Interface protocol   CTS control ←→ PC

(Subject to modifications)

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2 Introduction - System requirements

2.1 Serial Interface

The ASCII protocol can be used for the serial interfaces RS232, RS485 or USB.
These interface types are only optionally available.

2.2 Ethernet Interface

Ethernet interface of ITC-controller offers possibility of communication to customer's application comparable with the ASCII-Protocol for RS232 Interface.
Communication is based on a TCP/IP-Connection to the fixed port number 1080.
(It is not necessary to define the port in the network settings. The port entered there is only used for communicating with the CID-Pro software.)

In the "system-settings" – "network" menu, the communication parameters for the network connection must be defined.
You will receive the IP address, subnet mask and default gateway from your network administrator.

You need a fixed IP-Address, DHCP is not supported.

The number of simultaneous TCP/IP-connections to the chamber is limited to 5.

You can use the commands described here when the chamber should be controlled or data should be queried by customer's software. This makes sense when this software does further control of test sequence, like stimulate D.U.T. depending on chambers state.
For pure control and documentation of the chamber we suggest CID-pro software. There are comfortable functions to create test cycles and measurement files.

3 Construction of the protocol

3.1 Serial Interface

Interface:	RS 232
Baud rate:	19,200 bauds
Format:	8 bits, ODD parity (the parity bit completes the total of 1s to an odd figure)
Data flow control:	none
Framing:	**'STX' 'Data' 'CHK' 'ETX'**

STX = 0x02

ETX = 0x03

CHK = XOR connection of all data (without STX, ETX nor CHK)
> The highest bit (bit 7 resp. MSB) of the data and of the CHK always is 1.
> Example: ASC „1" = DEC 49 or DEC 128 = DEC 177 resp.
>> HEX 0x31 or HEX 0x80 = HEX 0xB1.

ADR = 0x81 - 0xA0 (address 01 - 32); is set through the software.
> Default = 0x81 (address 01).

But for „ETX" and „STX", the highest bit (MSB) is always 1.

3.2 Ethernet Interface

The commands over the Ethernet interface can only be successful if the write access of the chamber is released in the menu "System-Settings - Network - Connections".

4   Commands and Responses

4.1 Read time

4.1.1   Serial Interface

Command to chamber (PC to CPU):
'STX' 'ADR' 'T' 'CHK' 'ETX'
        'T'   ASCII code 0x54 OR 0x80 = **0xD4**

Reply of chamber (CPU to PC):
'STX' 'ADR' 'T' ddMMyyhhmmss 'CHK' 'ETX' (read value)
        'T'   ASCII code 0x54 OR 0x80 = **0xD4**
        ddMMyy   per byte in ASCII OR 0x80 (6 bytes)
        hhmmss   per byte in ASCII OR 0x80 (6 bytes)
            dd: Day
            MM: Month
            yy: Year
            hh: Hour
            mm: Minute
            ss: Second

4.1.2   Ethernet Interface

Command to chamber (PC to CPU):
T

        Example: T (1 character)

Reply of chamber (CPU to PC):
TddMMyyhhmmss
            dd: Day
            MM: Month
            yy: Year
            hh: Hour
            mm: Minute
            ss: Second

        Example: T101112082715 actual chamber time is: 10-11-2012 08:27:15
                            (13 characters)

4.2 Set time

4.2.1 Serial Interface

Command to chamber (PC to CPU):
'STX' 'ADR' 't' ddMMyyhhmmss 'CHK' 'ETX'

't'	ASCII code 0x74 OR 0x80 = **0xF4**
ddMMyy	per byte in ASCII OR 0x80 (6 bytes)
hhmmss	per byte in ASCII OR 0x80 (6 bytes)
dd:	Day
MM:	Month
yy:	Year
hh:	Hour
mm:	Minute
ss:	Second

Example:	ADR = 1, date = 091112, time = 145535
String =	0x02 0x81 0xF4 0xB0 0xB9 0xB1 0xB1 0xB1 0xB2
	0xB1 0xB4 0xB5 0xB5 0xB3 0xB5 0xFF 0x03 (17 bytes)

Reply of chamber (CPU to PC):
'STX' 'ADR' 't' ddMMyyhhmmss 'CHK' 'ETX' (read value)

't'	ASCII code 0x74 OR 0x80 = **0xF4**
ddMMyy	per byte in ASCII OR 0x80 (6 bytes)
hhmmss	per byte in ASCII OR 0x80 (6 bytes)
dd:	Day
MM:	Month
yy:	Year
hh:	Hour
mm:	Minute
ss:	Second

4.2.2 Ethernet Interface

Command to chamber (PC to CPU):
tddMMyyhhmmss

dd:	Day
MM:	Month
yy:	Year
hh:	Hour
mm:	Minute
ss:	Second

Example:	t101112082915 time to set:
	10.11.2012 08:29:15 (13 characters)

Reply of chamber (CPU to PC):
tddMMyyhhmmss
The received data are replied.

Example:	t101112082915 time to set:
	10.11.2012 08:29:15 (13 characters)

Notice:
There is a battery backup for the real-time clock. So the clock need not be set after every power ON.

4.3 Read analog channels - reading analog set and actual values

4.3.1 Serial Interface

Command to chamber (PC to CPU):

'STX' 'ADR' 'A' x 'CHK' 'ETX'

'A'	ASCII code 0x41 OR 0x80 = **0xC1**
x:	channelno - one byte in ASCII OR 0x80
	(cf. chapter 4.3.3 - Chamber configuration)

Example:	ADR = 1, channelno = 0 (temperature channel)
String =	0x02 0x81 0xC1 0xB0 0xF0 0x03 (6 bytes)

Reply of chamber (CPU to PC):

'STX' 'ADR' 'A' x_yyy.y_zzz.z 'CHK' 'ETX' (read value)

'A':	ASCII code 0x41 OR 0x80 = **0xC1**
x:	channelno - one byte in ASCII OR 0x80
	(cf. chapter 4.3.3 - Chamber configuration)
_:	blank = 0x20 OR 0x80 = 0xA0
yyy.y:	Actual value - format XXX.X (-XX.X for negative values)
	per byte in ASCII OR 0x80
zzz.z:	Set value - format XXX.X (-XX.X for negative values)
	per byte in ASCII OR 0x80

Example:	ADR = 1, channelno = 0 (temperature channel),
	actualvalue = -14.5 °C, setvalue = -13.8 °C
String =	0x02 0x81 0xC1 0xB0 0xA0 0xAD 0xB1 0xB4 0xAE 0xB5 0xA0
	0xAD 0xB1 0xB3 0xAE 0xB8 0xFA 0x03 (18 bytes)

Notice: If several channels are available, each one must be read separately.

4.3.2 Ethernet Interface

Command to chamber (PC to CPU):

A*x*

x:	Channel number - Mapping of channel numbers could be seen in
	chapter 4.3.3 - Chamber configuration.

Example:	A0 (Read chamber temperature, 2 characters)

Reply of chamber (CPU to PC):

Ax_yyy.y_zzz.z

x:	Channel number see above (cf. chapter 4.3.3 - Chamber configuration)
_:	blank
yyy.y:	Actual value of channel
zzz.z:	Set value of channel

Example:	A0 020.4 023.0 (actual temperature: 20,4°C, set value: 23,0°C,
	14 characters)

Notice:
- If chamber replies only with one number, this is the channel No., but the asked channel is not present. (invalid Channel No., because Channel No. CID of controller configuration is not > 0).
- If you use ramps (s. Command ‚u' and ‚d') you always get back the actual setpoint. (In earlier controllers you got back the ending point of the ramp.)

4.3.3 Chamber configuration

Example of a chamber configuration C-70/350:

Value Ax	Channel No CID	Channel	Limits			
A0	1	Temperature in [°C]	min.	-75.00 [°C],	max.	185.00 [°C]
A1	2	Humidity in [%rH]	min.	0.00 [%rH],	max.	98.00 [%rH]
A2	3	Water storage in [l]	min.	0.00 [l],	max.	15.00 [l]
A3	4	TempSupplyAir in [°C]	min.	-75.00 [°C],	max.	185.00 [°C]
A4	5	TempExhAir in [°C]	min.	-75.00 [°C],	max.	185.00 [°C]
A5	6	HumidSupplAir in [%rH]	min.	5.00 [%rH],	max.	98.00 [%rH]
A6	7	HumidExhAir in [%rH]	min.	5.00 [%rH],	max.	98.00 [%rH]

Notice: You can read out max. 16 analog channels!!!

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4.4 Read analog channels - read all analog actual/set values
Command available from ITC version 3.19 (delivery date: 14.08.2019)

4.4.1   Serial Interface

Command to chamber (PC to CPU):
> **'STX' 'ADR' 'A' a 'CHK' 'ETX'**
>> 'A'   ASCII code 0x41 OR 0x80 = **0xC1**
>> a*:*   all channels - one byte: ASCII code 0x61 OR 0x80 = **0xE1**
>>   (cf. chapter 4.3.3 - Chamber configuration)

> Example: ADR = 1, (all channels)
>> String =   0x02 0x81 0xC1 0xE1 0xA1 0x03 (6 bytes)

Reply of chamber (CPU to PC):
> **'STX' 'ADR' 'A' xx_yyy.y_zzz.z/xx_yyy.y_zzz.z/… 'CHK' 'ETX'** (read value)
>> 'A':   ASCII code 0x41 OR 0x80 = **0xC1**
>> x*x:*   channelno - zwo bytes in ASCII OR 0x80
>>   (cf. chapter 4.3.3 - Chamber configuration)
>> _*:*   blank = 0x20 OR 0x80 = 0xA0
>> *yyy.y:*   Actual value - format XXX.X (-XX.X for negative values)
>>   per byte in ASCII OR 0x80
>> *zzz.z:*   Set value - format XXX.X (-XX.X for negative values)
>>   per byte in ASCII OR 0x80
>> */:*   Separator = 0x2F OR 0x80 = 0xAF

> Example: A00 040.0 030.0/01 041…..
>> String =   0x02 0x81 0xC1 0xB0 0xB0 0xA0 0xB0 0xB4 0xB0 0xAE 0xB0 0xA0
>>   0xB0 0xB3 0xB0 0xAE 0xB0 0xAF 0xB0 0xB1 0xA0 0xB0 0xB4 0xB1 …

Notice: You can read out max. 16 analog channels!

4.4.2   Ethernet Interface

Command to chamber (PC to CPU):
> **Aa**
>> *a*:   All channels 0…n
>>   (cf. chapter 4.3.3 - Chamber configuration)

> Example: Aa (Read all chamber channels, 2 characters)

Reply of chamber (CPU to PC):
> **Axx_yyy.y_zzz.z/xx_yyy.y_zzz.z/…**
>> *xx*:   Channel index (cf. chapter 4.3.3 - Chamber configuration)
>> _*:*   blank
>> *yyy.y:*   Actual value - format XXX.X (-XX.X for negative values)
>> *zzz.z:*   Set value - format XXX.X (-XX.X for negative values)
>> */:*   Separator = 0x2F OR 0x80 = 0xAF

> Example: A00_020.4_023.0/01_080.7_014.8/ ……
>>   (actual temperature = 20,4°C, set temperature = 23,0°C,
>>   actual humidity = 80,7%, set humidity = 14,8%)

Notice: You can read out max. 16 analog channels!

4.5 Set analog channels

4.5.1 Serial Interface

Command to chamber (PC to CPU):

'STX' 'ADR' 'a' x_yyy.y 'CHK' 'ETX'

'a'	ASCII code 0x61 OR 0x80 = **0xE1**
x:	channelno - one byte in ASCII OR 0x80
	(cf. chapter 4.5.3 - Chamber configuration)
_:	blank = 0x20 OR 0x80 = 0xA0
yyy.y:	Set value - format XXX.X (-XX.X for negative values)
	per byte in ASCII OR 0x80

Example:	ADR = 1, channelno = 0 (temperature channel), value = -14.5 °C
String =	0x02 0x81 0xE1 0xB0 0xA0 0xAD 0xB1 0xB4 0xAE 0xB5 0xC3
	0x03 (12 bytes)

Notice: If several channels are available, each one must be set separately.

Reply of chamber (CPU to PC):

'STX' 'ADR' 'a' 'CHK' 'ETX'

'a'	ASCII code 0x61 OR 0x80 = **0xE1**

4.5.2 Ethernet Interface

Command to chamber (PC to CPU):

ax_yyy.y

x:	Channel number - Mapping of channel numbers could be seen in chapter 4.5.3 - Chamber configuration.
_:	blank
yyy.y:	Set value of channel

Example:	a0 -12.5 (change temperature set point to -12.5°C , 8 characters)

Reply of chamber (CPU to PC):

a

Example:	a (1 character)

Notice:
- If chamber replies only with one number, this is the channel No., but the asked channel is not present. (invalid Channel No., because Channel No. CID of controller configuration is not > 0).
- set point form command are limited to channel range
- The ramp control is activated if the ramp rate setting is < 500 K/min when this instruction is read. (The ramp only begins when the system starts.)
  Otherwise, the new target value is set immediately, even if the ramp rate setting instructions are not in use.

4.5.3   Chamber configuration

Example of a chamber configuration C-70/350:

Command ax	Channel No CID	Channel	Limits			
a0	1	Temperature in [°C]	min.	-75.00 [°C],	max.	185.00 [°C]
a1	2	Humidity in [%rH]	min.	0.00 [%rH],	max.	98.00 [%rH]

Notice: The motify of the set values for standard chambers make sense only for the first two channels and can even be overwritten by the chamber controller.

4.6 Specifying the rate of changes (gradients)

4.6.1 Definition rate of changes (gradients)

General: The value to be inputted in the commands described below has the unit of measurement K/min. The system will run with this rate of change using the set target value.

Attention: The gradient that is set will remain in effect in the controls until a new value is set. If a run is to be carried out with the maximum target value stepping range then the gradient is to be set to a maximum value of 999.9 K/min.

In order to carry out a ramp using a target value, input the change speed first and then input the desired final value as target value. When the final value is reached, the system will continue to run with this target value until a new value is inputted.

With the ITC controller, the actual target value in the context of the ramp will always be outputted when the command to read the analogue values is given. The command 'E' (see below) is to be used to query the set target value of the ramp.

Note: The value of the gradient can also be inputted in a different format. If, for example, more precise values are necessary for the gradient then values can be inputted with two decimal places.

Example: 00.05 → 0.05 K/min
23.45 → 23.45 K/min

Notice: Only change rates > 0.01 are accepted.

If the system is stopped (**Start/Stop button or instruction s1_0**), the ramp function is terminated and the end value of the ramp is set to the new target value.

If the system is interrupted (**Pause button or instruction s3_0**), the ramp function is interrupted (target values are not changed); the ramp continues when the pause is ended.

4.6.2 Chamber configuration

Example of a chamber configuration C-70/350:

Command/ Value u/d/U/E/Rx	Channel No CID	Channel	Limits			
u/d/U/E/R0	1	Temperature in [°C]	min.	-75.00 [°C],	max.	185.00 [°C]
u/d/U/E/R1	2	Humidity in [%rH]	min.	0.00 [%rH],	max.	98.00 [%rH]

Notice: On standard systems, setting target values typically only makes sense on the first two channels, and can even be overwritten by the system control.

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4.6.3 Set gradient ramp up (e.g. heating)

4.6.3.1 Serial Interface

Command to chamber (PC to CPU):
    'STX' 'ADR' 'u' x_yyy.y 'CHK' 'ETX'

'u'	ASCII code 0x75 OR 0x80 = **0x F5**
x:	channelno - one byte in ASCII OR 0x80
	(cf. chapter 4.6.2 - Chamber configuration)
_:	blank = 0x20 OR 0x80 = 0xA0
yyy.y:	Set value - format XXX.X
	per byte in ASCII OR 0x80

Notice: If several channels are available, each one must be set separately
          The value for the gradient is always a **positive one**.

Reply of chamber (CPU to PC):
    'STX' 'ADR' 'u' 'CHK' 'ETX' (read value)

'u'	ASCII code 0x75 OR 0x80 = **0x F5**

4.6.3.2 Ethernet Interface

Command to chamber (PC to CPU):
    ux_yyy.y

x:	Channel number - Mapping of channel numbers could be seen in chapter 4.6.2 - Chamber configuration.
_:	blank
yyy.y:	Set value set for ramping up in fixed format in K/min

    Example: u1 005.0 (8 characters)

Notice: If several channels are available, each one must be set separately
          The value for the gradient is always a **positive one**.

Reply of chamber (CPU to PC):
    u

    Example: u (1 character)

4.6.4 Set gradient ramp down (e.g. cooling)

4.6.4.1 Serial Interface

Command to chamber (PC to CPU):

'STX' 'ADR' 'd' x_yyy.y 'CHK' 'ETX'

'd'	ASCII code 0x64 OR 0x80 = **0x E4**
x:	channelno - one byte in ASCII OR 0x80
	(cf. chapter 4.6.2 - Chamber configuration)
_:	blank = 0x20 OR 0x80 = 0xA0
yyy.y:	Set value - format XXX.X
	per byte in ASCII OR 0x80

Notice: If several channels are available, each one must be set separately
The value for the gradient is always a **positive one**.

Reply of chamber (CPU to PC):

'STX' 'ADR' 'd' 'CHK' 'ETX' (read value)

'd'	ASCII code 0x64 OR 0x80 = **0x E4**

4.6.4.2 Ethernet Interface

Command to chamber (PC to CPU):

dx_yyy.y

x:	Channel number - Mapping of channel numbers could be seen in chapter 4.6.2 - Chamber configuration.
_:	blank
yyy.y:	Set value set for ramping down in fixed format in K/min

Example: d1 005.0 (8 characters)

Notice: If several channels are available, each one must be set separately
The value for the gradient is always a **positive one**.

Reply of chamber (CPU to PC):

d

Example: d (1 character)

4.6.5   Read adjusted gradient (set value of ramp gradient)

4.6.5.1 Serial Interface

Command to chamber (PC to CPU):
>   **'STX' 'ADR' 'U' x 'CHK' 'ETX'**
> | | |
> |---|---|
> | 'U' | ASCII code 0x55 OR 0x80 = **0xD5** |
> | *x:* | channelno - one byte in ASCII OR 0x80 |
> | | (cf. chapter 4.6.2 - Chamber configuration) |

Reply of chamber (CPU to PC):
>   **'STX' 'ADR' 'U' x_yyy.y_zzz.z 'CHK' 'ETX'**   (read value)
> | | |
> |---|---|
> | 'U' | ASCII code 0x55 OR 0x80 = **0xD5** |
> | *x:* | channelno - one byte in ASCII OR 0x80 |
> | | (cf. chapter 4.6.2 - Chamber configuration) |
> | *_:* | blank = 0x20 OR 0x80 = 0xA0 |
> | *yyy.y:* | gradientUp - value set for ramping up in K/min |
> | | per byte in ASCII OR 0x80 |
> | *zzz.z:* | gradientDown - value set for ramping down in K/min |
> | | per byte in ASCII OR 0x80 |

Notice: If several channels are available, each one must be read separately
The value for the gradient is always a **positive one**.

4.6.5.2 Ethernet Interface

Command to chamber (PC to CPU):
>   **Ux**
> | | |
> |---|---|
> | *x*: | Channel number - Mapping of channel numbers could be seen in chapter 4.6.2 - Chamber configuration. |

>   Example: U1 (2 characters)

Reply of chamber (CPU to PC):
>   **Ux_yyy.y_zzz.z**
> | | |
> |---|---|
> | *x*: | Channel number - Mapping of channel numbers could be seen in chapter 4.6.2 - Chamber configuration. |
> | *_:* | blank |
> | *yyy.y*: | value set for ramping up in K/min |
> | *_:* | blank |
> | *zzz.z*: | value set for ramping down in K/min |

>   Example: U1 005.0 003.0 (14 Zeichen)

Notice:

>   The value for raming down is also a positive value. This value specifies the changing rate of the set points independent of the chambers has enough power to follow these values.

4.6.6 Read adjusted final value of the ramp

4.6.6.1 Serial Interface

Command to chamber (PC to CPU):
'STX' 'ADR' 'E' x 'CHK' 'ETX'

'E'	ASCII code 0x45 OR 0x80 = **0xC5**
x:	channelno - one byte in ASCII OR 0x80
	(cf. chapter 4.6.2 - Chamber configuration)

Reply of chamber (CPU to PC):
'STX' 'ADR' 'E' x_yyy.y 'CHK' 'ETX' (read value)

'E'	ASCII-Code 0x45 OR 0x80 = **0xC5**
x:	channelno - one byte in ASCII OR 0x80
	(cf. chapter 4.6.2 - Chamber configuration)
_:	blank = 0x20 OR 0x80 = 0xA0
yyy.y:	finalValue - final value of the ramp
	per byte in ASCII OR 0x80

Notice: If several channels are available, each one must be read separately

4.6.6.2 Ethernet Interface

Command to chamber (PC to CPU):
Ex

x:	Channel number - Mapping of channel numbers could be seen in chapter 4.6.2 - Chamber configuration.

Example:	E1 (2 characters)

Reply of chamber (CPU to PC):
Ex_yyy.y

x:	Channel number - Mapping of channel numbers could be seen in chapter 4.6.2 - Chamber configuration.
_:	blank
yyy.y:	final value of ramp in fixed format

Example:	E1 -40.0 (8 characters)

Hinweise:

Wurde bisher keine Rampenfahrt durch das verändern des Sollwertes ausgelöst, wird als Wert 0.0 zurückgegeben.

4.6.7 Read ramp parameters

4.6.7.1 Serial Interface

Command to chamber (PC to CPU):
> **'STX' 'ADR' 'R' x 'CHK' 'ETX'**

'R'	ASCII code 0x52 OR 0x80 = **0xD2**
x:	channelno - one byte in ASCII OR 0x80
	(cf. chapter 4.6.2 - Chamber configuration)

Example:	ADR = 1, channel 0
String =	0x02 0x81 0xD2 0xB0 0xE3 0x03 (6 bytes)

Reply of chamber (CPU to PC):
> **'STX' 'ADR' 'R' x_ab_xxxx.xx_yyyy.yy_zzzz.zz 'CHK' 'ETX'** (read value)

'R'	ASCII code 0x52 OR 0x80 = **0xD2**
x:	channelno - one byte in ASCII OR 0x80
	(cf. chapter 4.6.2 - Chamber configuration)
_:	blank = 0x20 OR 0x80 = 0xA0
a:	ramp management active: ‚1'= active; ‚0'=inactive
b:	ramp management runs: ‚1' = runs; ‚0' = does not run
	because of Pause or Error
_:	blank = 0x20 OR 0x80 = 0xA0
xxxx.xx:	value set for ramping up in K/min in fixed format
_:	blank = 0x20 OR 0x80 = 0xA0
yyyy.yy:	value set for ramping down in K/min in fixed format
_:	blank = 0x20 OR 0x80 = 0xA0
zzzz.zz:	final value of ramp in fixed format
	all bytes in ASCII OR 0x80

Notice: The reason for the new data set is the enhanced formatting and the combined supply of ramp information.

Example:	
String =	0x02 0x81 0xD2 0xB0 0xA0 0xB0 0xB0 0xA0 0xB9 0xB9 0xB9 0xB9 0xAE
	0xB9 0xB0 0xA0 0xB9 0xB9 0xB9 0xB9 0xAE 0xB9 0xB0 0xA0 0xB0 0xB0
	0xB3 0xB0 0xAE 0xB0 0xB0 0x80 0xCE 0x03 (34 bytes)
	ADR = 1
	R0
	not active, does not run
	ramp up 9999.90 K/min
	ramp down 9999.90 K/min
	final value 0030.00 °C

4.6.7.2 Ethernet Interface

Command to chamber (PC to CPU):
   Rx
x:	Mapping of channel numbers could be seen in chapter 4.6.2 - Chamber configuration.

   Example: R0 (2 characters)

Reply of chamber (CPU to PC):
   Rx_ab_xxxx.xx_yyyy.yy_zzzz.zz

x:	Mapping of channel numbers could be seen in chapter 4.6.2 - Chamber configuration.
_:	blank
a:	ramp management active: ‚1'= active; ‚0'=inactive
b:	ramp management runs: ‚1' = runs; ‚0' = does not run because of Pause or Error
_:	blank
xxxx.xx:	value set for ramping up in K/min in fixed format
_:	blank
yyyy.yy:	value set for ramping down in K/min in fixed format
_:	blank
zzzz.zz:	final value of ramp in fixed format

   Example: R0 11 0005.00 0003.50 -010.00 (30 characters)

4.7 Read chamber state

4.7.1 Serial Interface

Command to chamber (PC to CPU):
'STX' 'ADR' 'S' 'CHK' 'ETX'

'S'	ASCII code 0x53 OR 0x80 = **0xD3**

Example:	ADR = 1
String =	0x02 0x81 0xD3 0xD2 0x03 (5 bytes)

Reply of chamber (CPU to PC):
'STX' 'ADR' 'S' xyzzzzzzw 'CHK' 'ETX' (read value)

'S'	ASCII code 0x53 OR 0x80 = **0xD3**
xyzzzzzzw:	'0' = „OFF"; '1' = „ON" per byte in ASCII OR 0x80 (0xB0 or 0xB1)
	Mapping of channel numbers could be seen in
	chapter 4.7.3 - Chamber configuration and 4.7.4 - Error number (w).

Example:	ADR = 1, x = 1, y = 0, z1 = 1, z2 = 1, z3 = 0, z4 = 0, z5 = 0, z6 = 0, w = 0
String =	0x02 0x81 0xD3 0xB1 0xB0 0xB1 0xB1 0xB0 0xB0 0xB0 0xB0
	0xB0 0xE3 0x03 (14 bytes)

4.7.2 Ethernet Interface

Command to chamber (PC to CPU):
S

Reply of chamber (CPU to PC):
Sxyzzzzzzw

x:	Start: '0' (chamber stopped), or '1' (chamber is running)
y:	Error: '0' (no Error present), or '1' (error pending, Error number see w)
z:	List of 6 digital channels. '0' (function OFF), '1' (function ON). Which channels are listed see chapter 4.7.3 - Chamber configuration. The list starts with Indicator channels. If there are less than 6 Indicators Softkey channel follows. If sum of both is less that 6, remaining digits are unused. There are always 6 digits replied
w:	Error number, when Error digit (y) is set this is the number of pending error. Meaning of the error number is found in Error report in documentation. If there are multiple erros pending the one appeared first is given, see chapter 4.7.4 - Error number (w).

Example:	S101101000 (Chamber started, no error, Temper On, humidity On, Additional dehumidification Off, DigOut1 ON, DigOut2 OFF, Channel 6 unused, Error number 0 (no error), 10 characters)

Notice:
- Order of Indicators and Softkeys is given by ascending order of "Channel No. CID" of both lists in controller configuration, see chapter 4.7.3 - Chamber configuration.
- Enabling bits are replied, e.g. if a function is switched on but not released a '0' is replied. Example: DigOut1 is set but Chamber is stopped. (This is related to blinking channel in handset.)

4.7.3 Chamber configuration

Example of a chamber configuration C-70/350:

Pos.	Value	Channel No CID	Channel	Type	Meaning
x		-	START / STOP	SYSTEM	Chamber ON/OFF?
y		-	COLLECTMALFUNCTION	SYSTEM	Error?
z1	**'0' or '1'**	1	PAUSE resp Temperature	Indicator 1	Chamber interrupt?
z2	**0x30**	2	Humidity	Indicator 2	State on/off
z3	**or**	3	Dew point >7°C	Indicator 3	State on/off
z4	**0x31**	4	Dew point <7°C	Indicator 4	State on/off
z5		1	Deep dehumidity	Softkey 1	State on/off
z6		2	RegSupplyAir	Softkey 2	State on/off
w	see table Chapter 4.6.4		ERROR NUMBER	SYSTEM	

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4.7.4 Error number (w)

Example of a chamber configuration C-70/350:

Value	No	Errortext	Type
0x01	01	Add water	
0x02	02	Upper temperature tolerance band	
0x03	03	Lower temperature tolerance band	
0x04	04	Upper humidity tolerance band	**Warning reports**
0x05	05	Lower humidity lower tolerance band	
0x06	06	De-sludge water bath	
0x31 - '1'	01	Min. temperature limit 08-B1	
0x32 - '2'	02	Max. temperature limit 08-B1	
0x33 - '3'	03	Temp. limiter 1 test space 01-F1.1	
0x34 - '4'	04	Thermal contact test space fan 02-F2.1	
0x35 - '5'	05	Max test specimen protection 09-A1	
0x36 - '6'	06	Pre-cooling overpressure 03-B50	
0x37 - '7'	07	Cooling overpressure 03-B40	
0x38 - '8'	08	Min. humidity 08-B2	
0x39 - '9'	09	Max. humidity 08-B2	
0x3a - ':'	10	Humidity sensor 08-B2	
0x3b - ';'	11	Lack of water humidity 07-B80	
0x3c - '<'	12	Therm. cont. condenser fan 03-F5.1	
0x3d - '='	13	Boiling pressure sensor 03-B60	
0x3e - '>'	14	Condenser pressure sensor C 03-B41	
0x3f - '?'	15	Pt100 exhaust air 08-B1.1	
0x40 - '@'	16	Pt100 supply air 08-B1.2	
0x41 - 'A'	17	Pt100 water bath 07-B4	
0x42 - 'B'	18	Float water supply 07-B81	
0x43 - 'C'	19	Pt100 moveable 08-B15	**Error reports**
0x46 - 'F'	22	Pt100 suction gas PC 03-B19	
0x47 - 'G'	23	Pt100 suction gas C 03-B13	
0x48 - 'H'	24	Pt100 compressed gas C 03-B10	
0x4a - 'J'	26	Suction gas temperature PC 03-B19	
0x4b - 'K'	27	Suction gas temperature C 03-B13	
0x4c - 'L'	28	Compr.gas temperature C 03-B10	
0x4e - 'N'	30	Pre-cooling negative pressure 03-B53	
0x4f - 'O'	31	Cooling negative pressure 03-B43	
0x52 - 'R'	34	SuctPre-coolRefrCycle 03-B53	
0x53 - 'S'	35	Suct.cool.refrig.cycle 03-B43	
0x5b - '['	43	Float water bath 07-B80	
0x5c - '\'	44	Pt100 suction steam C 03-B12	
0x5d - ']'	45	Pt100 suction steam PC 03-B18	
0x5e - '^'	46	Boiling pressure sensor C 03-B43	
0x5f - '_'	47	Boiling pressure sensor PC 03-B53	
0x62 - 'b'	50	Circuit breaker power supply 00-Q1	
0x63 - 'c'	51	Pre-cooling circuit	

4.8 Set digital channels - chamber Start/Stop

4.8.1 Serial Interface

Command to chamber (PC to CPU):
'STX' 'ADR' 's' x_y 'CHK' 'ETX'

's'	ASCII code 0x73 OR 0x80 = **0xF3**
x:	channelno - one byte in ASCII OR 0x80
	(cf. chapter 4.8.3 - Chamber configuration)
_:	blank = 0x20 OR 0x80 = 0xA0
y:	Value to set: „1" or „0" correspond to ON or OFF
	per byte in ASCII OR 0x80

Examples:	Chamber start: ADR = 1, chamber on = 1 (x = 1)
Command:	**s1 1 (Switch On chamber, 4 characters)**
String =	0x02 0x81 **0xF3 0xB1** 0xA0 **0xB1** 0xD2 0x03 (8 bytes)
	Chamber stop: ADR = 1, Anlage on = 0 (x = 1)
Command:	**s1 0 (Switch Off chamber, 4 characters)**
String =	0x02 0x81 **0xF3 0xB1** 0xA0 **0xB0** 0xD2 0x03 (8 bytes)
	Receipt error: ADR = 1, receipt collective failure = 0 (x = 2)
String =	0x02 0x81 0xF3 0xB2 0xA0 0xB0 0xD0 0x03 (8 bytes)
Command:	**s3 0 (Pause chamber, 4 characters)**
Command:	**s3 1 (Continue chamber, 4 characters)**

Reply of chamber (CPU to PC):
'STX' 'ADR' 's' x 'CHK' 'ETX'

's'	ASCII code 0x73 OR 0x80 = **0xF3**

4.8.2 Ethernet Interface

Command to chamber (PC to CPU):
sx_y

x:	Mapping of channel numbers could be seen in
	chapter 4.8.3 - Chamber configuration.
	Settable channels are the softkeys.
_:	blank
y:	Value to set: „1" or „0" correspond to ON or OFF

Examples:	**s1 1 (Switch On chamber, 4 characters)**
	s1 0 (Switch Off chamber, 4 characters)
	s2 0 (Receipt error)
	s3 0 (Pause chamber, 4 characters)
	s3 1 (Continue chamber, 4 characters)
	s5 1 (supposed there are 2 indicator channels softkey with Channel No. CID = 1 is set)

Reply of chamber (CPU to PC):
sx

x:	Mapping of channel numbers could be seen in
	chapter 4.8.3 - Chamber configuration.

Example:	S1 (2 characters)

4.8.3 Chamber configuration

Example of a chamber configuration C-70/350:

Command sx	Channel No CID	Channel	Type	Meaning
s1	-	START / STOP	SYSTEM	Chamber turn on/off
s2	-	COLLECTMALFUNCTION	SYSTEM	Receipt Error
s3	1	PAUSE	Indicator 1	Chamber interrupt
s4	*2*	*Humidity*	*Indicator 2*	*not changeable*
s5	*3*	*Dew point >7°C*	*Indicator 3*	*not changeable*
s6	*4*	*Dew point <7°C*	*Indicator 4*	*not changeable*
s7	1	Deep dehumidity	Softkey 1	**Softkey can be set!**
s8	2	RegSupplyAir	Softkey 2	**Softkey can be set!**
s9	3	Dig. output 1	Softkey 3	**Softkey can be set!**
s:	4	Dig. output 2	Softkey 4	**Softkey can be set!**
s;	5	De-sludge	Softkey 5	**Softkey can be set!**

Notice: You can set/reset max. 12 (15-3) digital channels!!!

4.9 Read additional digital channels

4.9.1 Serial Interface

Command to chamber (PC to CPU):
> **'STX' 'ADR' 'O' 'CHK' 'ETX'**
> > 'O'   ASCII code 0x4F OR 0X80 = **0xCF**

> Example: ADR = 1
> > String =   0x02 0x81 0xCF 0xCE 0x03 (5 bytes)

Reply of chamber (CPU to PC):
> **'STX' 'ADR' 'O' xyzm…ms…s 'CHK' 'ETX'** (read value)
> > 'O'   ASCII code 0x4F OR 0X80 = **0xCF**
> > *xyz*:   Steuerkanäle
> > *m..m:*   Indicator channels according controllers configuration
> > *s..s:*   Softkeys channels according controllers configuration
> > see chapter 4.9.3 - Chamber configuration.

The length of the replied string depends on the configuration of the chamber. All configured digital channels, flags and softkeys are reported. When function active a '1' otherwise a '0' is replied.

> Example: ADR = 1

> Command to chamber (PC to CPU):
> String =   0x02 0x81 0xCF 0xCE 0x03 (5 bytes)

> Reply of chamber (CPU to PC):
> String =   0x02 0x81 0xCF 0xB0 0xB1 0xB0 0xB0 0xB0 0xB1 0xB0 0xB0 0xB0
> > 0xB0 0xB0 0xB0 0xB0 0xB0 0xCE 0x03 (19 bytes)

4.9.2 Ethernet Interface

Command to chamber (PC to CPU):
O

Example: O (1 character)

Reply of chamber (CPU to PC):
Oxyzm…ms…s
- *x:*   Start: ‚1' for chamber started, ‚0' for chamber stopped
- *y:*   Error: ‚1' for error present, ‚0' for no error
- *z:*   Pause ‚1' for continue chamber, ‚0' for interrupt chamber
- *m..m:*   Indicator channels according controllers configuration
- *s..s:*   Softkeys channels according controllers configuration
            see chapter 4.9.3 - Chamber configuration.

Example: O10011010 (Chamber started, no error, 2 Indicators both ON,
                          3 softkeys second one switched ON, length variable)

Notice:
- Order of Indicators and Softkeys is given by ascending order of "Channel No. CID" of both lists, see chapter 4.9.3 - Chamber configuration.
- Enabling bits are replied, e.g. if a function is switched on but not released a '0' is replied. Example: DigOut1 is set but Chamber is stopped. (This is related to blinking channel in handset.)

4.9.3 Chamber configuration

Example of a chamber configuration C-70/350:

Value	Channel No CID	Channel	Type	Meaning
x	-	START / STOP	SYSTEM	Chamber ON/OFF?
y	-	COLLECTMALFUNCTION	SYSTEM	Error?
z	-	PAUSE	SYSTEM	Chamber interrupt?
m0	1	Temperature	Indicator 1	State on/off
m1	2	Humidity	Indicator 2	State on/off
m2	3	Dew point >7°C	Indicator 3	State on/off
m3	4	Dew point <7°C	Indicator 4	State on/off
s0	1	Deep dehumidity	Softkey 1	State on/off
s1	2	RegSupplyAir	Softkey 2	State on/off
s2	3	Dig. output 1	Softkey 3	State on/off
s3	4	Dig. output 2	Softkey 4	State on/off
s4	5	De-sludge	Softkey 5	State on/off

4.10 Set additional digital channels

4.10.1 Serial Interface

Command to chamber (PC to CPU):
'STX' 'ADR' 'o' xx_y 'CHK' 'ETX'

'o'	ASCII code 0x6F OR 0x80 = **0xEF**
xx:	Number of channel according list at command 'O' counting from zero. In ASCII-Code OR 0x80 (cf. chapter 4.10.3 - Chamber configuration)
_:	blank = 0x20 OR 0x80 = 0xA0
y:	Value to set: „1" or „0" correspond to ON or OFF

Example: xx = 09 turn on: ADR = 1
xx 10er = '0' = 0x30 OR 0x80 = 0xB0
xx 1er = '9' = 0x39 OR 0x80 = 0xB9

String = 0x02 0x81 0xEF 0xB0 0xB9 0xA0 0xB1 0xF6 0x03 (9 bytes)

Reply of chamber (CPU to PC):
'STX' 'ADR' 'o' xx 'CHK' 'ETX'

'o'	ASCII code 0x6F OR 0x80 = **0xEF**
xx:	Number of channel according list at command 'O' counting from zero. In ASCII-Code OR 0x80 (cf. chapter 4.10.3 - Chamber configuration)

Example: xx = 09 turn on: ADR = 1, compressed air = 1
String = 0x02 0x81 0xEF 0xB0 0xB9 0xE7 0x03 (7 bytes)

4.10.2 Ethernet Interface

Command to chamber (PC to CPU):
oxx_y

xx:	Channel No. 2 digits as decimal number see chapter 4.10.3 - Chamber configuration
_	blank
y:	Value to set: ‚0' for function OFF, ‚1' for function ON

Example: o09 1 (5 characters)
(For a chamber with 2 indicators softkey with channel No. CID = 5 is switched ON)

Reply of chamber (CPU to PC):
oxx

xx:	Channel No. 2 digits as decimal number

Example: o09 (3 characters)

Notice:
- You can use this command to switch softkey channels which are not reachable over S-command. Start/stop of chamber is not possible.

4.10.3 Chamber configuration

Example of a chamber configuration C-70/350:

Command oxx	Channel No CID	Channel	Type	Meaning
o00	*-*	*START / STOP*	*SYSTEM*	*not changeable*
o01	*-*	*COLLECTMALFUNCTION*	*SYSTEM*	*not changeable*
o02	*-*	*PAUSE*	*SYSTEM*	*not changeable*
o03	*1*	*Temperature*	*Indicator 1*	*not changeable*
o04	*2*	*Humidity*	*Indicator 2*	*not changeable*
o05	*3*	*Dew point >7°C*	*Indicator 3*	*not changeable*
o06	*4*	*Dew point <7°C*	*Indicator 4*	*not changeable*
o07	1	Deep dehumidity	Softkey 1	**Softkey can be set**
o08	2	RegSupplyAir	Softkey 2	**Softkey can be set**
o09	3	Dig. output 1	Softkey 3	**Softkey can be set**
o10	4	Dig. output 2	Softkey 4	**Softkey can be set**
o11	5	De-sludge	Softkey 5	**Softkey can be set**

4.11 Read program state

4.11.1 Serial Interface

Command to chamber (PC to CPU):
    'STX' 'ADR' 'P' 'CHK' 'ETX'
        'P'   ASCII code 0x50 OR 0x80 = **0xD0**

        Example: ADR = 1
          String =   0x02 0x81 0xD0 0xD1 0x03 (5 bytes)

Reply of chamber (CPU to PC):
    'STX' 'ADR' 'P' xxx 'CHK' 'ETX' (read value)
        'P'   ASCII code 0x50 OR 0x80 = **0xD0**
        xxx: actual program number (3 ASCII characters, 001-099)
                          000 = no program currently running

        Example: ADR = 1, program 1 runs (30Hex oder 80Hex, 30Hex oder 80Hex, 31Hex oder 80Hex)
          String =   0x02 0x81 0xD0 0xB0 0xB0 0xB1 0xE0 0x03 (8 bytes)

4.11.2 Ethernet Interface

Command to chamber (PC to CPU):
    P

        Example: P (1 character)

Reply of chamber (CPU to PC):
    Pxxx
        xxx: Number of currently running program, always in 3 digits, Program number 000 stands for program mode OFF

        Example: P000 (No program running, 4 characters)
                          P010 (Program No 10 is active, 4 characters)

4.12 Start/Stop a program

4.12.1 Serial Interface

Command to chamber (PC to CPU):
'STX' 'ADR' 'p' xxx 'CHK' 'ETX'

'p'	ASCII code 0x70 OR 0x80 = **0xF0**
xxx:	number of the program to be started (001-099).
	000 = stop the program

Examples:	ADR = 1, start program 1
String =	0x02 0x81 0xF0 0xB0 0xB0 0xB1 0xC0 0x03 (8 bytes)
	ADR = 1, stop program
String =	0x02 0x81 0xF0 0xB0 0xB0 0xB0 0xC1 0x03 (8 bytes)

Reply of chamber (CPU to PC):
'STX' 'ADR' 'p' xxx 'CHK' 'ETX' (read value)

'p'	ASCII code 0x70 OR 0x80 = **0xF0**
xxx:	number of the program to be started (001-099).
	000 = stop the program

Examples:	ADR = 1, start program 1
String =	0x02 0x81 0xF0 0xB0 0xB0 0xB1 0xC0 0x03 (8 bytes)

4.12.2 Ethernet Interface

Command to chamber (PC to CPU):
pxxx

xxx:	Number of program (3 digits),
	Program number 000 means stop program,

Example:	p001 1 (4 characters)

Reply of chamber (CPU to PC):
pxxx

xxx:	Number of program (3 digits),
	Program number 000 means stop program,

Example:	p001 1 (4 characters)

4.13 Read information of saved test programs

4.13.1 Serial Interface

Command to chamber (PC to CPU):

'STX' 'ADR' 'M' xx 'CHK' 'ETX'

'M'	ASCII code 0x4D OR 0x80 = **0xCD**
xx:	Command parameter - two-digit in ASCII OR 0x80

Following command parameters are implements:

xx = 01:   Read counter of programs with program number

Reply of chamber (CPU to PC):

M01_xxx;Nr1;Nr2;NrN; (variable length)

_:	blank = 0x20 OR 0x80 = 0xA0
xxx:	Number of all saved programs, all bytes in ASCII OR 0x80
';':	seperator = 0x3B OR 0x80 = 0xBB
Nr1..NrN:	Counter of the program numbers (three-digit), in ASCII OR 0x80

xx = 02:   Infos of the program number

Reply of chamber (CPU to PC):

M02_xxx;Name;Lines;Runtime; (variable length)

_:	blank = 0x20 OR 0x80 = 0xA0
xxx:	Program number, all bytes in ASCII OR 0x80
';':	seperator = 0x3B OR 0x80 = 0xBB
Name:	Program name
Lines:	Number of lines in the program
Runtime:	Program runtime in min. (without waitfunctions)

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4.13.2 Ethernet Interface

Command to chamber (PC to CPU):

Mxx
> *xx:*   Command parameter - two-digit

Example: M01 (3 characters)

Following command parameters are implements:

xx = 01:   Read counter of programs with program number
> Reply of chamber (CPU to PC):
> > **M01_xxx;Nr1;Nr2;NrN;** (variable length)
> > *_:*   blank
> > *xxx:*   Number of all saved programs,
> > *;:*   seperator
> > *Nr1..NrN:*
> > > Counter of the program numbers (three-digit)

Example: M01 002;001;002; (17 characters)

xx = 02:   Infos of the program number
> Reply of chamber (CPU to PC):
> > **M02_xxx;Name;Lines;Runtime;** (variable length)
> > *_:*   blank
> > *xxx:*   Program number
> > *;:*   seperator
> > *Name:* Program name
> > *Lines:* Number of lines in the program
> > *Runtime:*
> > > Program runtime in min. (without waitfunctions)

Example: M02 001;Prog.01;015;1440;

4.14 Read information about the current test program
Command available from ITC version 3.19 (delivery date: 14.08.2019)

4.14.1 Serial Interface

Command to chamber (PC to CPU):
'STX' 'ADR' 'D' xxx 'CHK' 'ETX'

'D'	ASCII code 0x44 OR 0x80 = **0xC4**
xxx:	Current program number - three digits in ASCII OR 0x80

Example:	Program = 001
String =	0x02 0x81 0xC4 0xB0 0xB0 0xB1 0xF4 0x03 (8 bytes)

Reply of chamber (CPU to PC):
'STX' 'ADR' 'D' xxx;Line;Wait;ProgRun;RuntimeProg;RemaintimeLine 'CHK' 'ETX'

'D'	ASCII code 0x44 OR 0x80 = **0xC4**
xxx:	Current program number - three-digit in ASCII OR 0x80
';':	Seperator = 0x3B OR 0x80 = 0xBB
Line:	Current program line
Wait:	Wait function active = 1, inactive = 0
ProgRun:	Program is running = 1, program is not running = 0
RuntimeProg:	Current runtime in seconds
RemaintimeLine:	Remaining runtime of the current program line in seconds

Example:	D001;001;0;1;00000063;00000537
String =	0x02 0x81 0xC4 0xB0 0xB0 0xB1 0xBB 0xB0 0xB0 0xB1 0xBB 0xB0 0xBB 0xB1 0xBB 0xB0 0xB0 0xB0 0xB0 0xB0 0xB0 0xB6 0xB3 0xBB 0xB0 0xB0 0xB0 0xB0 0xB0 0xB5 0xB3 0xB7 0xFB 0x03

4.14.2 Ethernet Interface

Command to chamber (PC to CPU):
Dxxx

xxx:	Current program number - three digits

Example:	D001 (4 characters)

Reply of chamber (CPU to PC):
Dxxx; ;Line;Wait;ProgRun;RuntimeProg;RemaintimeLine (variable length)

xxx:	Current program number - three-digit
';':	Seperator
Line:	Current program line
Wait:	Wait function active = 1, inactive = 0
ProgRun:	Program is running = 1, program is not running = 0
RuntimeProg:	Current runtime in seconds
RemaintimeLine:	Remaining runtime of the current program line in seconds

Example:	D001;001;0;1;00001440;00002646

4.15 Read error text

4.15.1 Serial Interface

Command to chamber (PC to CPU):
    'STX' 'ADR' 'F' 'CHK' 'ETX'
        'F'   ASCII code 0x46 OR 0x80 = **0xC6**

      Example: ADR = 1
        String =   0x02 0x81 0xC6 0xC7 0x03 (5 bytes)

Reply of chamber (CPU to PC):
    'STX' 'ADR' 'F' n..n 'CHK' 'ETX' (read value)
        'F'   ASCII code 0x46 OR 0x80 = **0xC6**
        n..n: text for the error memorized in the control unit.
                        Length always 32 ASCII characters.
                        If there is no error, TEXT is sent back with 32x'' (blank).

The total length of the data record always is 37 characters.
The formation of the check sum occurs in the same way than for the other data records.

4.15.2 Ethernet Interface

Command to chamber (PC to CPU):
    F

      Example: F (1 character)

Reply of chamber (CPU to PC):
    Fn..n
        n..n: Errortext 32 characters, if there is no error and no warning
                        present blanks are returned.

      Example: FTemperature range Min 08-B1 (33 characters)

Notice: If there are several errors, the first error is delivered.

4.16 Read currently errors

4.16.1 Read the number of all currently errors - Serial Interface

Command to chamber (PC to CPU):

    'STX' 'ADR' 'H01' 'CHK' 'ETX'

'H'	ASCII code 0x48 OR 0x80 = **0xC8**
01:	Command parameter - two-digit in ASCII OR 0x80

Example:	ADR = 1
String =	0x02 0x81 0xC8 0xB0 0xB1 0xC8 0x03 (7 bytes)

Reply of chamber (CPU to PC):

    'STX' 'ADR' 'H01'_Errornumber 'CHK' 'ETX' (read value)

'H'	ASCII code 0x48 OR 0x80 = **0xC8**
01:	Command parameter - two-digit in ASCII OR 0x80
_:	blank = 0x20 OR 0x80 = 0xA0
Errornumber:	Number of all currently errors including warnings - two-digit all bytes in ASCII OR 0x80

Example:	
String =	0x02 0x81 0xC8 0xB0 0xB1 0xA0 0xB0 0xB0 0xE8 0x03 (10 bytes)
	ADR = 1
	H01
	There are 00 errors

4.16.2 Read all currently errors - Serial Interface

Command to chamber (PC to CPU):
    'STX' 'ADR' 'H02' 'CHK' 'ETX'

'H'	ASCII code 0x48 OR 0x80 = **0xC8**
02:	Command parameter - two-digit in ASCII OR 0x80

Example:	ADR = 1
String =	0x02 0x81 0xC8 0xB0 0xB2 0xCB 0x03 (7 bytes)

Reply of chamber (CPU to PC):
    'STX' 'ADR' 'H02'_Errornumber;Errortext1;… Errortextn; 'CHK' 'ETX'
    (read value)

'H'	ASCII code 0x48 OR 0x80 = **0xC8**
02:	Command parameter - two-digit in ASCII OR 0x80
_:	blank = 0x20 OR 0x80 = 0xA0
Errornumber:	Number of all currently errors including warnings - two-digit all bytes in ASCII OR 0x80
';':	seperator = 0x3B OR 0x80 = 0xBB
Errortext1:	Error texts - each 32 bytes in ASCII OR 0x80,
';':	separated by separators (= 0x3B =R 0x80 = 0xBB)
Errortextn:	
';':	final separator

Example:	
String =	0x02 0x81 0xC8 0xB0 0xB2 0xA0
	0xB0 0xB3 0xBB
	0xD4 0xE8 0xE5 0xF2 0xED 0xAE 0xA0 0xF0 0xF2 0xEF
	0xF4 0xE5 0xE3 0xF4 0xA0 0xE6 0xE1 0xEE 0xA0 0xE3
	0xEF 0xEE 0xE4 0xAE 0xA0 0xB0 0xB3 0xAD 0xC6 0xB5
	0xAE 0xB1 0xBB
	0xD4 0xE5 0xED 0xF0 0xAE 0xA0 0xCC 0xE9 0xED 0xE9
	0xF4 0xE5 0xF2 0xA0 0xF4 0xE5 0xF3 0xF4 0xA0 0xF3
	0xF0 0xE1 0xE3 0xE5 0xA0 0xB0 0xB1 0xAD 0xC6 0xB1
	0xAE 0xB1 0xBB
	0xD0 0xF4 0xB1 0xB0 0xB0 0xA0 0xF3 0xF5 0xE3 0xF4
	0xAE 0xE7 0xE1 0xF3 0xA0 0xC3 0xA0 0xB0 0xB3 0xAD
	0xC2 0xB1 0xB3 0xA0 0xA0 0xA0 0xA0 0xA0 0xA0 0xA0
	0xA0 0xA0 0xBB
	0x8B 0x03 (110 bytes)
	ADR = 1
	H02
	There are 03 errors
	1. Error: "Therm. protect fan cond. 03-F5.1"
	2. Error: "Temp. Limiter test space 01-F1.1"
	3. Error: "Pt100 suct.gas C 03-B13 "

4.16.3 Read the number and entry of all currently errors - Ethernet Interface

Command to chamber (PC to CPU):
Hxx

    xx: Command parameter - two-digit

    Example: H01 (3 characters)

Following command parameters are implements:

xx = 01:   Read number of errors
                Reply of chamber (CPU to PC):
                H01_xx (6 characters)
                _: blank
                xx: Number of all currently errors including warnings

    Example: H01 02 (6 characters)

xx = 02:   Read number of all currently errors including warnings and the relevant texts
                Reply of chamber (CPU to PC):
                H02_xx;Message1;Message2;MessageN;
                (Length dependent on error count)
                _: blank
                xx: Number of all currently errors including warnings
                ;   separator
                Message1.. MessageN:
                      error texts in defined length (per 32 characters)

    Example: H02 02;Temperature Lim. Min 08-B1   ;Temp. Limiter test space 01-F1.1; (73 Zeichen)

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4.17 Read the lock state of the keyboard

4.17.1 Serial Interface

Command to chamber (PC to CPU):
    'STX' 'ADR' 'L' 'CHK' 'ETX'
        'L'   ASCII code 0x4C OR 0x80 = **0xCC**

    Example: ADR = 1
      String =   0x02 0x81 0xCC 0xCD 0x03 (5 bytes)

Reply of chamber (CPU to PC):
    'STX' 'ADR' 'L' x 'CHK' 'ETX' (read value)
        'L'   ASCII code 0x4C OR 0x80 = **0xCC**
        x: '0':   keyboard unlocked
                          '1':   keyboard locked level 1
                          '2':   keyboard locked level 2

    Example: unlock keyboard
      String =   0x02 0x81 0xCC 0xB0 0xFD 0x03 (6 bytes)

4.17.2 Ethernet Interface

Command to chamber (PC to CPU):
    L

    Example: L (1 character)

Reply of chamber (CPU to PC):
    Lx
        x: '0':   keyboard unlocked
                          '1':   keyboard locked level 1
                          '2':   keyboard locked level 2

    Example: L1 (2 characters)

4.18 Lock/unlock the keyboard

4.18.1 Serial Interface

Command to chamber (PC to CPU):
'STX' 'ADR' 'l' x 'CHK' 'ETX'

'l'	ASCII code 0x6C OR 0x80 = **0xEC**	
x:	'0':	keyboard unlocked
	'1':	keyboard locked level 1
	'2':	keyboard locked level 2

Example: ADR = 1; Lock keyboard level 2
String = 0x02 0x81 0xEC 0xB2 0xDF 0x03 (6 bytes)

Reply of chamber (CPU to PC):
'STX' 'ADR' 'l' x 'CHK' 'ETX'

'l'	ASCII code 0x6C OR 0x80 = **0xEC**	
x:	'0':	keyboard unlocked
	'1':	keyboard locked level 1
	'2':	keyboard locked level 2

4.18.2 Ethernet Interface

Command to chamber (PC to CPU):
lx

x:	'0':	keyboard unlocked
	'1':	keyboard locked level 1
	'2':	keyboard locked level 2

Example: l2 (2 characters)

Reply of chamber (CPU to PC):
lx

x:	'0':	keyboard unlocked
	'1':	keyboard locked level 1
	'2':	keyboard locked level 2

Example: l2 (2 characters)

4.19 Read software version statuses

Command available from ITC version 3.19 (delivery date: 14.08.2019)

4.19.1 Serial Interface

Command to chamber (PC to CPU):
'STX' 'ADR' 'C' 'CHK' 'ETX'
  'C'   ASCII code 0x43 OR 0x80 = **0xC3**

  Example: C
   String =   0x02 0x81 0xC3 0xC2 0x03 (5 bytes)

Reply of chamber (CPU to PC):
'STX' 'ADR' 'C' PLCVersion;ITCVersion;PLCNumber; 'CHK' 'ETX'
  'C'   ASCII code 0x43 OR 0x80 = **0xC3**
  ';':   Separator
  PLCVersion: PLC version
  ITCVersion: Software on the controller
  PLCNumber: Number of the CoDeSys program

  Example: C01;3.19;C70350TEST;
   String =   0x02 0x81 0xC3 0xB0 0xB1 0xBB 0xB3 0xAE 0xB1 0xB9 0xBB 0xC3
          0xB7 0xB0 0xB3 0xB5 0xB0 0xD4 0xC5 0xD3 0xD4 0xBB 0x89 0x03

4.19.2 Ethernet Interface

Command to chamber (PC to CPU):
  C

Reply of chamber (CPU to PC):
CPLCVersion;ITCVersion;PLCNumber
  ';':   Separator
  PLCVersion: PLC version
  ITCVersion: Software on the controller
  PLCNumber: Number of the CoDeSys program

  Example: C01;3.19;C70350TEST;

4.20 Read manual limits

Command available from ITC version 3.23 (delivery date: 22.10.2020)

4.20.1 Serial Interface

Command to chamber (PC to CPU):
> **'STX' 'ADR' 'G' x 'CHK' 'ETX'**
>> 'G'   ASCII code 0x47 OR 0x80 = **0xC7**
>> *x:*   channelno - one byte in ASCII OR 0x80
>>   (cf. chapter 4.5.3 - Chamber configuration)

> Example: ADR = 1, channelno = 0 (temperature channel)
> String =   0x02 0x81 0xC7 0xB0 0xF6 0x03 (6 bytes)

Reply of chamber (CPU to PC):
> **'STX' 'ADR' 'G' x_yyy.y_zzz.z 'CHK' 'ETX'** (read value)
>> 'G':   ASCII code 0x47 OR 0x80 = **0xC7**
>> *x:*   channelno - one byte in ASCII OR 0x80
>>   (cf. chapter 4.5.3 - Chamber configuration)
>> _: blank = 0x20 OR 0x80 = 0xA0
>> *yyy.y:*   Limit min of the selected analog channel with fixed format
>>   three digits before one after the decimal point
>>   (XXX.X - with negative values -XX.X)
>>   per byte in ASCII OR 0x80
>> *zzz.z:*   Limit max of the selected analog channel with fixed format
>>   three digits before one after the decimal point
>>   (XXX.X - with negative values -XX.X)
>>   per byte in ASCII OR 0x80

> Example: ADR = 1, channelno = 0 (temperature channel),
>   limit min = -80,0 °C, limit max = 190,0 °C
> String =   0x02 0x81 0xC7 0xB0 0xA0 0xAD 0xB8 0xB0 0xAE 0xB0 0xA0
>   0xB1 0xB9 0xB0 0xAE 0xB0 0xEB 0x03 (18 bytes)

Notice: If several channels are available, each one must be read separately.

4.20.2 Ethernet Interface

Command to chamber (PC to CPU):
> **G*x***
>> *x:*   Channel number - Mapping of channel numbers could be seen in
>>   chapter 4.5.3 - Chamber configuration.

> Example: G0 (Read limits of the chamber temperature, 2 characters)

Reply of chamber (CPU to PC):
> **G*x*_yyy.y_zzz.z**
>> *x:*   Channel number see above (cf. chapter 4.5.3 - Chamber configuration)
>> _: blank
>> *yyy.y:*   Limit min of the selected analog channel with one decimal place
>> *zzz.z:*   Limit max of the selected analog channel with one decimal place

> Example: G0 -80.0 190.0
>   (limit min = -80,0 °C, limit max = 190,0 °C, 14 characters)

Notice:
> If chamber replies only with one number, this is the channel No., but the asked channel is
> not present. (invalid Channel No., because Channel No. CID of controller configuration is not
> > 0, or the channel properties CID do not contain any limit values).

4.21 Set manual limits

Command available from ITC version 3.23 (delivery date: 22.10.2020)

4.21.1 Serial Interface

Command to chamber (PC to CPU):

'STX' 'ADR' 'g' x_yyy.y_zzz.z 'CHK' 'ETX'

'g'	ASCII code 0x67 OR 0x80 = **0xE7**
x:	channelno - one byte in ASCII OR 0x80
	(cf. chapter 4.5.3 - Chamber configuration)
_:	blank = 0x20 OR 0x80 = 0xA0
yyy.y:	Limit min of the selected analog channel with fixed format
	three digits before one after the decimal point
	(XXX.X - with negative values -XX.X)
	per byte in ASCII OR 0x80
zzz.z:	Limit max of the selected analog channel with fixed format
	three digits before one after the decimal point
	(XXX.X - with negative values -XX.X)
	per byte in ASCII OR 0x80

Example:	ADR = 1, channelno = 0 (temperature channel)
	limit min = -70,0 °C, limit max = 180,0 °C
String =	0x02 0x81 0xE7 0xB0 0xA0 0xAD 0xB7 0xB0 0xAE 0xB0 0xA0 0xB1
	0xB8 0xB0 0xAE 0xB0 0xC5 0x03 (18 bytes)

Notice: If several channels are available, each one must be set separately.

Reply of chamber (CPU to PC):

'STX' 'ADR' 'g' 'CHK' 'ETX'

'g'	ASCII code 0x67 OR 0x80 = **0xE7**

4.21.2 Ethernet Interface

Command to chamber (PC to CPU):

gx_yyy.y_zzz.z

x:	Channel number - Mapping of channel numbers could be seen in
	chapter 4.5.3 - Chamber configuration.
_:	blank
yyy.y:	Limit min of the selected analog channel with fixed format
	three digits before one after the decimal point
zzz.z:	Limit max of the selected analog channel with fixed format
	three digits before one after the decimal point

Example:	g0 -70.0 180.0
	(limit min = -70,0 °C, limit max = 180,0 °C, 14 characters)

Reply of chamber (CPU to PC):

g

Example:	g (1 character)

Notice:

- If chamber replies only with one number, this is the channel No., but the asked channel is not present. (invalid Channel No., because Channel No. CID of controller configuration is not > 0, or the channel properties CID do not contain any limit values)
- The limits form command are limited to channel range