HYDAC ELECTRONIC

Protocol Description SAE J1939

SAE J1939

HPT 1000S

Pressure transmitter

(Translation of original instructions)

Part No.: 670054 / Edition: 2021-03-02 E

Content

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Preface

This manual provides you, as user of our product, with key information on the operation and maintenance of the equipment.

It will help you to familiarise yourself with the product and assist you in obtaining maximum benefit in the applications for which it is designed.

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Keep the manual in the vicinity of the instrument for immediate reference.
Please note: the specifications given in this documentation regarding the instrument technology were correct at the time of publishing.
Modifications to technical specifications, illustrations and dimensions are therefore possible.

Should you find any errors whilst using this manual, or have any suggestions for improvements, please contact:

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We look forward to receiving your input.

“Putting experience into practice”

1 Introduction

The HPT has a CAN 2.0 B interface and can be operated according to the process defined in the standards SAE-J1939. The interface functions are divided into 3 parts:

Address Claiming, Configuration and Sending of measured values

1.1 Functions

- Measuring the current pressure value using:
  - 1kHz sample rate
  - Resolution 14 bit
- Measuring the actual pressure value
- Conversion of the pressure value into a user-scaleable linear process value
- Sending the current pressure value and device temperature:
  - Cyclically, within the range from 1 millisecond to 1 minute
- Product specific: Sending the current device temperature
  - Cyclically, within the range from 1 millisecond to 1 minute
- Smart additional functions: Provision of comprehensive device information and diagnostic data such as device temperature, measured channel-based events such as general measured channel-based operation hours, event counter, statistics of the actual benefit (operation per measured range unit / values not met or exceeded, overload etc.)

2 Address Claiming

2.1 General overview

Each HPT has a name and an address. Both can be configured by the user. The name of the HPT is a 64 bit value and is clearly recognisable worldwide, the address is an 8 bit value which must be clearly recognisable by the bus. This means, it is not allowed to have two devices with the same address connected to the same bus.
During Address Claiming the HPT communicates its address and name to the other bus participants. This is a reaction to eventual address conflicts.

2.2 Name

The name consists of the following parts:

Addressing ability
- 1 Bit Arbitrary Address Capable

Function specific sections
- 3 Bit Industrial Group (i.e. Global, Marine, Agriculture, ...)
- 7 Bit Vehicle System (depends on Industrial Group: Tractor, trailer, …)
- 4 Bit Vehicle System Instance (sequence number for systems of the same kind)
- 8 Bit Function (depending on Industrial Group: i.e. System Display, Levelling System, …)
- 5 Bit Function Instance (sequence number for functions of the same kind)
- 3 Bit ECU-Instance (sequence number for controllers having the same function)

Manufacturer specific sections

- 11 Bit Manufacturer Code
- 21 Bit Idendity
  The function-related parts are configurable, the manufacturer-related parts are firmly defined. This ensures a worldwide clear address identification.

Options for changing the J1939 name:

- Via Index 10-19
- HPT supports the J1939 name management to standard J1939-81. By means of the "name management" - Message (PGN 37632) the J1939 name can be changed during operation. The manufacturer code of the J1939 name may not be changed, it always corresponds with the manufacturer ID.

2.3 Address

The address can be set between 0 and 253. The address 254 is reserved for the status "no address assigned", the value 255 is used as broadcast address.
In each message the HPT sends, the address is assigned to the lowest 8 bits of the message ID.

Possibilities for addressing:

- The HPT can be configured as a "service configurable device" via an extra process which separated from the bus. With this process, our proprietary entries will be used to address the device (Index 1).
- The HPT supports the dynamic addressing according to the J1939-81 standard. Dynamic addressing is enabled if the bit "arbitrary address capable" of the J1939 name corresponds to 1 and inactive, when it corresponds with 0. If dynamic addressing is enabled, the device sends a "request for address claim" message at start-up, in order to detect all the used addresses and to select one free address in a second step.
- The HPT supports the "commanded address" message (PGN 65240) to the J1939-81 standard. Herewith a new address can be assigned to the device after a previous failure of an address claim has occurred. The configured address is valid until next restart, however, it can be stored persistently via a subsequent configuration process by means of the entry 102.

2.4 Start-up process

After each start-up, the HPT sends an "Address Claimed" message. Thus, it communicates its address and its name to the other participants. This message can also be requested by other participants using a "request" message.
If an other participant sends an "Address Claimed" message using the same address, the reaction of the HPT depends on the name of the other participant.
If HPT name is lower than the numerical name of the other participant, it again sends an "Address Claimed" message. If the HPT name is higher, it sends a "Cannot Claim" message and will then no more be available. It needs to be briefly disconnected from the supply voltage.
After sending an "Address Claimed" message, it takes 250 ms until the HPT takes up its regular operation mode. This is one of the requirements of SAE-J1939 to give other devices having the same address enough time to respond.

3 Configuration

3.1 General overview

The HPT has different settings which can be read and written by a master using SAE-J1939 messages. This is carried out by means of a so-called proprietary parameter group A with the PGN 61184 (0x00EF00). The data then contain information on which settings must be read or written and information on the values themselves as well.

3.2 Possible settings

All settings have an index enabling them to be addressed. In the following table, all the settings with their corresponding index are listed. Some settings are readable only (ro = read only), others are writable as well (rw = read write) or writable only (wo = write only). The data type is indicated as well.

3.2.1 Complete list of settings

In the following table, all the settings with their corresponding index are listed. The data type indicates how the data are to be interpreted. In a uint16 value for example, only the two first bytes are used and interpreted as an unsigned 16 bit integer value. Some settings can only be read (ro = read only), others can be written as well (rw = read write). The pre-set value is indicated within brackets.

a. Profile

Index	Sub index	Data type	r/w	Settings
0	0	uint16	ro	The profile number defines the layout of the setting table. It is always 1 for HPT.

E

b. General information

Index	Sub index	Data type	r/w	Settings
1	0	uint8	rw	Address (1)
2	0	uint8	rw	Baud rate, see Baud rate table below. (3 = 250 kBit)
3	0	string	ro	The characters 1-4 in the internal device ID correspond with the Software ID (Hptj").
4	0	string	ro	The characters 5-8 of the internal device ID (Software ID) ("2 ")
5	0	string	ro	Version and release number (i.e. 0510=Version5, Release10)
6	0	uint32	ro	Product code, 32 Bit number
7	0	uint32	ro	Serial number, 32 Bit number

c. Name sections

Index	Sub index	Data type	r/w	Settings
10	0	unit8	rw	1 Bit Arbitrary Address Capable (addressing mode)
11	0	uint8	rw	3 Bit Industrial Group (0=Global)
12	0	uint8	rw	7 Bit Vehicle System (0x7F)
13	0	uint8	rw	4 Bit Vehicle System Instance (0)
14	0	uint8	rw	8 Bit Function (0xFF)
15	0	uint8	rw	5 Bit Function Instance (0)
16	0	uint8	rw	3 Bit Control Unit Instance (0)
17	0	unit8	rw	1 Bit reserved
18	0	uint16	ro	11 Bit manufacturer code (124 = HYDAC ELECTRONIC GMBH)
19	0	uint32	ro	21 Bit Identity Number (corresponds with serial number)

d. Transmission of measured values

Index	Sub index	Data type	r/w	Settings
21	0	uint16	rw	Transmission Rate [ms] (100)
22	0	uint8	rw	Message length [Bytes], 2..8 (8)
23	0	uint8	rw	Priority, 0..7 (6)
24	0	uint8	rw	PDU format (0xFF = proprietary B)
25	0	uint8	rw	PDU Specific (0x00)
26	0	uint8	rw	Offset of the pressure in the message [bytes]
27	0	uint8	rw	Offset of the device temperature in the message [bytes]
28	0	uint8	rw	Extended Data Page bit
29	0	uint8	rw	Data page bit

e. Measured values display, pressure

The default values depend on the measuring range of the pressure transmitter. In the following, the default values for an HPT 1000S pressure transmitter are listed.

Index	Sub index	Data type	r/w	Settings
31	0	uint8	rw	Unit 0: bar, 1: psi, 2: MPa (i.e. 0=bar)
32	0	uint8	rw	Data length 16 Bit (2 Byte (2)) or 32 Bit (4 Byte (4))
33	0	uint32	rw	Resolution per digit with 3 decimals (i.e. 50; increment here: 0.050 bar)
34	0	int32	rw	Offset of the measured value with 3 decimals (e.g. 0)
35	0	int32	ro	Lower measuring range with 3 decimals (i.e. 0)
36	0	int32	ro	Upper measuring range with 3 decimals (e.g. 250000 = 250.000 bar)
37	0	uint8	wo	perform auto calibration (1= perform calibration)

f. Operation Data

Index	Sub index	Data type	r/w	Settings
51	0	uint16	ro	Measured value, pressure
53	0	uint24	ro	Device mode / status
54	0	uint16/32	ro	Measured value, device temperature
59	0	uint8	ro	Highest sub index status channel (3)
59	1	uint32	ro	Status channel 1 (pressure)
59	3	uint32	ro	Status channel 3 (device temperature)

g. Measured values display, device temperature

The measuring range of the device temperature is -25 .. 100 °C.

Index	Sub index	Data type	r/w	Settings
61	0	uint8	rw	Unit 3: °C, 4: °F, 5: K (z.B. 3 =°C)
62	0	uint8	rw	Data length 16 Bit (2 Byte (2)) or 32 Bit (4 Byte (4))
63	0	uint32	rw	Resolution per digit with 3 decimals (i.e. 250; increment here: 0.250 °C)
64	0	int32	rw	Offset of the measured value with 3 decimals. (i.e. -25000 = -25.000 °C)
65	0	int32	ro	Lower measuring range with 3 decimals (i.e. -25.000 °C)
66	0	int32	ro	Upper measuring range with 3 decimals (i.e. 100000 = 100.000 °C)

h. Commands

Index	Sub index	Data type	r/w	Settings
101	0	uint32	wo	Start editing mode (edit)
102	0	uint32	wo	Saving the settings (save)
103	0	uint32	wo	Reset to factory default settings (load)
104	0	uint32	wo	Restart (boot)

E

i. SSC (Switching Signal Channel)

The device provides two SSC (Switching Signal Channels), which are configurable by the customer, i.e. there are two setpoints per SSC which can be set.
Example: SP1 (set point 1) = 100 bar and SP2 (set point 2) = 300 bar. The counter calculates how often the sensor has been within this range.

i1. SSC 1.1 (Switching Signal Channel 1.1 = Switching signal channel 1, signal 1)

Index	Sub index	Data type	r/w	Settings
120	0	uint8	ro	Highest sub index status channel (6)
120	1	uint8	ro	SSC Status 0 = Configuration valid 1 = Configuration not valid
120	2	int32	rw	SP1 as process value
120	3	int32	rw	SP2 as process value
120	4	uint8	rw	Switching logic 0 = Switching logic High Active 1 = Switching logic Low Active
120	5	uint8	rw	Switching mode 0 = Switching function deactivated 1 = Switching function Single Point 2 = Switching function Window 3 = Switching function Two Point
120	6	int32	rw	Hysteresis as process value

i2. SSC 1.2 (Switching Signal Channel 1.2 = Switching signal channel 1, signal 2)

Index	Sub index	Data type	r/w	Settings
121	0	uint8	ro	Highest sub index (6)
121	1	uint8	ro	SSC Status 0 = Configuration valid 1 = Configuration not valid
121	2	int32	rw	SP1 as process value
121	3	int32	rw	SP2 as process value
121	4	uint8	rw	Switching logic 0 = Switching logic High Active 1 = Switching logic Low Active
121	5	uint8	rw	Switching mode 0 = Switching function deactivated 1 = Switching function Single Point 2 = Switching function Window 3 = Switching function Two Point
121	6	int32	rw	Hysteresis as process value

j. Smart Functions

j1. Operating hours

Index	Sub index	Data type	r/w	Settings
150	0	uint8	ro	Highest sub index status channel (3)
150	1	uint32	ro	Operating hours
150	2	uint32	ro	Temperature-weighted device operation hours (Arrhenius)

j2. Erasable operating hours

Index	Sub index	Data type	r/w	Settings
151	0	uint8	ro	Highest sub index status channel (3)
151	1	uint32	ro	Erasable operating hours

j3. Lifelong values channel 1

Index	Sub index	Data type	r/w	Settings
160	0	uint8	ro	Highest sub index status channel (3)
160	1	int32	ro	Lifelong average
160	2	int32	ro	Lifelong min value
160	3	int32	ro	Lifelong max value

j4. Erasable values channel 1

Index	Sub index	Data type	r/w	Settings
161	0	uint8	ro	Highest sub index status channel (3)
161	1	int32	ro	Erasable average
161	2	int32	ro	Erasable min value
161	3	int32	ro	Erasable max value

j5. Lifelong counter values channel 1

Index	Sub index	Data type	r/w	Settings
162	0	uint8	ro	Highest sub index status channel (4)
162	1	uint32	ro	Number of shortfalls
162	2	uint32	ro	Number of overruns
162	3	uint32	ro	Number of overloads
162	4	uint32	ro	Number of measurement errors

j6. Erasable counter values channel 1

Index	Sub index	Data type	r/w	Settings
163	0	uint8	ro	Highest sub index status channel (5)
163	1	uint32	ro	Number of shortfalls
163	2	uint32	ro	Number of overruns
163	3	uint32	ro	Number of overloads
163	4	uint32	ro	SSC (channel number).1
163	5	uint32	ro	SSC (channel number).2

j7. Lifelong statistics channel 1

Index	Sub index	Data type	r/w	Settings
164	0	uint8	ro	Highest sub index / number of ranges (11)
164	1	uint32	ro	Operating time in the range 1 in [s]
164	2	uint32	ro	Operating time in the range 2 in [s]
164	3	uint32	ro	Operating time in the range 3 in [s]
164	4	uint32	ro	Operating time in the range 4 in [s]
164	5	uint32	ro	Operating time in the range 5 in [s]
164	6	uint32	ro	Operating time in the range 6 in [s]
164	7	uint32	ro	Operating time in the range 7 in [s]
164	8	uint32	ro	Operating time in the range 8 in [s]
164	9	uint32	ro	Operating time in the range 9 in [s]
164	10	uint32	ro	Operating time in the range 10 in [s]
164	11	uint32	ro	Operating time in the range 11 in [s]

Note:
It depends on the product if statistical values are used and how many of them, and what the used statistical values stand for. There can only be 11 ranges in total. The size and the structure of the ranges is product specific.

Example:
Operating time 1 in the range below 0 [%FS]
Operating time 2 within the range from 0 to 10 [%FS]
Operating time 3 within the range from 10 to 30 [%FS]
Operating time 4 within the range from 30 to 40 [%FS]
Operating time 5 within the range from 40 to 60 [%FS]
Operating time 6 within the range from 60 to 70 [%FS]
Operating time 7 within the range from 70 to 80 [%FS]
Operating time 8 within the range from 80 to 90 [%FS]
Operating time 9 within the range from 90 to 100 [%FS]
Operating time 10 within the range from 100 to 140 [%FS]
Operating time 11 in the range above 140 [%FS] *(overflow)*

j8. Erasable statistics channel 1

Index	Sub index	Data type	r/w	Settings
165	0	uint8	ro	Highest sub index / number of ranges (11)
165	1	uint32	ro	Operating time in the range 1 in [s]
165	2	uint32	ro	Operating time in the range 2 in [s]
165	3	uint32	ro	Operating time in the range 3 in [s]
165	4	uint32	ro	Operating time in the range 4 in [s]
165	5	uint32	ro	Operating time in the range 5 in [s]
165	6	uint32	ro	Operating time in the range 6 in [s]
165	7	uint32	ro	Operating time in the range 7 in [s]
165	8	uint32	ro	Operating time in the range 8 in [s]
165	9	uint32	ro	Operating time in the range 9 in [s]
165	10	uint32	ro	Operating time in the range 10 in [s]
165	11	uint32	ro	Operating time in the range 11 in [s]

j9. Lifelong device temperature values

Index	Sub index	Data type	r/w	Settings
200	0	uint8	ro	Highest sub index status channel (3)
200	1	int32	ro	Average
200	2	int32	ro	Min. value
200	3	int32	ro	Max. value

j10. Erasable device temperature values

Index	Sub index	Data type	r/w	Settings
201	0	uint8	ro	Highest sub index status channel (3)
201	1	int32	ro	Average
201	2	int32	ro	Min. value
201	3	int32	ro	Max. value

j11. Lifelong counter values of the device temperature

Index	Sub index	Data type	r/w	Settings
202	0	uint8	ro	Highest sub index status channel (3)
202	1	uint32	ro	Number of shortfalls
202	2	uint32	ro	Number of overruns
202	3	uint32	ro	Number of measuring faults device temperature

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j12. Lifelong counter values of the device temperature

Index	Sub index	Data type	r/w	Settings
203	0	uint8	ro	Highest sub index / number of ranges (8)
203	1	uint32	ro	Operating time in the range 1 in [s]
203	2	uint32	ro	Operating time in the range 2 in [s]
203	3	uint32	ro	Operating time in the range 3 in [s]
203	4	uint32	ro	Operating time in the range 4 in [s]
203	5	uint32	ro	Operating time in the range 5 in [s]
203	6	uint32	ro	Operating time in the range 6 in [s]
203	7	uint32	ro	Operating time in the range 7 in [s]
203	8	uint32	ro	Operating time in the range 8 in [s]
203	9	uint32	ro	Operating time in the range 9 in [s]
203	10	uint32	ro	Operating time in the range 10 in [s]
203	11	uint32	ro	Operating time in the range 11 in [s]

Note:
It depends on the product if statistical values are used and how many of them, and what the used statistical values stand for. There can only be 11 ranges in total. The size and the structure of the ranges is product specific.

Example:
Operating time 1 in the range below -4 [%FS]
Operating time 2 within the range from -4 to 4 [%FS]
Operating time 3 in the range below 4 to 20 [%FS]
Operating time 4 in the range below 20 to 36 [%FS]
Operating time 5 within the range from 36 to 52 [%FS]
Operating time 6 within the range from 52 to 60 [%FS]
Operating time 7 within the range from 60 to 68 [%FS]
Operating time 8 in the range below 68 to 76 [%FS]
Operating time 9 within the range from 76 to 84 [%FS]
Operating time 10 within the range from 84 to 92 [%FS]
Operating time 11 in the range above 92 [%FS]

j13. Erasable device temperature statistics

Index	Sub index	Data type	r/w	Settings
204	0	uint8	ro	Highest sub index / number of ranges (8)
204	1	uint32	ro	Operating time in the range 1 in [s]
204	2	uint32	ro	Operating time in the range 2 in [s]
204	3	uint32	ro	Operating time in the range 3 in [s]
204	4	uint32	ro	Operating time in the range 4 in [s]
204	5	uint32	ro	Operating time in the range 5 in [s]
204	6	uint32	ro	Operating time in the range 6 in [s]
204	7	uint32	ro	Operating time in the range 7 in [s]
204	8	uint32	ro	Operating time in the range 8 in [s]
204	9	uint32	ro	Operating time in the range 9 in [s]
204	10	uint32	ro	Operating time in the range 10 in [s]
204	11	uint32	ro	Operating time in the range 11 in [s]

j14. Functions for erasing the operation data

Index	Sub index	Data type	r/w	Settings
205	0	uint8	ro	Highest sub index status channel (2)
205	1	uint32	wo	Erasing the general operation data
205	2	uint32	wo	Erasing the channel-related operation data

3.2.2 Setting of the Baud rate

HPT supports Baud rates from 10 kBit up to 1 MBit, according to the following table:

Index	Baud rate
0	1000 kBit
1	800 kBit
2	500 kBit
3	250 kBit
4	125 kBit
5	100 kBit
6	50 kBit
7	20 kBit
8	10 kBit

3.2.3 Settings for measured value transmission

During transmission of the measured values it is defined in which message the current pressure will be transmitted, at which position and how often. This is required because in this way, certain predefined parameter groups can be realised. The data width, however, is always 16 bits, which means 2 bytes. The pressure can thus, for instance, be transmitted from the 4th byte in a message of 8 bytes length. The remaining 6 bytes in the message are empty.

The following settings are possible:

- The transmission rate (see Index 21) indicates how often the pressure value is transmitted. The value is expressed in bar. At 0 bar the pressure is only transmitted on request.
- The length of the message in which the pressure value is transmitted (see Index 22).
- The priority of the message (see Index 23).
- The PGN (Parameter Group Number) consisting of PF (Parameter Format) (see Index 24) and PS (Parameter Specific) (see Index 25). The result of this PGN combined with the priority and the address is the ID of the message by means of which the pressure value is sent.
- Offset of the pressure value in the message (see Index 26).

3.2.4 Settings of measured values display

The settings of the measured values display defines how a certain pressure will be displayed. The following settings are possible:

- Setting of the pressure unit (bar, psi or MPa), (see Index 31 and 61).
- Lower and upper measurement range (see Index 35 and 36 as well as Index 65 and 66). These values are readable only. The values are signed 32 bit values which are displayed with 3 decimals. At an upper measuring range limit of 125°C, for instance, the numerical value 125,000 is read out.
- The data length providing the current temperature is pre-set to 16 bit (2 bytes). It can be changed to 32 bit (see Index 32 and 62).
- By setting the resolution and the offset (see Index 33 and 34 as well as Index 63 and 64), you can adjust the display of the current pressure value. Both settings have 3 decimals as well. The resolution indicates the pressure per digit.

HPT only sends out the correct measured values if the measured values display is configured in a way that all values within the measuring range fit into an unsigned 16 bit value. The values 0xFFFF and 0xFFFE are reserved for SAE J1939. This means, the measured value at the lower measuring range limit must be greater than or equal to 0 and the value at the upper measuring range limit must be lower than or equal to 65533.

Once the data length for the display of the measured values has been changed to 32 bits, the error values 0xFFFFFFFF and 0xFFFFFFFE and the upper measured values limit will be lower than or equal to 4294967293.

Should the measured value display not be configured properly, the sent value is always 0xFFFE, which means "error" according to SAE J1939. Furthermore, the device mode and the device status will be set accordingly.

Example 1 Pressure range form 0 to 450 bar
The current pressure value must be sent in 0.05 bar steps. This means, a value of 1200 corresponds to 60 bar. This leads to the following settings

- Unit: 0 (=bar)
- Lower measuring range: 0 (0.000 bar)
- Upper measuring range: 250000 (250.000 bar)
- Offset: 0 (0.000 bar)
- Resolution: 50 (0.050 bar/digit)

3.2.5 Device mode and device status

The device mode and the device status (see Index 53) display the status of the device. Both indications are 24 bits long. The first byte contains the device mode, the following two bytes contain the device status. In the device status, each bit has a particular meaning.
The following table indicates which errors lead to which mode and which value corresponds to which device status. In case of multiple errors, the status will result from an or-operation of the error values.

Byte 1: Device Mode

Mode		Error
0	Ready for operation	No active error present, device is ready for operation
2	Minor fault	A minor fault has recently occurred. As soon as the error has been eliminated, the device will work again.
3	Moderate fault	A moderate fault has occurred. The error may possibly be eliminated by switching the device on / off.
4	Serious error	A severe error has occurred.

Byte 2+3: Device status

Status	Error	Mode
0x00000000	approved	0
Bit0 (0x00000001)	Loading the settings for the operation data recording has not been successful	2
Bit1 (0x00000002)	Asic error	3
Bit2 (0x00000004)	Measured value shortfall	0
Bit3 (0x00000008)	Measured value overrun	0
Bit4 (0x00000010)	Loading production setup not successful	4
Bit5 (0x00000020)	Loading factory setup not successful	4
Bit6 (0x00000040)	Loading user setup not successful	2
Bit7 (0x00000080)	Saving user setup not successful	2
Bit8 (0x00000100)	Asic error	3
Bit9 (0x00000200)	Faulty configuration of the measured values transmission	2
Bit10 (0x00000400)	Loading pcb setup not successful	0
Bit11 (0x00000800)	Loading hardware setup not successful	4

Bit12 (0x00001000)	Limit shortfall	2
Bit13 (0x00002000)	Limit overrun	2
Bit14 (0x00004000)	Error in the receive queue of the CAN handler.	3
Bit15 (0x00008000)	Error during start-up of the SAE J1939 controller.	4

3.3 Carry out configuration

Before the settings can be changed the HPT must be set to its editing mode. The changed settings must then be stored and a restart needs to be carried out. Please see chapter "commands" below.

To read and write the settings, the master sends a message with the parameter group number 61184 to the HPT's address. The HPT always responds using the same parameter group number and sends an acknowledge code.
In case of reading requests the requested data are sent with the code.

3.4 Message data structure

The content of the messages is listed in the following table:

Byte	Content
0	Setting index
1	r/w, 0=read, 1=write
2	Sub index of the configuration (0 if no sub index is used)
3	Acknowledge, see remarks
4-7	Data LittleEndian

For entries in which a sub index is used, i.e. 59 (status channel) a sub index has to be set in order to inquire the channel.

The acknowledge code is always 0 with regard to the messages sent by the master. In the response of the HPT the acknowledge code means:

Ack-Code	Description
0	Ok
1	Parameters read only
2	Value too high
3	Value too low
4	Index does not exist
5	Error while saving parameters
6	Error while restoring parameters
7	Invalid r/w Byte (i.e. >1)
8	Parameters write only
9	Invalid data

10	Processor occupied
11	Error while accessing the hardware
12	Sub index does not exist

Example: Reading serial number (index=7)

Master

index	r/w	dc	ack	value (4Bytes)
7	0	0	0	0

HPT

index	r/w	dc	ack	value (4Bytes)
7	0	0	0	123456

Example: Setting of transmission rate (index=21) to 150 ms

Master

index	r/w	dc	ack	value (4Bytes)
21	1	0	0	150

HPT

index	r/w	dc	ack	value (4Bytes)
21	1	0	0	0

3.5 Commands

3.5.1 Start editing mode

Before the settings are written, the master must set the sensor to the editing mode. This is carried out by writing the string "edit" into the Index 101. In the editing mode, the sensor reacts exclusively to configuration commands. The editing mode can only be finished by restart.

Prior to restarting, the changes must explicitly be saved (Index 102). If restart is carried out without saving, all changes will be lost!

Master

Index	r/w	dc	ack	Value (→ "edit")			
(Byte 1)	**(Byte 2)**	**(Byte 3)**	**(Byte 4)**	**(Byte 5)**	**(Byte 6)**	**(Byte 7)**	**(Byte 8)**
101	1	0	0	0x65 "e"	0x64 "d"	0x69 "i"	0x74 "t"

Sensor

Index	r/w	dc	ack	Value			
(Byte 1)	**(Byte 2)**	**(Byte 3)**	**(Byte 4)**	**(Byte 5)**	**(Byte 6)**	**(Byte 7)**	**(Byte 8)**
101	1	0	0	0	0	0	0

3.5.2 Saving the settings

The changed settings will not automatically become persistent, which means, they will not be stored permanently. For this purpose, an extra storage process needs to be carried out explicitly. This is carried out by writing the string "save" into the Index 102.

Master

Index	r/w	dc	ack	Value (→ "save")			
(Byte 1)	(Byte 2)	(Byte 3)	(Byte 4)	(Byte 5)	(Byte 6)	(Byte 7)	(Byte 8)
102	1	0	0	0x73 "s"	0x61 "a"	0x76 "v"	0x65 "e"

Sensor

Index	r/w	dc	ack	Value			
(Byte 1)	(Byte 2)	(Byte 3)	(Byte 4)	(Byte 5)	(Byte 6)	(Byte 7)	(Byte 8)
102	1	0	0	0	0	0	0

3.5.3 Reset to factory default settings

The settings can be reset to factory default settings at any time. For this purpose, the string "load" must be written into Index 103.

Master

Index	r/w	dc	ack	Value (→ "load")			
(Byte 1)	(Byte 2)	(Byte 3)	(Byte 4)	(Byte 5)	(Byte 6)	(Byte 7)	(Byte 8)
103	1	0	0	0x6C "l"	0x6F "o"	0x61 "a"	0x64 "d"

Sensor

Index	r/w	dc	ack	Value			
(Byte 1)	(Byte 2)	(Byte 3)	(Byte 4)	(Byte 5)	(Byte 6)	(Byte 7)	(Byte 8)
103	1	0	0	0	0	0	0

3.5.4 Restart

A restart is carried out by briefly disconnecting HPT from the power supply. A restart can also be performed by writing the string "boot" into the index 104.

Master

Index	r/w	dc	ack	Value (→ "boot")			
(Byte 1)	(Byte 2)	(Byte 3)	(Byte 4)	(Byte 5)	(Byte 6)	(Byte 7)	(Byte 8)
104	1	0	0	0x62 "b"	0x6F "o"	0x6F "o"	0x74 "t"

4 Sending the measured value

Depending on the configuration, HPT sends the current temperature via message. The configuration was described in the previous chapter. In addition to being sent cyclically, the measured value can also be requested by means of a "request" message, PGN 59904 (0x00EA00) at any time.

5 Miscellaneous

The Software Identification (version number) can be requested by means of a "request" message on PGN 65242 (0x00FEDA).

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Note

The information in this manual relates to the operating conditions and applications described. For applications or operating conditions not described please contact the relevant technical department.

If you have any questions or suggestions or encounter any problems of a technical nature, please contact your HYDAC representative.