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APPENDIX  INTERFACE PROTOCOL

APPENDIX  INDEX
1 INTRODUCTION

1.1 General information

For installation and operation of the test system there is the operating manual for the test system, and this operating manual for the control unit Touchpanel 3½.

• Before commissioning, read and observe the operating manual for the test system and this operating manual.

1.1.1 For your information

The symbols and danger warnings used in this operating manual have the following meanings:

1.1.1.1 Symbols

– A dash is used for enumerations.
• Instructions for the operator and operating company are indicated by a dot.
→ Cross-references are indicated by an arrow.

1.1.1.2 Danger warnings

Warnings in this operating manual are explained by means of text and adjacent symbols.

DANGER

is used in instances where any failure to comply with instructions could endanger human or other life or might pose a threat to the environment.

WARNING

is used in instances where any failure to comply with instructions could cause damage to the test system or its load.

NOTE

is used to draw attention to a piece of advice.
1.1.2 Safety instructions
All safety instructions given in the test system operating manual must be complied with.

1.2 Description
Operation, monitoring and documentation of the test systems employ a 3½" touch display.
The software is available in German and English.
The software package contains the following functions:
– Control and monitoring of the test system
– Conducting tests in manual mode and program mode
– Creating programs
– Error messages display
1.3 TFT Touch Display

Entries on the touch display are made either with a finger tip or with a touch pen.

**WARNING**

To prevent scratches on the surface, do not use any sharp-edged objects, such as ball pens, keys, rings, coins or cutlery.

1.3.1 Cleaning

Use a clean cloth and standard glass cleaner to clean the surface of the touch display. Do not spray the glass cleaner directly onto the surface of the touch display, but apply it to the cloth and wipe it across the surface.

**WARNING**

Do not use roughening cleaning agents!

If you wish to clean the surface of the touch display during operation, press the button in the »Settings« menu → 3.3 (Page 13). The surface is blocked for 15 seconds for cleaning.
1) option
2) climatic test systems only
2 AN OVERVIEW

The basic menu is the starting point for all functions. From here you reach various submenus and can switch on the light in the test space, see the operating status of the test system and call up information concerning the test system and the software. Further information on the basic menu and submenus is available in Section → 3 Basic menu (Page 9).

2.1 Basic menu

A Operating status of the test system
B Display of current actual values for temperature and humidity 2)
C Return to basic menu
D Switch light in the usable space on / off → 2.2 (Page 6)
E Return to the last menu
F Information concerning the test system and the software → 2.4 (Page 7)
G Display of date and time

Fig. 2-1
Basic menu

1) option
2) climatic test systems only
2.2 **Light in the usable space**

- please see Section 2.1, Fig. 2-1 (Page 5)

With [image], you can switch the light in the usable space on and off.

When the light is switched on, the display changes [image].

In the configuration menu, the time after which the light is automatically switched off again can be set → 3.3.4 Configuration (Page 19).

2.3 **Entry menu**

There are various entry menus for entry of text and numbers. These appear immediately as soon as a changeable field is pressed. An entry is confirmed by pressing [image].

![Fig. 2-2 Entry of numbers](image)

![Fig. 2-3 Entry of text](image)
2.4 Device information

A Device information:
Device designation
Device number
Year of manufacture
Order number

B Information on the software (software version, PLC version/system, BSP version)

C Information concerning Touchpanel 3½" (version of the control unit)
2.5 **Inactive buttons**

Various functions are only available in certain operating modes. If you try to undertake one of these functions, e.g. the following message appears:

![Inactive button message](image)

**Extern operation!**
**Button not active!**

OK

*Fig. 2-5*
*External operation*

- Confirm the message with OK. This returns you to the previous menu.
3 BASIC MENU

3.1 Overview

A Operating status of the test system manual operation or program operation
B Display of current actual values for temperature and humidity 2)
C Return to basic menu
D Calls up the trend graphics → 3.2 (Page 11)
E Test / end program → 4.2.4 (Page 32), → 4.4.4 (Page 40)
F Test / start/interrupt program → 4.2.3 (Page 32), → 4.4.2 (Page 39), → 4.4.3 (Page 40)
G Switch light in the usable space on / off → 2.2 (Page 6)
H Calls up the error history → 6.2 (Page 55)
I Return to the last menu
J Calls up the program editor → 5 (Page 43)
K Additional settings (language, limit values, parameters, configuration) → 3.3 (Page 13)
L Information concerning the test system and the software → 2.4 (Page 7)
M Calls up options, customer channels, set values and measurement values → 4.3 (Page 33)
N Calls up the operating menu → 4 (Page 29)
O Display of the maintenance status → 3.4 (Page 28)

1) option
2) climatic test systems only
Overview

Basic menu

P  Operating status of the test system
   Running arrow: Test active
   Break symbol: Program interrupted → 4.4.3 (Page 40)
   Flashing clock with arrow: Delayed start active → 4.4.7 (Page 41)

Q  Display of date and time

R  Display of all active alarms → 6 (Page 53)
   Alarm horn off
3.2 Trend graphics

- please see Section 3.1, Fig. 3-1 (Page 9)

**Fig. 3-2**

Trend graphics

A Temperature scale
B Humidity scale
C History → 3.2.1 (Page 12)
D New recording

**WARNING**

*If you change the temperature or humidity values in the scale, the current recording will be deleted!*

**New recording**

- If you would like to start a new recording, press the **Now** button → Fig. 3-2, Pos. D.

**WARNING**

*Pressing the **Now** button deletes the current recording.*
3.2.1 History

- please see Section 3.2, Fig. 3-2 (Page 11)

A maximum of 12 hours of a test can be recorded and saved in the history. You can move forwards and back by a half an hour each time you press the arrow buttons \( \leftarrow / \rightarrow \).

![History](image-url)
3.3 Settings

- please see Section 3.1, Fig. 3-1 (Page 9)

Fig. 3-4
Menu for settings

A Select language → 3.3.1 (Page 14)
B Communication with controller → 3.3.3 (Page 18)
C Clean touch display → 1.3.1 (Page 3)
D User administration → 3.3.2 (Page 15)
E Calling up the menu for limit values → 3.3.5 (Page 27)
F Calling up the menu for parameters → only for service organisation
G Calling up the menu for configuration → 3.3.4 (Page 19)
3.3.1 **Set language**

- please see Section 3.3, Fig. 3-4 (Page 13)

The user interface can be depicted in German and English.

![Language interface](image)

A The user interface is depicted in German
B The user interface is depicted in English

- Mark the corresponding language → Fig. 3-5, Pos. A / B.

The interface immediately changes to the desired language.
3.3.2 User administration

- please see Section 3.3, Fig. 3-4 (Page 13)

All functions are distributed among ten user levels (0 to 9). As a result, you have the possibility to allow several users access to various functional areas. Each level is assigned a password that can be activated using the password for User Level 9. The passwords cannot be changed.

NOTE

The password protection is deactivated in the state as delivered. The password for User Level 9 is on the page after the cover sheet.

**Fig. 3-6**  
Access rights

A   Activate password for the User Level → 3.3.2.2 (Page 17)  
B   Listing of the individual User Levels → 3.3.2.1 (Page 16)  
C   Reset access rights to User Level 0 → 3.3.2.3 (Page 17)  
D   Display of the current User Level
### 3.3.2.1 Allocation of the User Level

- please see Section 3.3.2, Fig. 3-6 (Page 15)

![Fig. 3-7](image)

**Fig. 3-7**

**Level Info**

<table>
<thead>
<tr>
<th>User Level</th>
<th>Released functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Access to the basic menu, to test system and software information, switch on light in the test space, call up graphic menu, set language, call up error menu, clean touch display</td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Switch test on/off (manual operation), start, interrupt and stop preset program</td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Specify nominal values in manual operation, change between manual operation and program operation, select program, switch options and customer channels on/off, specify set values</td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Call up program editor, set limit values, set external operation, call up the configuration menu, software configuration</td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Activate password protection</td>
</tr>
</tbody>
</table>
3.3.2.2 Activate password

- please see Section 3.3.2, Fig. 3-6 (Page 15)

![Diagram showing setup of password settings with options A, B, and C.]

A  Password for Level 2 not active
B  Passwords for Level 4 and Level 6 active
C  Automatic resetting of the access rights after the set time

**NOTE**

If resetting of the access rights after 0 min. is set, then the password is not reset automatically, only in case of a power failure.

3.3.2.3 Block access right

- please see Section 3.3.2, Fig. 3-6 (Page 15)

After you have completed operations, you should block your access right again to prevent access to unauthorised persons.

- To do this, press the button → Fig. 3-6, Pos. C.

**NOTE**

You now have the rights for User Level 0.
3.3.3 **External communication with controller**

- Please see Section 3.3, Fig. 3-4 (Page 13)

To switch over to external operation, select the **Intern** button.

In external operation, external control systems (e.g. SimPATI software) can communicate with the controller. The operation with the Touchpanel 3½" is locked.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Function</th>
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<tr>
<td>Activated</td>
<td>Status display: Manual mode or program name</td>
</tr>
<tr>
<td>Intern</td>
<td></td>
</tr>
<tr>
<td>Activated</td>
<td>Status display: Ext. Man. Manual and program operation, starting and stopping with Touchpanel 3½&quot;, not possible Values can be displayed and specified via the external control system</td>
</tr>
<tr>
<td>External</td>
<td></td>
</tr>
</tbody>
</table>
3.3.4 Configuration

- please see Section 3.3, Fig. 3-4 (Page 13)

![Configuration menu](image)

A  Set power failure parameters → 3.3.4.1 (Page 20)
B  Set the date and time → 3.3.4.2 (Page 21)
C  Interface configuration → 3.3.4.3 (Page 22)
D  Set alarm horn → 3.3.4.4 (Page 26)
E  Set test space illumination → 3.3.4.5 (Page 26)
3.3.4.1 Set power failure time / power failure tolerance

- please see Section 3.3.4, Fig. 3-9 (Page 19)

A Never continue test
B Always continue test
C Mains power failure time

If power is restored within this time after a power failure, operation is resumed at the point where it was interrupted.

The power failure tolerance is the maximum amount by which the actual value may deviate from its nominal value during a power failure. The power failure tolerance value always refers to the test space temperature.

Example:
The set value is 10K: this means that, once power has been restored, if the temperature deviates from the set nominal value by less than 10 K, operation will be continued using the settings in place prior to the mains failure, if the power failure time is within the permitted range.
3.3.4.2 Set the date and time

- please see Section 3.3.4, Fig. 3-9 (Page 19)

![Set the date and time](image)

- Enter the date and time
- Then press the **apply** button
- Exit the menu with ** EXIT **
3.3.4.3 Configure interfaces

- please see Section 3.3.4, Fig. 3-9 (Page 19)

This chapter only relates to external communication with the controller of the test system.

![Diagram](image)

**NOTE**

If linking is carried out in the LAN, it must be assured that no conflicts arise with other network users when using the communications channels and addresses (e.g. double connections). We strongly recommend to have your network administrator set up the networks!

**WARNING**

Improper configuration may impair the operation of the network.

**NOTE**

If the test system is controlled via RS232, no IP address has to be assigned.
RS232 settings

- please see Section 3.3.4.3, Fig. 3-12 (Page 22)

**A** Set bus address

**B** Select baud rate

**C** Setting the interface protocol

**Bus address**

This function allocates a number (= address) to the test system. This is especially useful if you have several test systems and they communicate with a PC. The address appears on the printouts.

There are a total of 100 numbers available - 0 to 99.

- You allocate an address to the test system by pressing the button under »BUS-Adresse RS232« → Fig. 3-13, Pos. A.

The entry menu appears.

- Enter the desired bus address.

- Confirm the input by pressing

**Baudrate**

The baudrate specifies how fast the data is transmitted from the control unit to the test system. Baudrates which can be set: 9600, 19200, 38400, 57600, 115000.

- To set the desired baud rate, select the corresponding button under »Baudrate« → Fig. 3-13, Pos. B.

**Interface protocol**

- Select the interface protocol corresponding to your test system by pressing the corresponding button under »Protocol« → Fig. 3-13, Pos. C.

**NOTE**

If you write your own programs for the PC, select ASCII.
Ethernet settings

- please see Section 3.3.4.3, Fig. 3-12 (Page 22)

![Ethernet Interface]

A Obtain an IP address automatically (DHCP)
B Assigning the IP address → Page 25
C Active IP addresses

Fig. 3-14
Ethernet interface
Assigning the IP address

- Please observe → Fig. 3-14 (Page 24)

To enable communication in the network with the controller, the controller must be assigned a clear IP address in the network.

**Fig. 3-15**
Setting the IP address

A Obtain an IP address automatically (DHCP)
B Enter the IP address
C Enter the subnet mask
D Enter the standard gateway
E Save settings
F Exit menu without saving

- Enter the IP address, the subnet mask and the standard gateway

**NOTE**
The values must be defined by a network administrator.

or

- select »Obtain an IP-Address via DHCP« on → Fig. 3-15 , Pos. A.

**NOTE**
The address is assigned automatically by the external server if the network supports this → consult the network administrator.
3.3.4.4 Set alarm horn

- please see Section 3.3.4, Fig. 3-9 (Page 19)

An alarm horn is integrated into the Touchpanel 31/2". The configuration menu »Alarm-horn« can be used to set when the alarm horn should be activated.

![Fig. 3-16 Alarm horn](image)

A Alarm horn activated for alarms
B Alarm horn activated for warnings
C Alarm horn activated for messages

3.3.4.5 Set time for test space lighting

- please see Section 3.3.4, Fig. 3-9 (Page 19)

Here you can set the time after which the test space illumination automatically switches off again when switched off. If 0 min are set, there is no automatic switch-off.

![Fig. 3-17 Test space illumination](image)

A The time set for switching the illumination off automatically
3.3.5 **Set limit values for test space temperature**

- please see Section 3.3, Fig. 3-4 (Page 13)

![Fig. 3-18](image)

**A** Current temperature actual and nominal value
Above: nominal value, below: actual value

**B** Settable alarm limits

**C** Settable warning limits

**D** Tolerance band

**E** Display additional control variables

**NOTE**
*Monitoring is activated only when checked.*

**Alarm limits**
Depending on the control variable, the test system switches off automatically when the limit is exceeded, or an error message appears on the control unit, but the test system remains in operation.

**Warning limits**
When the warning limits are exceeded, an error message appears on the control unit.

**Tolerance band**
The tolerance band specifies a permitted deviation of the actual value from the nominal value. If the actual value exceeds or falls below the tolerance band, an error message appears on the control unit.
3.4 Maintenance function

- please see Section 3.1, Fig. 3-1 (Page 9)

The controller monitors various counters (e.g. compressor operating hours, fan operating hours, etc.) that are stored for the maintenance intervals.

The maintenance status is displayed by an LED in the upper right corner. The maintenance status indicates how many % of the threshold has already been reached. The status of the maintenance variable that is the farthest advanced is displayed.

![Fig. 3-19 Service display](image)

The LED indicates the maintenance status in % increments. The LED displays the range from 0% to 50% in green, the range from 50% to 75% in yellow, and from 75% to 100% in red.

**NOTE**

*If the maintenance status is in the range from 50% - 75% (yellow), then we recommend that you arrange a maintenance appointment with our service organisation.*

Selecting the maintenance bar causes the following menu to be displayed:

![Fig. 3-20 Counter](image)

A Age of device [h]
B Operating hours [h]
C Compressor running time [h]
D Show additional maintenance counters (e.g. fan running time)
4 OPERATING MENU

You can call up the operating menu by pressing «Operation» in the basic menu. There are two operating modes: manual operation and program operation. In manual operation, all settings must be entered manually. In program operation, the test is specified by a previously created program.

4.1 Overview

A Operating mode display
   »Manual« or name of the selected program

B Display of the actual value of the control variables

C Calling up the nominal value specification of the control variables

D Calling up the program editor → 5 (Page 43)

E Manual mode → 4.2 (Page 30)

F Program operation → 4.4 (Page 37)

G Calls up options, customer channels, set values and measurement values → 4.3 (Page 33)

Fig. 4-1
Operating mode
4.1.1 Selecting the operating mode

- please see Section → 4.1, Fig. 4-1 (Page 29)

The operating mode is selected using the buttons »Manual« and »Program« in the operating menu.

- Press the desired operating mode. The corresponding button is shown dark. In the depiction below, manual operation is activated.

Fig. 4-2
Selection of operating mode, here »Manual«

4.2 Manual operation

No program operation is possible in manual operation. The settings are made manually.

- Press the button »Manual« → Fig. 4-1 , Pos. E.

NOTE

The operating status is displayed → Pos. A (Page 29). If manual operation is already active, the »Manual« button does not have to be pressed.
4.2.1 Enter nominal value

- Press the corresponding nominal value → Fig. 4-1 (Page 29), Pos. C.

The following menu appears:

The entry menu appears.

- Press the corresponding nominal value → Fig. 4-3, Pos. A / B.

A Nominal temperature value
B Nominal humidity value
C Start test → 4.2.3 (Page 32)
D End test → 4.2.4 (Page 32)
E Options → 4.3 (Page 33)

A Entry limits for nominal value
Above: minimum value that can be set, below: maximum value that can be set
- Enter the new value and confirm your entry with.

1) option
2) climatic test systems only
4.2.2 Additional control variables
If the test system is equipped with various option, more than two control variables may be available.

- Press the arrow button ▲ / ▼ → Fig. 4-3 (Page 31)

The various control variables are shown sequentially.

4.2.3 Start test
- To start the test, press ▶ → Fig. 4-3, Pos. C.

A query follows, whether the temperature limiter has been set.

--

Start Unit
adjustable temperature limiter adapted?

- If the temperature limiter has not been set, exit the display with ▼.
- Set the temperature limiter.
- If the temperature limiter is set, press ▶ to start the test.

The test starts with the set values for the nominal value profiles and digital channels.

4.2.4 End test
- To end the test, press ▼ → Fig. 4-3, Pos. D.
4.3 Options

You reach the menu for Options via the button »Options« → Fig. 4-1, Pos. G.

A Digital customer inputs → 4.3.1 (Page 34)
B Extra functions → 4.3.2 (Page 34)
C Set values → 4.3.3 (Page 35)
D Measurement values → 4.3.4 (Page 36)

NOTE

The option buttons A to D (→ Fig. 4-5) are only selectable if the test system is equipped with the relevant option.
4.3.1 Display digital customer inputs

- please see Section 4.3, Fig. 4-5 (Page 33)

Additional equipment can be connected to the digital inputs/outputs on site → Appendix »Connections for interfaces« in the device instructions.

Active customer inputs are shown with a green background.

![Customer inputs](image)

4.3.2 Switching extra functions (digital channels)

- please see Section 4.3, Fig. 4-5 (Page 33)

Any extra functions that may be set up (e.g. customer outputs, UV radiation or compressed air dehumidifier) can be switched on/off in this menu.

![Extra functions](image)

- Press the corresponding extra function

Extra functions can be displayed using the arrow at the right edge of the screen. Switched-on extra functions are shown with a green background.
4.3.3 Set values

- please see Section 4.3, Fig. 4-5 (Page 33)

In this menu, the values for the various set values can be set.

- Press on the set value and enter the new value via the entry menu. Confirm with .

Additional set values can be displayed via the arrows on the right screen edge.
4.3.4 Measurement values

• please see Section 4.3, Fig. 4-5 (Page 33)

Various measurement values are displayed in this menu.

![Fig. 4-9: Enter measurement values](image)

Additional measurement values can be displayed via the arrows on the right screen edge.
4.4 Program operation

In program operation, the test is specified by a stored program. This can have been created with the Touchpanel 3 1/2" control unit.

- To enter program operation, press the button »Program« → Fig. 4-1, Pos. F (Page 29).

A preset program appears.

![Diagram of program interface](image)

A Preset program

- **A** Program number
- **B** Program cycles → 4.4.5 (Page 41)
- **C** Advanced time → 4.4.6 (Page 41)
- **D** Program start time → 4.4.7 (Page 41)
- **E** End program → 4.4.4 (Page 40)
- **F** Start program → 4.4.2 (Page 39)
4.4.1 Select program

- Select the program number of the preset program → Fig. 4-10, Pos. A

The program list appears.

A Program number
B Program name
D Program created with Touchpanel 3½" control unit
E Jump to program 1
F Page through program list in increments of 10
G Page through program list in increments of 5

- Select a program from the program list
4.4.2 Start the program

- To start the program, press ➡️ Fig. 4-10, Pos. F.

A query follows, whether the temperature limiter has been set.

- If the temperature limiter has not been set, exit the display with ☐

- Set the temperature limiter.

- If the temperature limiter is set, press ➡️ to start the program.

After the program has been started, the program name and program number appear in the upper-left corner ➡️ Fig. 4-12, Pos. A.

---

**Fig. 4-12**

Operating mode in ongoing operation

- **A** Program number and program name
- **B** Program start time / end time
- **C** Display of cycles
- **D** End program ➡️ 4.4.4 (Page 40)
- **E** Interrupt program ➡️ 4.4.3 (Page 40)
- **F** Display of nominal values stored in the program
- **G** Display of the program duration, total running time
After the program time elapses, the following message appears:

![Program finish message](image)

A  Program name
B  Display of when the program was started
C  Display of program end

- Press on the button of the control unit to acknowledge the information.

The »Operation« menu appears.

NOTE

You are now in manual operation.

### 4.4.3 Interrupting a program

If a program is interrupted, only the program time is stopped. The controller and extra functions remain switched on.

- To interrupt the program, press ![止め](image) → Fig. 4-12, Pos. E.
- To let the program continue to run, press ![再生](image).

### 4.4.4 End program

- To end the program, press ![停止](image) → Fig. 4-12, Pos. D.
4.4.5 **Program cycles**

- please see Section 4.4, Fig. 4-10 (Page 37)

The program cycles function can be used to repeat the program.

- Set the number of cycles (runs) → Fig. 4-10, Pos. B

**NOTE**

*The number of cycles can be changed during a program run → Fig. 4-12, Pos. C.*

4.4.6 **Advanced time**

- please see Section 4.4, Fig. 4-10 (Page 37)

You can use the advanced time function to define a time / location in the program at which the program should be started.

Example:

Program duration: 2 h 45 min.

Defined advanced time: 45 min.

The first 45 minutes of the program are skipped, and the program then starts at the defined point. The program duration is only two hours.

- Set the advanced time → Fig. 4-10, Pos. C

4.4.7 **Program start time**

- please see Section 4.4, Fig. 4-10 (Page 37)

This function can be used to define the time at which the program should be started.

- Set the desired date and the time → Fig. 4-10, Pos. D.
Program operation

Operating menu

1) option
2) climatic test systems only
5 CREATING AND EDITING PROGRAMS

You can use the program editor to create programs (→ 5.2) or to edit existing programs (→ 5.3).

5.1 Description of the program editor

Various templates are stored in the system, e.g. one for temperature tests (»Temperature«) and one for climatic tests (»Hot cold«). The corresponding channels are then already set up with the template.

• Press the button »Edit profile«

The program list appears.

Fig. 5-1

Program list

A Program number
B Program name
C Jump to program 1
D Page through program list in increments of 10
E Page through program list in increments of 5

NOTE
Up to 100 programs can be displayed and stored.
5.2 Create new program

- Select an empty program number from the program list (→ Fig. 5-1).

![Create new program](image)

- Press the button Edit.
- The message »Program reading...« appears, and then the program editor which can be used to create the program.
5.2.1 Program Editor

Fig. 5-3 Program editor

<table>
<thead>
<tr>
<th>A</th>
<th>Program name</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Segment number</td>
</tr>
<tr>
<td>C</td>
<td>Control variables / set values</td>
</tr>
<tr>
<td>D</td>
<td>Select control variable / set value</td>
</tr>
<tr>
<td>E</td>
<td>Nominal value of the selected control variable / set value</td>
</tr>
<tr>
<td>F</td>
<td>Extra functions (digital channels)</td>
</tr>
<tr>
<td>G</td>
<td>Select extra functions</td>
</tr>
<tr>
<td>H</td>
<td>Beginning of the loops → 5.2.3 (Page 48)</td>
</tr>
<tr>
<td>I</td>
<td>Wait for control variable → 5.2.4 (Page 48)</td>
</tr>
<tr>
<td>J</td>
<td>Tolerance band → 5.2.4 (Page 48)</td>
</tr>
<tr>
<td>K</td>
<td>Number of loops</td>
</tr>
<tr>
<td>L</td>
<td>Save program</td>
</tr>
<tr>
<td>M</td>
<td>Do not save program</td>
</tr>
<tr>
<td>N</td>
<td>Additional segments, control variables or extra functions</td>
</tr>
<tr>
<td>O</td>
<td>Limits of the selected control variable → 5.2.2 (Page 47)</td>
</tr>
</tbody>
</table>

**NOTE**

In the program, each change in the profile (constant, jump or ramp) is depicted as a segment.
Create new program

- Enter the new program name
- Specify the first segment for the control variable, e.g. temperature
- If an extra function has to be set, activate it
- Specify additional segments
- Once you have created the program, press the \[\text{Save program}\] button to save the program.

A query appears as to whether you want to save the program.

![Program storing?] (Yes | No)

- Confirm the query with \[\text{Yes}\]
- If you do not want to save the created program, press the \[\text{Delete} \] button. You will be taken back to the program list.

**Example of a program:**

<table>
<thead>
<tr>
<th>Segment no.</th>
<th>Time [h]</th>
<th>Nominal value [°C]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-</td>
<td>23.0</td>
</tr>
<tr>
<td>2</td>
<td>0.5</td>
<td>23.0</td>
</tr>
<tr>
<td>3</td>
<td>1.0</td>
<td>70.0</td>
</tr>
<tr>
<td>4</td>
<td>2.0</td>
<td>70.0</td>
</tr>
<tr>
<td>5</td>
<td>0.0</td>
<td>-5.0</td>
</tr>
<tr>
<td>6</td>
<td>2.5</td>
<td>-5.0</td>
</tr>
</tbody>
</table>
5.2.2 Limits

- please see Section 5.2.1, Fig. 5-3 (Page 45)

You can use this function to set warning limits for the selected control variable.

![Image of limit values](image)

A Maximum limit
B Minimum limit

- Press the corresponding limit \(\rightarrow\) Fig. 5-5, Pos. A / B.

The entry menu appears.

- Enter the new value and confirm your entry with \(\text{ENT}\).

**WARNING**

*If you have previously activated the limit monitoring for the test space temperature (\(\rightarrow\) 3.3.5 (Page 27), Pos. C), these values will be overwritten.*
5.2.3 Segment loop

- please see Section 5.2.1, Fig. 5-3 (Page 45)

You can use this function to repeat several segments. The loop is attached at the end.

- Select the last segment of the loop, and define the beginning of the loop in it → Fig. 5-3, Pos. H.

- Specify the number of loops (repeats) → Fig. 5-3, Pos. K.

5.2.4 Wait for control variable (wait function)

- please see Section 5.2.1, Fig. 5-3 (Page 45)

The result of the wait function is that after a ramp or a jump a program only continues when the actual value is reached. The number of the control variable that should be waited for is entered in the Pos. I (→ Fig. 5-3).

Tolerance band

If the Wait function is activated, a tolerance also has to be entered. The value entered creates a tolerance band around the set nominal value (e.g. ± 2 K).

The tolerance is a measure for when to start the section time for the next program step. If the temperature is within the tolerance band, the section time starts running.

**NOTE**

*The time set for a ramp extends by the wait time which results from the Wait function.*
5.3 Editing/copying a program

- Select the program you want to edit from the program list → Fig. 5-1.

The following menu appears:

A Program number and program name
B Edit the program
C Copy the program
D Delete the program

- Press the button to edit an existing program → 5.3.2 (Page 52)
- Press the button to copy and then edit an existing program → 5.3.1 (Page 50)
5.3.1 **Copy the program**

- Select the program you want to copy from the program list → Fig. 5-1.
- Press the button → Fig. 5-6, Pos. C

The following menu appears:

![Program copy menu](image)

- **A** Program number and program name of the source
- **B** Program slot to be copied to
- **C** Exit menu

- Press the button »B« → Fig. 5-7

The current program list appears

![Current program list](image)

- Select the program number that the copied program should be saved to.

---

1) option
2) climatic test systems only
NOTE
Up to 100 programs can be displayed and stored.

Fig. 5-9
Copy program

A Program number that the program is copied to
B Exit menu
C Save

• Press (to save the copied program.

The program list appears with the copied program.

Fig. 5-10
Program copied

NOTE
The copied program appears with the same name as the source program. You can edit the program as described in Section 5.3.2.
5.3.2 Editing a program

- Select the program to be edited from the program list → Fig. 5-1

- Press the button → Fig. 5-6, Pos. B

The message »Program reading...« appears, and then the program editor which can be used to edit the program → 5.2.1 (Page 45).

NOTE

In the program, each change in the profile (constant, jump or ramp) is depicted as a segment.
6 TROUBLESHOOTING

The following messages are displayed on the control unit:

- Alarm messages (shown on a red background)
- Warning messages (shown on a yellow background)
- Information (shown on a green background)

When a message occurs, a flashing warning triangle appears in the upper-right area of the screen. The colour of the warning triangle is based on the message that is active.

A Display of all active alarms / Alarm horn off
B Calls up the error history → 6.2 (Page 55)

NOTE
If a malfunction occurs during program mode that results in a switch-off (stand-by) of the test system, the program is stopped. If the error is rectified and the error message is acknowledged, the program continues from that point.

- To correct the error, note the error messages described in the operating manual for the test system.
6.1 Acknowledging errors

Once the cause of the error has been rectified, the error messages must be acknowledged. The message number is displayed for each message.

- To display the error messages, press the flashing warning triangle → Fig. 6-1, Pos. A.

A list of all active messages appears:

![Active Messages](image)

**Fig. 6-2**
Active messages

- A Alarm signal
- B Warning signal
- C Information
- D Acknowledge messages
- E Message number

You can use the arrow buttons 🅿️ / 🅷️ to page up and down.

- Press the Quit, alarm button to acknowledge the messages
- Exit the menu with 🅷️
- To let the program continue to run, press 🅷️
6.2 Error history

- please see Section 6, Fig. 6-1 (Page 53)

All error and fault messages from the test system are entered in the error history.

**NOTE**

128 messages can be stored.

![Error history diagram](image)

A Acknowledged error message
B Active error message

The **Quit alarm** button can be used to acknowledge the messages.

**NOTE**

The acknowledged messages are shown in a pale version of the respective colour. The acknowledgement time is displayed after the message.

**NOTE**

A description of the messages can be found in the operating manual for the test system.
1) option
2) climatic test systems only
APPENDIX: INTERFACE PROTOCOL

If you do not intend to use our PC control software, you will still be able to control the test system from your PC. However you will need some programming knowledge. You will have to write a control program.

Use one of the regular programming languages (e.g. Turbo Pascal or C++).

The test system is equipped with an RS232 interface. The following characteristics apply for data transmission from the controller to the PC:

- 9600 / 115200 Baud
- 1 Start bit
- 8 Data bits
- 1 Stop bit
- No parity
- No handshaking

**NOTE**

The INTERNAL / EXTERNAL mode set on the control unit is not supported, i.e. the test system can be operated either via the interface or via the control unit.

1 ASCII-1

1.1 What can you do with your PC?

- Enter and query nominal values for control variables
- Query actual values for control variables
- Query and change status of digital channels
- Query the temperature from a variety of standalone measurement sensors ¹)
- Start programs
- Specify how many times a program should run
- Stop programs
- Read the error status
- Read the error messages of the test system
- Acknowledge error messages

**NOTE**

If the test system has more than two analogue channels, then we recommend using the ASCII 2 protocol because it offers more convenient control of the test system. The same is true if set values (e.g. fan speed ¹), blowing down ¹) are to be set or queried.
1.2 How the program works

The program sends a string to the controller. The program uses this send string to request data. The controller responds to this string by sending a response string back to the PC.

WARNING

Communications between the PC and the controller in the test system will not work unless you link the »checksum« program section into your control program → 1.4 Program section »Checksum« (Page 6).

1.2.1 General guidelines for send string

A string contains a series of ASCII characters. Before each send string, you must enter the ASCII character to mark the start of text. After each send string, you must enter the ASCII character to mark the end of text.

<table>
<thead>
<tr>
<th>Start of text</th>
<th>»start of text {STX}«</th>
<th>ASCII code 02</th>
</tr>
</thead>
<tbody>
<tr>
<td>End of text</td>
<td>»end of text ({ETX})«</td>
<td>ASCII code 03</td>
</tr>
</tbody>
</table>

NOTE

These characters are omitted in the following examples for simplification purposes. The bus address of the test system is represented by z and the checksum to be calculated is represented by CC.

CAUTION

The controller processes data slower than a PC. Therefore do not send more than one string per second. Otherwise the processes in the controller (open and closed-loop control) may be disrupted.

1.2.2 General guidelines for response string

The response string contains two extra characters:

<table>
<thead>
<tr>
<th>{ACK} (acknowledged)</th>
<th>The controller recognised and accepted the send string from the PC.</th>
<th>ASCII code 06</th>
</tr>
</thead>
<tbody>
<tr>
<td>{NCK} (not acknowledged)</td>
<td>The send string was not recognised.</td>
<td>ASCII code 15</td>
</tr>
</tbody>
</table>
1.3 Send strings of the ASCII-1 interface protocol

1.3.1 Reading actual values

The following string asks for the current status of the test system.

1.3.1.1 Send string (PC → controller)

The string reads as follows: {STX}z?E8{ETX}

{STX}
  z Bus address of test system
  ? Request to send
  E8 Checksum
{ETX}

1.3.1.2 Response string (controller → PC)

The following string contains information on actual and nominal values for control variables, together with various other settings.

The string reads as follows:
{STX}1T018.5F066.0P0T000.0#--T010.0F090.0R100000000000000002B{ETX}

1.3.2 Setting nominal values for control variables

The following string sets the nominal values for control variables 1 to 25 and the nominal values for control variables 2 to 35, and starts the operation.

1.3.2.1 Send string (PC → controller)

zT025.0F35R1100000000000000CC

1.3.2.2 Response string (controller → PC)

z{ACK}CC the string was accepted
z{NAK}CC the string was not accepted
e.g. because a nominal value was above or below the set limit.

NOTE

The send string always consists of nominal values for two control parameters and 16 digital channels. For test systems with a single control variable the second control variable is ignored.
1.3.3 Querying temperature from standalone measurement sensors

The following string reads the measured temperature value from standalone sensors.

1.3.3.1 Send string (PC → controller)

\[ z: \text{Get:P_Var} : \text{xxx} : \text{CC} \]

XXX 216, 217, 218 or 219 for temperature sensors 1 to 4

1.3.3.2 Response string (controller → PC)

\[ z: \text{Get:P_Var} : 216 : 32.5 : \text{CC} \]

Actual value of temperature measurement sensor 1 (P_Var216) = 32.5°C

1.3.4 Start the program

The following string starts a program.

1.3.4.1 Send string (PC → controller)

\[ z: \text{Set:AutoStart} : \text{xxx} : \text{CC} \]

XXX 1 to 120 (number of the program)

1.3.4.2 Response string (controller → PC)

\[ z(\text{ACK}) \text{CC} \] if the program was started
\[ z(\text{NAK}) \text{CC} \] if the program slot is empty

1.3.5 Specify how many times a program should run

The following string specifies the number of program repeats.

1.3.5.1 Send string (PC → controller)

\[ z: \text{Set:AutoLoop} : \text{xxx} : \text{CC} \]

XXX 1 to 9999 (number of program repeats)

1.3.5.2 Response string (controller → PC)

\[ z(\text{ACK}) \text{CC} \]

1.3.6 Stopping program

The following string stops a running program.

1.3.6.1 Send string (PC → controller)

\[ z: \text{Set:AutoStop} : \text{CC} \]

1.3.6.2 Response string (controller → PC)

\[ z(\text{ACK}) \text{CC} \]
1.3.7 Read error status
The following string displays a bit pattern of all current errors.

1.3.7.1 Send string (PC → controller)
z:Get:Errors:CC

1.3.7.2 Response string (controller → PC)
z:Get:Errors:CC

   Cumulative 1 there is still at least one error present
   error
   0 there is no error present

The following 64-place bit pattern displays the error messages still present, read from left
to right. A "1" in the far left of the bit pattern therefore means that error No. 1 is still there.

1.3.8 Reading error messages
The following string reads the error message of an error number.

1.3.8.1 Send string (PC → controller)
z:Get:ErrorText:xx:CC

   xx Number of the error message whose text should be read

1.3.8.2 Response string (controller → PC)
z:Get:ErrorText:xx:Errortext:CC
e.g.: z:Get:ErrorText:16:Return of mains power:<CC>
or
z{NAK}CC if the error message does not exist

1.3.9 Acknowledging errors
The following string acknowledges all reported, acknowledgeable errors.

1.3.9.1 Send string (PC → controller)
z:Set:ErrorQuit:CC

1.3.9.2 Response string (controller → PC)
z{ACK}CC
1.4 Program section »Checksum«

The checksum is the complement of the Modulo-256 remainder following the division of the ASCII values of all the characters in the string; the values for ETX and the checksum itself are not included.

Each send string must contain a checksum!

NOTE

The checksum is a way of cross-checking the ASCII values in a string, including the ASCII value of »STX«. The ASCII value for »ETX« and the checksum are not included. The checksum is shown in upper case characters, e.g. 8E.

Programming language: C++

const char ASCII[] = "0123456789ABCDEF";

char *Checksum (char *buffer)
{
    static char Hex[10];
    static int a1, a2;
    register unsigned int i;
    int sum;
    sum = 256;
    for ( i=0 ; i<strlen(buffer) ; i++ )
    {
        sum-=buffer[i];
        if ( sum<0 )
            sum+= 256;
    }
    a1 = (sum & 0xF0) >> 4;
    a2 = sum & 0x0F;
    Hex[0] = ASCII[a1];
    Hex[1] = ASCII[a2];
    Hex[2] = 0;
    return(Hex);
}

NOTE

To verify that the checksum has been calculated correctly, use the example of the send string in Chapter 1.3.1 Reading actual values (Page 3). You must obtain »8E« for the checksum.

The controller checks the checksum of the send string to prevent transmission errors.
2 ASCII-2

2.1 What can you do with your PC?
- Set and query nominal values for control variables
- Query actual values for control variables
- Query and change status of digital channels
- Set change rates for fluctuating nominal values \(^1\)
- Starting and stopping programs
- Reading error messages
- Acknowledge error messages

2.2 How the program works
The program sends a string to the controller. The program uses this send string to request data. The controller responds to this string by sending a response string back to the PC.

2.2.1 General guidelines for send string
A string contains a series of ASCII characters. Before each send string, you must enter the ASCII character to mark the start. After each send string, you must enter the ASCII character to mark the end.

<table>
<thead>
<tr>
<th>Start</th>
<th><code>$</code></th>
<th>ASCII code 36</th>
</tr>
</thead>
<tbody>
<tr>
<td>End</td>
<td><code>&lt;CR&gt;</code> Carriage Return</td>
<td>ASCII code 13</td>
</tr>
</tbody>
</table>
2.3 Send strings of the ASCII 2 interface protocol

2.3.1 Reading actual values
The following string asks for the current status of the test system.

2.3.1.1 Send string (PC → controller)
The string reads as follows: $01<CR>

\[
\begin{align*}
01 & \quad \text{Bus address of test system} \\
I & \quad \text{Request to transmit the actual status} \\
<CR>
\end{align*}
\]

2.3.2 Response string (controller → PC) for a test system with 2 control variables
The following string contains nominal and actual values for temperature and humidity\(^2\), together with various other settings.

The values are instantaneous values.

The string reads as follows:

\[
\begin{align*}
0023.0 & \quad \text{Nominal value, control variable 1} \\
0020.5 & \quad \text{Actual value, control variable 1} \\
0050.0 & \quad \text{Nominal value, control variable 2} \\
0041.0 & \quad \text{Actual value, control variable 2} \\
0080.0 & \quad \text{Set value 1} \\
0080.0 & \quad \text{Set value 1} \\
0000.0 & \quad \text{not used} \\
0020.0 & \quad \text{Actual value Pt100-1 (°C, analogue I/O card) \(^1\)} \\
0000.0 & \quad \text{not used} \\
0020.2 & \quad \text{Actual value Pt100-2 (°C, analogue I/O card) \(^1\)} \\
0000.0 & \quad \text{not used} \\
0020.3 & \quad \text{Actual value Pt100-3 (°C, analogue I/O card) \(^1\)} \\
0000.0 & \quad \text{not used} \\
0020.4 & \quad \text{Actual value Pt100-4 (°C, analogue I/O card) \(^1\)} \\
0 & \quad \text{Unused digital output 0} \\
1 & \quad \text{Digital output 1} \\
1 & \quad \text{Digital output 2} \\
01010101010101010101010101010101010101010 & \quad \text{Other digital outputs} \\
<CR>
\end{align*}
\]

\(^1\) option
\(^2\) climatic test systems only
2.3.3 Setting nominal values for control variables

The following string sets the nominal values for control variables 1 to 25 and the nominal values for control variables 2 to 50, and starts the operation.

The string reads as follows:

$01E 0023.0 0050.0 0080.0 0000.0 0000.0 0000.0 0000.0 0000.0 011 01010101010101010101010101010 <CR>

NOTE

It is important that the nominal values are within their corresponding limits (e.g. temperature range), otherwise the command will not be executed correctly. For the permissible limits, please refer to the query command described in → 2.3.8 (Page 11).

NOTE

32 digital channels are always transmitted. If the controller has fewer outputs, the non-existent channels are shown as 0. Each nominal analogue value is separated with a space.
2.3.4 Defining change rates ¹)

The following string allows you to set gradients for the change rate of nominal values. For both temperature and relative humidity, two gradients are set for heating/cooling and humidifying/dehumidifying respectively.

The string reads as follows:

\$xxU aaaa.a bbbb.b cccc.c dddd.d <CR>

- **aaaa.a**: Heating gradient (in K/min, e.g. 0003.0 = 3K/min)
- **bbbb.b**: Cooling gradient (positive sign!) (in K/min, e.g. 0003.0 = 3K/min)
- **cccc.c**: Dehumidifying gradient (in % RH/min, e.g. 002.5 = 2.5 % RH/min)
- **dddd.d**: Dehumidifying gradient (positive sign!) (in % RH/min, e.g. 002.5 = 2.5 % RH/min)
- **xx**: Test system address (1 to 32)

**NOTE**

No more than one gradient can be set per control variable (e.g. for heating); the other (e.g. cooling) must be equal to zero. The new nominal value must match the direction of the gradient (rising or falling). Gradient calculation is deactivated if both gradients are equal to zero.

2.3.5 Starting and stopping programs

The following string starts a program.

2.3.5.1 Send string (PC → controller)

\$xxPyyyy<CR>

- **xx**: Test system bus address (1 to 32)
- **yyyy**: Number of the program (1 to 120)

2.3.5.2 Response string (controller → PC)

0 <CR> if it was possible to start the program

A running program can be stopped with the following string:

2.3.5.3 Send string (PC → controller)

\$xxP0000<CR>

- **xx**: Test system bus address (1 to 32)
2.3.6 **Reading error messages**
The following string always displays the first existing error with the error number and error text.

2.3.6.1 **Send string (PC → controller)**
$xxF<CR>
   
   xx  Test system bus address (1 to 32)

2.3.6.2 **Response string (controller → PC)**
$xxx<CR><Empty spaces><Error text><CR>
   
   e.g.: 16 Return of mains power<CR>
   
   or:
   
   0 <CR> if there are no errors present

**NOTE**
*Only the first error is displayed in each case.*

2.3.7 **Acknowledge error messages**
The following string acknowledges all errors.

2.3.7.1 **Send string (PC → controller)**
$xxQ<CR>
   
   xx  Test system bus address (1 to 32)

2.3.7.2 **Response string (controller → PC)**
$xxx<CR>
   
   xx  Number of errors still present

2.3.8 **Description of the I- and E-set**
The query can be made e.g. via hyperterminal, observing the interface setting (→ Page 1), by entering $xx?.

2.3.8.1 **Send string (PC → controller)**
$xx?
   
   xx  Test system bus address (1 to 32)

The structure of the strings, the limits of the nominal and set values, and the digital channels for the device configurations are output.
Interface protocol

1) option

2) climatic test systems only
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