWARE IDENTIFICATION

The Request Software Identification message is used to request the actual firmware version of the KHC J1939 sensor. The Software Identification Parameter Group Number (PGN 65242) must be requested.

Request Software Identification PGN	
Byte D0	PGN 65242 (low byte)
Byte D1	PGN 65242 (mid byte)
Byte D2	PGN 65242 (high byte)

Figure 37 - Request Software Identification message data fields

The response message sent by the KHC J1939 sensor is the following.

Request Software Identification response message for KHC J1939	
Byte D0	Number of software identification fields (fixed to 1)
Byte D1	SW version (char 1)
Byte D2	SW version (char 2)
Byte D3	SW version (char 3)
Byte D4	SW version (char 4)
Byte D5	Delimiter “*”
Byte D6	FFh
Byte D7	FFh

Figure 38 - Software Identification Message Response

The software version is transmitted as a char sequence inside the first identification field, terminated by the char “*”.

Example

Request message:

CAN-ID	DLC	Data		
		D0	D1	D2
18EADaSaH	3	DAh	FEh	00h

Figure 39 - Request Software Identification message Example

Da - Destination Address: KHC J1939 Address

Sa - Source Address: Master Source Address (the sender of the message)

Response message: In this example, the software version is “1.00”

CAN-ID	DLC	Data							
		D0	D1	D2	D3	D4	D5	D6	D7
18FEDASaH	8	01h	31h “1”	2Eh “.”	30h “0”	30h “0”	2Ah “*”	FFh	FFh

Figure 40 - Software Identification message response example

Sa - Source Address: KHC J1939 Address (the sender of the message)

9.4. REQUEST COMPONENT IDENTIFICATION

The Request Component Identification message is used to request the actual Serial Number of the KHC J1939 sensor. The Component Identification Parameter Group Number (PGN 65259) must be requested.

Request Component Identification PGN	
Byte D0	PGN 65259 (low byte)
Byte D1	PGN 65259 (mid byte)
Byte D2	PGN 65259 (high byte)

Figure 41 - Request Software Identification message data fields

The response message sent by the KHC J1939 sensor is the following.

Request Component Identification response message for KHC J1939	
Byte D0	Delimiter “*”
Byte D1	Delimiter “*”
Byte D2	Serial Number (low byte)
Byte D3	Serial Number (mid-low byte)
Byte D4	Serial Number (mid-high byte)
Byte D5	Serial Number (high byte)
Byte D6	Delimiter “*”
Byte D7	Delimiter “*”

Figure 42 - Software Identification Message Response

The Serial Number is transmitted as byte sequence, coded in BCD format (Binary Coded Decimal), inside the third field, delimited by the char “*”. The Serial Number is a 32bit number, expressed in the form of YYWWNNNN (YY=year of production (last 2 digits), WW=week of production, NNNN=progressive number inside the specified week).

The Serial Number is also printed on the label attached to the case of the KHC J1939 sensor.

Example:

Request message:

CAN-ID	DLC	Data		
		D0	D1	D2
18EADaSa	3	EBh	FEh	00h

Figure 43 - Request Component Identification message Example

Da - Destination Address: KHC J1939 Address

Sa - Source Address: Master Source Address (the sender of the message)

Response message:

CAN-ID	DLC	Data							
		D0	D1	D2	D3	D4	D5	D6	D7
18FEEBSa	8	2Ah “*”	2Ah “*”	18h	00h	06h	16h	2Ah “*”	2Ah “*”

Figure 44 - Component Identification message response example

Sa - Source Address: KHC J1939 Address (the sender of the message)

In this example, the Serial Number is 16060018

10. DIAGNOSTIC MESSAGES

The KHC J1939 sensor supports the DM13 diagnostic message only.

10.1. STOP START BROADCAST (DM13)

The DM13 message is used to stop or start broadcast messages.

One of the uses for this message is to reduce network traffic during certain diagnostic procedures.

With this message the periodic transmission of the Data Record message can be temporarily suspended.

Stop Start Broadcast (DM13)	
Data length	8 bytes
Data Page	0
PDU Format	223 (DFh)
PDU Specific	DA (Destination Address)
Default Priority	6
PGN	57088 (00DF00h)

Figure 45 - Stop Start Broadcast (DM13) Message Specification

Stop Start Broadcast (DM13)		
Byte D0	Bits 8-7	Current Data Link
	Bits 6-5	J1587
	Bits 4-3	J1922
	Bits 2-1	J1939 Network #1, Primary Vehicle Network
Byte D1	Bits 8-7	J1939 Network #2
	Bits 6-5	ISO 9141
	Bits 4-3	J1850
	Bits 2-1	Other, Manufacture Specified Port
Byte D2	Bits 8-7	J1939 Network #3
	Bits 6-5	Proprietary Network #1
	Bits 4-3	Proprietary Network #2
	Bits 2-1	J1939 Network #4
Byte D3	Bits 8-5	Hold Signal
	Bits 4-1	Suspend Signal (*)
Byte D4	Bits 8-1	Suspend Duration (*)
Byte D5	Bits 8-1	Suspend Duration (*)
Byte D6	Bits 8-1	SAE Reserved
Byte D7	Bits 8-1	SAE Reserved

Figure 46 - Stop Start Broadcast (DM13) Message Data Fields

(*) not supported in KHC J1939 sensor

The KHC J1939 sensor is assigned to the Network #1, Primary Vehicle Network or to the Current Data Link.

For each of the 2-bit fields in the Stop Start Broadcast command, they are interpreted as follows:

Bits	Information
00	Stop Broadcast
01	Start Broadcast
10	Reserved
11	Don't care/Take no action

Figure 47 - Stop Start Broadcast (DM13) bit definitions

The DM13 message is sent whenever a Stop or Start Broadcast event is necessary. If a device is in Stop Broadcast state, the commanding device must send the Hold Signal every 5 seconds to keep the device in the modified state. If the Hold Signal is not received for 6 seconds, all the devices revert back to their normal state.

The 4-bit field of the Hold Signal in byte D3 of the DM13 message is interpreted as follows:

Bit States for bits 8-5 in Byte D3	Device to take action
0000	All devices
0001	Devices whose broadcast state has been modified
0010 to 1110	Reserved
1111	Not available

Figure 48 – Hold Signal States

Example

Stop Broadcast – Current Data Link

CAN-ID	DLC	Data							
		D0	D1	D2	D3	D4	D5	D6	D7
18DFDaSah	8	3Fh	FFh	FFh	FFh	FFh	FFh	FFh	FFh

Figure 49 – Stop Broadcast – Current Data Link Example

Start Broadcast – Current Data Link

CAN-ID	DLC	Data							
		D0	D1	D2	D3	D4	D5	D6	D7
18DFDaSah	8	7Fh	FFh	FFh	FFh	FFh	FFh	FFh	FFh

Figure 50 - Start Broadcast – Current Data Link Example

Stop Broadcast – J1939 Network #1

CAN-ID	DLC	Data							
		D0	D1	D2	D3	D4	D5	D6	D7
18DFDaSah	8	FCh	FFh	FFh	FFh	FFh	FFh	FFh	FFh

Figure 51 – Stop Broadcast – J1939 Network #1 Example

Start Broadcast – J1939 Network #1

CAN-ID	DLC	Data							
		D0	D1	D2	D3	D4	D5	D6	D7
18DFDaSah	8	FDh	FFh	FFh	FFh	FFh	FFh	FFh	FFh

Figure 52 - Start Broadcast – J1939 Network #1 Example

Hold Signal – J1939 Network #1 and Current Data Link

CAN-ID	DLC	Data							
		D0	D1	D2	D3	D4	D5	D6	D7
18DFDaSah	8	FFh	FFh	FFh	0Fh	FFh	FFh	FFh	FFh

Figure 53 – Hold Signal – J1939 Network #1 and Current Data Link Example

Da - Destination Address: KHC J1939 Address

Sa - Source Address: Master Source Address (the sender of the message)

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