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HEINZMANN®
Engine & Turbine Management

HEINZMANN-CAN
Customer Module

The appropriate manuals must be thoroughly studied before installation, initial start-up and maintenance.

All instructions pertaining to the system and safety must be followed in full. Non-observance of the instructions may lead to injury to persons and/or material damage.

HEINZMANN shall not be held liable for any damage caused through non-observance of instructions.

Independent tests and inspections are of particular importance for all applications in which a malfunction could result in injury to persons or material damage.

All examples and data, as well as all other information in this manual are there solely for the purpose of instruction and they may not be used for special application without the operator running independent tests and inspections beforehand.

HEINZMANN does not guarantee, neither expressly nor tacitly, that the examples, data or other information in this manual is free from error, complies with industrial standards or fulfils the requirements of any special application.

To avoid any injury to persons and damage to systems, the following monitoring and protective systems must be provided:

– Overspeed protection independent of the rpm controller

HEINZMANN shall not be held liable for any damage caused through missing or insufficiently rated overspeed protection.

– thermal overload protection

The following must also be provided for alternator systems:

– Overcurrent protection
– Protection against faulty synchronisation for excessively-large frequency, voltage or phase difference
– Directional contactor

The reasons for overspeeding may be:

– Failure of positioning device, control unit or its auxiliary devices
– Linkage sluggishness and jamming

The following must be observed before an installation:

– Always disconnect the electrical mains supply before any interventions to the system.
– Only use cable screening and mains supply connections that correspond with the *European Union EMC Directive*
– Check the function of all installed protection and monitoring systems

	**Please observe the following for electronically controlled injection (MVC):** – For **common rail** systems each injector line must be equipped with a separate mechanical flow-rate limiter – For **unit pump** (PLD) and **pump-injector unit** (PDE) systems, the fuel enable is first made possible by the solenoid valve's control plunger motion. This means that in the event of the control plunger sticking, the fuel supply to the injection valve is stopped.
	As soon as the positioning device receives power, it can actuate the controller output shaft automatically at any given time. The range of the controller shaft or control linkage must therefore be secured against unauthorised access.
	HEINZMANN expressly rejects any implied guarantee pertaining to any marketability or suitability for a special purpose, including in the event that **HEINZMANN** was notified of such a special purpose or the manual contains a reference to such a special purpose.
	HEINZMANN shall not be held liable for any indirect and direct damage nor for any incidental and consequential damage that results from application of any of the examples, data or miscellaneous information as given in this manual.
	HEINZMANN shall not provide any guarantee for the design and planning of the overall technical system. This is a matter of the operator its planners and its specialist engineers. They are also responsible for checking whether the performances of our devices match the intended purpose. The operator is also responsible for a correct initial start-up of the overall system.

Revision index

Version	Changes effected	Date	Author
12-05	written	2005-12-07	Sz
11-06	Sensors for slide reduction, traction voltage, traction current and traction power implemented	2006-11-24	Sz
02-11	Auxiliary device (AC) added	2010-12-21	DeM
	Error telegrams 141 to 145 added in chapter 3.4.4 Current errors	2010-12-21	DeM
	Chapter 3.5 Theseus / XIOSGenSet / XIOSCHP send telegrams (GC → CM) enhanced	2010-12-22	DeM
	Sensors added in chapter 4.1.2 THESEUS (GC)	2010-12-23	DeM
	Chapters 4.3 Overview table, 6 Fax form and 7 Addresses removed	2010-12-23	DeM
	Chapter 3.6 PHLOX send telegrams (AC → CM) added	2011-01-18	DeM
	Chapter 3.10 Overview of send telegrams enhanced	2011-01-18	DeM
	Chapter 4.2 Value range of measured and indicated values enhanced	2011-01-18	DeM
	Chapter 4.1.3 PHLOX (AC) added	2011-01-19	DeM
04-11	Auxiliary device (AC) type KRONOS 20 added and chapter 4.1.4 KRONOS 20 (AC) added	2011-03-31	DeM
	Actual power replaced by relative power and power set point replaced by relative power set point in command 20 refer to chapter 3.4.1 Sensors	2011-04-01	DeM
05-12	Warning notices updated	2012-03-13	DeM
	Chapter 2.1.5 Request for reading or writing a parameter added	2012-03-26	DeM
	Chapter 2.1.6 Request for execution of internal control unit functions added	2012-03-26	DeM
	Chapter 3.1.5 Request for reading or writing a parameter added	2012-03-26	DeM
	Chapter 3.1.6 Request for execution of internal control unit functions added	2012-03-26	DeM
	Chapter 3.4.7 Response of request for reading or writing a parameter added	2012-03-26	DeM
	Chapter 3.4.8 Response of request for execution of internal control unit functions added	2012-03-26	DeM
	Some minor modifications	2012-05-03	DeM
06-13	Layout of error telegrams 144 and 145 corrected in chapter 3.4.4 Current errors	2013-06-06	PiI

Version	Changes effected	Date	Author
10-14	Chapter 1.6 Baud rate revised	2014-10-28	DeM
	Chapter 3.1.2 Sensors enhanced	2014-10-28	DeM
	Chapter 3.4.5 Configurable telegrams enhanced	2014-10-29	DeM
	Sensors added in chapter 4.1.3 PHLOX (AC)	2014-10-29	DeM
	Some minor modifications	2014-10-29	DeM
10-21	PHLOX III and E-LES LC integrated	2021-10-21	FeC
	Description of current error telegrams #41-48, #141-148 completed	2021-10-21	FeC
	E-Motor Control (MC) integrated	2021-10-21	FeC, DeM
	EFI Control messages added	2021-10-21	FeC
	Transmission of cylinder exhaust temperature sensors added	2021-10-21	FeC

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1 HEINZMANN-CAN protocol

The HEINZMANN-CAN protocol is based on the CAN specification 2.0B with a 29 bit identifier.

The identifier contains information about sender and receiver and the command code. The maximum 8 data bytes are therefore available completely for operative data.

1.1 Identifier structure

Bit range	Code	Meaning	Value
28…27	p	priority	always 2
26…23	d	type of receiving device (destination)	0…15
22…18	m	destination node number	0, 1…31
17	r	reserved	always 0
16…13	s	type of sending device (source)	0…15
12…8	n	source node number	1…31
7…0	c	command	0…255

Table 1: Identifier structure

Each connection in a HEINZMANN-CAN network is therefore a point-to-point connection. A telegram is sent by a unique source to a unique destination. An exception is the transmission of a command to all units of the same type using node number 0, but this command is not used in the context of the customer module.

1.2 Node types

Sources and destinations are subdivided in node type (device type) and a node number. The following device types are configured for communication with the customer module.

Device type	Code	Control device
0	DC	Speed governor conventional or direct injector
1	GC	THESEUS, XIOS^{GenSet} or XIOS^{CHP}
4	MC	Motor Control
5	AC	Auxiliary device, for example PHLOX (ignition control unit), KRONOS 20 (AFR control unit), ARIADNE (knock control), ELEKTRA (AFR control unit), E-LES LC (AFR control unit) or Positioner

Table 2: Node types

The customer module itself is of the following type:

Device type	Code	Control device
6	CM	Customer Module

Table 3: Node type customer module

Communication in CAN is established only if the device type is authorized:

4406 *CanCommCMOn* = 1 must be set in the control device, if a communication to a customer module must be established.

1.3 Node numbers

For each device type in the HEINZMANN-CAN network each node number in the range between 1 and 31 must be assigned only once. Node number 0 is not allowed for a single device, since it is used as the number for messages to all nodes of a certain type.

The node number of the control device (DC, GC, MC or AC) is defined in 401 *CanMyNode-Number* and the node number of the customer module with which the control device must work is entered in 403 *CanCMNodeNumber*.

1.4 Commands

The possible command codes of the telegrams and the respective data content are described at length in ↑ *3 Telegram structure*. The command codes always relate both to the connection and the direction between two device types, which means that the same command numbers may have a different meaning when used for connections between different types and in different directions.

1.5 Identifier for the customer module

The basic structure of the 29-bit form of the identifier in connection with the customer module is as follows. mmmmm are the five bits for the node number of the receiving device, nnnnn is the node number of the sending device and cccccccc is the command code.

Direction	p	d	m	r	s	n	c	Identifier
CM → DC	2	0	m	0	6	n	c	10 0000 mmmmm 0 0110 nnnnn cccccccc
CM → GC	2	1	m	0	6	n	c	10 0001 mmmmm 0 0110 nnnnn cccccccc
CM → MC	2	4	m	0	6	n	c	10 0100 mmmmm 0 0110 nnnnn cccccccc
CM → AC	2	5	m	0	6	n	c	10 0101 mmmmm 0 0110 nnnnn cccccccc
DC → CM	2	6	m	0	0	n	c	10 0110 mmmmm 0 0000 nnnnn cccccccc

Direction	p	d	m	r	s	n	c	Identifier
GC → CM	2	6	m	0	1	n	c	10 0110 mmmmm 0 0001 nnnnn cccccccc
MC → CM	2	6	m	0	4	n	c	10 0110 mmmmm 0 0100 nnnnn cccccccc
AC → CM	2	6	m	0	5	n	c	10 0110 mmmmm 0 0101 nnnnn cccccccc

Table 4: Identifier

1.6 Baud rate

The selected baud rate can be set in the HEINZMANN device with the parameter 416 *CanBaudrate*.

In 416 *CanBaudrate*, only the values 125 kBaud, 250 kBaud, 500 kBaud and 1000 kBaud are admissible as baud rates, for every other entry 250 kBaud will be used. The baud rate is set internally with the CAN controller specific segments so that the sample point is at 75%.

If another baud rate should be necessary or the segment settings have to be changed because of the sample point or the cable length, this can be made possible with a customized firmware.

1.7 Monitoring the CAN communication

The communication is constantly monitored. After the control device is switched on, a certain amount of time may pass before an error message is originated. This delay is set in parameter 400 *CanStartTimeOutDelay*. All devices connected to the CAN network should have the same delay setting. The whole network must be fed tension during this time, in order not to trigger an error message during start-up.

The parameters 2422 *CanCMNodeState31to16* and 2423 *CanCMNodeState15to01* show if a connection between the control device and a customer module has been established. The bit corresponding to the node number of the customer module is activated in the process.

The following general error messages are generated:

3070 *ErrCanBus* Error CAN bus

3071 *ErrCanComm* Error CAN communication

In case of a CAN bus error, the CAN controller emits errors such as BusStatus, ErrorStatus or DataOverrun. Even if the controller is initialized again, the errors are not eliminated durably. The reason usually is faulty cabling, lack of termination or different baud rates used by the users connected to the network. The control device tries to reach an error-free state by keeping to initialize the CAN controller.

As opposed to that, the CAN communication error 3071 *ErrCanComm* relates to an error in content, i.e. there is no physical error in the network and communication is in principle possible. Information about the communication errors of the HEINZMANN-CAN bus is shown in the following parameters:

2401	*CanTxBufferState*	State of source buffer
2402	*CanRxBufferState*	State of destination buffer
2403	*CanRxTimeout*	State of destination timeout monitoring
2404	*CanTypeMismatch*	State of device numbers

The values of the parameters 2401 to 2403 are in binary code and the bit number relates to the device type. An activation of these parameters triggers off a 3071 *ErrCanComm* error.

Source and destination buffer are monitored for overflow and indicated in parameters 2401 *CanTxBufferState* und 2402 *CanRxBufferState*. The receipt of messages must be completed within a fixed amount of time. Otherwise error 2403 *CanRxTimeout* is activated. The error 2404 *CanTypeMismatch* finally indicates a configuration error. A second user with the same device number and the same device type is connected to the network. In case of source or destination buffer overflow, the overflow is only indicated and the communication proceeds but for one or several messages that cannot be received or sent. If too many messages cannot be received, error 2403 *CanRxTimeout* is triggered. If a source buffer overflow causes messages to be withheld, the other side indicates the timeout error.

The error 2403 *CanRxTimeout* is generally activated when the other side cannot be reached. In this case messages keep getting sent to the other side, but the content switches to certain emergency procedures.

Whether the control device is generally ready to communicate via CAN is indicated by parameter 2405 *CanOnline*.

2 Customer Module

The functions apply to the control devices, which are described in the related *Basic Information*. As additional extension, the CAN bus allows to exchange data between a HEINZMANN control device and a customer module. Besides the pre-defined telegrams containing pre-defined data there are three more parameterizable telegrams, which allow to send freely chosen data from the HEINZMANN device to the customer module.

Parameter changes relating to the customer module become active only after saving and reset of the control device.

In order to send and receive telegrams between a HEINZMANN control device and a customer module, the parameter 4406 *CanCommCMOn* = 1 must be set.

2.1 Receiving data

The delay time for timeout monitoring for arriving telegrams is set in 21950 *CMRxTel10-Timeout* to 21956 *CMRxTel25Timeout*. If a telegram was not received during this span of time, error 3071 *ErrCanComm* is activated. If the timeout parameters are set to 0, there is no specific timeout monitoring for the relative telegram.

Besides that, there is always a general timeout monitoring for all CAN communication between control device and customer module. The customer module must, just as the control device, transmit a signal at least once every second.

2.1.1 Switch functions

All switch functions defined in the control device may be received by way of a dedicated hardware input or by way of the customer module's telegram 10 (↑ *3.1.1 Switch functions*). The receipt path must be communicated to the control device.

In order for the control device to be able to use the switch functions received by way of telegram 10, in 24810 *ChanTyp…* to 24849 *ChanTyp…*, the value 8 must be entered to indicate the chosen channel type. If the receipt is to happen exclusively by way of the hardware, channel type 0 must be chosen.

If channel type 8 (customer module) is chosen, the bit number in telegram 10 must be indicated in the corresponding parameter 20810 *Comm…* to 20849 *Comm….* Up to 32 different switch functions may be transmitted with telegram 10. They are chosen and assigned by the programmer of the customer module.

If a switch function received by the customer module requires additional wiring, the number of the digital input used for the purpose must be indicated in parameter 810 *Funct…* to 849 *Funct….* If this parameter is set to 0, the switch function is received only via CAN.

If channel type 0 (own hardware) is chosen, only the number of the digital input used for the purpose must be indicated in parameter 810 *Funct…* to 849 *Funct….* The input number 0 amounts to saying "not used".

8xx	*Funct…* = DI-No.	<> 0: redundant cabling, 0: no cabling
248xx	*ChanTyp…* = 8	Switch is received via CAN customer module
208xx	*Comm…* = Bit-No.	Bit number in telegram 10 (0, 1…32)

The bit number counts bytewise, i.e. the first data byte of the telegram contains the bits 1…8 (LSB…MSB), the second the bits 9…16 (LSB…MSB), and so on. The bit number 0 amounts to saying "not used".

A switch function is activated if it addressed by at least one of the two possible sources (digital input or telegram 10).

The value "1" in telegram 10 switches a function ON, the value "0" switches it OFF: Switch functions serving as toggle commands are defined as follows: "1" for the state indicated to the left of "OR" in the name and "0" for the state to the right of "OR". Example: In switch function 2827 *SwitchSetpoint2Or1* the transmission of "1" activates speed set point 2, "0" activates speed set point 1.

DcDesk 6 supports the configuration of switch functions by communication modules via menu item "Control unit/Adjustment/Switch functions".

2.1.1.1 Error in the configuration or in CAN receipt of switch functions

If the switch functions 248xx *ChanTyp…* are set = 8, but the customer module is not activated with 4406 *CanCommCMOn* = 1, all switch functions are reset to 0 and the error message 3000 *ConfigurationError* is sent.

If there is a CAN error, either a bus error, downtime of the customer module or a timeout of telegram 10, all switch functions assigned to the CAN customer module are equally returned to 0. If the telegram is received again, switch functions are determined again by way of CAN.

2.1.1.2 Switch function motor stop in the speed governor (DC)

In case of a CAN error, switches determined via CAN are deleted or reset to zero. If in this case a "motor stop signal" transmitted via CAN is to lead to a motor stop in any case, the parameter 4810 *StopImpulseOrSwitch* must be set to 1. This parameter allows to define whether an external stop command remains active only during the time the command is explicitly active or if an impulse is sufficient to keep the command active until the motor has stopped.

4810	*StopImpulseOrSwitch* = 1	Motor stop active only if the stop command is explicitly active
4810	*StopImpulseOrSwitch* = 0	A single switch impulse is sufficient to keep the command active until the motor has stopped.

2.1.2 Sensors

Each sensor defined in the control device may be received either by way of a dedicated hardware input or by way of the customer module's telegrams 20 to 25 (↑ *3.1.2 Sensors*). The receipt path must be communicated to the control device.

In order for the control device to be able to use the sensor values received by way of the telegrams 20 to 25, the value 8 must be set in 4900 *ChanTyp…* to 4926 *ChanTyp…* to indicate the chosen channel type. For receipt by way of an analogue input on the hardware, channel type "0" must be entered and for receipt by way of a PWM input on the hardware, channel type "1" must be used.

In the corresponding parameter 900 *AssignIn…* to 926 *AssignIn…* the number of the input channel must be entered. Channel number 0 amounts to saying "not used".

49xx	*ChanTyp…* = 8	Sensor is received via CAN customer module
9xx	*AssignIn…* = channel no.	Channel number in telegrams 20…25 (0, 1…24)

Up to 24 different sensors may be transmitted with telegrams 20 … 25. Choice is left to the programmer of the customer module. The channel numbers in the telegrams count word by word, i.e. the first word in telegram 20 defines channel 1, the second word channel 2, and so on. The fourth word of telegram 25 has channel number 24.

DcDesk 6 supports the configuration of sensors by communication modules via menu item "Control unit/Adjustment/Sensors".

Parameterizing example for DC

You want current boost pressure and coolant temperature to be received every 50 ms via words 1 and 2 of telegram 20.

Number	Parameter	Value	Unit
904	*AssignIn_BoostPress*	*1*	
907	*AssignIn_CoolantTemp*	*2*	
4406	*CanCommCMOn*	*1*	
4904	*ChanTypBoostPress*	*8*	
4907	*ChanTypCoolantTemp*	*8*	
21951	*CMRxTel20Timeout*	*0.05*	*s*

2.1.2.1 Error in the configuration or in CAN receipt of sensors

If the sensors 49xx *ChanTyp…* are set = 8 but the customer module is not activated with 4406 *CanCommCMOn* = 1, all sensor values are reset to zero and the error message 3000 *ConfigurationError* is transmitted.

If there is a CAN error, either a bus error, downtime of the customer module or a timeout of one of the telegrams 20…25, all sensors assigned to the CAN customer module are equally returned to 0. If the telegram is received again, sensors values are transmitted again by way of CAN.

The effective value of sensors in case of error depends on the settings in 5000 …*SubstOrLast* to 5026 …*SubstOrLast* and 5040 …*HoldOrReset* to 5066 …*HoldOrReset*.

500x …*SubstOrLast* = 1	substitution value 1000 *Subst…* is used
500x …*SubstOrLast* = 0	last valid value is used

After the return of the CAN signal, the sensor error caused by a CAN error may be kept until the error is reset or until the error disappears, depending on the setting of parameter 504x …*HoldOrReset*.

504x …*HoldOrReset* = 1	sensor error kept for error reset
504x …*HoldOrReset* = 0	sensor error deletes itself when error cause disappears

2.1.3 Requesting parameter values

With the request telegram 80 *(↑ 3.1.3 Requesting parameter values*) the customer module can request the one-time-only transmission of up to four parameter values. This results in the transmission of up to four parameter numbers, that must exist in the control device and cannot have an agreed level higher than 4. The values of these parameters are then sent back in answer telegram 80 (↑ *3.4.6 Answer to request of parameter values*).

The answer telegram is a sensible option when data are not required continuously, such as hours of operation or certain parameter settings.

2.1.4 Request of a send telegram

The request telegram 81 (↑ *3.1.4 Request of a send telegram*) allows to transmit the number of one of the defined send telegrams of the control device. This telegram is then sent once. This is useful when the data is not required continuously and the bus load can be reduced using this procedure. The requested telegram is sent even if it has not been activated via parameter 25960 *CMTxTel20On* and the following.

2.1.5 Request for reading or writing a parameter

The customer module can read or write any parameter value with the request telegram 83 (↑ *3.1.5 Request for reading or writing a parameter*). This is done by transmitting the parameter number with the associated parameter value and the access mode (0 = read, 1 = write). The parameter must exist in the control unit and the defined level may not be higher than 4. The parameter number, the current parameter value and a return code are returned in the response telegram 83 (↑ *3.4.7 Response of request for reading or writing* a *parameter*).

The return code can be:

- 0: OK
- 1: Not OK
- 3: Parameter is read-only
- 6: Parameter does not exist

2.1.6 Request for execution of internal control unit functions

The customer module can force the execution of internal control unit functions with the request telegram 84 (↑ *3.1.6 Request for execution of internal control unit functions*). This is done by transmitting one data byte as a function code. The following internal control unit functions are supported:

- 0: Request/Force to reset the control unit
- 1: Request/Force to store the parameter values in the ROM
- 2: Request/Force to reset the current errors

A return code is returned in the response telegram 84 (↑ *3.4.8 Response of request for execution of internal control unit functions*). The following values are possible for the return code:

- 0: OK
- 1: Not OK

2.2 Data transmission

For each telegram to be sent, the respective activation parameter starting at 25960 *CMTxTel20On* must be set:

259xx	*CMTxTel…On* = 1	send telegram
259xx	*CMTxTel…On* = 0	do not send telegram

All telegrams except the error telegrams are send regularly at the time interval set in the transmission rate starting at parameter 21960 *CMTxTel20SendRate* and the following. If "0"

is set, telegrams are sent at every main loop cycle, i.e. with Intel- or Philips-CAN controllers every 15.625 ms, with M16C systems every 16 ms and every 10 ms for all other systems. Because of the possibly resulting high bus load it should be considered with care if and for which telegrams this is really necessary.

2.2.1 Current errors

The up to five or eight error telegrams 41 to 45 or 141 to 148 (↑ *3.4.4 Current errors*) transmit the current error states in the control device. After the first transmission occurring immediately after the connection is established, they are sent again only if at least one error state changes in the corresponding telegram.

2.2.2 Freely configurable telegrams

For the three or nine (standard in PHLOX, ARIADNE, ELEKTRA and MVC 01) freely configurable telegrams 50, 51 and 52 or 50 to 58 (↑ *3.4.5 Configurable telegrams*) up to four parameter numbers of data each can be defined for regular transmission to the customer module using the parameters 29800 *CMTel50ParamSet(0)* to 29813 *CMTel52ParamSet(3)* or to 29843 *CMTel58ParamSet(3)*. The four field elements must be filled one after the other, beginning with index 0. The current values of these parameters are sent back in the same places in send telegram 80. Basically words are transmitted, even when a single parameter contains only a byte or bit value.

The input of parameter number 0 results in an entry of 0 in the corresponding place in the send telegram. Send telegram length results from the number of valid telegram entries, meaning that the data transmission ends with the first invalid, non-existing parameter number.

2.2.3 Transmission of bit values

To transmit several bit values in compressed form, a bit collection may be assembled using field 29900 *BitCollParamSet(0)*. Here you enter the parameter numbers of bit values of the control unit that can assume only the values 0 or 1. In each field index a positive or negative parameter number or 0 may be entered.

With the values of the indicated parameters words are formed which are shown in 23720 *BitCollection(0)* and following. The first 16 entries of 29900 *BitCollParamSet(0)* form the first word of 23720 *BitCollection(0)*; the second 16 entries form the second word, and so on. The value of the parameter in index 0 yields bit 0, the value in parameter 1 becomes bit 1, and so on.

When the parameter number is positive, the value of the parameter is included in the bit collection. When the parameter number is negative, the negated parameter value is included in the bit collection. If a zero is entered, the value 0 appears in the bit collection.

Parameter numbers starting from 23720 *BitCollection(0)* can be entered again in an element of the fields 29800 *CMTel50ParamSet(0)* to 29813 *CMTel52ParamSet(3)*, in order to send a bit collection to the customer module.

DcDesk 6 supports the configuration of bit collections for communication modules via menu item "Control unit/Adjustment/Bit collection".

Parameterizing example for DC

Boost pressure (2904 *BoostPressure*), oil temperature (2909 *OilTemp*), rotational speed (2000 *Speed*) and the causes of a power limitation (2711 *FuelLimitMaxActive*, 2712 *StartLimitActive*, 2713 *SpeedLimitActive*, 2714 *BoostLimitActive* and 2715 *ForcedLimitActive*) are to be transmitted each 100 ms by way of a freely parameterizable telegram.

Number	Parameter	Value	Unit
21971	*CMTxTel50SendRate*	*0.1*	*s*
4406	*CanCommCMOn*	*1*	
25971	*CMTxTel50On*	*1*	
29800	*CMTel50ParamSet(0)*	*2904*	
29801	*CMTel50ParamSet(1)*	*2909*	
29802	*CMTel50ParamSet(2)*	*2000*	
29803	*CMTel50ParamSet(3)*	*23720*	
29900	*BitCollParamSet(0)*	*2711*	
29901	*BitCollParamSet(1)*	*2712*	
29902	*BitCollParamSet(2)*	*2713*	
29903	*BitCollParamSet(3)*	*2714*	
29904	*BitCollParamSet(4)*	*2715*	

3 Telegram structure

The following section describes in detail all the telegrams used.

3.1 Receive telegrams (CM → DC/GC/MC/AC)

A control device of the type speed governor (DC), THESEUS (GC), e-motor control (MC) or auxiliary device (AC) for example PHLOX or KRONOS 20 can receive the following telegrams from the customer module.

3.1.1 Switch functions

Command: 10

Data bytes: 1, 2, 3 or 4

Identifier: CM → DC: 10 0000 mmmmm 0 0110 nnnnn 00001010
CM → GC: 10 0001 mmmmm 0 0110 nnnnn 00001010
CM → MC: 10 0100 mmmmm 0 0110 nnnnn 00001010 CM → AC:10 0101 mmmmm 0 0110 nnnnn 00001010

Timeout: 21950 *CMRxTel10Timeout*

Activation: automatic if 248xx *ChanTyp…* = 8 receives a switch function by way of HZM-CAN CM

		byte 0	byte 1	byte 2	byte 3
bit	7	Switch Function 8	Switch Function 16	Switch Function 24	Switch Function 32
	6	Switch Function 7	Switch Function 15	Switch Function 23	Switch Function 31
	5	Switch Function 6	Switch Function 14	Switch Function 22	Switch Function 30
	4	Switch Function 5	Switch Function 13	Switch Function 21	Switch Function 29
	3	Switch Function 4	Switch Function 12	Switch Function 20	Switch Function 28
	2	Switch Function 3	Switch Function 11	Switch Function 19	Switch Function 27
	1	Switch Function 2	Switch Function 10	Switch Function 18	Switch Function 26
	0	Switch Function 1	Switch Function 9	Switch Function 17	Switch Function 25

Table 5: Command 10 switch functions

Each bit in this telegram corresponds to the value of a switch function currently to be set.

Switch functions may be assigned to the single bits by the programmer of the customer module. It is important that during the configuration of the control device the correct bit number is assigned to the respective parameter in 20810 *Comm…* to 20849 *Comm…* (↑ *2.1.1 Switch functions*).

Of the maximum of four data bytes only the part necessary for the switch functions must be transmitted.

3.1.2 Sensors

Sensor values are received by the customer module by way of up to four telegrams with four values each, amounting to 16 sensor values available in total.

The various sensors may be assigned to the data words by the programmer of the customer module. It is important to remember that during the configuration of the control device the correct channel number must be assigned to the respective parameter in 900 *AssignIn…* to 926 *AssignIn…* (↑ *2.1.2 Sensors*).

Each sensor value must be sent within the internal value range of the control device (↑ *4.1 Value range of sensors*). Of the available maximum of four data words only the required ones must be sent (2, 4, 6 or 8 bytes).

Command: 20

Data bytes: 2, 4, 6 or 8

Identifier:
CM → DC: 10 0000 mmmmm 0 0110 nnnnn 00010100
CM → GC: 10 0001 mmmmm 0 0110 nnnnn 00010100
CM → MC: 10 0100 mmmmm 0 0110 nnnnn 00010100
CM → AC: 10 0101 mmmmm 0 0110 nnnnn 00010100

Timeout: 21951 *CMRxTel20Timeout*

Activation: automatic if 49xx *ChanTyp…* = 8 and 9xx *AssignIn…* = 1…4 receives one of these sensors by way of HZM-CAN CM

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Channel	Sensor 1		Sensor 2		Sensor 3		Sensor 4	

Table 6: Command 20 sensors

Command: 21

Data bytes: 2, 4, 6 or 8

Identifier:
CM → DC: 10 0000 mmmmm 0 0110 nnnnn 00010101
CM → GC: 10 0001 mmmmm 0 0110 nnnnn 00010101
CM → MC: 10 0100 mmmmm 0 0110 nnnnn 00010101
CM → AC: 10 0101 mmmmm 0 0110 nnnnn 00010101

Timeout: 21952 *CMRxTel21Timeout*

Activation: automatic if 49xx *ChanTyp…* = 8 and 9xx *AssignIn…* = 5…8 receives one of these sensors by way of HZM-CAN CM

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Channel	Sensor 5		Sensor 6		Sensor 7		Sensor 8	

Table 7: Command 21 sensors

Command: 22

Data bytes: 2, 4, 6 or 8

Identifier:
CM → DC: 10 0000 mmmmm 0 0110 nnnnn 00010110
CM → GC: 10 0001 mmmmm 0 0110 nnnnn 00010110
CM → MC: 10 0100 mmmmm 0 0110 nnnnn 00010110
CM → AC: 10 0101 mmmmm 0 0110 nnnnn 00010110

Timeout: 21953 *CMRxTel22Timeout*

Activation: automatic if 49xx *ChanTyp…* = 8 and 9xx *AssignIn…* = 9…12 receives one of these sensors by way of HZM-CAN CM

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Channel	Sensor 9		Sensor 10		Sensor 11		Sensor 12	

Table 8: Command 22 sensors

Command: 23

Data bytes: 2, 4, 6 or 8

Identifier:
CM → DC: 10 0000 mmmmm 0 0110 nnnnn 00010111
CM → GC: 10 0001 mmmmm 0 0110 nnnnn 00010111
CM → MC: 10 0100 mmmmm 0 0110 nnnnn 00010111
CM → AC: 10 0101 mmmmm 0 0110 nnnnn 00010111

Timeout: 21954 *CMRxTel23Timeout*

Activation: automatic if 49xx *ChanTyp…* = 8 and 9xx *AssignIn…* = 13…16 receives one of these sensors by way of HZM-CAN CM

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Channel	Sensor 13		Sensor 14		Sensor 15		Sensor 16	

Table 9: Command 23 sensors

Command: 24

Data bytes: 2, 4, 6 or 8

Identifier:
CM → DC: 10 0000 mmmmm 0 0110 nnnnn 00011000
CM → GC: 10 0001 mmmmm 0 0110 nnnnn 00011000
CM → MC: 10 0100 mmmmm 0 0110 nnnnn 00011000
CM → AC: 10 0101 mmmmm 0 0110 nnnnn 00011000

Timeout: 21955 *CMRxTel24Timeout*

Activation: automatic if 49xx *ChanTyp…* = 8 and 9xx *AssignIn…* = 17…20 receives one of these sensors by way of HZM-CAN CM

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Channel	Sensor 17		Sensor 18		Sensor 19		Sensor 20	

Table 10: Command 24 sensors

Command: 25

Data bytes: 2, 4, 6 or 8

Identifier:
CM → DC: 10 0000 mmmmm 0 0110 nnnnn 00011001
CM → GC: 10 0001 mmmmm 0 0110 nnnnn 00011001
CM → MC: 10 0100 mmmmm 0 0110 nnnnn 00011001
CM → AC: 10 0101 mmmmm 0 0110 nnnnn 00011001

Timeout: 21956 *CMRxTel25Timeout*

Activation: automatic if 49xx *ChanTyp…* = 8 and 9xx *AssignIn…* = 21…24 receives one of these sensors by way of HZM-CAN CM

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Channel	Sensor 21		Sensor 22		Sensor 23		Sensor 24	

Table 11: Command 25 sensors

3.1.3 Requesting parameter values

Command: 80

Data bytes: 2, 4, 6 or 8

Identifier:
CM → DC: 10 0000 mmmmm 0 0110 nnnnn 01010000
CM → GC: 10 0001 mmmmm 0 0110 nnnnn 01010000
CM → MC: 10 0100 mmmmm 0 0110 nnnnn 01010000
CM → AC: 10 0101 mmmmm 0 0110 nnnnn 01010000

With a request by way of command 80 (↑ *2.1.3 Requesting parameter values*) up to four parameters may be requested by indicating their parameter number. The parameter can be shorter, if less than four parameter numbers are required.

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Parameter Number 1		Parameter Number 2		Parameter Number 3		Parameter Number 4	

Table 12: Command 80 requesting parameter values

The control device sends the requested parameter values with the answer telegram 80 (↑ *3.4.6 Answer to request of parameter values*). Only parameters with an existing number and a level defined as not higher than 4 are accepted.

The customer module can send a new request telegram only after having received the answer to the preceding one.

3.1.4 Request of a send telegram

Command: 81

Data bytes: 1

Identifier:
CM → DC: 10 0000 mmmmm 0 0110 nnnnn 01010001
CM → GC: 10 0001 mmmmm 0 0110 nnnnn 01010001
CM → MC: 10 0100 mmmmm 0 0110 nnnnn 01010001
CM → AC: 10 0101 mmmmm 0 0110 nnnnn 01010001

	byte 0
Value	Telegram Number

Table 13: Command 81 request of a send telegram

With the request telegram 81 (↑ *2.1.4 Request of a send telegram*) the customer module transmits one of the send telegram numbers of the control device and in doing so activates a single sending of the corresponding telegram.

3.1.5 Request for reading or writing a parameter

Command: 83

Data bytes: 5

Identifier:
CM → DC: 10 0000 mmmmm 0 0110 nnnnn 01010011
CM → GC: 10 0001 mmmmm 0 0110 nnnnn 01010011
CM → MC: 10 0100 mmmmm 0 0110 nnnnn 01010011
CM → AC: 10 0101 mmmmm 0 0110 nnnnn 01010011

The value of a parameter can be read or written depending on the access mode with the request telegram 83 (↑ *2.1.5 Request for reading or writing a parameter*). Write access is not necessarily supported by every control unit.

The parameter value must be specified in the external value range. This value range is defined for each parameter and is described in the control unit associated basic information as well as shown in DcDesk 6. Any defined decimal places are taken into account by multiplying by powers of ten.

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**
	High byte	Low byte	High byte	Low byte	
Value	Parameter Number		Parameter Value		0 = Read Access 1 = Write Access

Table 14: Command 83 request for reading or writing a parameter

The control unit sends back the parameter number, the current parameter value and a return code using the response telegram 83 (↑ *3.4.7 Response of request for reading or writing a parameter*). The customer module can only transmit a new request telegram again if the response has been received of the foregoing request.

3.1.6 Request for execution of internal control unit functions

Command: 84

Data bytes: 1

Identifier:
CM → DC: 10 0000 mmmmm 0 0110 nnnnn 01010100
CM → GC: 10 0001 mmmmm 0 0110 nnnnn 01010100
CM → MC: 10 0100 mmmmm 0 0110 nnnnn 01010100
CM → AC: 10 0101 mmmmm 0 0110 nnnnn 01010100

The execution of an internal control unit function can be forced with the request telegram 84 (↑ *2.1.6 Request for execution of internal control unit functions*). The reset of the control unit (function code = 0), the storage of the parameter values in the ROM (function code = 1) and the reset of the current errors (function code = 2) are supported.

	byte 0
Value	Function Code

Table 15: Command 84 request for execution of internal control unit functions

The control unit sends back a return code as a success message with the response telegram 84 (↑ *3.4.8 Response of request for execution of internal control unit functions*).

3.2 EFI Control receive telegrams (CM → AC / DC)

Note: telegrams described in this chapter are not available in all control units for EFI Control. Availability of specific messages, parameter numbers, usage and internal limitation of received values are depending on the application and firmware version.

3.2.1 Set points and commands

Command: 70

Data bytes: 8

Identifier: CM → AC: 10 0101 mmmmm 0 0110 nnnnn 01000110

Timeout: 21980 *CMRxTel70Timeout*

Activation: 25980 *CMRxTel70On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Pre Injection Delivery Begin 22327 *PreInjDBBaseMap*		Pre Injection Fuel Quantity 22330 *PreInjFuelQBaseMap*		Pre-Pre Injection Delivery Begin 22307 *PrePreDBBaseMap*		Pre-Pre Injection Fuel Quantity 22310 *PrePreFuelQBaseMap*	

Table 16: Command 70 receiving injection timing set points

Command: 71

Data bytes: 8

Identifier: CM → AC: 10 0101 mmmmm 0 0110 nnnnn 01000111

Timeout: 21981 *CMRxTel71Timeout*

Activation: 25981 *CMRxTel71On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Post Injection Delivery Begin 22347 *PostInjDBBaseMap*		Post Injection Fuel Quantity 22350 *PostInjFuelQBaseMap*		Post-Post Injection Delivery Begin 22367 *PostPostDBBaseMap*		Post-Post Injection Fuel Quantity 22370 *PostPostFuelQBaseMap*	

Table 17: Command 71 receiving injection timing set points

Command: 72

Data bytes: 8

Identifier: CM → AC: 10 0101 mmmmm 0 0110 nnnnn 01001000

Timeout: 21982 *CMRxTel72Timeout*

Activation: 25982 *CMRxTel72On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	3rd Post Injection Delivery Begin 22387 *Post3DBBaseMap*		3rd Post Injection Fuel Quantity 22390 *Post3FuelQBaseMap*		4th Post Injection Delivery Begin 22407 *Post4DBBaseMap*		4th Post Injection Fuel Quantity 22410 *Post4FuelQBaseMap*	

Table 18: Command 72 receiving injection timing set points

Command: 73

Data bytes: 2

Identifier: CM → AC: 10 0101 mmmmm 0 0110 nnnnn 01001001

Timeout: 21983 *CMRxTel73Timeout*

Activation: 25983 *CMRxTel73On* = 1

	byte 0	**byte 1**
	High byte	Low byte
Value	Common Rail Pressure Set point 22002 *CR_PressSetpBaseMap*	

Table 19: Command 73 receiving common rail pressure set point

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Command: 74

Data bytes: 4

Identifier: CM → AC: 10 0101 mmmmm 0 0110 nnnnn 01001010

Timeout: 21984 *CMRxTel74Timeout*

Activation: 25984 *CMRxTel74On* = 1

		Byte 0	Byte 1	Byte 2	Byte 3
bit	**7**				
	6				
	5	4th Post Injection ON	4th Post CAN Delivery Begin ON	4th Post CAN Fuel Quantity ON	
	4	3rd Post Injection ON	3rd Post CAN Delivery Begin ON	3rd Post CAN Fuel Quantity ON	
	3	Post-Post Injection ON	Post-Post CAN Delivery Begin ON	Post-Post CAN Fuel Quantity ON	
	2	Post Injection ON	Post CAN Delivery Begin ON	Post CAN Fuel Quantity ON	Injection ENABLE
	1	Pre Injection ON	Pre CAN Delivery Begin ON	Pre CAN Fuel Quantity ON	
	0	Pre-Pre Injection ON	Pre-Pre CAN Delivery Begin ON	Pre-Pre CAN Fuel Quantity ON	Common Rail CAN pressure Setpoint ON

Table 20: Command 74 receiving injection commands

Command: 75

Data bytes: 6

Identifier: CM → AC: 10 0101 mmmmm 0 0110 nnnnn 01001011

Timeout: 21985 *CMRxTel75Timeout*

Activation: 25985 *CMRxTel75On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5
	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Fuel Quantity Setpoint 2350 *FuelQuantity*		-		-	

Table 21: Command 75 receiving injection timing set points in case Fuel Quantity is used

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5
	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	-		Main Injection Delivery Begin 32311 *DelBegBaseMap*		Main Injection Delivery Period 32300 *DeliveryPeriod*	

Table 22: Command 75 receiving injection timing set points in case Delivery Begin/Period are used

The Parameter numbers, parameter ranges and units are depending on the application and the firmware version. The following table is only an example. For further information, please refer to the corresponding control unit description or the application manual.

No.	Designation	External value range	Unit	Internal value range
22327	*PreInjDBBaseMap*	-359.99…359.99	°crank	-32767…32767
22330	*PreInjFuelQBaseMap*	0.0…100.0	%	0…65535
22307	*PrePreDBBaseMap*	-359.99…359.99	°crank	-32767…32767
22310	*PrePreFuelQBaseMap*	0.0…100.0	%	0…65535
22347	*PostInjDBBaseMap*	-359.99…359.99	°crank	-32767…32767
22350	*PostInjFuelQBaseMap*	0.0…100.0	%	0…65535
22367	*PostPostDBBaseMap*	-359.99…359.99	°crank	-32767…32767
22370	*PostPostFuelQBaseMap*	0.0…100.0	%	0…65535
22387	*Post3DBBaseMap*	-359.99…359.99	°crank	-32767…32767
22390	*Post3FuelQBaseMap*	0.0…100.0	%	0…65535
2240	*Post4DBBaseMap*	-359.99…359.99	°crank	-32767…32767
22410	*Post4FuelQBaseMap*	0.0…100.0	%	0…65535
22002	*CR_PressSetpBaseMap*	0.0…2000.0	bar	0…65535
2350	*FuelQuantity*	0.0…100.0	%	0…65535
32311	*DelBegBaseMap*	-359.99…359.99	°crank	-32767…32767
32300	*DeliveryPeriod*	-359.99…359.99	°crank	-32767…32767

Table 23: Value range example of parameters for EFI Control

3.2.2 Cylinder mask

Command: 79

Data bytes: 4 (single injection group) or 8 (double injection groups)

Identifier: CM → DC: 10 0000 mmmmm 0 0110 nnnnn 01001111
CM → AC: 10 0101 mmmmm 0 0110 nnnnn 01001111

Timeout: 21989 *CMRxTel79Timeout*

Activation: 25989 *CMRxTel79On* = 1

Single injection group:

		Byte 0	Byte 1	Byte 2	Byte 3
bit	7		Cyl. #24 ON	Cyl. #16 ON	Cyl. #08 ON
	6		Cyl. #23 ON	Cyl. #15 ON	Cyl. #07 ON
	5		Cyl. #22 ON	Cyl. #14 ON	Cyl. #06 ON
	4		Cyl. #21 ON	Cyl. #13 ON	Cyl. #05 ON
	3		Cyl. #20 ON	Cyl. #12 ON	Cyl. #04 ON
	2		Cyl. #19 ON	Cyl. #11 ON	Cyl. #03 ON
	1		Cyl. #18 ON	Cyl. #10 ON	Cyl. #02 ON
	0		Cyl. #17 ON	Cyl. #09 ON	Cyl. #01 ON

Table 24: Command 79 receiving cylinder mask for single injection group

Double injection groups:

Cylinders of first injection group: bytes 0-3

Cylinders of second injection group: bytes 4-7

		Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
bit	7				Cyl. #08 ON				Cyl. #08 ON
	6				Cyl. #07 ON				Cyl. #07 ON
	5				Cyl. #06 ON				Cyl. #06 ON
	4				Cyl. #05 ON				Cyl. #05 ON
	3			Cyl. #12 ON	Cyl. #04 ON			Cyl. #12 ON	Cyl. #04 ON
	2			Cyl. #11 ON	Cyl. #03 ON			Cyl. #11 ON	Cyl. #03 ON
	1			Cyl. #10 ON	Cyl. #02 ON			Cyl. #10 ON	Cyl. #02 ON
	0			Cyl. #09 ON	Cyl. #01 ON			Cyl. #09 ON	Cyl. #01 ON

Table 25: Command 79 receiving cylinder mask for double injection groups

If telegram 79 is active (25989 *CMRxTel79On* = 1), the CAN cylinder mask is activated and remains active as soon as a first Telegram 79 is received.

An active CAN cylinder mask is indicated by:

23989 *CylMaskCANOn* CAN cylinder mask active/inactive

The active CAN cylinder mask is displayed in:

23990 *CylMaskCAN*

CylMaskCAN16to1 Active CAN cylinder mask (cylinder 1-16)

23991 *CylMaskCAN20to17*

CylMaskCAN24to17 Active CAN cylinder mask (cylinder 17-20 or cylinder 17-24)

23992 *CylMaskCANCoAmp* Active CAN cylinder mask for second injection group

3.3 E-motor control receive telegrams (CM → MC)

3.3.1 Torque set point and commands

Command: 90

Data bytes: 8

Identifier: CM → MC: 10 0100 mmmmm 0 0110 nnnnn 01011010

Timeout: 50 ms

Activation: 4490 *ExternalControlOn* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	External Torque Set Point 2505 *TorqueSetpExt* 0…32767 = 0.0…200.0 Nm		*External commands*				*Telegram counter*	*Telegram Checksum*

Table 26: Command 90 receiving torque set point and commands from external controller

		External commands	
		High byte	**Low byte**
bit	**7**	2490 *ExtCtrlSystemRelease* System release granted, release of the torque specification	
	6	2491 *ExtCtrlBackOrForward* Direction of rotation: Backward or Forward request	
	5	2492 *ExtCtrlShutDown* System shut down request	
	4	2493 *ExtCtrlBrakeOn* Brake activated	
	3	2494 *ExtCtrlBrakingOn* Motor brake active	
	2		2610 *RecuperationLevel* Recuperation level, setting value corresponds to field index from: 0..5
	1		
	0		

Table 27: Command 90 byte 2 & 3 external commands

Command: 91

Data bytes: 1

Identifier: CM → MC: 10 0100 mmmmm 0 0110 nnnnn 01011011

Activation: 5290 *ImmobilizerType* = 1

		Byte 0
bit	7	
	6	
	5	
	4	
	3	
	2	
	1	
	0	3290 *ImmobilizerRelease*

Table 28: Command 91 receiving immobilizer release

3.3.2 Pedal generator application

Command: 112

Data bytes: 8

Identifier: CM → MC: 10 0100 mmmmm 0 0110 nnnnn 01110000

Timeout: 50 ms

Activation: 4200 *PedalTorqueSensorTyp* = 9

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Torque 3454 *PedalGenTorqueRaw* 0…64255 = -400.0…403.1875 Nm limited in range 0…200.0 Nm		Pedal Speed 3453 *PedalGenSpeedRaw* 0…64255 = -400.0…403.1875 1/min limited in range 0…403.1875 1/min				*Telegram counter*	*Telegram Checksum*

Table 29: Command 112 receiving drive values

Command: 113

Data bytes: 8

Identifier: CM → MC: 10 0100 mmmmm 0 0110 nnnnn 01110001

Timeout: 50 ms

Activation: 4200 *PedalTorqueSensorTyp*= 9

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Transmission Ratio 3401 *TransmissionRatio* 0…64255 = -32.000…32.255 limited in range 0.000…5.000		Actual Current 3450 *PedalGenActCurrent* 0…64255 = -60.00…68.51 A, limited in range -60.00…60.00 A				*Telegram counter*	*Telegram Checksum*

Table 30: Command 113 receiving info values

Command: 114

Data bytes: 8

Identifier: CM → MC: 10 0100 mmmmm 0 0110 nnnnn 01110010

Activation: 4200 *PedalTorqueSensorTyp*= 9

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Bits 0-13 3040 *ErrPedalGenerator1* Bits 14-15 3041 *ErrPedalGenerator2*		Bits 0-11 3041 *ErrPedalGenerator2* Bits 12-15 3042 *ErrPedalGenerator3*		Bits 0-9 3042 *ErrPedalGenerator3* Bits 10-15 3043 *ErrPedalGenerator4*			Operating Mode 3455 *PedalGen OperateMode*

Table 31: Command 114 receiving diagnostics values

3.4 Send telegrams (DC/GC/MC/AC → CM)

A control device of the type speed governor (DC), THESEUS (GC), e-motor control (MC) or auxiliary device (AC) for example PHLOX or KRONOS 20 can send the following telegrams to the customer module.

3.4.1 Sensors

A maximum of four telegrams with a total of 16 pre-defined sensor values may be sent to the customer module.

Each sensor value is sent within the internal value range (↑ *4.1 Value range of sensors*). In place of sensor values not available in the specific control device, the value 0 is transmitted.

Command: 20

Data bytes: 4, 6 or 8

Identifier: DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00010100
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00010100

Send rate: 21960 *CMTxTel20SendRate*

Activation: 25960 *CMTxTel20On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Set Point Adjuster 1 2900 *Setpoint1Extern*		Set Point Adjuster 2 2901 *Setpoint2Extern*		Relative Power 3232 *RelativePower*		Relative Power Set Point 3231 *RelativePowerSetp*	

Table 32: Command 20 sensors with 8 data bytes

Special structure for the auxiliary device (AC) of type PHLOX

	byte 0	**byte 1**	**byte 2**	**byte 3**
	High byte	Low byte	High byte	Low byte
Value	Actual Power 2918 *MeasuredPower*		Manifold Pressure 2912 *ManifoldPressure*	

Table 33: Command 20 sensors with 4 data bytes (PHLOX)

Special structure for the auxiliary device (AC) of type KRONOS 20 or E-LES LC

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**
	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Actual Power 2918 *MeasuredPower*		λ Probe Voltage 2915 *LambdaProbe*		Methane Content 2916 *CH4Content*	

Table 34: Command 20 sensors with 6 data bytes (KRONOS 20 or E-LES LC)

Command: 21

Data bytes: 8

Identifier: DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00010101
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00010101
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00010101

Send rate: 21961 *CMTxTel21SendRate*

Activation: 25961 *CMTxTel21On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Boost Pressure or Manifold Pressure		Oil Pressure		Ambient Pressure		Coolant Pressure	

Table 35: Command 21 sensors

Command: 22

Data bytes: 8

Identifier: DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00010110
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00010110
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00010110

Send rate: 21962 *CMTxTel22SendRate*

Activation: 25962 *CMTxTel22On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Coolant Temperature		Charge Air Temp. or Manifold Temperature		Oil Temperature		Exhaust Temperature	

Table 36: Command 22 sensors

Command: 23

Data bytes: 2

Identifier: DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00010111

Send rate: 21963 *CMTxTel23SendRate*

Activation: 25963 *CMTxTel23On* = 1

	byte 0	byte 1
	High byte	Low byte
Value	Fuel / Gas Temperature	

Table 37: Command 23 sensors

Command: 24

Data bytes: 2, 4, 6, or 8, depending on number of cylinders

Identifier: DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00011000
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00011000
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00011000

Send rate: 21993 *CMTxTel24SendRate*

Activation: 25993 *CMTxTel24On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Exhaust temperature cyl. #01		Exhaust temperature cyl. #02		Exhaust temperature cyl. #03		Exhaust temperature cyl. #04	

Table 38: Command 24 sensors

Command: 25

Data bytes: 2, 4, 6, or 8, depending on number of cylinders

Identifier: DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00011001
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00011001
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00011001

Send rate: 21994 *CMTxTel25SendRate*

Activation: 25994 *CMTxTel25On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Exhaust temperature cyl. #05		Exhaust temperature cyl. #06		Exhaust temperature cyl. #07		Exhaust temperature cyl. #08	

Table 39: Command 25 sensors

Command: 26

Data bytes: 2, 4, 6, or 8, depending on number of cylinders

Identifier: DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00011010
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00011010
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00011010

Send rate: 21995 *CMTxTel26SendRate*

Activation: 25995 *CMTxTel26On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Exhaust temperature cyl. #09		Exhaust temperature cyl. #10		Exhaust temperature cyl. #11		Exhaust temperature cyl. #12	

Table 40: Command 26 sensors

Command: 27

Data bytes: 2, 4, 6, or 8, depending on number of cylinders

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00011011
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00011011
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00011011

Send rate: 21996 *CMTxTel27SendRate*

Activation: 25996 *CMTxTel27On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Exhaust temperature cyl. #13		Exhaust temperature cyl. #14		Exhaust temperature cyl. #15		Exhaust temperature cyl. #16	

Table 41: Command 27 sensors

Command: 28

Data bytes: 2, 4, 6, or 8, depending on number of cylinders

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00011100
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00011100
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00011100

Send rate: 21997 *CMTxTel28SendRate*

Activation: 25997 *CMTxTel28On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Exhaust temperature cyl. #17		Exhaust temperature cyl. #18		Exhaust temperature cyl. #19		Exhaust temperature cyl. #20	

Table 42: Command 28 sensors

Command: 29

Data bytes: 2, 4, 6, or 8, depending on number of cylinders

Identifier: DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00011101
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00011101
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00011101

Send rate: 21998 *CMTxTel29SendRate*

Activation: 25998 *CMTxTel29On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Exhaust temperature cyl. #21		Exhaust temperature cyl. #22		Exhaust temperature cyl. #23		Exhaust temperature cyl. #24	

Table 43: Command 29 sensors

3.4.2 Rotational speed and fuel quantity

Command: 30

Data bytes: 6 or 8

Identifier: DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00011110
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00011110
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00011110

Send rate: 21964 *CMTxTel30SendRate*

Activation: 25964 *CMTxTel30On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Actual Speed 2000 *Speed*		Speed Set Point 2031 *SpeedSetp*		Fuel Quantity 2350 *FuelQuantity*		Actual Position 2300 *ActPos*	

Table 44: Command 30 rotational speed and fuel quantity

All values are sent within the internal value range (↑ *4.2 Value range of measured and indicated values*).

The position of actuators is sent only by conventional speed governors, solenoid valve-controlled systems and THESEUS transmit only 6 bytes.

If other measurement values are not available in the specific control device, the value 0 is transmitted.

3.4.3 Alarm and engine state

Command: 40

Data bytes: 1 or 2

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00101000
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00101000
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 00101000
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00101000

Send rate: only if the data bytes change or on request (↑ *2.1.4 Request of a send telegram*)

Activation: 25965 *CMTxTel40On* = 1

		byte 0	byte 1
bit	**7**		
	6		PHLOX: 3807 *IgnitionActive* E-Motor Control: Internal release from slave
	5		PHLOX: 3908 *IgnitionEnabled* E-Motor Control: Internal release
	4		3806 *EngineReleased* PHLOX: 3806 *IgnitionReleased* KRONOS 20 / E-LES LC / E-Motor Control: 3806 *SystemReleased*
	3		3805 *EngineRunning* E-Motor Control: 3805 *SystemRunning*
	2		3804 *EngineStarting* E-Motor Control: -
	1	3801 *CommonAlarm*	3803 *EngineStopped* E-Motor Control: 3803 *SystemStopped*
	0	3800 *EmergencyAlarm*	3802 *EngineStopRequest* PHLOX: 3802 *IgnitionStopRequest* KRONOS 20 / E-LES LC / E-Motor Control: 3802 *SystemStopRequest*

Table 45: Command 40 alarm and engine state

The speed governor (DC), the e-motor control (MC) and the auxiliary device (AC) transmit both bytes. THESEUS (GC) transmits the second byte only if working with the integrated engine speed governor.

3.4.4 Current errors

After connection is established by way of telegram 97, all activated error telegrams with the current state of the corresponding error bits are sent once (↑ *2.2.1 Current errors*). Subsequently they are transmitted only if at least one error bit has changed since the last transmission.

The telegrams 141 to 148 are used by control units which have for the current error indication an error state. The telegrams 41 to 45 are used when the control unit displays the current error only as a bit value.

The meaning of the error bits is described in the manuals of the respective control device. In place on non-existing error numbers a 0 is sent.

Command: 41

Data bytes: 8

Identifier: DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00101001
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00101001
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00101001

Send rate: only if the data bytes change or on request (↑ *2.1.4 Request of a send telegram*)

Activation: 25966 *CMTxTel41On* = 1

		byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
bit	7	-	3087	3079	3071	3063	3055	3047	3039
	6	3094	3086	3078	3070	3062	3054	3046	3038
	5	3093	3085	3077	3069	3061	3053	3045	3037
	4	3092	3084	3076	3068	3060	3052	3044	3036
	3	3091	3083	3075	3067	3059	3051	3043	3035
	2	3090	3082	3074	3066	3058	3050	3042	3034
	1	3089	3081	3073	3065	3057	3049	3041	3033
	0	3088	3080	3072	3064	3056	3048	3040	3032

Table 46: Command 41 current errors

Command: 42

Data bytes: 8

Identifier: DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00101010
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00101010
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00101010

Send rate: only if the data bytes change or on request (↑ *2.1.4 Request of a send telegram*)

Activation: 25967 *CMTxTel42On* = 1

		byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
bit	7	3031	3023	3015	3007	13095	13087	13079	13071
	6	3030	3022	3014	3006	13094	13086	13078	13070
	5	3029	3021	3013	3005	13093	13085	13077	13069
	4	3028	3020	3012	3004	13092	13084	13076	13068
	3	3027	3019	3011	3003	13091	13083	13075	13067
	2	3026	3018	3010	3002	13090	13082	13074	13066
	1	3025	3017	3009	3001	13089	13081	13073	13065
	0	3024	3016	3008	3000	13088	13080	13072	13064

Table 47: Command 42 current errors

Command: 43

Data bytes: 8

Identifier: DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00101011
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00101011
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00101011

Send rate: only if the data bytes change or on request (↑ *2.1.4 Request of a send telegram*)

Activation: 25968 *CMTxTel43On* = 1

This telegram is sent only if the control device has defined error numbers in the range 13000 to 13095.

		byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
bit	7	13063	13055	13047	13039	13031	13023	13015	13007
	6	13062	13054	13046	13038	13030	13022	13014	13006
	5	13061	13053	13045	13037	13029	13021	13013	13005
	4	13060	13052	13044	13036	13028	13020	13012	13004
	3	13059	13051	13043	13035	13027	13019	13011	13003
	2	13058	13050	13042	13034	13026	13018	13010	13002
	1	13057	13049	13041	13033	13025	13017	13009	13001
	0	13056	13048	13040	13032	13024	13016	13008	13000

Table 48: Command 43 current errors

Command: 44

Data bytes: 8

Identifier: DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00101100
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00101100
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00101100

Send rate: only if the data bytes change or on request (↑ *2.1.4 Request of a send telegram*)

Activation: 25969 *CMTxTel44On* = 1

This telegram is sent only if the control device has defined error numbers in the range 23000 to 23095.

		byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
bit	7	23095	23087	23079	23071	23063	23055	23047	23039
	6	23094	23086	23078	23070	23062	23054	23046	23038
	5	23093	23085	23077	23069	23061	23053	23045	23037
	4	23092	23084	23076	23068	23060	23052	23044	23036
	3	23091	23083	23075	23067	23059	23051	23043	23035
	2	23090	23082	23074	23066	23058	23050	23042	23034
	1	23089	23081	23073	23065	23057	23049	23041	23033
	0	23088	23080	23072	23064	23056	23048	23040	23032

Table 49: Command 44 current errors

Command: 45

Data bytes: 8

Identifier: DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00101101
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00101101
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00101101

Send rate: only if the data bytes change or on request (↑ *2.1.4 Request of a send telegram*)

Activation: 25970 *CMTxTel45On* = 1

This telegram is sent only if the control device has defined error numbers in the range 23000 to 23095.

		byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
bit	7	23031	23023	23015	23007	-	-	-	-
	6	23030	23022	23014	23006	-	-	-	-
	5	23029	23021	23013	23005	-	-	-	-
	4	23028	23020	23012	23004	-	-	-	-
	3	23027	23019	23011	23003	-	-	-	-
	2	23026	23018	23010	23002	-	-	-	-
	1	23025	23017	23009	23001	-	-	-	-
	0	23024	23016	23008	23000	-	-	-	-

Table 50: Command 45 current errors

Command: 141

Data bytes: 8

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 10001101
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 10001101
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 10001101
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10001101

Send rate: only if the data bytes change or on request (↑ *2.1.4 Request of a send telegram*)

Activation: 25966 *CMTxTel141On* = 1

		byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
bit	**7**	3031	3023	3015	3007	3063	3055	3047	3039
	6	3030	3022	3014	3006	3062	3054	3046	3038
	5	3029	3021	3013	3005	3061	3053	3045	3037
	4	3028	3020	3012	3004	3060	3052	3044	3036
	3	3027	3019	3011	3003	3059	3051	3043	3035
	2	3026	3018	3010	3002	3058	3050	3042	3034
	1	3025	3017	3009	3001	3057	3049	3041	3033
	0	3024	3016	3008	3000	3056	3048	3040	3032

Table 51: Command 141 current errors

Command: 142

Data bytes: 8

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 10001110
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 10001110
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 10001110
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10001110

Send rate: only if the data bytes change or on request (↑ *2.1.4 Request of a send telegram*)

Activation: 25967 *CMTxTel142On* = 1

		byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
bit	7	3095	3087	3079	3071	13027	13019	13011	13003
	6	3094	3086	3078	3070	13026	13018	13010	13002
	5	3093	3085	3077	3069	13025	13017	13009	13001
	4	3092	3084	3076	3068	13024	13016	13008	13000
	3	3091	3083	3075	3067	13023	13015	13007	3099
	2	3090	3082	3074	3066	13022	13014	13006	3098
	1	3089	3081	3073	3065	13021	13013	13005	3097
	0	3088	3080	3072	3064	13020	13012	13004	3096

Table 52: Command 142 current errors

Command: 143

Data bytes: 8

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 10001111
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 10001111
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 10001111
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10001111

Send rate: only if the data bytes change or on request (↑ *2.1.4 Request of a send telegram*)

Activation: 25968 *CMTxTel143On* = 1

This telegram is sent only if the control device has defined error numbers greater than 13027.

		byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
bit	7	13059	13051	13043	13035	13091	13083	13075	13067
	6	13058	13050	13042	13034	13090	13082	13074	13066
	5	13057	13049	13041	13033	13089	13081	13073	13065
	4	13056	13048	13040	13032	13088	13080	13072	13064
	3	13055	13047	13039	13031	13087	13079	13071	13063
	2	13054	13046	13038	13030	13086	13078	13070	13062
	1	13053	13045	13037	13029	13085	13077	13069	13061
	0	13052	13044	13036	13028	13084	13076	13068	13060

Table 53: Command 143 current errors

Command: 144

Data bytes: 8

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 10010000
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 10010000
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 10010000
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10010000

Send rate: only if the data bytes change or on request (↑ *2.1.4 Request of a send telegram*)

Activation: 25969 *CMTxTel144On* = 1

This telegram is sent only if the control device has defined error numbers greater than 13091.

		byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
bit	7	23023	23015	23007	13099	23055	23047	23039	23031
	6	23022	23014	23006	13098	23054	23046	23038	23030
	5	23021	23013	23005	13097	23053	23045	23037	23029
	4	23020	23012	23004	13096	23052	23044	23036	23028
	3	23019	23011	23003	13095	23051	23043	23035	23027
	2	23018	23010	23002	13094	23050	23042	23034	23026
	1	23017	23009	23001	13093	23049	23041	23033	23025
	0	23016	23008	23000	13092	23048	23040	23032	23024

Table 54: Command 144 current errors

Command: 145

Data bytes: 8

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 10010001
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 10010001
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 10010001
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10010001

Send rate: only if the data bytes change or on request (↑ *2.1.4 Request of a send telegram*)

Activation: 25970 *CMTxTel145On* = 1

This telegram is sent only if the control device has defined error numbers greater than 23055.

		byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
bit	7	23087	23079	23071	23063	33019	33011	33003	23095
	6	23086	23078	23070	23062	33018	33010	33002	23094
	5	23085	23077	23069	23061	33017	33009	33001	23093
	4	23084	23076	23068	23060	33016	33008	33000	23092
	3	23083	23075	23067	23059	33015	33007	23099	23091
	2	23082	23074	23066	23058	33014	33006	23098	23090
	1	23081	23073	23065	23057	33013	33005	23097	23089
	0	23080	23072	23064	23056	33012	33004	23096	23088

Table 55: Command 145 current errors

Command: 146

Data bytes: 8

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 10010010
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 10010010
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 10010010
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10010010

Send rate: only if the data bytes change or on request (↑ *2.1.4 Request of a send telegram*)

Activation: 25990 *CMTxTel146On* = 1

This telegram is sent only if the control device has defined error numbers greater than 33019.

		byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
bit	7	33051	33043	33035	33027	33083	33075	33067	33059
	6	33050	33042	33034	33026	33082	33074	33066	33058
	5	33049	33041	33033	33025	33081	33073	33065	33057
	4	33048	33040	33032	33024	33080	33072	33064	33056
	3	33047	33039	33031	33023	33079	33071	33063	33055
	2	33046	33038	33030	33022	33078	33070	33062	33054
	1	33045	33037	33029	33021	33077	33069	33061	33053
	0	33044	33036	33028	33020	33076	33068	33060	33052

Table 56: Command 146 current errors

Command: 147

Data bytes: 8

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 10010011
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 10010011
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 10010011
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10010011

Send rate: only if the data bytes change or on request (↑ *2.1.4 Request of a send telegram*)

Activation: 25991 *CMTxTel147On* = 1

This telegram is sent only if the control device has defined error numbers greater than 33083.

		byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
bit	7	43015	43007	33099	33091	43047	43039	43031	43023
	6	43014	43006	33098	33090	43046	43038	43030	43022
	5	43013	43005	33097	33089	43045	43037	43029	43021
	4	43012	43004	33096	33088	43044	43036	43028	43020
	3	43011	43003	33095	33087	43043	43035	43027	43019
	2	43010	43002	33094	33086	43042	43034	43026	43018
	1	43009	43001	33093	33085	43041	43033	43025	43017
	0	43008	43000	33092	33084	43040	43032	43024	43016

Table 57: Command 147 current errors

Command: 148

Data bytes: 8

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 10010100
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 10010100
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 10010100
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10010100

Send rate: only if the data bytes change or on request (↑ *2.1.4 Request of a send telegram*)

Activation: 25992 *CMTxTel148On* = 1

This telegram is sent only if the control device has defined error numbers greater than 43047.

		byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
bit	7	43079	43071	43063	43055	53011	53003	43095	43087
	6	43078	43070	43062	43054	53010	53002	43094	43086
	5	43077	43069	43061	43053	53009	53001	43093	43085
	4	43076	43068	43060	43052	53008	53000	43092	43084
	3	43075	43067	43059	43051	53007	43099	43091	43083
	2	43074	43066	43058	43050	53006	43098	43090	43082
	1	43073	43065	43057	43049	53005	43097	43089	43081
	0	43072	43064	43056	43048	53004	43096	43088	43080

Table 58: Command 148 current errors

3.4.5 Configurable telegrams

Configurable telegrams send the value of the parameters entered in 29800 *CMTel50-ParamSet(0)* to 29813 *CMTel52ParamSet(3)* or to 29843 *CMTel58ParamSet(3)* (↑ *2.2.2 Freely configurable telegrams*).

All values are sent in the external value range. This range is defined for each parameter and is described in the basic information for the specific control device and is shown in DcDesk 6. If places after the decimal point have been defined, for the transmission these are solved by multiplication with powers of ten.

Command: 50

Data bytes: 2, 4, 6 or 8

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00110010
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00110010
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 00110010
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00110010

Send rate: 21971 *CMTxTel50SendRate*

Activation: 25971 *CMTxTel50On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Value of 29800 *CMTel50ParamSet(0)*		Value of 29801 *CMTel50ParamSet(1)*		Value of 29802 *CMTel50ParamSet(2)*		Value of 29803 *CMTel50ParamSet(3)*	

Table 59: Command 50 configurable telegram

Command: 51

Data bytes: 2, 4, 6 or 8

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00110011
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00110011
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 00110011
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00110011

Send rate: 21972 *CMTxTel51SendRate*

Activation: 25972 *CMTxTel51On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Value of 29805 *CMTel51ParamSet(0)*		Value of 29806 *CMTel51ParamSet(1)*		Value of 29807 *CMTel51ParamSet(2)*		Value of 29808 *CMTel51ParamSet(3)*	

Table 60: Command 51 configurable telegram

Command: 52

Data bytes: 2, 4, 6 or 8

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00110100
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00110100
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 00110100
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00110100

Send rate: 21973 *CMTxTel52SendRate*

Activation: 25973 *CMTxTel52On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Value of 29810 *CMTel52ParamSet(0)*		Value of 29811 *CMTel52ParamSet(1)*		Value of 29812 *CMTel52ParamSet(2)*		Value of 29813 *CMTel52ParamSet(3)*	

Table 61: Command 52 configurable telegram

Command: 53

Data bytes: 2, 4, 6 or 8

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00110101
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00110101
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 00110101
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00110101

Send rate: 21974 *CMTxTel53SendRate*

Activation: 25974 *CMTxTel53On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Value of 29815 *CMTel53ParamSet(0)*		Value of 29816 *CMTel53ParamSet(1)*		Value of 29817 *CMTel53ParamSet(2)*		Value of 29818 *CMTel53ParamSet(3)*	

Table 62: Command 53 configurable telegram

Command: 54

Data bytes: 2, 4, 6 or 8

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00110110
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00110110
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 00110110
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00110110

Send rate: 21975 *CMTxTel54SendRate*

Activation: 25975 *CMTxTel54On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Value of 29820 *CMTel54ParamSet(0)*		Value of 29821 *CMTel54ParamSet(1)*		Value of 29822 *CMTel54ParamSet(2)*		Value of 29823 *CMTel54ParamSet(3)*	

Table 63: Command 54 configurable telegram

Command: 55

Data bytes: 2, 4, 6 or 8

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00110111
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00110111
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 00110111
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00110111

Send rate: 21976 *CMTxTel55SendRate*

Activation: 25976 *CMTxTel55On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Value of 29825 *CMTel55ParamSet(0)*		Value of 29826 *CMTel55ParamSet(1)*		Value of 29827 *CMTel55ParamSet(2)*		Value of 29828 *CMTel55ParamSet(3)*	

Table 64: Command 55 configurable telegram

Command: 56

Data bytes: 2, 4, 6 or 8

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00111000
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00111000
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 00111000
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00111000

Send rate: 21977 *CMTxTel56SendRate*

Activation: 25977 *CMTxTel56On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Value of 29830 *CMTel56ParamSet(0)*		Value of 29831 *CMTel56ParamSet(1)*		Value of 29832 *CMTel56ParamSet(2)*		Value of 29833 *CMTel56ParamSet(3)*	

Table 65: Command 56 configurable telegram

Command: 57

Data bytes: 2, 4, 6 or 8

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00111001
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00111001
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 00111001
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00111001

Send rate: 21978 *CMTxTel57SendRate*

Activation: 25978 *CMTxTel57On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Value of 29835 *CMTel57ParamSet(0)*		Value of 29836 *CMTel57ParamSet(1)*		Value of 29837 *CMTel57ParamSet(2)*		Value of 29838 *CMTel57ParamSet(3)*	

Table 66: Command 57 configurable telegram

Command: 58

Data bytes: 2, 4, 6 or 8

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 00111010
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00111010
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 00111010
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 00111010

Send rate: 21979 *CMTxTel58SendRate*

Activation: 25979 *CMTxTel58On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Value of 29840 *CMTel58ParamSet(0)*		Value of 29841 *CMTel58ParamSet(1)*		Value of 29842 *CMTel58ParamSet(2)*		Value of 29843 *CMTel58ParamSet(3)*	

Table 67: Command 58 configurable telegram

3.4.6 Answer to request of parameter values

Only the parameters of the request telegram 80 (↑ *3.1.3 Requesting parameter values*) with an existing number and a level defined as not higher than 4 are accepted. The answer telegram 80 transmits the current values of these parameters.

All values are sent in the external value range. This range is defined for each parameter and in shown in the basic information for the specific control device and in DcDesk 6. If places after the decimal point have been defined, for the transmission these are solved by multiplication with powers of ten.

Command: 80

Data bytes: 2, 4, 6 or 8

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 01010000
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 01010000
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 01010000
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 01010000

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Value of requested Parameter No. 1		Value of requested Parameter No. 2		Value of requested Parameter No. 3		Value of requested Parameter No. 4	

Table 68: Command 80 answer to request of parameter values

3.4.7 Response of request for reading or writing a parameter

(↑ *3.1.5 Request for reading or writing a parameter*)

Command: 83

Data bytes: 5

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 01010011
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 01010011
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 01010011
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 01010011

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**
	High byte	Low byte	High byte	Low byte	
Value	Parameter Number		Parameter Value		Return Code

Table 69: Command 83 response of request for reading or writing a parameter

The current parameter value is transmitted in the external value range.

The return code can be:

- 0: OK
- 1: Not OK
- 3: Parameter is read-only
- 6: Parameter does not exist

3.4.8 Response of request for execution of internal control unit functions

(↑ *3.1.6 Request for execution of internal control unit functions*)

Command: 84

Data bytes: 1

Identifier:
DC → CM: 10 0110 mmmmm 0 0000 nnnnn 01010100
GC → CM: 10 0110 mmmmm 0 0001 nnnnn 01010100
MC → CM: 10 0110 mmmmm 0 0100 nnnnn 01010100
AC → CM: 10 0110 mmmmm 0 0101 nnnnn 01010100

	byte 0
Value	Return Code

Table 70: Command 84 response of request for execution of internal control unit functions

The return code can be:

- 0: OK
- 1: Not OK

3.5 Theseus / XIOSGenSet / XIOSCHP send telegrams (GC → CM)

All values are sent within the internal value range (↑ *4.2 Value range of measured and indicated values*).

3.5.1 Bus bar frequencies

Command: 60

Data bytes: 6

Identifier: GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00111100

Send rate: 21980 *CMTxTel60SendRate*

Activation: 25980 *CMTxTel60On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5
	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	12001 *FrequencyNet_L1 / FrequencyBus_L1*		12002 *FrequencyNet_L2 / FrequencyBus_L2*		12003 *FrequencyNet_L3 / FrequencyBus_L3*	

Table 71: Command 60 bus bar frequencies

3.5.2 Generator frequencies

Command: 61

Data bytes: 6

Identifier: GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00111101

Send rate: 21981 *CMTxTel61SendRate*

Activation: 25981 *CMTxTel61On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5
	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	12011 *FrequencyGeneratorL1 / FrequencyGen_L1*		12012 *FrequencyGeneratorL2 / FrequencyGen_L2*		12013 *FrequencyGeneratorL3 / FrequencyGen_L2*	

Table 72: Command 61 generator frequencies

3.5.3 Bus bar voltages

Command: 62

Data bytes: 6

Identifier: GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00111110

Send rate: 21982 *CMTxTel62SendRate*

Activation: 25982 *CMTxTel62On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5
	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	12107 *VoltageBusPrim_1_2 / VoltBusPrimary_1_2*		12108 *VoltageBusPrim_2_3 / VoltBusPrimary_2_3*		12109 *VoltageBusPrim_3_1 / VoltBusPrimary_3_1*	

Table 73: Command 62 bus bar voltages

3.5.4 Generator voltages

Command: 63

Data bytes: 6

Identifier: GC → CM: 10 0110 mmmmm 0 0001 nnnnn 00111111

Send rate: 21983 *CMTxTel63SendRate*

Activation: 25983 *CMTxTel63On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5
	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	12127 *VoltageGenPrim_1_2 / VoltGenPrimary_1_2*		12128 *VoltageGenPrim_2_3 / VoltGenPrimary_2_3*		12129 *VoltageGenPrim_3_1 / VoltGenPrimary_3_1*	

Table 74: Command 63 generator voltages

3.5.5 Primary phase currents

Command: 64

Data bytes: 6

Identifier: GC → CM: 10 0110 mmmmm 0 0001 nnnnn 01000000

Send rate: 21984 *CMTxTel64SendRate*

Activation: 25984 *CMTxTel64On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5
	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	12147 *CurrentPrim_L1 / CurrentPrimary_L1*		12148 *CurrentPrim_L2 / CurrentPrimary_L2*		12149 *CurrentPrim_L3 / CurrentPrimary_L3*	

Table 75: Command 64 primary phase currents

3.5.6 Power values

Command: 65

Data bytes: 8

Identifier: GC → CM: 10 0110 mmmmm 0 0001 nnnnn 01000001

Send rate: 21985 *CMTxTel65SendRate*

Activation: 25985 *CMTxTel65On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	12208 *PowerPrim / ActivePowerPrimary*		12209 *PowerReactivePrim / ReactivePowerPrimary*		12210 *PowerApparentPrim / ApparentPowerPrimary*		12203 *cosPhi*	

Table 76: Command 65 power values

3.5.7 Energy meter for produced active power

Command: 66

Data bytes: 6

Identifier: GC → CM: 10 0110 mmmmm 0 0001 nnnnn 01000010

Send rate: 21986 *CMTxTel66SendRate*

Activation: 25986 *CMTxTel66On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5
	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13700 *Produced-Power* [GWh]		13701 *Produced-Power* [MWh]		13702 *Produced-Power* [kWh]	

Table 77: Command 66 energy meter for produced active power

3.5.8 Energy meter for produced reactive power

Command: 67

Data bytes: 6

Identifier: GC → CM: 10 0110 mmmmm 0 0001 nnnnn 01000011

Send rate: 21987 *CMTxTel67SendRate*

Activation: 25987 *CMTxTel67On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5
	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13704 *Produced-PowerReac* [GWh]		13705 *Produced-PowerReac* [MWh]		13706 *Produced-PowerReac* [kWh]	

Table 78: Command 67 energy meter for produced reactive power

3.5.9 Energy meter for consumed active power

Command: 68

Data bytes: 6

Identifier: GC → CM: 10 0110 mmmmm 0 0001 nnnnn 01000100

Send rate: 21988 *CMTxTel68SendRate*

Activation: 25988 *CMTxTel68On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5
	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13710 *Consumed-Power* [GWh]		13711 *Consumed-Power* [MWh]		13712 *Consumed-Power* [kWh]	

Table 79: Command 68 energy meter for consumed active power

3.5.10 Energy meter for consumed reactive power

Command: 69

Data bytes: 6

Identifier: GC → CM: 10 0110 mmmmm 0 0001 nnnnn 01000101

Send rate: 21989 *CMTxTel69SendRate*

Activation: 25989 *CMTxTel69On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5
	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13714 *Consumed-PowerReac* [GWh]		13715 *Consumed-PowerReac* [MWh]		13716 *Consumed-PowerReac* [kWh]	

Table 80: Command 69 energy meter for consumed reactive power

3.6 PHLOX send telegrams (AC → CM)

All values are sent within the internal value range (↑ *4.2 Value range of measured and indicated values*).

3.6.1 Ignition basic data

Command: 160

Data bytes: 4 or 6

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10100000

Send rate: 21980 *CMTxTel160SendRate*

Activation: 25980 *CMTxTel160On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**
	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	Actual speed 2000 *Speed*		Ignition timing w/o cylinder corrections 3910 *ActiveIgnitionTiming*		Ignition energy w/o cylinder corrections 3940 *CommonIgnEnergySetp*	

Table 81: Command 160 ignition basic data for PHLOX I & II

	byte 0	**byte 1**	**byte 2**	**byte 3**
	High byte	Low byte	High byte	Low byte
Value	Actual speed 2000 *Speed*		Ignition timing w/o cylinder corrections 3910 *ActiveIgnitionTiming*	

Table 82: Command 160 ignition basic data for PHLOX III

3.6.2 Cylinder specific ignition angle

Command: 161

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10100001

Send rate: 21981 *CMTel161-164SendRate* or
21981 *CMTel161-168SendRate*

Activation: 25981 *CMTxTel161-164On* = 1 or
25981 *CMTxTel161-168On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13550 *IgnitionAngle1*		13551 *IgnitionAngle2*		13552 *IgnitionAngle3*		13553 *IgnitionAngle4*	

Table 83: Command 161 cylinder specific ignition angle

Command: 162

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10100010

Send rate: 21981 *CMTel161-164SendRate* or
21981 *CMTel161-168SendRate*

Activation: 25981 *CMTxTel161-164On* = 1 or
25981 *CMTxTel161-168On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13554 *IgnitionAngle5*		13555 *IgnitionAngle6*		13556 *IgnitionAngle7*		13557 *IgnitionAngle8*	

Table 84: Command 162 cylinder specific ignition angle

Command: 163

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10100011

Send rate: 21981 *CMTel161-164SendRate* or
21981 *CMTel161-168SendRate*

Activation: 25981 *CMTxTel161-164On* = 1 or
25981 *CMTxTel161-168On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13558 *IgnitionAngle9*		13559 *IgnitionAngle10*		13560 *IgnitionAngle11*		13561 *IgnitionAngle12*	

Table 85: Command 163 cylinder specific ignition angle

Command: 164

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10100100

Send rate: 21981 *CMTel161-164SendRate* or
21981 *CMTel161-168SendRate*

Activation: 25981 *CMTxTel161-164On* = 1 or
25981 *CMTxTel161-168On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13562 *Ignition-Angle13*		13563 *Ignition-Angle14*		13564 *Ignition-Angle15*		13565 *Ignition-Angle16*	

Table 86: Command 164 cylinder specific ignition angle

Command: 165

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10100101

Send rate: 21981 *CMTel161-168SendRate*

Activation: 25981 *CMTxTel161-168On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13566 *IgnitionAngle17*		13567 *IgnitionAngle18*		13568 *IgnitionAngle19*		13569 *IgnitionAngle20*	

Table 87: Command 165 cylinder specific ignition angle

Command: 166

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10100110

Send rate: 21981 *CMTel161-168SendRate*

Activation: 25981 *CMTxTel161-168On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13570 *IgnitionAngle21*		13571 *IgnitionAngle22*		13572 *IgnitionAngle23*		13573 *IgnitionAngle24*	

Table 88: Command 166 cylinder specific ignition angle

Command: 167

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10100111

Send rate: 21981 *CMTel161-168SendRate*

Activation: 25981 *CMTxTel161-168On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13574 *IgnitionAngle25*		13575 *IgnitionAngle26*		13576 *IgnitionAngle27*		13577 *IgnitionAngle28*	

Table 89: Command 167 cylinder specific ignition angle

Command: 168

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10101000

Send rate: 21981 *CMTel161-168SendRate*

Activation: 25981 *CMTxTel161-168On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13578 *IgnitionAngle29*		13579 *IgnitionAngle30*		13580 *IgnitionAngle31*		13581 *IgnitionAngle32*	

Table 90: Command 168 cylinder specific ignition angle

3.6.3 Cylinder specific ignition energy (not relevant for PHLOX III)

Command: 169

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10101001

Send rate: 21982 *CMTel169-172SendRate* or
21982 *CMTel169-176SendRate*

Activation: 25982 *CMTxTel169-172On* = 1 or
25982 *CMTxTel169-176On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13600 *MeasIgn-Energy1*		13601 *MeasIgn-Energy2*		13602 *MeasIgn-Energy3*		13603 *MeasIgn-Energy4*	

Table 91: Command 169 cylinder specific ignition energy

Command: 170

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10101010

Send rate: 21982 *CMTel169-172SendRate* or
21982 *CMTel169-176SendRate*

Activation: 25982 *CMTxTel169-172On* = 1 or
25982 *CMTxTel169-176On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13604 *MeasIgn-Energy5*		13605 *MeasIgn-Energy6*		13606 *MeasIgn-Energy7*		13607 *MeasIgn-Energy8*	

Table 92: Command 170 cylinder specific ignition energy

Command: 171

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10101011

Send rate: 21982 *CMTel169-172SendRate* or
21982 *CMTel169-176SendRate*

Activation: 25982 *CMTxTel169-172On* = 1 or
25982 *CMTxTel169-176On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13608 *MeasIgn-Energy9*		13609 *MeasIgn-Energy10*		13610 *MeasIgn-Energy11*		13611 *MeasIgn-Energy12*	

Table 93: Command 171 cylinder specific ignition energy

Command: 172

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10101100

Send rate: 21982 *CMTel169-172SendRate* or
21982 *CMTel169-176SendRate*

Activation: 25982 *CMTxTel169-172On* = 1 or
25982 *CMTxTel169-176On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	high byte	Low byte
Value	13612 *MeasIgn-Energy13*		13613 *MeasIgn-Energy14*		13614 *MeasIgn-Energy15*		13615 *MeasIgn-Energy16*	

Table 94: Command 172 cylinder specific ignition energy

Command: 173

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10101101

Send rate: 21982 *CMTel169-176SendRate*

Activation: 25982 *CMTxTel169-176On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13616 *MeasIgn-Energy17*		13617 *MeasIgn-Energy18*		13618 *MeasIgn-Energy19*		13619 *MeasIgn-Energy20*	

Table 95: Command 173 cylinder specific ignition energy

Command: 174

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10101110

Send rate: 21982 *CMTel169-176SendRate*

Activation: 25982 *CMTxTel169-176On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13620 *MeasIgn-Energy21*		13621 *MeasIgn-Energy22*		13622 *MeasIgn-Energy23*		13623 *MeasIgn-Energy24*	

Table 96: Command 174 cylinder specific ignition energy

Command: 175

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10101111

Send rate: 21982 *CMTel169-176SendRate*

Activation: 25982 *CMTxTel169-176On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13624 *MeasIgn-Energy25*		13625 *MeasIgn-Energy26*		13626 *MeasIgn-Energy27*		13627 *MeasIgn-Energy28*	

Table 97: Command 175 cylinder specific ignition energy

Command: 176

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10110000

Send rate: 21982 *CMTel169-176SendRate*

Activation: 25982 *CMTxTel169-176On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13628 *MeasIgn-Energy29*		13629 *MeasIgn-Energy30*		13630 *MeasIgn-Energy31*		13631 *MeasIgn-Energy32*	

Table 98: Command 176 cylinder specific ignition energy

3.6.4 Cylinder specific spark duration

Command: 177

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10110001

Send rate: 21983 *CMTel177-180SendRate* or
21983 *CMTel177-184SendRate*

Activation: 25983 *CMTxTel177-180On* = 1 or
25983 *CMTxTel177-184On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13650 *SparkDuration1*		13651 *SparkDuration2*		13652 *SparkDuration3*		13653 *SparkDuration4*	

Table 99: Command 177 cylinder specific spark duration

Command: 178

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10110010

Send rate: 21983 *CMTel177-180SendRate* or
21983 *CMTel177-184SendRate*

Activation: 25983 *CMTxTel177-180On* = 1 or
25983 *CMTxTel177-184On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13654 *Spark-Duration5*		13655 *Spark-Duration6*		13656 *Spark-Duration7*		13657 *Spark-Duration8*	

Table 100: Command 178 cylinder specific spark duration

Command: 179

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10110011

Send rate: 21983 *CMTel177-180SendRate* or
21983 *CMTel177-184SendRate*

Activation: 25983 *CMTxTel177-180On* = 1 or
25983 *CMTxTel177-184On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13658 *SparkDuration9*		13659 *Spark-Duration10*		13660 *Spark-Duration11*		13661 *Spark-Duration12*	

Table 101: Command 179 cylinder specific spark duration

Command: 180

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10110100

Send rate: 21983 *CMTel177-180SendRate* or
21983 *CMTel177-184SendRate*

Activation: 25983 *CMTxTel177-180On* = 1 or
25983 *CMTxTel177-184On* = 1

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13662 *Spark-Duration13*		13663 *Spark-Duration14*		13664 *Spark-Duration15*		13665 *Spark-Duration16*	

Table 102: Command 180 cylinder specific spark duration

Command: 181

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10110101

Send rate: 21983 *CMTel177-184SendRate*

Activation: 25983 *CMTxTel177-184On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13666 *Spark-Duration17*		13667 *Spark-Duration18*		13668 *Spark-Duration19*		13669 *Spark-Duration20*	

Table 103: Command 181 cylinder specific spark duration

Command: 182

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10110110

Send rate: 21983 *CMTel177-184SendRate*

Activation: 25983 *CMTxTel177-184On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13670 *Spark-Duration21*		13671 *Spark-Duration22*		13672 *Spark-Duration23*		13673 *Spark-Duration24*	

Table 104: Command 182 cylinder specific spark duration

Command: 183

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10110111

Send rate: 21983 *CMTel177-184SendRate*

Activation: 25983 *CMTxTel177-184On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13674 *Spark-Duration25*		13675 *Spark-Duration26*		13676 *Spark-Duration27*		13677 *Spark-Duration28*	

Table 105: Command 183 cylinder specific spark duration

Command: 184

Data bytes: 8

Identifier: AC → CM: 10 0110 mmmmm 0 0101 nnnnn 10111000

Send rate: 21983 *CMTel177-184SendRate*

Activation: 25983 *CMTxTel177-184On* = 1

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	13678 *Spark-Duration29*		13679 *Spark-Duration30*		13680 *Spark-Duration31*		13681 *Spark-Duration32*	

Table 106: Command 184 cylinder specific spark duration

3.7 E-motor control send telegrams (MC → CM)

All values are sent within the “Chainless Drive” value range (↑ *4.2 Value range of measured and indicated values*).

3.7.1 Pedal generator drive values

Command: 112

Data bytes: 8

Identifier: MC → CM: 10 0110 mmmmm 0 0100 nnnnn 01110000

Send rate: 10 ms

Activation: 4200 *PedalTorqueSensorTyp* = 9

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	2012 *WheelSpeedTrack*		3401 *TransmissionRatio*		*Status bits*		*Telegram counter*	*Telegram Checksum*

Table 107: Command 112 drive values

		Status bits
bit	**7**	
	6	
	5	
	4	*Reverse Operation*
	3	
	2	
	1	
	0	*Automatic Transmission*

Table 108: Command 112 byte 4 status bits

3.7.2 Pedal generator limit values

Command: 113

Data bytes: 8

Identifier: MC → CM: 10 0110 mmmmm 0 0100 nnnnn 01110001

Send rate: 10 ms

Activation: 4200 *PedalTorqueSensorTyp* = 9

	byte 0	**byte 1**	**byte 2**	**byte 3**	**byte 4**	**byte 5**	**byte 6**	**byte 7**
	High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte
Value	3452 *PedalGenChargCurr Max*		3451 *PedalGenDischCurr Max*				*Telegram counter*	*Telegram Checksum*

Table 109: Command 113 limit values

3.8 Special telegrams

3.8.1 Connection establishment

Command: 97

Data bytes: none

Identifier:

CM → DC:	10 0000 mmmmm 0 0110 nnnnn 01100001
CM → GC:	10 0001 mmmmm 0 0110 nnnnn 01100001
CM → MC:	10 0100 mmmmm 0 0110 nnnnn 01100001
CM → AC:	10 0101 mmmmm 0 0110 nnnnn 01100001
DC → CM:	10 0110 mmmmm 0 0000 nnnnn 01100001
GC → CM:	10 0110 mmmmm 0 0001 nnnnn 01100001
MC → CM:	10 0110 mmmmm 0 0100 nnnnn 01100001
AC → CM:	10 0110 mmmmm 0 0101 nnnnn 01100001

After the duplicate ID check (command 98) is concluded, both the customer module and the counterpart keep on sending command 97 without data bytes (with data length 0) until any command is received from the other side. This has the purpose to ensure commands with real data are sent to the other side only after the other side is initialized and has started the communication.

3.8.2 Duplicate ID check

Command: 98

Data bytes: 1 byte, value 1

Identifier: CM → CM: 10 0000 mmmmm 0 0110 nnnnn 01100010

To test the CAN bus parameters, during the phase of initialization each node sends a duplicate ID check telegram command 98 with data byte =1 to its own node type and to its own node number.

3.8.3 Answer to duplicate ID check

Command: 98

Data bytes: 1 byte, value 0

Identifier: CM → CM: 10 0000 mmmmm 0 0110 nnnnn 01100010

Each connected device receiving a duplicate ID check telegram because it is of the same type and has the same node number as the sender must reply to it with command 98 and data byte = 0. As a result, both devices – the sender and the receiver – leave the bus to prevent errors.

3.8.4 Life sign

Command: 99

Data bytes: none

Identifier:

CM → DC:	10 0000 mmmmm 0 0110 nnnnn 01100011
CM → GC:	10 0001 mmmmm 0 0110 nnnnn 01100011
CM → MC:	10 0100 mmmmm 0 0110 nnnnn 01100011
CM → AC:	10 0101 mmmmm 0 0110 nnnnn 01100011
DC → CM:	10 0110 mmmmm 0 0000 nnnnn 01100011
GC → CM:	10 0110 mmmmm 0 0001 nnnnn 01100011
MC → CM:	10 0110 mmmmm 0 0100 nnnnn 01100011
AC → CM:	10 0110 mmmmm 0 0101 nnnnn 01100011

To reduce bus load to a minimum, telegrams should be sent only when new information has to be transmitted. If no other telegram has to be sent, the life sign must be sent every second, thereby giving the other side the possibility to recognize if there is a downtime.

3.9 Overview of receipt telegrams

Com-mand	Telegram	from	to	Reference
10	Switches 1…32	CM	DC, GC, MC, AC	*3.1.1 Switch functions*
20	Sensors 1…4	CM	DC, GC, MC, AC	*3.1.2 Sensors*
21	Sensors 5…8	CM	DC, GC, MC, AC	*3.1.2 Sensors*
22	Sensors 9…12	CM	DC, GC, MC, AC	*3.1.2 Sensors*
23	Sensors 13…16	CM	DC, GC, MC, AC	*3.1.2 Sensors*
24	Sensors 17…20	CM	DC, GC, MC, AC	*3.1.2 Sensors*
25	Sensors 21…24	CM	DC, GC, MC, AC	*3.1.2 Sensors*
80	Requesting parameter values	CM	DC, GC, MC, AC	*3.1.3 Requesting* parameter values
81	Request of a telegram	CM	DC, GC, MC, AC	*3.1.4 Request of a send telegram*
83	Request for reading or writing a parameter	CM	DC, GC, MC, AC	*3.1.5 Request for reading or writing a parameter*
84	Request for execution of internal control unit functions	CM	DC, GC, MC, AC	*3.1.6 Request for execution of internal control unit functions*
70 to 72	EFI-Control: Injection timing set points	CM	AC	*3.2 EFI Control receive telegrams (CM → AC / DC)*
73	EFI-Control: Common rail pressure set point	CM	AC	*3.2 EFI Control receive telegrams (CM → AC / DC)*
74	EFI-Control: Injection commands	CM	AC	*3.2 EFI Control receive telegrams (CM → AC / DC)*
75	EFI-Control: Injection timing set points	CM	AC	*3.2 EFI Control receive telegrams (CM → AC / DC)*
79	EFI-Control: Cylinder mask	CM	DC, AC	*3.2 EFI Control receive telegrams (CM → AC / DC)*

Com-mand	Telegram	from	to	Reference
90	E-motor control: Torque set point and commands	CM	MC	*3.3 E-motor control receive telegrams (CM → MC)*
91	E-motor control: Immobilizer release	CM	MC	*3.3 E-motor control receive telegrams (CM → MC)*
112	E-motor control: Drive values	CM	MC	*3.3 E-motor control receive telegrams (CM → MC)*
113	E-motor control: Info values	CM	MC	*3.3 E-motor control receive telegrams (CM → MC)*
114	E-motor control: Diagnostics values	CM	MC	*3.3 E-motor control receive telegrams (CM → MC)*

Table 110: Overview of receipt telegrams

3.10 Overview of send telegrams

Com-mand	Telegram	from	to	Reference
20	Set point values and power	DC	CM	*3.4.1 Sensors*
	Power and manifold pressure	AC	CM	*3.4.1 Sensors*
	Power, λ probe and methane content	AC	CM	*3.4.1 Sensors*
21	Pressure sensors	DC, GC	CM	*3.4.1 Sensors*
22	Temperature sensors	DC, GC	CM	*3.4.1 Sensors*
23	Temperature sensors	DC	CM	*3.4.1 Sensors*
24 to 29	Cylinder exhaust temperature sensors	DC, GC, AC	CM	*3.4.1 Sensors*
30	Rotational speed and fuel quantity	DC, GC	CM	*3.4.2 Rotational speed and fuel quantity*
40	Alarm and engine state	DC, GC, MC, AC	CM	*3.4.3 Alarm and engine state*
41 to 45	Error codes (devices with error bit indication)	DC, GC, AC	CM	*3.4.4 Current errors*

Com-mand	Telegram	from	to	Reference
50 to 58	Configurable	DC, GC, MC, AC	CM	*3.4.5 Configurable telegrams*
60	Bus bar frequencies	GC	CM	*3.5.1 Bus bar frequencies*
61	Generator frequencies	GC	CM	*3.5.2 Generator frequencies*
62	Bus bar voltages	GC	CM	*3.5.3 Bus bar voltages*
63	Generator voltages	GC	CM	*3.5.4 Generator voltages*
64	Primary phase currents	GC	CM	*3.5.5 Primary phase currents*
65	Power values	GC	CM	*3.5.6 Power values*
66	Energy meter for produced active power	GC	CM	*3.5.7 Energy meter for produced active power*
67	Energy meter for produced reactive power	GC	CM	*3.5.8 Energy meter for produced reactive power*
68	Energy meter for consumed active power	GC	CM	*3.5.9 Energy meter for consumed active power*
69	Energy meter for consumed reactive power	GC	CM	*3.5.10 Energy meter for consumed reactive power*
80	Answer to request of parameter values	DC, GC, MC, AC	CM	*3.4.6 Answer to request of parameter values*
83	Response of request for reading or writing a parameter	DC, GC, MC, AC	CM	*3.4.7 Response* of request for reading or writing a parameter
84	Response of request for execution of internal control unit functions	DC, GC, MC, AC	CM	*3.4.8 Response of request for execution of internal control unit functions*
112	E-motor control: Drive values	MC	CM	*3.7.1 Pedal generator drive values*
113	E-motor control: Limit values	MC	CM	*3.7.2 Pedal generator limit values*
141 to 148	Error codes (devices with error status)	DC, GC, MC, AC	CM	*3.4.4 Current errors*
160	Ignition basic data	AC	CM	*3.6.1 Ignition basic data*
161 to 168	Cylinder specific ignition angle	AC	CM	*3.6.2 Cylinder specific ignition angle*

Com-mand	Telegram	from	to	Reference
169 to 176	Cylinder specific ignition energy	AC	CM	*3.6.3 Cylinder specific ignition energy*
177 to 184	Cylinder specific spark duration	AC	CM	*3.6.4 Cylinder specific spark duration*

Table 111: Overview of send telegrams

3.11 Overview of special telegrams

Com-mand	Telegram	from	to	Reference
97	Connection establishment	DC	CM	*3.8.1 Connection establishment*
		GC	CM	
		MC	CM	
		AC	CM	
		CM	DC	
		CM	GC	
		CM	MC	
		CM	AC	
98	Duplicate ID check	CM	CM	*3.8.2 Duplicate ID check*
98	Answer to duplicate ID check	CM	CM	*3.8.3 Answer to duplicate ID check*
99	Life sign	CM	DC	*3.8.4 Life sign*
		CM	GC	
		CM	MC	
		CM	AC	
		DC	CM	
		GC	CM	
		MC	CM	
		AC	CM	

Table 112: Overview of special telegrams

4 Parameter description

In the following six chapters (↑ *4.1 Value range of sensors*, ↑ *4.2 Value range of measured and indicated values*, ↑ *4.3 Parameters*, ↑ *4.4 Measurement values*, ↑ *4.5 Functions* and ↑ *4.6 Fields*) show only the parameters relevant for the customer module and their respective meaning. For other parameters of the control device please see the corresponding basic information.

4.1 Value range of sensors

Sensor values are transmitted from the control device to the customer module and in the opposite direction always in the internal value range of the control device. The mapping of the internal value range to the used range is shown in the following tables for a selection of control units. For other control units, please refer to the corresponding manual. It must be borne in mind that the used value range of several parameters is itself parameterizable.

4.1.1 Speed governor (DC)

		Value range				
Sensor		maximum		used		internal
No.	Indicated value		Unit	No.	Reference parameter	
2900	*Setpoint1Extern*	0.0…100.0	%		0.0 100.0	0 65535
2901	*Setpoint2Extern*	0.0…100.0	%		0.0 100.0	0 65535
2904	*BoostPressure*	0.00…5.00	bar	982 983	*BoostPressSensorLow* *BoostPressSensorHigh*	0 65535
2905	*OilPressure*	0.00…20.00	bar	980 981	*OilPressSensorLow* *OilPressSensorHigh*	0 65535
2906	*AmbientPressure*	0…2000	mbar	984 985	*AmbPressSensorLow* *AmbPressSensorHigh*	0 65535
2907	*CoolantTemp*	-100.0…1000.0	°C		-100.0 1000.0	0 65535
2908	*ChargeAirTemp*	-100.0…1000.0	°C		-100.0 1000.0	0 65535
2909	*OilTemp*	-100.0…1000.0	°C		-100.0 1000.0	0 65535
2910	*FuelTemp*	-100.0…1000.0	°C		-100.0 1000.0	0 65535
2911	*ExhaustTemp*	-100.0…1000.0	°C		-100.0 1000.0	0 65535
2914	*SlideExcitReduction*	0.0…100.0	%		0.0 100.0	0 65535
2915	*SlideSpeedReduction*	0.0…4000.0	min^{-1}	991	0 *SpeedRedSensorHigh*	0 65535

		Value range				
Sensor		maximum		used		internal
No.	Indicated value		Unit	No.	Reference parameter	
2916	*CoolantPressure*	0.00…10.00	bar	978 979	*CoolPressSensorLow* *CoolPressSensorHigh*	0 65535
2917	*AsymmetricLoad*	0.0…100.0	%		0.0 100.0	0 65535
2918	*MeasuredPower*	0.0…100.0	%		0.0 100.0	0 65535
		0.0…2500.0	kW	992 993	*MeasPowerSensorLow* *MeasPowerSensorHigh*	0 65535
2919	*PowerSetpoint*	0.0…100.0	%		0.0 100.0	0 65535
		0.0…2500.0	kW	994 995	*PowerSetpSensorLow* *PowerSetpSensorHigh*	0 65535
2920	*TurboOilTemp*	-100.0…1000.0	°C		-100.0 1000.0	0 65535
2921	*FuelPressure*	0.00…10.00	bar	996 997	*FuelPressSensorLow* *FuelPressSensorHigh*	0 65535
2922	*OilLevel*	0.0…100.0	%		0.0 100.0	0 65535
2923	*FuelLimitExtern*	0.0…100.0	%		0.0 100.0	0 65535
2924	*TransmissionOilPress*	0.00…40.00	bar	998 999	*TrOilPressSensorLow* *TrOilPressSensorHigh*	0 65535

Table 113: Value range of sensors of speed governor (DC)

4.1.2 THESEUS (GC)

		Value range				
Sensor		maximum		used		internal
No.	Indicated value		Unit	No.	Reference parameter	
2900	*PowerSetpoint1*	0.0…200.0	%	980 981	*PowerSetpoint1Low* *PowerSetpoint1High*	0 65535
2901	*PFSetpoint*	0.00…1.00		982 983	*PFSetpointLow* *PFSetpointHigh*	0 65535
2902	*LoadLimitExt*	0.0…200.0	%	984 985	*LoadLimitExtLow* *LoadLimitExtHigh*	0 65535
2903	*AnalogLSLineIn*	0.0…200.0	%	986 987	*AnalogLSLineInLow* *AnalogLSLineInHigh*	0 65535
2904	*ImpExpSetpoint*	-30000…30000	kW	990 991	*ImpExpSetpointLow* *ImpExpSetpointHigh*	0 65535
2905	*PowerSetpoint2*	0.0…200.0	%	992 993	*PowerSetpoint2Low* *PowerSetpoint2High*	0 65535

2906	*AnalogVArSLineIn*	-200.0…200.0	%	994 995	*AnalogVArSLineInLow* *AnalogVArSLineInHigh*	0 65535
2907	*GrossLoadSetpoint*	0…30000	kW	976 977	*GrossLoadSetpLow* *GrossLoadSetpHigh*	0 65535
2911	*OilTemp*	-100.0…1000.0	°C		-100.0 1000.0	0 65535
2912	*OilPressure*	0.00…20.00	bar	988 989	*OilPressSensorLow* *OilPressSensorHigh*	0 65535
2913	*CoolantTemp*	-100.0…1000.0	°C		-100.0 1000.0	0 65535
2914	*CoolantLevel*	0.0…100.0	%		0.0 100.0	0 65535
2915	*FuelLevel*	0.0…100.0	%		0.0 100.0	0 65535
2916	*ExhaustTemp*	-100.0…1000.0	°C		-100.0 1000.0	0 65535
2917	*CoolantPressure*	0.00…5.00	bar	996 997	*CoolPressSensorLow* *CoolPressSensorHigh*	0 65535
2918	*AuxCoolantPressure*	0.00…5.00	bar	998 999	*AuxCoolPrssSensorLow* *AuxCoolPrsSensorHigh*	0 65535
2919	*FuelPressure*	0.00…5.00	bar	978 979	*FuelPressSensorLow* *FuelPressSensorHigh*	0 65535
2921	*GenTempStator1*	-100.0…1000.0	°C		-100.0 1000.0	0 65535
2922	*GenTempStator2*	-100.0…1000.0	°C		-100.0 1000.0	0 65535
2923	*GenTempStator3*	-100.0…1000.0	°C		-100.0 1000.0	0 65535
2924	*GenTempRotor1*	-100.0…1000.0	°C		-100.0 1000.0	0 65535
2925	*GenTempRotor2*	-100.0…1000.0	°C		-100.0 1000.0	0 65535
2926	*GenTempRotor3*	-100.0…1000.0	°C		-100.0 1000.0	0 65535

Table 114: Value range of sensors of THESEUS (GC)

4.1.3 PHLOX (AC)

		Value range				
Sensor		**maximum**		**used**		**internal**
No.	**Indicated value**		**Unit**	**No.**	**Reference parameter**	
2900	*IgnitionTimingOffset*	-30.0…30.0	°BTDC	950 951	*IgnTimOffsSensorLow* *IgnTimOffsSensorHigh*	0 65535
2901	*IgnitionEnergyOffset*	-31…31		952 953	*IgnEgyOffsSensorLow* *IgnEgyOffsSensorHigh*	0 65535

		Value range				
Sensor		maximum		used		internal
No.	Indicated value		Unit	No.	Reference parameter	
2902	*IgnAutoSpkOffset*	-1.500…1.500	ms	954 955	*AutoSpkOffsSensLow* *AutoSpkOffsSensHigh*	0 65535
2912	*ManifoldPressure*	0.00…5.00	bar	974 975	*MnfldPressSensorLow* *MnfldPressSensorHigh*	0 65535
2918	*MeasuredPower*	0.0…100.0	%		0.0 100.0	0 65535

Table 115: Value range of sensors of PHLOX I & II (AC)

		Value range				
Sensor		maximum		used		internal
No.	Indicated value		Unit	No.	Reference parameter	
2900	*IgnitionTimingOffset*	-30.0…30.0	°BTDC	950 951	*IgnTimOffsSensorLow* *IgnTimOffsSensorHigh*	0 65535
2912	*ManifoldPressure*	0.00…5.00	bar	974 975	*MnfldPressSensorLow* *MnfldPressSensorHigh*	0 65535
2918	*MeasuredPower*	0.0…100.0	%		0.0 100.0	0 65535

Table 116: Value range of sensors of PHLOX III (AC)

4.1.4 KRONOS 20 (AC)

		Value range				
Sensor		maximum		used		internal
No.	Indicated value		Unit	No.	Reference parameter	
2910	*CurveIndexInput*	0…4		982 983	*CurveIndexSensorLow* *CurveIndexSensorHigh*	0 65535
2911	*RichLeanCorrInput*	80.0…120.0	%	984 985	*RichLeanSensorLow* *RichLeanSensorHigh*	0 65535
2912	*ManifoldPressure*	0.00…5.00	bar	986 987	*MnfldPressSensorLow* *MnfldPressSensorHigh*	0 65535
2913	*ManifoldTemp*	-100.0…1000.0	°C		-100.0 1000.0	0 65535
2914	*MeasuredPower*	0.0…2500.0	kW	988 989	*MeasPowerSensorLow* *MeasPowerSensorHigh*	0 65535
2915	*LambdaProbe*	0.00…5.00	V	990 991	*LambdaProbeLow* *LambdaProbeHigh*	0 65535
2916	*CH4Content*	0.0…100.0	%	992 993	*CH4ContentSensorLow* *CH4ContentSensorHigh*	0 65535

Table 117: Value range of sensors of KRONOS 20 (AC)

4.1.5 E-LES LC (AC)

Value range						
Sensor		**maximum**		**used**		**internal**
No.	**Indicated value**		**Unit**	**No.**	**Reference parameter**	
2900	*ManifoldPressure*	0.00…5.00	bar	950 951	*MnfldPressSensorLow* *MnfldPressSensorHigh*	0 65535
2901	*ManifoldTemp*	-100.0…1000.0	°C		-100.0 1000.0	0 65535
2902	*LambdaProbe*	0.00…3.66	V	954 955	*LambdaProbeLow* *LambdaProbeHigh*	0 65535

Table 118: Value range of sensors of E-LES LC (AC)

4.1.6 Cylinder exhaust temperatures (DC, GC, AC)

Note: The parameter numbers depend on the control unit, the application and the firmware version.

Value range						
Sensor		**maximum**		**used**		**internal**
No.	**Indicated value**		**Unit**	**No.**	**Reference parameter**	
12900 to 12923	*ExhaustTempCyl01* *ExhaustTempCyl24*	-100.0…1000.0	°C		-100.0 1000.0	0 65535

Table 119: Value range of cylinder exhaust temperature sensors

4.2 Value range of measured and indicated values

No.	Indicated value	External value range	Unit	Internal value range
2000	*Speed*	0.0…4000.0	min^{-1}	0…65535
2031	*SpeedSetp*	0…4000	min^{-1}	0…65535
2350	*FuelQuantity*	0.0…100.0 0…500.0	% mm^3	0…65535
2300	*ActPos*	0.0…100.0	%	0…65535
3231	*RelativePowerSetp*	0.0…200.0	%	0…65535
3232	*RelativePower*	0.0…200.0	%	0…65535

Table 120: Value range of measured and indicated values

No.	Indicated value	External value range	Unit	Internal value range
12001	*FrequencyNet_L1 / FrequencyBus_L1*	0.00…100.00	Hz	0…65535
12002	*FrequencyNet_L2 / FrequencyBus_L2*	0.00…100.00	Hz	0…65535
12003	*FrequencyNet_L3 / FrequencyBus_L3*	0.00…100.00	Hz	0…65535
12011	*FrequencyGeneratorL1 / FrequencyGen_L1*	0.00…100.00	Hz	0…65535
12012	*FrequencyGeneratorL2 / FrequencyGen_L2*	0.00…100.00	Hz	0…65535
12013	*FrequencyGeneratorL3 / FrequencyGen_L3*	0.00…100.00	Hz	0…65535
12107	*VoltageBusPrim_1_2 / VoltBusPrimary_1_2*	0…60000	V	0…65535
12108	*VoltageBusPrim_2_3 / VoltBusPrimary_2_3*	0…60000	V	0…65535
12109	*VoltageBusPrim_3_1 / VoltBusPrimary_3_1*	0…60000	V	0…65535
12127	*VoltageGenPrim_1_2 / VoltGenPrimary_1_2*	0…60000	V	0…65535
12128	*VoltageGenPrim_2_3 / VoltGenPrimary_2_3*	0…60000	V	0…65535
12129	*VoltageGenPrim_3_1 / VoltGenPrimary_3_1*	0…60000	V	0…65535
12147	*CurrentPrim_L1 / CurrentPrimary_L1*	0…10000	A	0…65535
12148	*CurrentPrim_L2 / CurrentPrimary_L2*	0…10000	A	0…65535
12149	*CurrentPrim_L3 / CurrentPrimary_L3*	0…10000	A	0…65535

No.	Indicated value	External value range	Unit	Internal value range
12203	*cosPhi*	-1.00…1.00 / -1.000…1.000		-32768…32767
12208	*PowerPrim / ActivePowerPrimary*	-30000…30000	kW	-32768…32767
12209	*PowerReactivePrim / ReactivePowerPrimary*	-30000…30000	kVAr	-32768…32767
12210	*PowerApparentPrim / ApparentPowerPrimary*	-30000…30000	kVA	-32768…32767
13700	*ProducedPower*	0…65535	GWh	0…65535
13701	*ProducedPower*	0…999	MWh	0…999
13702	*ProducedPower*	0…999	kWh	0…999
13704	*ProducedPowerReac*	0…65535	GWh	0…65535
13705	*ProducedPowerReac*	0…999	MWh	0…999
13706	*ProducedPowerReac*	0…999	kWh	0…999
13710	*ConsumedPower*	0…65535	GWh	0…65535
13711	*ConsumedPower*	0…999	MWh	0…999
13712	*ConsumedPower*	0…999	kWh	0…999
13714	*ConsumedPowerReac*	0…65535	GWh	0…65535
13715	*ConsumedPowerReac*	0…999	MWh	0…999
13716	*ConsumedPowerReac*	0…999	kWh	0…999

Table 121: Value range of measured and indicated values of THESEUS / XIOS^{GenSet} / XIOS^{CHP} (GC)

No.	Indicated value	External value range	Unit	Internal value range
3910	*ActiveIgnitionTiming*	-10.0…90.0	°BTDC	-910…8192
3940	*CommonIgnEnergySetp*	0…31		0…31
13550 to 13581	*IgnitionAngle1* … *IgnitionAngle32*	-10.0…90.0	°BTDC	-910…8192
13600 to 13631	*MeasIgnEnergy1* … *MeasIgnEnergy32*	0…1000	mJ	0…65535
13650 to 13681	*SparkDuration1* … *SparkDuration32*	0.000…1.500	ms	0…1500

Table 122: Value range of measured and indicated values of PHLOX I & II (AC)

No.	Indicated value	External value range	Unit	Internal value range
3910	*ActiveIgnitionTiming*	-10.0…90.0	°BTDC	-910…8192

No.	Indicated value	External value range	Unit	Internal value range
13550 to 13581	*IgnitionAngle1* *IgnitionAngle32*	-10.0…90.0	°BTDC	-910…8192
13650 to 13681	*SparkDuration1* *SparkDuration32*	0.000…1.500	ms	0…1500

Table 123: Value range of measured and indicated values of PHLOX III (AC)

No.	Indicated value	External value range	Unit	Internal value range	Transmission value range
2012	*WheelSpeedTrack*	-6000…6000	1/min	-32767…32767	-6000…5765.8 1/min = 0…64255
3401	*TransmissionRatio*	0.000…5.000		0…5000	-32.000…32.255 = 0…64255
3452	*PedalGenChargCurrMax*	0.00…60.00	A	0…32767	0.000…64.255 A = 0…64255
3451	*PedalGenDischCurrMax*	0.00…60.00	A	0…32767	0.000…64.255 A = 0…64255

Table 124: Value range of measured and indicated values of e-motor control (MC)

4.3 Parameters

No.	Name		Meaning
400	**CanStartTimeOutDelay**		
	Level:	6	Delay of CAN-connection monitoring after reset
	Range:	0..100 s	
	Page(s):	15	
401	**CanMyNodeNumber**		
	Level:	6	Own node number in CAN network
	Range:	1..31	
	Page(s):	14	
403	**CanCMNodeNumber**		
	Level:	6	Node number of customer module in CAN network
	Range:	1..31	
	Page(s):	14	
416	**CanBaudrate**		
ff.	**CanxBaudrate**		
	Level:	4	CAN baud rate for CAN controller x
	Range:	125, 250, 500, 1000 kBaud	x = 1…2
	Page(s):	15	
900	**AssignIn…**		
ff.	Level:	6	Assignment for input channel of set point adjuster or sensor
	Range:	0..16	
	Page(s):	19, 25	
1000	**Subst…**		
ff.	Level:	4	Substitution value for set point adjuster or sensor in case of input failure
	Range:		
	Page(s):	20	
20810	**Comm…**		
ff.	Level:	6	Bit number assigned to switch function in telegram 10
	Range:	0..32	
	Page(s):	17, 24	
21950	**CMRxTel10Timeout**		
	Level:	4	Time interval within which telegram 10 must be received
	Range:	0..100 s	
	Page(s):	17, 24	
21951	**CMRxTel20Timeout**		
	Level:	4	Time interval within which telegram 20 must be received
	Range:	0..100 s	
	Page(s):	17, 25	
21952	**CMRxTel21Timeout**		
	Level:	4	Time interval within which telegram 21 must be received
	Range:	0..100 s	
	Page(s):	17, 26	
21953	**CMRxTel22Timeout**		
	Level:	4	Time interval within which telegram 22 must be received
	Range:	0..100 s	
	Page(s):	17, 26	

No.	Name		Meaning
21954	**CMRxTel23Timeout**		
	Level:	4	Time interval within which telegram 23 must be received
	Range:	0..100 s	
	Page(s):	17, 27	
21955	**CMRxTel24Timeout**		
	Level:	4	Time interval within which telegram 24 must be received
	Range:	0..100 s	
	Page(s):	17, 27	
21956	**CMRxTel25Timeout**		
	Level:	4	Time interval within which telegram 25 must be received
	Range:	0..100 s	
	Page(s):	17, 28	
21960	**CMTxTel20SendRate**		
	Level:	4	Time interval for sending telegram 20 from the control device
	Range:	0..100 s	to the customer module
	Page(s):	21, 41	
21961	**CMTxTel21SendRate**		
	Level:	4	Time interval for sending telegram 21 from the control device
	Range:	0..100 s	to the customer module
	Page(s):	21, 42	
21962	**CMTxTel22SendRate**		
	Level:	4	Time interval for sending telegram 22 from the control device
	Range:	0..100 s	to the customer module
	Page(s):	21, 42	
21963	**CMTxTel23SendRate**		
	Level:	4	Time interval for sending telegram 23 from the control device
	Range:	0..100 s	to the customer module
	Page(s):	21, 43	
21964	**CMTxTel30SendRate**		
	Level:	4	Time interval for sending telegram 30 from the control device
	Range:	0..100 s	to the customer module
	Page(s):	21, 46	
21971	**CMTxTel50SendRate**		
	Level:	4	Time interval for sending telegram 50 from the control device
	Range:	0..100 s	to the customer module
	Page(s):	21, 23, 61	
21972	**CMTxTel51SendRate**		
	Level:	4	Time interval for sending telegram 51 from the control device
	Range:	0..100 s	to the customer module
	Page(s):	21, 62	
21973	**CMTxTel52SendRate**		
	Level:	4	Time interval for sending telegram 52 from the control device
	Range:	0..100 s	to the customer module
	Page(s):	21, 62	
21974	**CMTxTel53SendRate**		
	Level:	4	Time interval for sending telegram 53 from the control device
	Range:	0..100 s	to the customer module
	Page(s):	21, 63	

No.	Name		Meaning
21975	**CMTxTel54SendRate**		
	Level:	4	Time interval for sending telegram 54 from the control device to the customer module
	Range:	0..100 s	
	Page(s):	21, 63	
21976	**CMTxTel55SendRate**		
	Level:	4	Time interval for sending telegram 55 from the control device to the customer module
	Range:	0..100 s	
	Page(s):	21, 64	
21977	**CMTxTel56SendRate**		
	Level:	4	Time interval for sending telegram 56 from the control device to the customer module
	Range:	0..100 s	
	Page(s):	21, 64	
21978	**CMTxTel57SendRate**		
	Level:	4	Time interval for sending telegram 57 from the control device to the customer module
	Range:	0..100 s	
	Page(s):	21, 65	
21979	**CMTxTel58SendRate**		
	Level:	4	Time interval for sending telegram 58 from the control device to the customer module
	Range:	0..100 s	
	Page(s):	21, 65	
21980	**CMRxTel70Timeout**		
	Level:	4	EFI Control: Time interval within which telegram 70 must be received
	Range:	0..100 s	
	Page(s):	32	
21980	**CMTxTel60SendRate**		
	Level:	4	Time interval for sending telegram 60 from the THESEUS control device to the customer module
	Range:	0..100 s	
	Page(s):	21, 69	
21980	**CMTxTel160SendRate**		
	Level:	4	Time interval for sending telegram 160 from the PHLOX control device to the customer module
	Range:	0..100 s	
	Page(s):	21, 73	
21981	**CMRxTel71Timeout**		
	Level:	4	EFI Control: Time interval within which telegram 71 must be received
	Range:	0..100 s	
	Page(s):	32	
21981	**CMTxTel61SendRate**		
	Level:	4	Time interval for sending telegram 61 from the THESEUS control device to the customer module
	Range:	0..100 s	
	Page(s):	21, 69	
21981	**CMTel161-164SendRate** **CMTel161-168SendRate**		
	Level:	4	Time interval for sending telegram group 161-164 or 161-168 from the PHLOX control device to the customer module, it is sent one telegram out of the group per interval
	Range:	0..100 s	
	Page(s):	21, 74	
21982	**CMRxTel72Timeout**		
	Level:	4	EFI Control: Time interval within which telegram 72 must be received
	Range:	0..100 s	
	Page(s):	33	

No.	Name		Meaning
21982	**CMTxTel62SendRate**		
	Level:	4	Time interval for sending telegram 62 from the THESEUS
	Range:	0..100 s	control device to the customer module
	Page(s):	21, 70	
21982	**CMTel169-172SendRate**		
	CMTel169-176SendRate		
	Level:	4	Time interval for sending telegram group 169-172 or 169-176
	Range:	0..100 s	from the PHLOX control device to the customer module, it is
	Page(s):	21, 78	sent one telegram out of the group per interval
			Note: only for PHLOX I & II, not relevant for PHLOX III
21983	**CMRxTel73Timeout**		
	Level:	4	EFI Control: Time interval within which telegram 73 must be
	Range:	0..100 s	received
	Page(s):	33	
21983	**CMTxTel63SendRate**		
	Level:	4	Time interval for sending telegram 63 from the THESEUS
	Range:	0..100 s	control device to the customer module
	Page(s):	21, 70	
21983	**CMTel177-180SendRate**		
	CMTel177-184SendRate		
	Level:	4	Time interval for sending telegram group 177-180 or 177-184
	Range:	0..100 s	from the PHLOX control device to the customer module, it is
	Page(s):	21, 82	sent one telegram out of the group per interval
21984	**CMRxTel74Timeout**		
	Level:	4	EFI Control: Time interval within which telegram 74 must be
	Range:	0..100 s	received
	Page(s):	34	
21984	**CMTxTel64SendRate**		
	Level:	4	Time interval for sending telegram 64 from the THESEUS
	Range:	0..100 s	control device to the customer module
	Page(s):	21, 70	
21985	**CMRxTel75Timeout**		
	Level:	4	EFI Control: Time interval within which telegram 75 must be
	Range:	0..100 s	received
	Page(s):	35	
21985	**CMTxTel65SendRate**		
	Level:	4	Time interval for sending telegram 65 from the THESEUS
	Range:	0..100 s	control device to the customer module
	Page(s):	21, 71	
21986	**CMTxTel66SendRate**		
	Level:	4	Time interval for sending telegram 66 from the THESEUS
	Range:	0..100 s	control device to the customer module
	Page(s):	21, 71	
21987	**CMTxTel67SendRate**		
	Level:	4	Time interval for sending telegram 67 from the THESEUS
	Range:	0..100 s	control device to the customer module
	Page(s):	21, 71	

No.	Name		Meaning
21988	**CMTxTel68SendRate**		
	Level:	4	Time interval for sending telegram 68 from the THESEUS
	Range:	0..100 s	control device to the customer module
	Page(s):	21, 72	
21989	**CMRxTel79Timeout**		
	Level:	4	EFI Control: Time interval within which telegram 79 must be
	Range:	0..100 s	received
	Page(s):	36	
21989	**CMTxTel69SendRate**		
	Level:	4	Time interval for sending telegram 69 from the THESEUS
	Range:	0..100 s	control device to the customer module
	Page(s):	21, 72	
21993	**CMTxTel24SendRate**		
	Level:	4	Time interval for sending telegram 24 from the control device
	Range:	0..100 s	to the customer module
	Page(s):	43	
21994	**CMTxTel25SendRate**		
	Level:	4	Time interval for sending telegram 25 from the control device
	Range:	0..100 s	to the customer module
	Page(s):	44	
21995	**CMTxTel26SendRate**		
	Level:	4	Time interval for sending telegram 26 from the control device
	Range:	0..100 s	to the customer module
	Page(s):	44	
21996	**CMTxTel27SendRate**		
	Level:	4	Time interval for sending telegram 27 from the control device
	Range:	0..100 s	to the customer module
	Page(s):	45	
21997	**CMTxTel28SendRate**		
	Level:	4	Time interval for sending telegram 28 from the control device
	Range:	0..100 s	to the customer module
	Page(s):	45	
21998	**CMTxTel29SendRate**		
	Level:	4	Time interval for sending telegram 29 from the control device
	Range:	0..100 s	to the customer module
	Page(s):	46	

4.4 Measurement values

No.	Name		Meaning
2401	**CanTxBufferState**		
	Level:	1	State of CAN source buffer
	Range:	0000..FFFF Hex	(indication of buffer overflow per device type)
	Page(s):	16	
2402	**CanRxBufferState**		
	Level:	1	State of CAN destination buffer
	Range:	0000..FFFF Hex	(indication of buffer overflow per device type)
	Page(s):	16	
2403	**CanRxTimeout**		
	Level:	1	State of CAN destination timeout monitoring
	Range:	0000..FFFF Hex	(indication per device type)
	Page(s):	16	
2404	**CanTypeMismatch**		
	Level:	1	State of CAN device type monitoring
	Range:	0/1	(indication of double assignment of node numbers)
	Page(s):	16	
2405 ff.	**CanOnline CanxOnline**		
	Level:	1	General state of CAN communication
	Range:	0/1	CAN controller x
	Page(s):	16	x = 1…2
2422	**CanCMNodeState31to16**		
	Level:	1	Connection status to customer modules with node numbers
	Range:	0000..FFFF Hex	from 16 to 31
	Page(s):	15	
2423	**CanCMNodeState15to01**		
	Level:	1	Connection status to customer modules with node numbers
	Range:	0000..FFFF Hex	from 1 to 15
	Page(s)	15	
3000	**ConfigurationError**		
	Level:	1	Indication of configuration error
	Range:	0..65535	
	Page(s):	18, 20	
3070 ff.	**ErrCanBus ErrCanBusx**		
	Level:	1	Error indication of CAN bus
	Range:	0/1	CAN controller x
	Page(s):	15	x = 1…2
3071 ff.	**ErrCanComm ErrCanCommx**		
	Level:	1	Error indication of CAN communication
	Range:	0/1	CAN controller x
	Page(s):	15, 17	x = 1…2

No.	Name		Meaning
23720	**BitCollection(0)**		
ff.	Level:	1	Bit collection for CAN transmission
	Range:	0000..FFFF Hex	
	Page(s):	22	
23989	**CylMaskCANOn**		
	Level:	1	Indication of active/inactive CAN cylinder mask
	Range:	0/1	
	Page(s):	37	
23990	**CylMaskCAN**		
	CylMaskCAN16to1		
	Level:	1	Active CAN cylinder mask (cylinder 1-16)
	Range:	0000..FFFF Hex	Note: Parameter range depends on number of cylinders.
	Page(s):	37	
23991	**CylMaskCAN20to17**		
	CylMaskCAN24to17		
	Level:	1	Active CAN cylinder mask (cylinder 20-17 or 24-17)
	Range:	00..FF Hex	Note: Parameter range depends on number of cylinders.
	Page(s):	37	
23992	**CylMaskCANCoAmp**		
	Level:	1	Active CAN cylinder mask for second injection group
	Range:	000..FFF Hex	Note: Parameter range depends on number of cylinders.
	Page(s):	37	

4.5 Functions

No.	Name		Meaning
4406	**CanCommCMOn**		
	Level:	6	Activation of sending and receiving to/from customer module
	Range:	0/1	via CAN
	Page(s):	14, 17, 18, 20, 23	
4900	**ChanTyp…**		
ff.	Level:	6	Configuration of sensor input channel type
	Range:	0..8	0 = analogue
	Page(s):	19, 20, 25	1 = PWM
			8 = CM
5000	**…SubstOrLast**		
ff.	Level:	4	Selection of replacement value for set point adjuster and
	Range:	0/1	sensor in case of error
	Page(s):	20	0 = last valid value
			1 = replacement value
5040	**…HoldOrReset**		
ff.	Level:	4	Selects if the error of set point adjuster or sensor is to be
	Range:	0/1	deleted or kept after signal returns
	Page(s):	20	0 = error is deleted
			1 = error is kept
24810	**ChanTyp…**		
ff.	Level:	6	Configuration of switch input channel type
	Range:	0..8	0 = digital input
	Page(s):	17	8 = CM and digital input
25960	**CMTxTel20On**		
	Level:	4	Activation of send telegram 20
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 41	1 = telegram is sent
25961	**CMTxTel21On**		
	Level:	4	Activation of send telegram 21
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 42	1 = telegram is sent
25962	**CMTxTel22On**		
	Level:	4	Activation of send telegram 22
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 42	1 = telegram is sent
25963	**CMTxTel23On**		
	Level:	4	Activation of send telegram 23
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 43	1 = telegram is sent
25964	**CMTxTel30On**		
	Level:	4	Activation of send telegram 30
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 46	1 = telegram is sent

No.	Name		Meaning
25965	**CMTxTel40On**		
	Level:	4	Activation of send telegram 40
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 47	1 = telegram is sent
25966	**CMTxTel41On**		
	Level:	4	Activation of send telegram 41
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 48	1 = telegram is sent
25966	**CMTxTel141On**		
	Level:	4	Activation of send telegram 141
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 53	1 = telegram is sent
25967	**CMTxTel42On**		
	Level:	4	Activation of send telegram 42
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 49	1 = telegram is sent
25967	**CMTxTel142On**		
	Level:	4	Activation of send telegram 142
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 54	1 = telegram is sent
25968	**CMTxTel43On**		
	Level:	4	Activation of send telegram 43
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 50	1 = telegram is sent
25968	**CMTxTel143On**		
	Level:	4	Activation of send telegram 143
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 55	1 = telegram is sent
25969	**CMTxTel44On**		
	Level:	4	Activation of send telegram 44
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 51	1 = telegram is sent
25969	**CMTxTel144On**		
	Level:	4	Activation of send telegram 144
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 56	1 = telegram is sent
25970	**CMTxTel45On**		
	Level:	4	Activation of send telegram 45
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 52	1 = telegram is sent
25970	**CMTxTel145On**		
	Level:	4	Activation of send telegram 145
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 57	1 = telegram is sent
25971	**CMTxTel50On**		
	Level:	4	Activation of send telegram 50
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 23, 61	1 = telegram is sent

No.	Name		Meaning
25972	**CMTxTel51On**		
	Level:	4	Activation of send telegram 51
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 62	1 = telegram is sent
25973	**CMTxTel52On**		
	Level:	4	Activation of send telegram 52
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 62	1 = telegram is sent
25974	**CMTxTel53On**		
	Level:	4	Activation of send telegram 53
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 63	1 = telegram is sent
25975	**CMTxTel54On**		
	Level:	4	Activation of send telegram 54
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 63	1 = telegram is sent
25976	**CMTxTel55On**		
	Level:	4	Activation of send telegram 55
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 64	1 = telegram is sent
25977	**CMTxTel56On**		
	Level:	4	Activation of send telegram 56
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 64	1 = telegram is sent
25978	**CMTxTel57On**		
	Level:	4	Activation of send telegram 57
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 65	1 = telegram is sent
25979	**CMTxTel58On**		
	Level:	4	Activation of send telegram 58
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 65	1 = telegram is sent
25980	**CMRxTel70On**		
	Level:	4	Activation of receive telegram 70 (EFI Control)
	Range:	0/1	0 = telegram is not received
	Page(s):	32	1 = telegram is received, timeout monitoring active
25980	**CMTxTel60On**		
	Level:	4	Activation of send telegram 60 (THESEUS)
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 69	1 = telegram is sent
25980	**CMTxTel160On**		
	Level:	4	Activation of send telegram 160 (PHLOX)
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 73	1 = telegram is sent
25981	**CMRxTel71On**		
	Level:	4	Activation of receive telegram 71 (EFI Control)
	Range:	0/1	0 = telegram is not received
	Page(s):	32	1 = telegram is received, timeout monitoring active

No.	Name		Meaning
25981	**CMTxTel61On**		
	Level:	4	Activation of send telegram 61 (THESEUS)
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 69	1 = telegram is sent
25981	**CMTxTel161-164On**		
	CMTxTel161-168On		
	Level:	4	Activation of send telegrams 161-164 or 161-168 (PHLOX)
	Range:	0/1	0 = telegrams are not sent
	Page(s):	20, 74	1 = telegrams are sent
25982	**CMRxTel72On**		
	Level:	4	Activation of receive telegram 72 (EFI Control)
	Range:	0/1	0 = telegram is not received
	Page(s):	33	1 = telegram is received, timeout monitoring active
25982	**CMTxTel62On**		
	Level:	4	Activation of send telegram 62 (THESEUS)
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 70	1 = telegram is sent
25982	**CMTxTel169-172On**		
	CMTxTel169-176On		
	Level:	4	Activation of send telegrams 169-172 or 169-176 (PHLOX)
	Range:	0/1	0 = telegrams are not sent
	Page(s):	20, 78	1 = telegrams are sent
			Note: only for PHLOX I & II, not relevant for PHLOX III
25983	**CMRxTel73On**		
	Level:	4	Activation of receive telegram 73 (EFI Control)
	Range:	0/1	0 = telegram is not received
	Page(s):	33	1 = telegram is received, timeout monitoring active
25983	**CMTxTel63On**		
	Level:	4	Activation of send telegram 63 (THESEUS)
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 70	1 = telegram is sent
25983	**CMTxTel177-180On**		
	CMTxTel177-184On		
	Level:	4	Activation of send telegrams 177-180 or 177-184 (PHLOX)
	Range:	0/1	0 = telegrams are not sent
	Page(s):	20, 82	1 = telegrams are sent
25984	**CMRxTel74On**		
	Level:	4	Activation of receive telegram 74 (EFI Control)
	Range:	0/1	0 = telegram is not received
	Page(s):	34	1 = telegram is received, timeout monitoring active
25984	**CMTxTel64On**		
	Level:	4	Activation of send telegram 64 (THESEUS)
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 70	1 = telegram is sent
25985	**CMRxTel75On**		
	Level:	4	Activation of receive telegram 75 (EFI Control)
	Range:	0/1	0 = telegram is not received
	Page(s):	35	1 = telegram is received, timeout monitoring active

No.	Name		Meaning
25985	**CMTxTel65On**		
	Level:	4	Activation of send telegram 65 (THESEUS)
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 71	1 = telegram is sent
25986	**CMTxTel66On**		
	Level:	4	Activation of send telegram 66 (THESEUS)
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 71	1 = telegram is sent
25987	**CMTxTel67On**		
	Level:	4	Activation of send telegram 67 (THESEUS)
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 71	1 = telegram is sent
25988	**CMTxTel68On**		
	Level:	4	Activation of send telegram 68 (THESEUS)
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 72	1 = telegram is sent
25989	**CMRxTel79On**		
	Level:	4	Activation of receive telegram 79 (EFI Control)
	Range:	0/1	0 = telegram is not received
	Page(s):	36, 37	1 = telegram is received, timeout monitoring active
25989	**CMTxTel69On**		
	Level:	4	Activation of send telegram 69 (THESEUS)
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 72	1 = telegram is sent
25990	**CMTxTel146On**		
	Level:	4	Activation of send telegram 146
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 58	1 = telegram is sent
25991	**CMTxTel147On**		
	Level:	4	Activation of send telegram 147
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 59	1 = telegram is sent
25992	**CMTxTel148On**		
	Level:	4	Activation of send telegram 148
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 60	1 = telegram is sent
25995	**CMTxTel26On**		
	Level:	4	Activation of send telegram 26
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 44	1 = telegram is sent
25996	**CMTxTel27On**		
	Level:	4	Activation of send telegram 27
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 45	1 = telegram is sent
25997	**CMTxTel28On**		
	Level:	4	Activation of send telegram 28
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 45	1 = telegram is sent

No.	Name		Meaning
25998	**CMTxTel29On**		
	Level:	4	Activation of send telegram 29
	Range:	0/1	0 = telegram is not sent
	Page(s):	20, 46	1 = telegram is sent

4.6 Fields

No.	Name		Meaning
29800	**CMTel50ParamSet(0)**		
to	Level:	4	Parameter values for freely configurable telegrams to the
29803	Range:	-29999..29999	customer module
	Page(s):	22, 23, 23, 61, 61	
29805	**CMTel51ParamSet(0)**		
to	Level:	4	Parameter values for freely configurable telegrams to the
29808	Range:	-29999..29999	customer module
	Page(s):	22, 23, 61, 62	
29810	**CMTel52ParamSet(0)**		
to	Level:	4	Parameter values for freely configurable telegrams to the
29813	Range:	-29999..29999	customer module
	Page(s):	22, 23, 61, 62	
29815	**CMTel53ParamSet(0)**		
to	Level:	4	Parameter values for freely configurable telegrams to the
29818	Range:	-29999..29999	customer module
	Page(s):	22, 23, 61, 63	
29820	**CMTel54ParamSet(0)**		
to	Level:	4	Parameter values for freely configurable telegrams to the
29823	Range:	-29999..29999	customer module
	Page(s):	22, 23, 61, 63	
29825	**CMTel55ParamSet(0)**		
to	Level:	4	Parameter values for freely configurable telegrams to the
29828	Range:	-29999..29999	customer module
	Page(s):	22, 23, 61, 64	
29830	**CMTel56ParamSet(0)**		
to	Level:	4	Parameter values for freely configurable telegrams to the
29833	Range:	-29999..29999	customer module
	Page(s):	22, 23, 61, 64	
29835	**CMTel57ParamSet(0)**		
to	Level:	4	Parameter values for freely configurable telegrams to the
29838	Range:	-29999..29999	customer module
	Page(s):	22, 23, 61, 65	
29840	**CMTel58ParamSet(0)**		
to	Level:	4	Parameter values for freely configurable telegrams to the
29843	Range:	-29999..29999	customer module
	Page(s):	22, 23, 61, 65	
29900	**BitCollParamSet(0)**		
ff.	Level:	4	Parameter values for bit collection
	Range:	-29999..29999	
	Page(s):	22	

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