Process Control System

Series DE-VX 4600

by demig Prozessautomatisierung

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Content

1. Chapter: Introduction

1.1 Introductory information

1.1.1. General treatment

Please read the operating instructions carefully before installing or handling the control system DE-VX 4600, in order to avoid dangerous situations and damages. This manual itself is limited to the handling of the control system, and not the different applications. Because of the variable usage and its complexity, it is not possible for these operating instructions to replace a complex training.

Please observe therefore:

- **These operating instructions are not instructions for your process engineered application.**
- **Consider the consequences of a malfunction for your process engineered application.**
- **Make sure that the process control system is only handled by qualified staff.**

1.1.2. CE-Conformity

The process control systems of the serie DE-VX 4600 corresponds to the standards and guidelines named in the conformity declaration. To make sure these are observed, please pay attention to the following:

- It is the responsibility of the installing person to observe all the standards and guidelines for the usage and installation of the process control system.
- Make sure that only qualified staff installs the process control system.
- Make sure that all the precautions stated in the chapter "Information for the installation" are observed.
- Reparations of the process control system by the customer are not allowed.
- By using the process control system for unintended purposes as well violating the regulations mentioned above, demig Prozessautomatisierung GmbH assumes no responsibility. The conformity declaration then loses its validity.

1.1.3. Installation instructions

Please check the process control system immediately upon receipt. In case of any damages, the device must not be installed. Pay attention to the terms of installation in chapter service and technical data.

1.1.4. Structure of the operating instructions

These operating instructions are structured according to the menu structure of the operating interface of the process control system. Therefore, each main menu point has its own chapter. All of the security advice is marked with this symbol:

⚠ Warning:

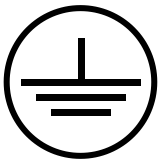
Further information is shown in a frame with the headline information. Security functions are marked with the following symbol:

⚠ Notice:

1.1.5. Security symbols

The following security symbols are shown on the controller:

Attention! An incorrect connection of the device may lead to system disturbances, - damages, quality losses as well as danger to persons and environment. The connections not marked directly at the controller are explained in the corresponding documentation (Operating Instructions, Pin Assignment Cards).



Protective ground wire (min. 6mm² cross section!)

1.1.6. Disclaimer

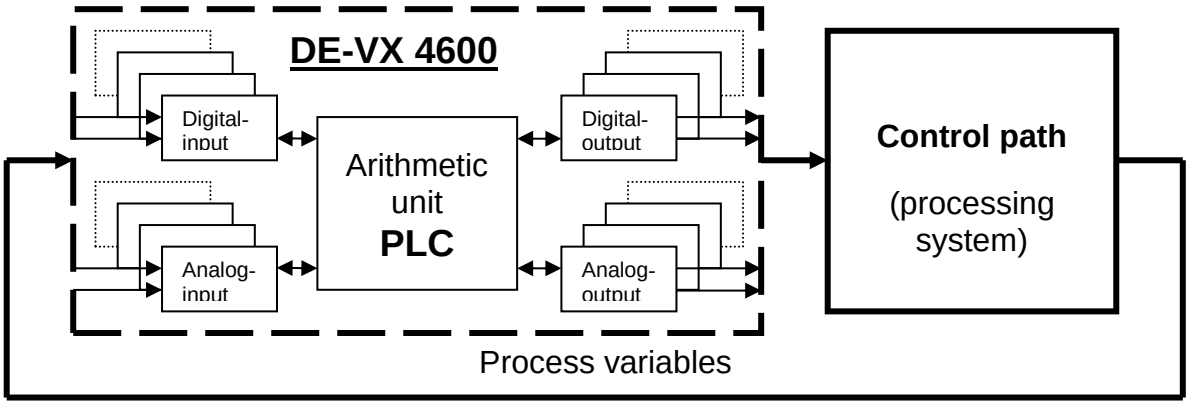
Possible errors cannot be excluded. demig Prozessautomatisierung GmbH assumes neither a legal responsibility nor the liability for misprints, wrong information and/or omissions or the resultant damages. Suggestions for improvement and advice are always welcome.

1.2 Brief explanation of the control system

1.2.1. General explanation

The variable control systems of the serie DE-VX 4600 have been developed according to controlling and process engineering aspects, whereas we have directed our attention to the adaptability and the easy handling.

The configuration takes place on an external PC. Subsequently, the configuration data will be transmitted to the controllers DE-VX 4600.



Due to the internal connections to all program components, the integrated PLC can do the same functions as an external PLC. Moreover, structures in the controller itself may be created e.g. logical connections of internal signs and states. That means that complete processes in the controller structure are realizable by algorithms which may be created by means of the PLC functions.

For the handling of the configuration software of the shown functions e.g. digital or analog inputs/outputs, integrated PLC, controller structure and symbolic programming, please see the operating instructions "Configuration Software". The technical data of both systems are listed in the chapter "Service and Technical Data".

1.2.2. The program structure

Programs of the treatment process are created from different components of the DE-VX 4600. This flexible structure is described as follows:

The principle is that every **process program** consists of a **handling program** and a **parameter set**. The process program is called under the menu point "**Load**" (see chapter 4-4).

Handling program — Consists of the single process segments ("**Heating**", "**Cooling**") with the corresponding process data (set points, section times etc.).

Parameter set — Possesses further data which is valid for all process segments (band width, limit values etc.).

To create the process programs, the parameter sets and the handling programs are created first.

The handling programs and the parameter sets are created individually and stored in separate data files. Therefore, handling programs and parameter sets may be combined in every various combinations to create the process program. That means that different process programs and different parameter sets may be combined with the same handling program.

Process programs are therefore only the combination of handling programs and parameter sets.

1.3 General handling of the control system

The control systems of the serie DE-VX 4600 is operated by a multiplex menu. An internal membrane keypad or an external PC keyboard may be used for the inputs.

The control systems DE-VX 4600 are used mostly in installations with high safety-related requirements. Control systems used as automatic monitoring and intervention systems have to meet strict requirements. Therefore, we realized visual as well as dialog-related displays in the DE-VX 4600, which allow the user to control the process (see 3rd chapter) or which give alarms and messages in certain situations. These functions are freely configurable.

1.3.1. Menu functions

1.3.1.1. Menu line

Main menus or sub menus are chosen by the menu line. By means of the arrow keys, the user can choose the menu (function) and confirm by pressing key “**E**”. By inputting the function number (number in front of the function), a menu point may be directly Entered. For each chosen menu point, the user finds a brief explanation under the menu line.

1.3.1.2. Input menu

Input menus may be very different. Depending on the function, it is only sometimes necessary to mark special positions, whereas other times, complete alpha numeric inputs are demanded. By means of “**F4**” (in the input menu), selection menus may be called for easier handling.

1.3.1.3. Selection menu

In the case that several possibilities are to be selected, selection windows are shown on the screen. Values from these windows can be selected using the **arrow keys** and can be confirmed by “**E**”.

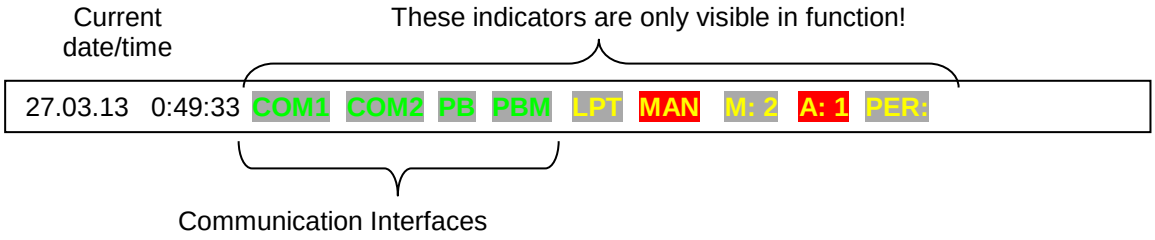
> **Notice:**
> As a general rule, the keys for special functions are described in the buttom margin of the menu window.

As a general rule, selection menus are called using "**F4**". Normally, the keys for the special functions are listed below the menu windows.

1.3.2. State lines

In the top part of the screen the user finds the system's status. This part consists of three lines which are permanently shown independent of the chosen menu.

The 1st line shows the general state of the controller.



COM1 COM2 — **Serial interfaces** (RS232, RS422, RS485)
During active connection green letters on gray background, yellow letters on red background for alarms.

PB PBM — **Profibus and profibus master**
During active connection green letters on gray background, yellow letters on red background for alarms.

LPT — **Printer status** (yellow letters on gray background)
Is shown during printing

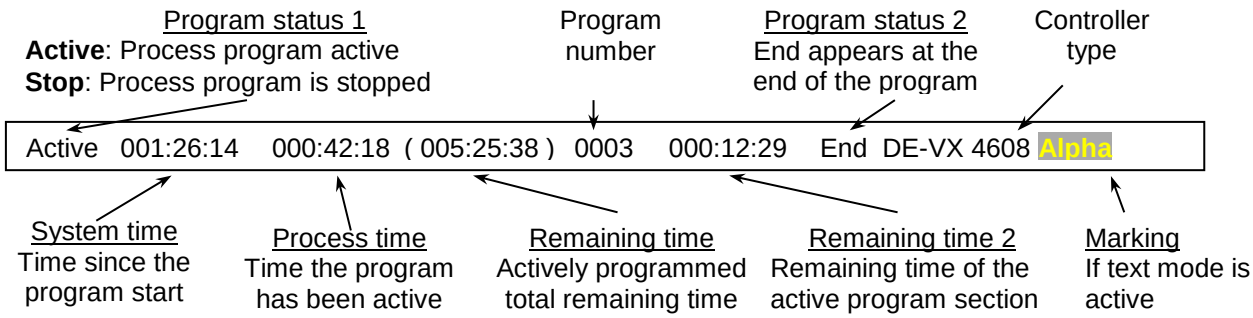
MAN — **Manual operation** (yellow letters on red background)
Is shown for manual set process variables.

M: 2 — **Current messages** (yellow letters on gray background)
Shows the number of current messages

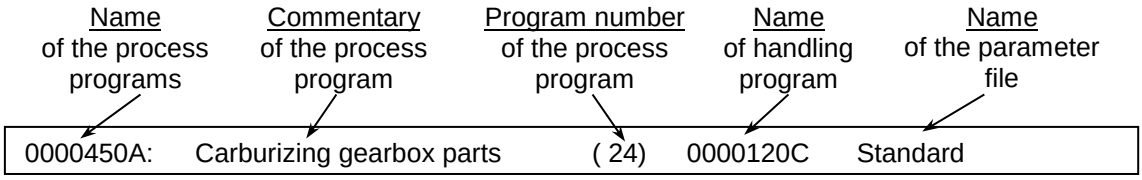
A: 1 — **Current alarms** (yellow letters on red background)
Shows the number of current alarms

PER:2 — **Peripheral card status** (yellow letters on gray background)
Shows an error of the I/O cards

The 2nd line shows the state of the current program.



The 3rd line shows information about the current process program.

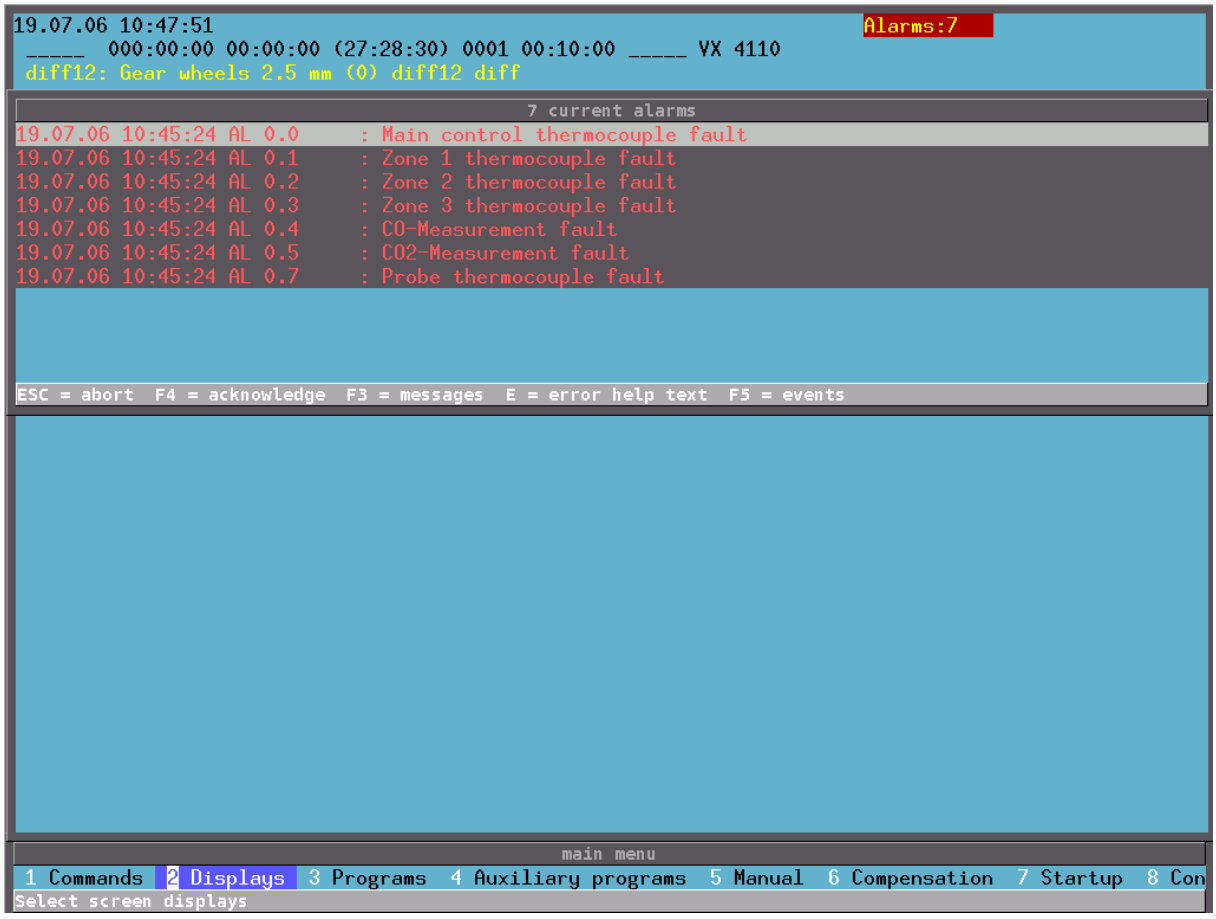


1.3.3. System for alarms and messages

During the engineering and configuration of the control systems, the security and technical demands are realized by means of the configuration software. The concept of alarms and messages (e.g. by the integrated PLC) depends on certain situations of the process or the installation. In the status range (line 1), the number of alarms/ messages to be expected are shown. With key “**F3**” and the functions "*Diagrams*" - "*Alarms*" / "*Messages*", alarms and messages may be called along with the date and time they occurred. These texts are generally created during the configuration phase, but they may be changed or added at any time in the function "*Startup*" - "*Texts*".

Notice:

If the “*Alarms*”/ “*Messages*” functions are blocked from the user by the password function, it is possible to call the messages using “**F3**”; it is not possible to acknowledge alarms!



1.3.3.1. Alarms

Alarms are security-related and must be confirmed (key "**F4**"). There are four possibilities to show alarms:

Example 1: New alarm is active and not yet confirmed: alarm flashes in the alarm list.

Example 2: Alarm is not active and not yet confirmed: alarm flashes in the alarm list.

Example 3: Alarm is active and confirmed: alarm is written in red in the alarm list.

Example 4: Alarm is no longer active and confirmed: alarm will be deleted from the alarm list.

1.3.3.2. Messages

Messages are listed as soon as they are active on the message list with date and time they occurred. They are deleted as soon as they are not active. That means that messages do not have to be confirmed.

1.3.3.3. Alarm and message functions

Choose **Alarms/ Messages** with the arrow keys

Key: *Function:*

Abort alarm list/ message list

Confirm alarm

Switch alarm list/message list

Show help text

Show events (history)

Print events (menu events)

Events is a section where the last alarms/messages up to a certain number are stored. They may be printed out . When this number is exceeded, the oldest alarm/ message will be deleted. The data consist of the error identification and the time they occurred/ ended.

Help Texts give further information in addition to the alarms and messages. They can indicate the first actions the user is to take e.g. in case of alarms. Therefore serious consequences can be avoided. The help texts are created with the configuration software. They may be changed or completed at any time with the function "*Start up*" - "*Texts*".

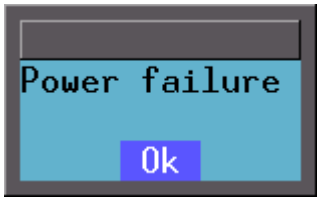
⚠ Warning:

The handling of the alarms and messages is a **Safety function!** If it is treated improperly by unauthorized persons, system disturbances, system damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary to make sure that only instructed and authorized persons operate the system!

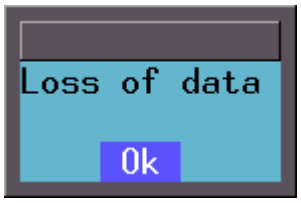
1.3.4. Internal prompts and messages

With the handling of the numerous functions of the systems DE-VX 4600, the user starts a dialog with the system. For certain functions, the system shows information in the display that is so important that the user has to confirm it before it is deleted from the display. Other information that is less important is shown for a certain time in the display and will be deleted automatically

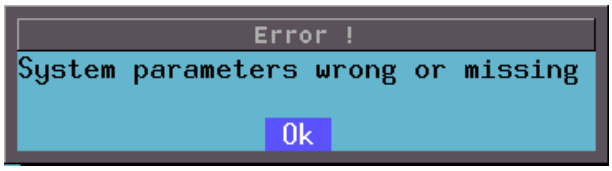
1.3.4.1. Examples of messages



Follows the restart of the control system before the log-in e.g. after a power failure.



Follows if data, e.g. programs or measuring data get lost or have been changed. The intervention of the start-up team of of demig staff is necessary.



With new devices that ar not configured (or by changing the configuration), this message will be shown when starting the control system. To adjust the system parameters, see Chapter 4 Section 7

1.3.5. General key functions

1.3.5.1. Membrane keypad of the controller and external PC keyboard

Membrane keypad	*Function*	*PC-keyboard*
F1/? A	**Help system** (display theme-oriented help texts)	"**F1**"
F2 F	**Special function key** (see relevant information in menu) e.g.: - Start storing procedures - Jump to the last input field - Jump to OK-field - Change the scalings in the process diagram	"**F2**"
F3 K	**Display alarms and messages** (see introduction 3.3)	"**F3**"
F4 P	**Special function key** (see relevant information in menu) e.g.: - Open the selection menu - Mark and/ or demark the marker fields - Change the animated site view	"**F4**"
F5 B	**Special function key** (see relevant information in menu) e.g.: - Display the alarms and messages - Select characters: one character before - Zoom in all site views	"**F5**"
F6 G	**Special function key** (see relevant information in menu) e.g.: - Change between different ramp set point transmitters of a site - Select characters: one character behind - Changes in the "Test" function	"**F6**"
F7 L	**Special function key** (see relevant information in menu) e.g.: - Change access rights - Copy program modules and reinsert them - Show an alphanumerical keyboard	"**F7**"
F8 Q	**Special function key** (see relevant information in menu) e.g.: - Mark everything in selection menu - In the input menu, move to one input field back - Go back to the previous help text in the help system	"**F8**"
S1 ... S8	**Special function keys** Different functions can be defined during the configuration e.g.: - Short cut of menu points - Softkey function	--

Special function key

Jump to the secondary functions of a key.

"Shift"

Special function key

Jump permanently to the alphanumerical key. Switch-off the function by pressing this key once again.

--

Special function key (see relevant information in menu), e.g.:

Switch between the display presentations "**Site view**", "**Trend**", "**Process**" and "**Numerical**"

"page up" "page down"

Special function key (see relevant information in menu)

e.g.:
- Calling of functions (menu items)
- Confirm input and selected data
- Move forward between input fields

"Enter"

Special function key (see relevant information in menu)

e.g.:
- Abort input procedures without adopting data
- Leave the current menu level and go to the next higher one
- Jump to the ESC-field
- Interrupt and end processes (print out)

"ESC"

Backspace key

Delete previous character

"Back-space"

Change between animated site views

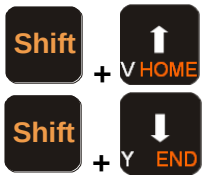
When more than one animated site view is present, they can be changed using these keys

arrow up arrow down

Selection and navigation functions

Navigate cursor in the screen forms

arrow keys



Jump functions

Jump to the first or to the last function

"Pos 1" "End"

Number keys

"0" - "9"

Space

"Space"

Tabulator **"Tab"**

Special function keys (see relevant information in menu)

e.g.: - Change signs **"+", "-"**

- Insert or delete lines

Delete keys **"Del"**

Delete the character after the current cursor position.

1.3.6. The help system

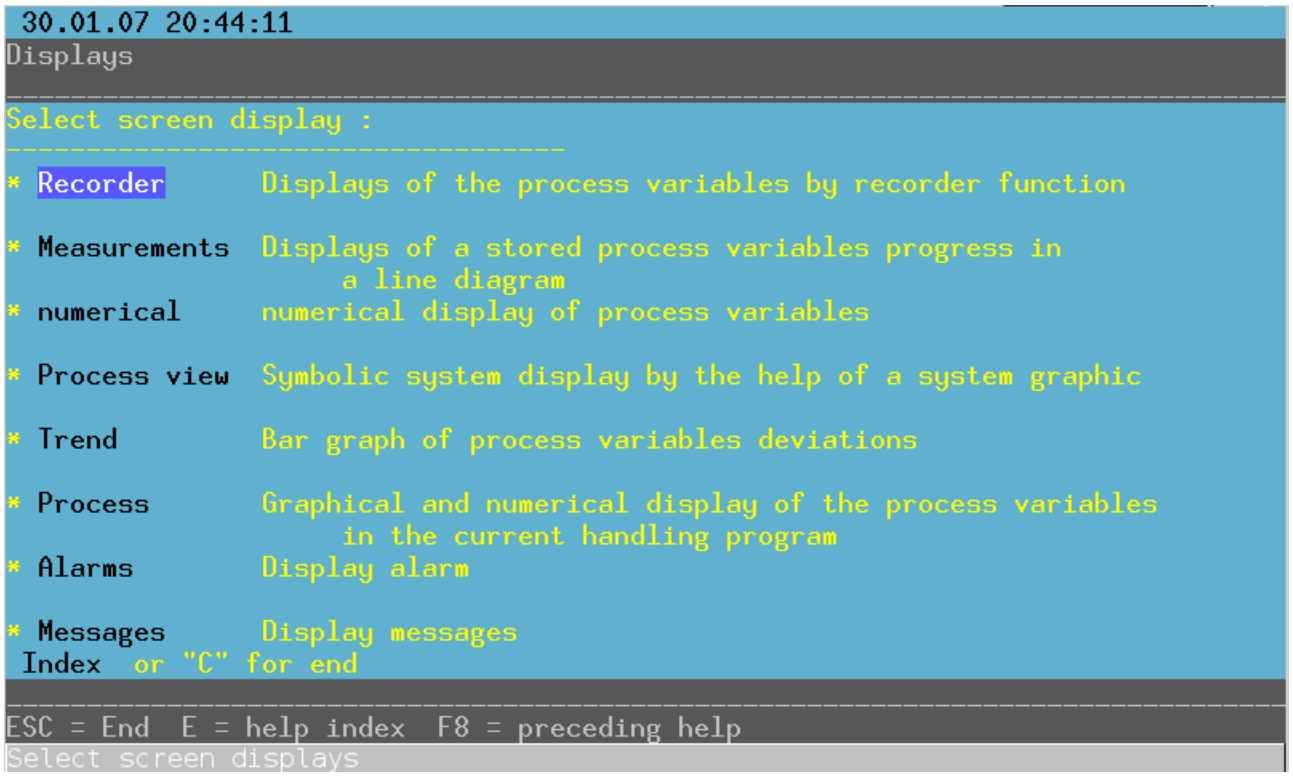
The help system of the control systems DE-VX 4600 is designed so that by pressing the "**F1**" key, the user is shown a support window on the screen with contents that refer to the function area that is currently being edited (context sensitive).

Call the Help System

By calling the Help System in the **main menu**, the function that was selected by the user in the main menu with the **arrow keys** along with the functions in its submenu will be displayed in the help window with a brief description.

In every help window the index function can be selected, which has the following functions:

- General information of the control system
- Description of the keyboard layout (see Introduction 3.5.1)
- Description of the status lines (see Introduction 3.2), as well as
- Listing of all functions of the functions and their submenus, with the possibility to dial directly



1.3.6.1. Operation of the help function

The operation functions are the same in all help windows:

A function (submenu item) can be selected using the **arrow keys** (the selected function will be highlighted blue), or can be switched to on the next page.

More help with this function (submenu item) can be selected with the "**E**" key.

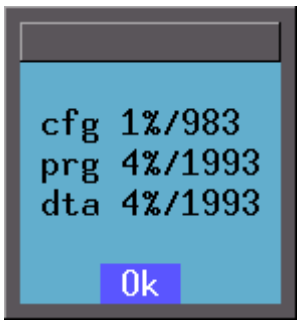
Switch to previously displayed help.

Leave the Help Function.

1.3.6.2. Additional options in the help system

In this window, you can call up the version of the control software and the characteristics of the networkconnection.

Furthermore, there is a 4x5 digit key code for the demig staff, in order to make an fault analysis.



Here, you can call up the background storage-utilization.

The configuration files are stored in the directory

cfg the process program is in prg and the measurement files are in dta.

1.3.7. Term definitions

1.3.7.1. Program

Handling program Program that consists of previously configured program elements (process phases) (see chapter 4: "Program").

Program module Previously configured process phases (e.g. program start, heating, cooling) to create the handling program (see chapter 4: "Program")

Parameter sets Program parameters (e.g. set point deviation, band widths, limit values, tolerances) that are related to a single handling program and valid only during this program (see chapter 4: "Parameters").

Program parameters See parameter sets

Process program Combination of comment text, program number for external program call, handling program and parameter sets (see chapter 4: "Process programs").

Process programs are finished programs that can be loaded for the working off of treatment processes (see chapter 4: "Load").

System parameters Parameters (e.g. set point deviation, band widths, limit values, tolerances) which are valid for all process programs (general installation) (see chapter 5: "System Data").

1.3.7.2. Representation/ Indication

Num. representation Numerical display of selected current process variables (see chapter 3: "Numerical").

Recorder display Graphical recorder display (line diagram) of selected current process variables

Process display Graphical display (line diagram) of the process variables of the entire current treatment processes, as well as numerical displays of the current values (see chapter 3: "Process").

Process view Display of the animated site view with indication of the current process variables (see chapter 3: "Process view").

Measurements Graphical indication (line diagram) of the process variable sequences of closed, saved treatment processes.

Trend Bar graph as a trend indicator of current process variables deviations (see chapter 3: "Trend").

Alarms Important events in the process sequence which must be acknowledged (see chapter 8: "Texts").

Messages Events of less importance in the process sequence. They disappear as soon as the event is over (see chapter 8: "Texts").

1.3.7.3. Parameters

Display parameters Definition of the numerical display of process variables (see chapter 8: "Display parameters")

Recorder parameters Definition of process variables displayed in the recorder mode and for measurement recording (see chapter 8: "Recorder parameters")

Process variables para. Definition of the process variables that are numerically displayed below the line diagram display ("Recorder Display", "Process Variables") (see chapter 8: "Process variables")

Schematic display para. Definition of process variables displayed in the animated site view (see Chapter 8: "Animated Site View Parameters")

Trend parameters Definition of the process variable deviations displayed as a bar diagram (see chapter 8: "Trend Parameters")

"Display" parameters Determine which display parameters, trend parameters and process variables the user will be directly shown (see chapter 8: "Presentation")

1.3.7.4. Other definitions/ functions

Softkeys Freely programmable menu items which can control the functions of the installation (see chapter 9: "Control")

Manual Function through which the manual operation of current process variables is possible (see chapter 6: "Manual")

Automatic Function through which the manual operation of current process variables is reset to automatic mode (see Chapter 6: "Automatic")

Compensation Compensation function in which the analogous inputs of a configured actual value can be compensated (see chapter 7: "Compensation")

Compensation (card) Compensation function in which the analogous inputs can be individually compensated (see chapter 7: "Compensation (card)")

Step sequences Name for step sequences functions in an installation that can be processed consecutively, e.g. with a vacuum lock: open lock > open front door > load lock chamber > close front door > evacuate lock chamber > open inner door > unload lock chamber > close inner door > establish pressure equalization in lock chamber > open lock (see chapter 2: "Step sequences")

2. Chapter: Commands

2.1 Brief description

"Time displacement"

It is possible to change the current process time.

"Start", "Stop", "Reset"

The current handling program may be

- started ("Start"),
- stopped ("Stop") and
- reset ("Reset").

"Operation"

Call the configured operations for an automated treatment by the control system with or without the user's confirmation.

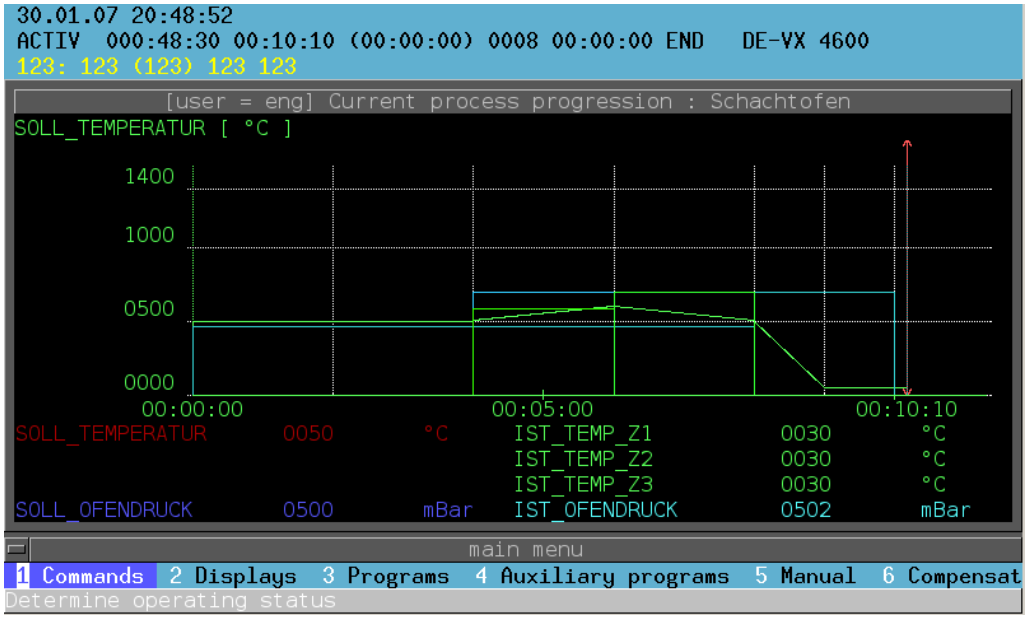
"Step sequences"

Visualization of configured step sequences with the possibility of manual controlling.

Warning:

The functions described in this chapter are **security functions!** If they are treated improperly by unauthorized persons system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

2.2 Menu selection



Z X Navigate the main menu "Commands"

E T choose

1 M or automatic dialing

E T To choose the submenu of "Commands" or directly with

1 M "Time displacement"

2 N "Start"

3 O "Stop"

4 H "Reset"

5 I "Operation (if configured)"

6 J "Step sequences"

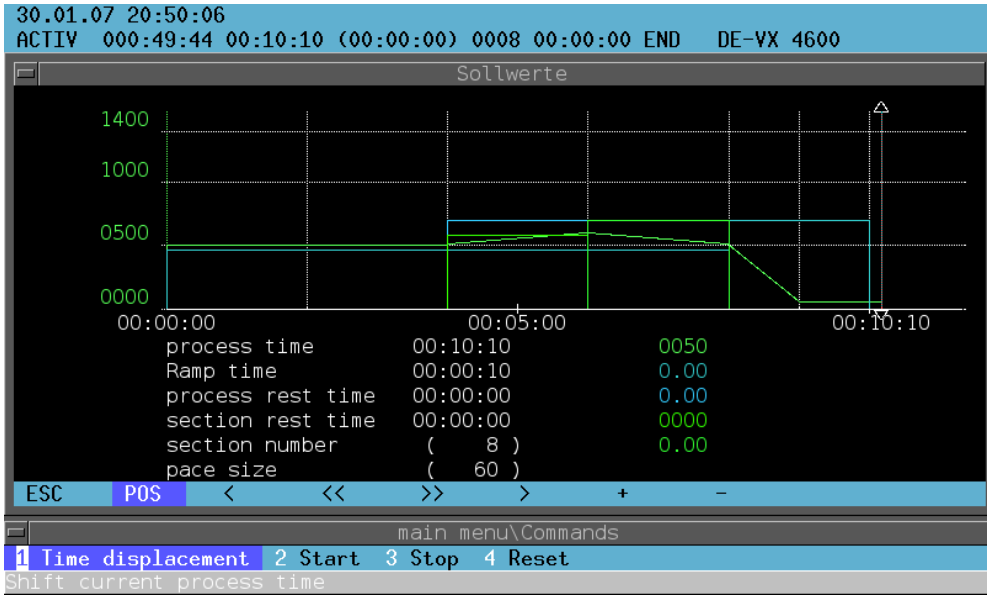
Notice:

All functions may be blocked for the user by PLC commands in the configuration or by authorizations.

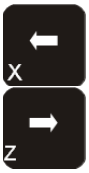
2.3 Function "Time displacement"

With this function, it is possible to change the current position in the process program by the displacement of the process time bar. In case of more than one defined ramp setpoint block, after selecting the function „Time displacement“ a selection follows to choose from which ramp setpoint block the process time bar is to be shifted.

The currently red process time bar, which shows the current position in the treatment program, will turn white. Below the graphic you will find information about the process time bar.



Step to the next function



Navigate to the next function of the function line

Enlarge/ reduce steps (in seconds)

Proceed the choosen function in the function line

Meaning of the symbols in the function line:

ESC	Leave the function
POS	Take over the time displacement for the running process
<	Navigate the time bar step by step towards the program start
<<	Navigate the time bar to the beginning of the previous ramp
>>	Navigate the time bar to the beginning of the following ramp
>	Navigate the time bar step by step towards the program end
+	Enlarge steps (in seconds)
-	Reduce steps (in seconds)

2.4 Functions "Start", "Stop", "Reset"

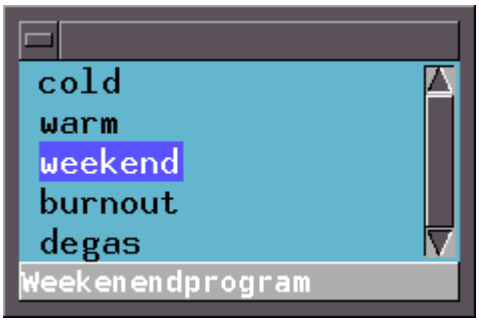
Function "Start" Starts current (loaded) process program or continues stopped ("*Stop*") program. In the second status line (see 1.3.2) the program status 1 is set to "ACTIVE" and the program will be continued.

Function "Stop" Stops the current process program. In the second status line the program status is set to "Stop".

Function "Reset" Resets the process program to the program start. The program status 1 in the status line disappears.

2.5 Function "Operation"

For certain operations like "burn out furnace" or warm start or "weekend temperature reduction with interrupted carburization for pusher furnaces", the necessary steps, depending on the configuration, can be handled here either automatically by the control system or step by step with confirmation of the user. By selecting the menu point "*Operation*", the configured operation programs are shown in the selection menu.



Navigate operation program

Choose selection

Leave function

Warning:

This function is a Safety Function! If it is treated improperly by unauthorized persons, system disturbances, system damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary to make sure that only instructed and authorized persons operate the system!

2.5.1. Program sequences in operation programs

Depending on the configuration, the following sequences are possible:

(Data)-Input	*Action:*	Input necessary (e.g. time)
Headlines and texts without confirmation	*Action:*	No input necessary
Texts with confirmation	*Action:*	Confirmation with "OK"-field necessary
Waiting for a condition (value)	*Action:*	No input necessary. The operation program continues after a certain value has been reached (e.g. time or temperature)
Waiting for an event	*Action:*	No input necessary. The operation program continues after a certain event has happened (e.g. signal "Door opened")

2.5.2. Handling and treatment of operation programs

Depending on the configuration, the handling of operation programs can consist of sequences which will be treated automatically (without further inputs of the user). For other sequences, inputs in the input mask or confirmations of the information texts are necessary. Without the necessary actions of the user, the operation program cannot be continued. The further treatment of the program can be aborted (abort) or the program can be reset to the standard program (reset).

During the course of operation programs, the already treated working steps as well as information texts are shown as a list in a status and information window.

2.6 Function "Step sequences"

In certain systems, step sequences are used for the control of processes. In this part of the program, these step sequences may be visualized in the automatic operation and may be controlled manually in the manual operation. The function of the program part “step sequences” strongly depends on the individual configuration and will not be described generally for all applications. You will find further information in the documentation of corresponding systems.

⚠ Warning:

This function is a Safety Function! If it is treated improperly by unauthorized persons, system disturbances, system damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary to make sure that only instructed and authorized persons operate the system!

3. Chapter: Displays

3.1 Brief description

By selecting the main menu point "*Displays*" the user selects a required display:

"Recorder"

Display of the current profile of selected variables

"Measurements"

Line diagram display of the finished and stored processes

"Numerical"

Numerical display of selected current process variables

"Process View"

Graphical display of the process with display of process variables

"Trend"

Bar diagram display as a trend barometer of process variables

"Process"

Graphical and numerical display of the process variables of the current treatment program

"Alarms"

List of all (no longer) active and (not) confirmed alarms with online help

"Messages"

List of all active messages with online help

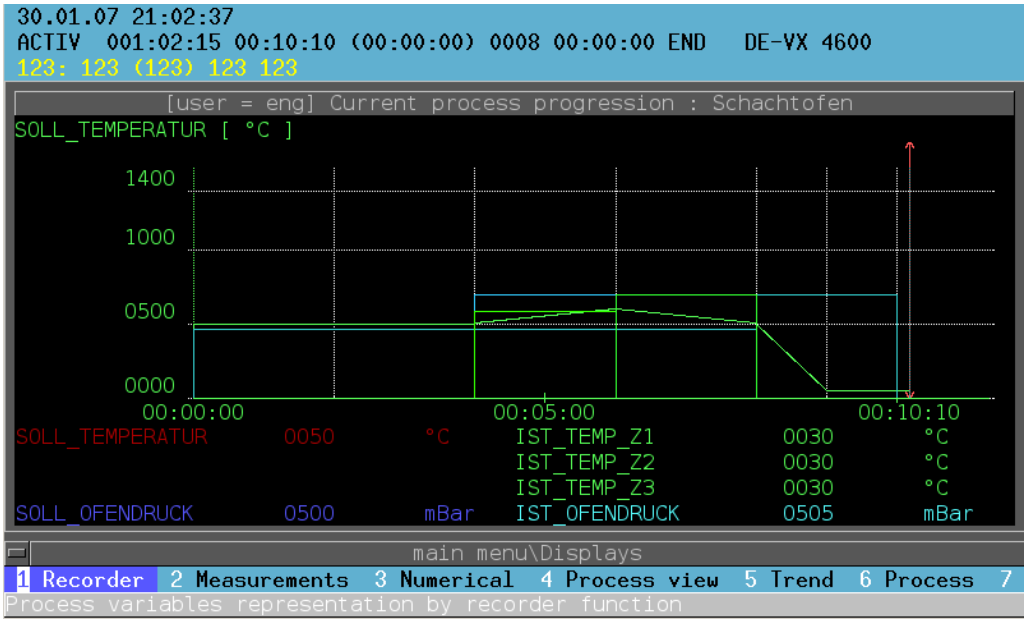
"Edit Symbol Values"

Modification of values in symbols

Warning:

The functions described in this chapter are **security functions!** If they are treated improperly by unauthorized persons system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

3.2 Menu selection



Z X Navigate the main menu "Displays"

E T Choose

2 N or automatic dialing

E T Choose the submenu in the menu "Displays" or automatic dialing by:

1 M	"Recorder"	6 J	"Process"
2 N	"Measurement"	7 C	"Alarms"
3 O	"Numerical"	8 D	"Messages"
4 H	"Process view"	9 E	"Edit symbols"
5 I	"Trend"		

Notice:

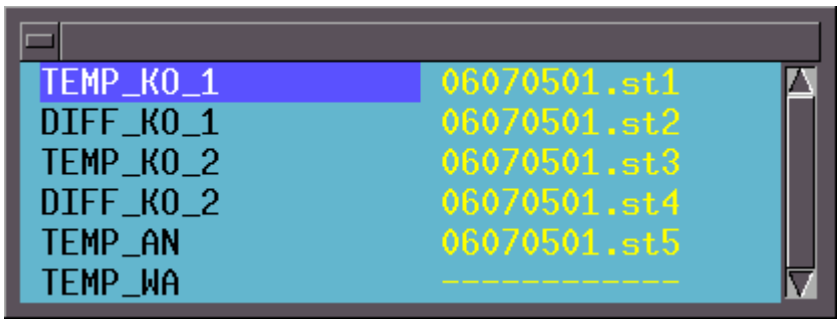
All functions may be blocked for the user by PLC commands in the configuration or by authorizations.

3.3 Line diagram-functions

3.3.1. Function "Recorder"

The process control systems DE-VX 4100 possesses up to 8 independent recorders which may each display and store max. 8 process variables. With the function "*Recorder*", the current process variables are displayed in a line diagram. For the required display mode, the user selects a recorder resp. a parameter block (the name may be fixed in the configuration e.g.: "TEMP_RECORDER" and "DIFFUSION_RECORDER" and the display may be configured in the menu "*Start up*" - "*Recorder parameter*"). In case there is no recorder defined in the configuration, there will be no selection list.

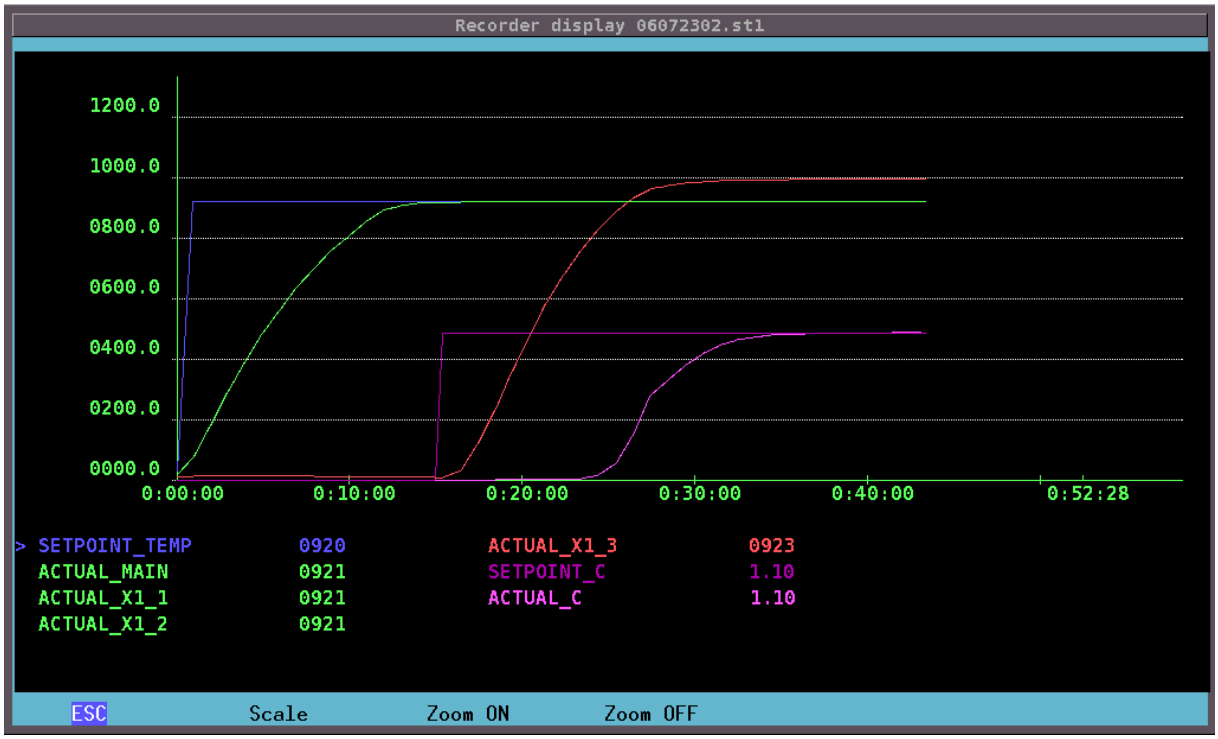
> ⚠ **Notice:**
>
> The selection of a parameter block influences the recording of measuring data. Depending on the configuration the process variables are recorded or not.



By selecting the submenu point "*Recorder*" this selection menu appears, from which the parameter blocks may be selected. The name of the current measurement is shown on the right, next to the recorder name. If there is no recorder measurement active, the following is shown: "**----------**".

Choose the requested recorder with 

The existing process diagram is structured graphically by analyzing the recorded measuring data. The further functions are described in the following chapters.

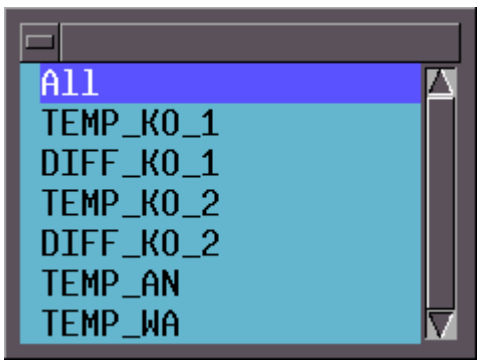


Meaning of the symbols in the function line:

ESC	Abort
Scale	Select y-scale (see 3.3.3.1)
Zoom on	Turn on zoom function (see 3.3.3.2)
Zoom off	Turn off zoom function (see 3.3.3.2)

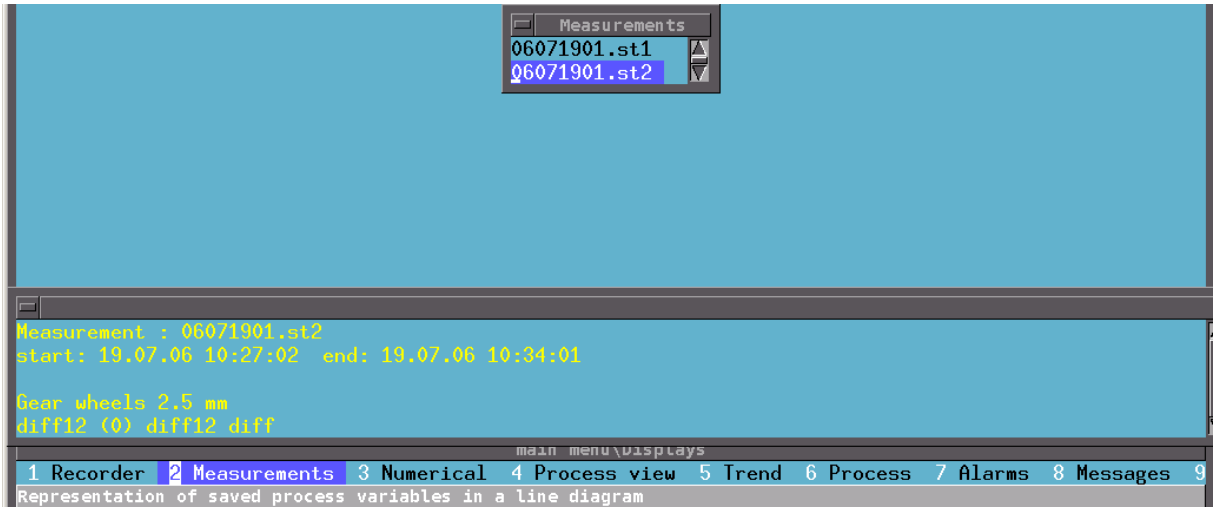
3.3.2. Function "Measurements"

The function "*Measurements*" shows the already finished and recorded measurements in a line diagram.



By selecting the submenu point "*Measurements*" a selection menu is shown where a single or all recorders can be selected.

By selecting the submenu point "*Measurements*", a selection menu is shown from which the existing measurement data files may be selected. For each file, an information window is shown where the start point and the end point of the measurement and the used process program is indicated.

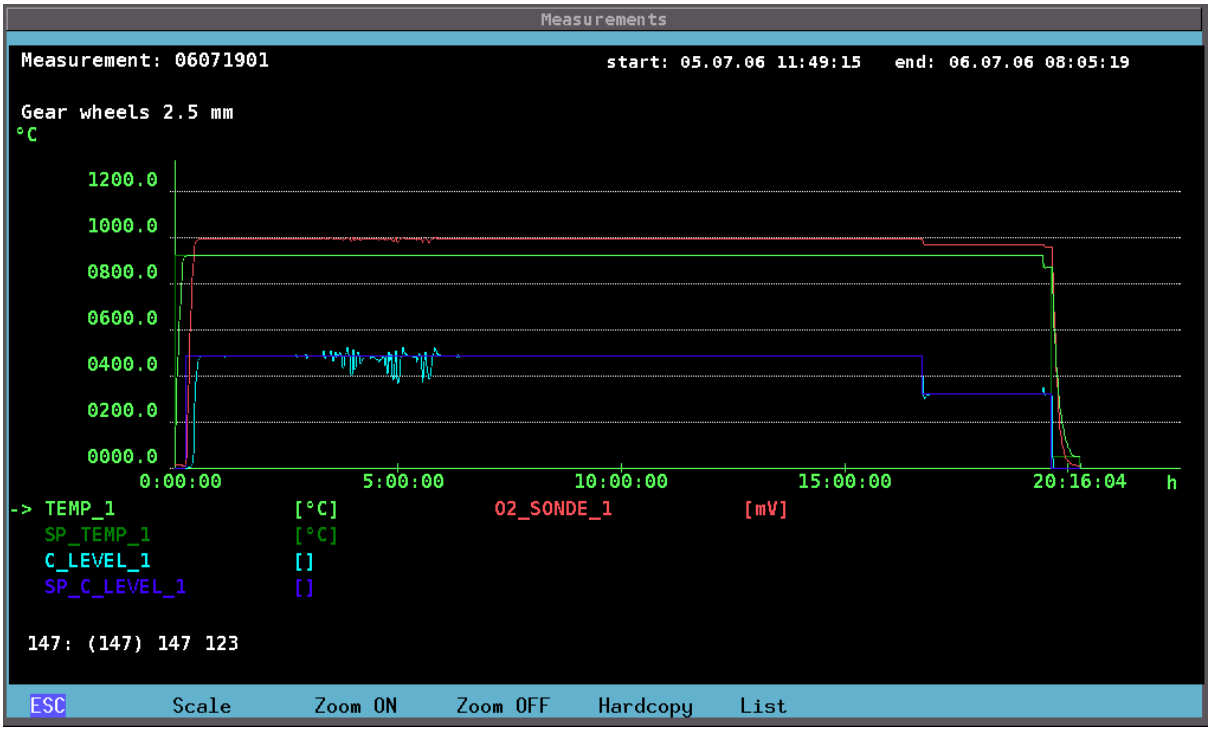


The name of the measurement file is structured as follows:

- The first two numbers indicate the year
- The next two numbers indicate the month
- The next two numbers indicate the day
- And the last two numbers are continuous numbers, in case there are several measurements a day.

The file ending consists of the letters "ST" and a number between 1 and 8 which is related to the respective recorder.

After the selection of the required measuring, the recording is shown in a line diagram including information about the file name, the start and the end of the recording as well as the current process program running during the recording. Further functions are described in the following chapters.



Meaning of the symbols in the function line:

ESC	Abort
Scale	Select y-scale (see 3.3.3.1)
Zoom on	Turn on zoom function (see 3.3.3.2)
Zoom off	Turn off zoom function (see 3.3.3.2)
Hardcopy	Print measurement graphic (see 3.3.3.3)
List	Print of list with all process variables of a measurement file. (see 3.3.3.4)

3.3.3. Functions in the line diagram

3.3.3.1. Scale

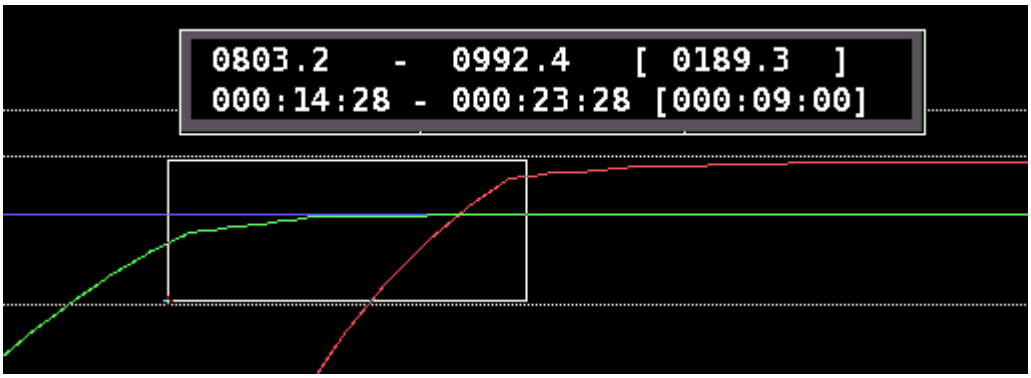
With this function the y-axis´ scale can be switched. In case values with different measurement ranges are recorded, the right scaling is shown. die richtige Skalierung angezeigt. The choosen symbol is marked by an arrow and the axis are shown in the corresponding color.

3.3.3.2. Zoom function

This function lets the user zoom-in on sections in the shown line diagram. These sections may be printed out on a connected printer as quality proof (see chapter 3.3.4). By selecting the function "*Zoom On*", a cursor (cross) is shown in the origin of the line diagram and may be moved using the arrow keys. By typing "**E**", the left bottom corner of the area to be zoomed-in is defined. To define the right top corner of the area, move the cursor to the required position and type "**E**" again. The selected range is now enlarged, and the scaling changes accordingly.

Notice:

The zoom function is possible at any time. An already enlarged area can be shown with even more details. The limit is reached at a resolution of 10 sec. at the time (x)-axis.



By selecting the function "*Zoom Off*", the original diagram is shown.

3.3.3.3. Hardcopy

This function allows the printing out of a line diagram of a measuring file in order to use it as quality proof.

By selecting this function, a selection menu is shown. A maximum of 4 scales may now be selected to print out in addition to the process variables. To select these scales, place the cursor next to the required scales and push the "**F4**" key (settings according to the start-up under function "*Start-up*" - "*Recorder Parameters*"). The scales´ colors correspond to the belonging process variables fixed during the start-up (see "*Start-up*" - "*Recorder Parameters*"). In case there is no scale marked, the currently shown scale will be printed. In case there are more than 4 scales selected, an error message will appear. By marking the second selection possibility by "**F4**" the selected variable is shown logarithmical.

3.3.3.4. Table

By selecting this function, all recorded data are printed out on the selected printer in table form.

3.4 Function "Numerical"

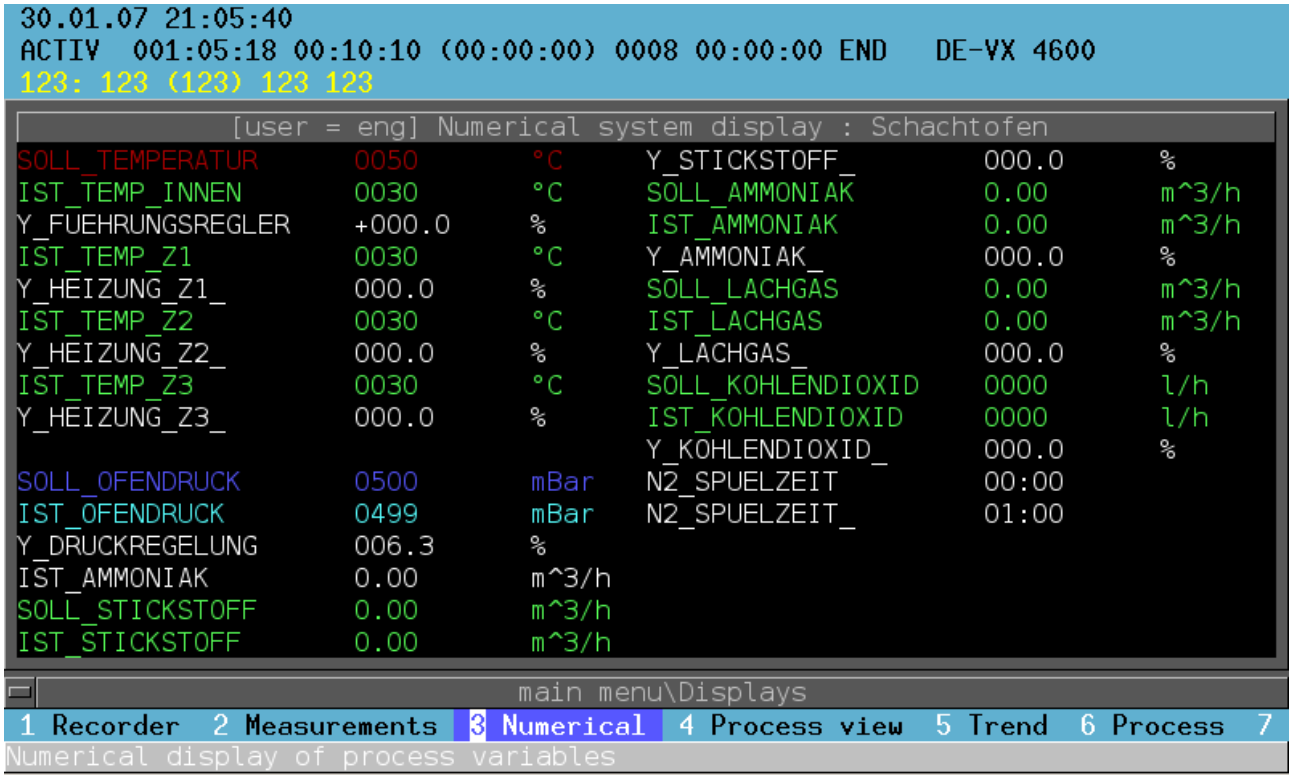
With this function, the current process variables are shown in tabular form. The shown values are updated every second. With the selection of this submenu, a changeover to the numeric display follows (parameter definition under "*Start-up*" - "*Display Parameters*")

Notice:

This display stays as a permant display in all other menus, until another type is selected.

With the key  the user may directly switch between the different types of display.

The correct order is as follows: Numerical → Process view → Trend → Process



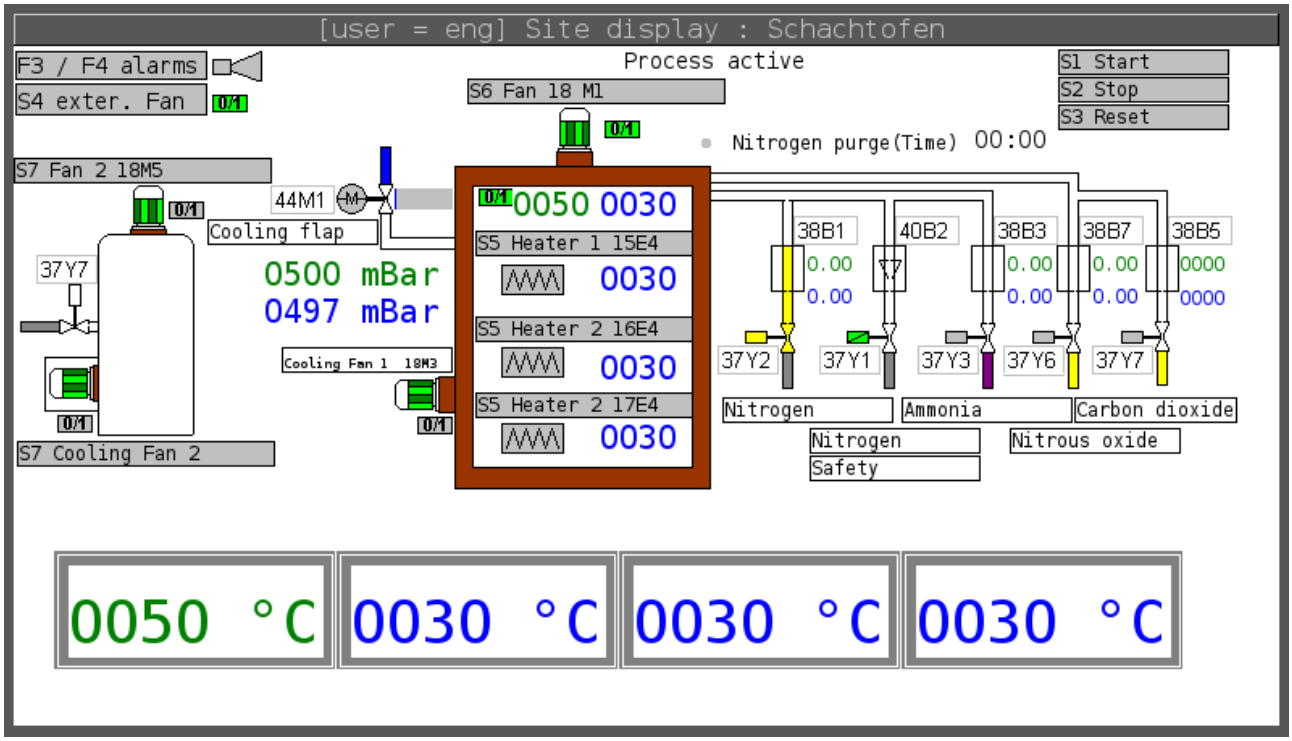
If the display files are released for manual edit (see chapter 8.3.1), a selection menu is shown by means of key "**F8**" with all potential files and the possibility to change them manually.

3.5 Function "Process view"

With this function, process variables may be displayed in an animated site-view. This function is realized with a picture that is overlaid with current elements (see chapter 8.5). This function gives a quick overview of the system's state. For example, alarms are directly shown at the position where they occurred in the system. Furthermore, the state of valves and switches may be shown graphically. Up to 8 animated site views may be stored.

To navigate between the process views use the keys 

.



3.6 Function "Trend"

With this function, current process variables are shown as a trend display (the difference between the actual value and the set point is shown in a bar diagram). The process variables are shown additionally as absolute values (numerical display). Modifications are updated in real-time. If the allowed band widths/limit values are exceeded resp. fallen below, the bars will change their color (from green to red). The display follows the parameters defined in "*Start-up*" - "*Trend Parameters*". A maximum of 5 trends may be shown at the same time on the screen.

To navigate to other (max. 8) trend display use the keys 

.

3.7 Function "Process"

With this function, the course of the process variables (set points) of the complete treatment process (process program) is shown in a line diagram and the current process variables (max. 8 values depending on the setting) are shown in a numeric display. The scales are defined with the function "*Start-up*" - "*Process Variables*". The display of control tracks to the single program sections may also be activated here.

3.8 Function "Alarms"

Safety-related guidelines are realized during the projecting and the configuration of the control system by means of the configuration software. The alarm and message system triggers alarms resp. messages in certain system-related and process-related situations e.g. via the internal PLC.

In line 1 of the status range (see introduction 3.2), the number of the coming alarms/ messages is shown. By pushing key "**F3**" or by using this function, alarms may be seen according to the date and time when they occurred. Generally, the texts are defined during the configuration. They may be modified or completed at any time with the function "*Start-up*" - "*Texts*" (also see introduction 1.3.3).

⚠ Warning:

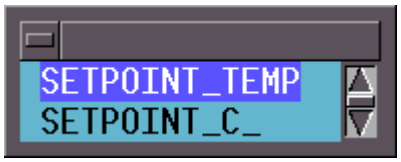
The functions described in this chapter are **security functions!** If they are treated improperly by unauthorized persons system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

3.9 Function "Messages"

This function is similar to the alarm function. Messages are not relevant concerning the security and are therefore not to be acknowledged. A list with all messages may be seen with the selection of this submenu or with key "**F3**" in the alarm display (also see introduction 1.3.3).

3.10 Function "Edit symbol values"

In the configuration of the controller, certain variables are administered in symbols. With the help of this function it is possible to modify values in released symbols. To use this function, the controller must be switched to numerical display (see chapter II-4). After using this function, a selection window is shown with all symbols released for edit. These may be changed with the function "*Start-up*" - "*Display Parameters*".

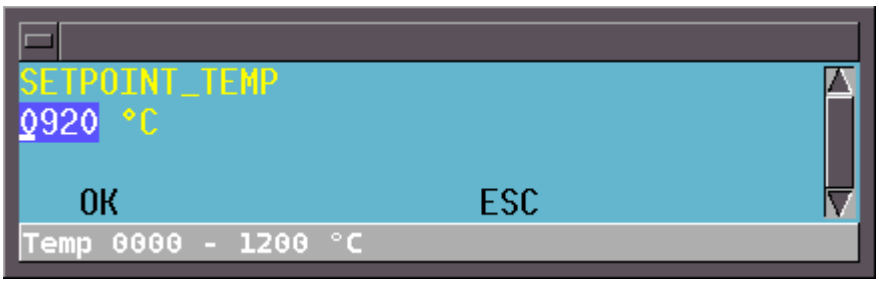


Navigating the symbol to edit

Choose the symbol and open the edit window

Abort

After the selection of a symbol, the edit window is opened where the required value may be inserted by the key pad. The new value is adopted with "**OK**". The process will be stopped without modifications with "**ESC**".



Warning:

The functions described in this chapter are **security functions!** If they are treated improperly by unauthorized persons system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

4. Chapter: Programs

4.1 Brief description

"Program"

Change or create new handling programs

"Load"

Load process programs into the working storage

"Test"

Display ramp data of a handling program in a line diagram for tests

"Parameters"

Change or create new program parameter sets

"Process programs"

Combination of handling programs and parameter sets to process programs

"Delete"

Delete handling programs

"Print"

Print handling programs

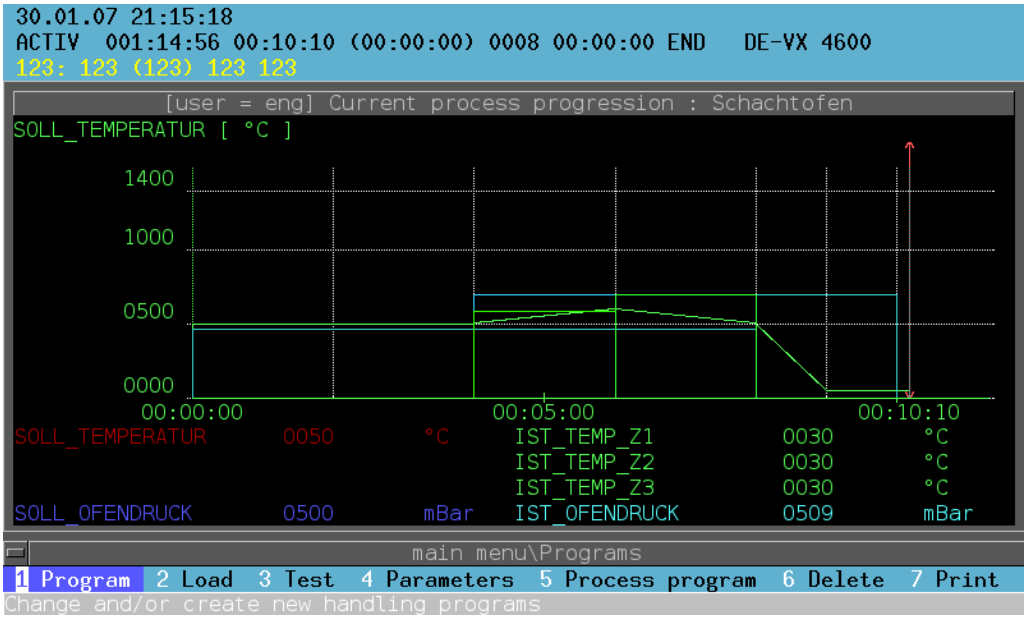
"Diffusion Automatic special function (option)"

Special function in the controller configuration for the automatic programming of handling programs for C-level controlling.

⚠ Warning:

The functions described in this chapter are **security functions!** If they are treated improperly by unauthorized persons system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

4.2 Menu selection



Z / X — Navigate the main menu "Programs"

E / T — Choose

3 / O — or automatic dialing

E / T — Choose the submenu in the menu "Programs" or automatic dialing by:

1 / M	"Program"	5 / I	"Process programs"
2 / N	"Load"	6 / J	"Delete"
3 / O	"Test"	7 / C	"Print"
4 / H	"Parameters"		

Notice:

All functions may be blocked for the user by PLC commands in the configuration or by authorizations.

4.3 Function "Program"

With this function it is possible to create or change handling programs out of preconfigured program blocks (process phases). The user is automatically led to the necessary inputs of the variable data. Section depending general adjustments like controlling and security functions are already installed in these program blocks and do not need any further attention. By using this function, errors or illogical input are prevented.

Notice:

In case no program blocks are configured, the programming “**Manual**” follows (see chapter 10).

By selecting the submenu point "*Program*" an input mask for the program name appears. After confirmation with "**E**" the selection menu is opened with all existing handling programs that may be changed. After the input of a name in the field above the "OK"-field (poss. call with "**ALPHA**" the alphanumeric keyboard), a new handling program with the input name may be created.

After the adoption of a program, name a selection list of a ramp set point block - if connected - to work on the handling program. A configuration with up to 8 ramp set point blocks is possible.

4.3.1. Work on program blocks for handling programs

Two windows are shown on the screen after loading resp. creating the handling program. The upper window shows the previous succession of program blocks and is intended for new inputs. The lower shows the current data of the selected program block.

Navigate input to upper/ lower program block.

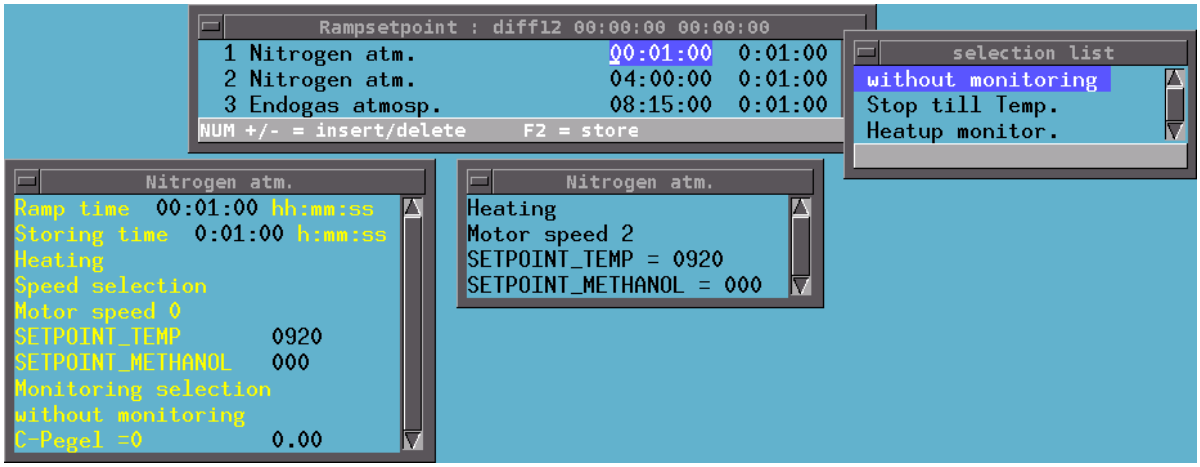
Open the input mask for the chosen program block.

In the input mask, which is opened by the selection of a program block, all configured set points important for this program block are interrogated step by step. The input is done by means of the membrane keypad. The configured range limits are shown in the footer and the inputs are monitored accordingly.

An adoption of the new entered or changed values is only possible after a run through of all inquiries, as otherwise a logical control would not be possible.

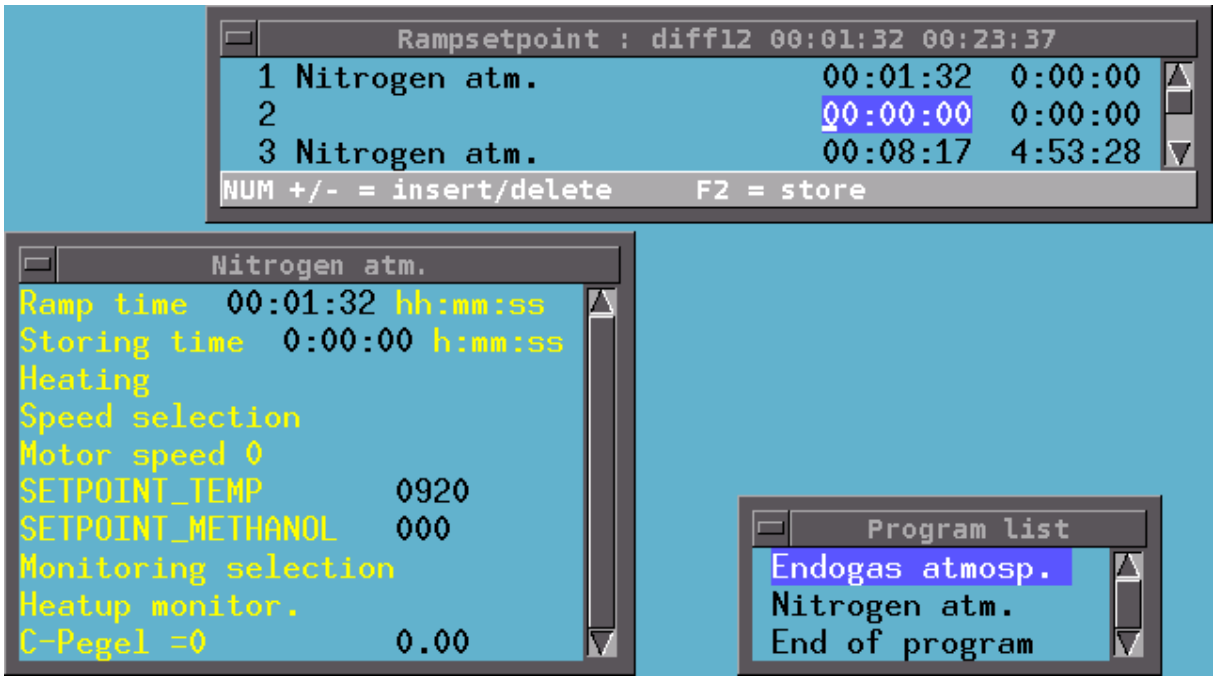
4.3.2. Example for the input of special functions in handling programs

Depending on the system and the system configuration of the DE-VX 4600 (symbolic programming), it is possible to allocate single program blocks/ symbols to functions and parameters. That means that besides the numerical inputs of times and set points, even inquiries appear which have influence on the controlling. In the example below, the type of control for the catalytic heating is inquired.



4.3.3. Insert/ delete program blocks in handling programs

For the creation or changing of handling programs, it is sometimes necessary to insert new program blocks or delete existing ones. To avoid the possible endangering of persons, charges or of the system itself, a succession regulation for program blocks may be defined in the system configuration to make illogical program constellations impossible. Therefore, a selection with only the possible program blocks is shown during the entry.



Delete selected program block. **ATTENTION**, no safety request!

Add a further program block **before** the selected one. A selection of possible program blocks will appear.

Navigate the required program block in the program list.

Choose required program block.

Abort the entry of a program block.

4.3.4. Information for the simplified treatment of handling programs

a) During the generation of new programs that are similar to existing ones, it is possible to call them up and to store them under a new name after changes have been made.

b) An easier treatment of handling programs is possible with the menu point "*Program*". With this function, program parts may be marked, copied, deleted and pasted at any position:

Navigate program block

Call the process menu

Navigate the process menu

Choose function

Description of the functions in the process menu

1. Mark

Program segments may be marked by using the arrow keys. Marked components are highlighted blue. The segments are laid down by key "**E**". With a new call of the selection menu, it is possible to treat them with the following functions: "*Mark (new)*", "*Copy*", "*Cut*", "*Delete*".

2. Copy

By confirming this function with key "**E**", the previously marked program segments are copied into intermediate data storage. These copied segments may be treated by a new call of the selection menu with the function "*Paste*".

3. Cut

By confirming this function with key "**E**", the previously marked program segments are cut out of the handling program (deleted) and copied into the intermediate data storage. These cut segments may be treated by a new call of the selection menu with the function "*Paste*".

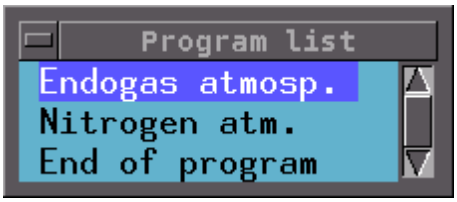
4. Paste

By confirming this function with key "**E**", the content which is in the intermediate data storage is pasted into the current process program. The pasting takes place **behind** the currently selected program segment.

5. Delete

By confirming this function with key "**E**", the previously marked program segments are deleted from the handling program.

c) A program segment may be changed by using "**F4**". Then a selection menu appears with all possible program segments, which are given because of the previous component.



Navigate program segment to be changed

Call program list

Navigate new program segment

Choose new program segment

After that, it is necessary to rework the selected program segment in the set points, in order for it to be adopted in the handling program.

With this key it is possible to change directly to the function "*Test*" (see chapter 4.5). This makes it possible to check changes immediately.

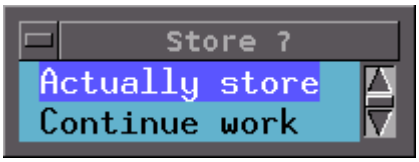
With this key a program segment - selected by the cursor key - is copied and pasted directly behind it.

4.3.5. Store input or abort function

4.3.5.1. Store input

During the treatment of handling programs, the user moves between different display windows whose appearance, form and content depend on the respective system configuration. The windows, out of which the user can leave by storing the inputs, show the following hint at the bottom of the window "**F2 = Store**".

After using key "**F2**" the following window is shown:



"*Continue Working*": go back to the last position, "*Actually Store*": enquiry for the ramp set point block and for the name of the handling program. As a preselection, the name input at the beginning of the treatment is shown. The name may be replaced by a new one. (Call of the alpha numerical keyboard by "**ALPHA**"). If the selected name already exists in the storage, an inquiry follows whether the handling program to be stored should overwrite it.

4.3.5.2. Abort input

Inputs may be aborted at any time by "**ESC**". There will first be a safety request.

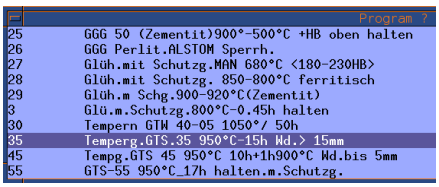
Notice:

The existing inputs since the last storage get irrevocably lost!

4.4 Function "Load"

With this function, a new process program is loaded from the data storage into the working storage of the control system.

By selecting the submenu "*Load*", an input mask appears. With key "**E**" (without any input) a selection menu is shown, sorted to file name or comment text, with all existing programs. In the bottom area of the screen, the selected numbers of the process programs will appear.



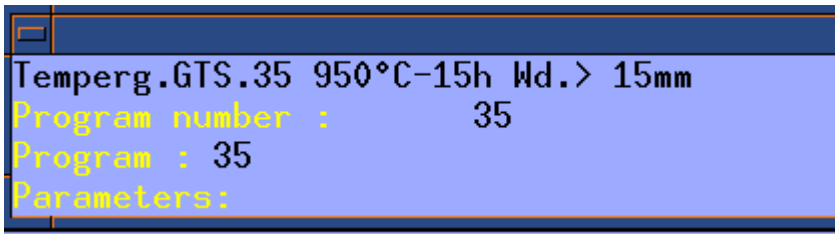
Navigate the selection bar

Choose the selected process program

Switch (permanent) of sort order: File name/comment or comment/file name

Abort

After the adoption of a process program, the comment line, the program number (for BCD-selection), the name of the handling program and the name of the program parameter file are shown for control. In case the allocated files (handling program, parameter set) do not exist or are defective, an alert appears on the screen. In this case, the process program should be corrected immediately in the submenu "*Process Program*" (see chapter 4.7)!



Warning:

The loading of a process program into the memory is a **security function!** The overwriting of an active process program during a currently running process can lead to system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

4.5 Function "Test"

With this function, the ramp data of the single set point channels are controlled graphically.

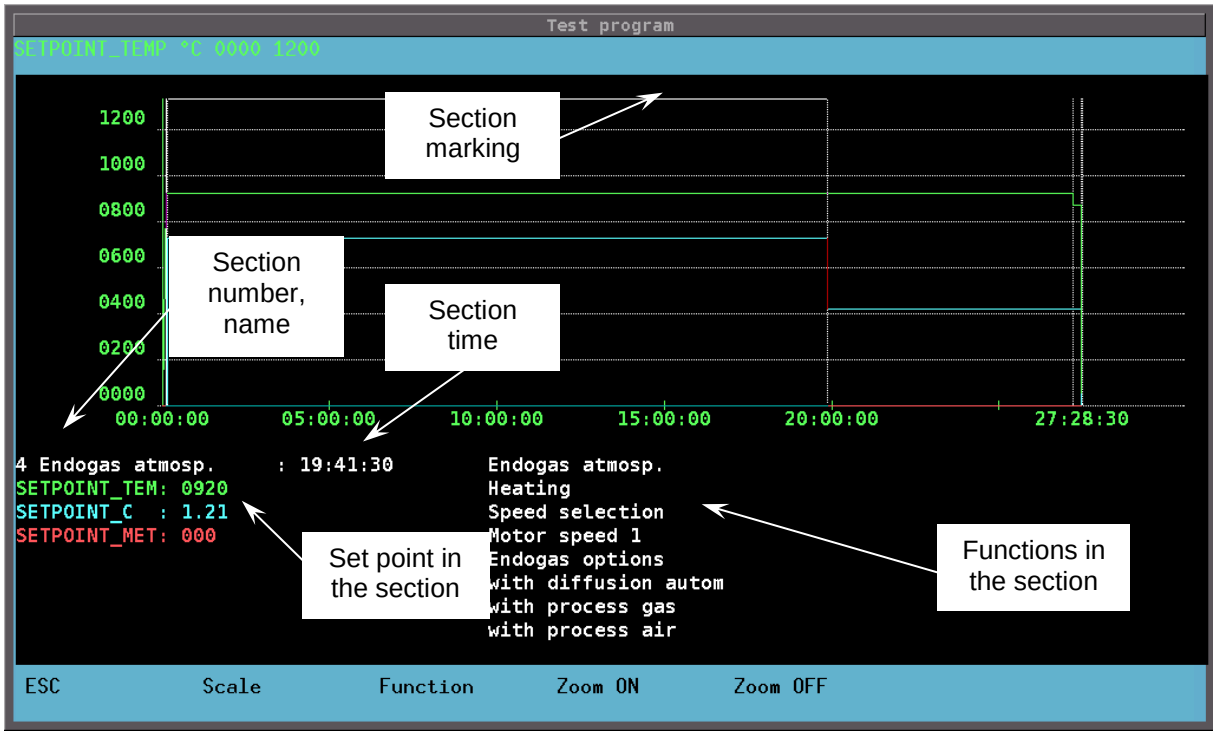
With the selection of the submenu "*Test*", the user is asked to select a handling program for testing (see chapter 4.4). This handling program is shown as a line diagram. Furthermore, the following functions are available:

"**ESC**"	Abort
"**Scale**"	Select scale (see chapter 3.3.3.1)
"**Function**"	Test of program block section by section (see chapter 4.5.1)
"**Zoom on**"	Turn on zoom function (see chapter 3.3.3.3)
"**Zoom off**"	Turn off zoom function

4.5.1. Function "Function"

Besides the graphical display of the programmed set point ramps, the control of the functions fixed in the program segments are of importance. By means of this function, the required information is shown to each program segment.

By selecting the submenu "*Function*", the first program segment is framed in white and the information about this segment is shown below the graphic.



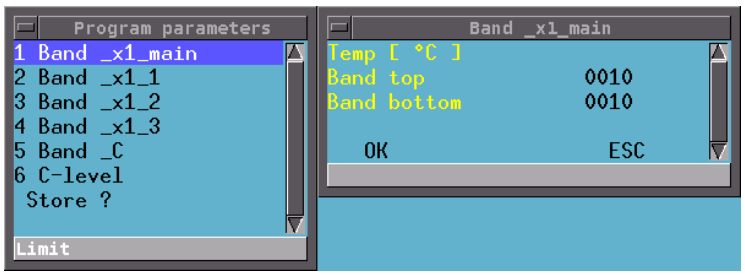
By means of the keys X Z the user may navigate between the program blocks; with the key ESC R the user leaves this function. For the meaning of further functions see chapter 3.3.3.

4.6 Function "Parameter"

With this function, parameter sets for handling programs may be created resp. modified. This concerns general data for process programs e.g. band widths or fix set points.

4.6.1. Treatment of parameter sets

With the selection of the submenu "*Parameter*", the user is asked to input a file name of the parameter file ("**ALPHA**" on the alphanumeric keyboard) or to load an already existing parameter set. Then two windows are shown on the screen. In the left window, the parameters defined in the configuration are shown, and in the right window the input possibilities for this parameter are shown. Possible input ranges - if configured - are shown in the footer and the input is controlled thereupon. With the last input, the data is adopted and returned to the left window.



V HOME / Y END — Navigate the parameters in the left window

E T — Choose marked parameter for inputs

ESC R — Abort the input and return to the left window.

To store the inputs use key "**F2**", or select the menu point "S*tore?*" in the left window (see chapter 4.3.5.1).

Warning:

The treatment of parameter sets is **security function!** Faulty parameter sets as part of process programs can lead to system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system!

4.7 Function "Process program"

With this function, handling programs and parameter sets are combined to loadable process programs.

4.7.1. Edit process programs

By selecting the submenu "*Process program*", the user is asked to input a file name of a process program ("**ALPHA**" for alphanumerical keyboard) or to load an already existing parameter set.

Then a window with the following input possibilities is shown:

- Comment line to the process program (if necessary via alphanumeric keyboard)
- Additional program numbers for external program call (e.g. via BCD switch). The input is not obligatory.
- Input of a handling program existing in the storage (selection menu via "**F4**") or programming of a new handling program via key "**F5**" (see chapter 4.3).
- Input of a parameter set existing in the storage (selection menu via "**F4**"), or programming of a new parameter set via key "**F5**" (see chapter 4.6).

The process program is stored by selecting "**OK**" or by key "**F2**" (direct jump to "**OK**") (see chapter 4.3.5.1).

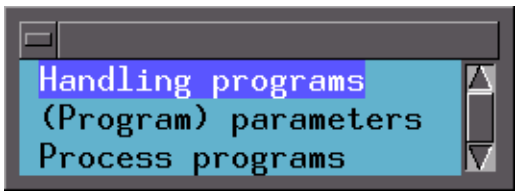
To abort without changing use "**ESC**" or key "**ESC**" (direct jump to "**ESC**"). There will be no safety request!

Warning:

The treatment of process programs is a **security function!** Faulty process programs can lead to system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system!

4.8 Function "Delete"

With this function it is possible to delete files from the storage. This concerns exclusively handling programs, program parameter sets or process programs. By selecting the submenu "*Program*", a window is shown and a further selection menu, with files that may be selected to delete, is displayed by selection of a file group which is to be deleted.

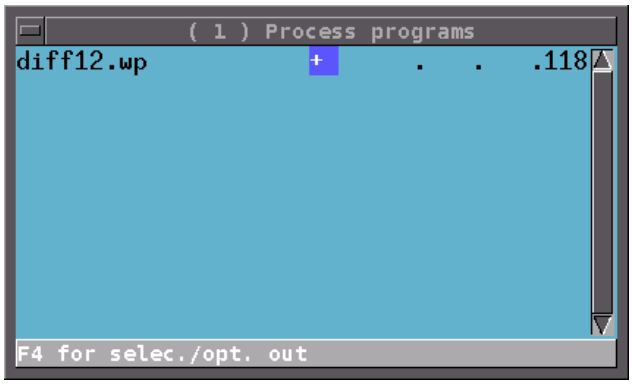


Navigate file group to be deleted

Choose the selection

Abort

> **Notice:**
>
> Before deleting save the data files if necessary on an external data carrier! (see chapter 12.4)
>
> **After deleting the files are irrevocably deleted!**



Navigate files to be deleted

(Un)mark files to be deleted

Mark all files

Introduction of the deletion process (Safety request!)

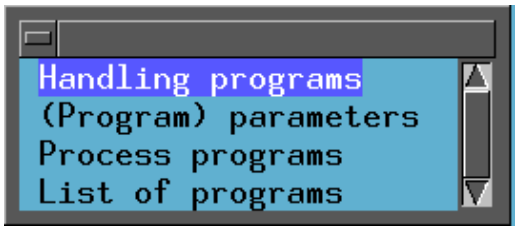
Abort

After the introduction of the deletion process by "**F2**", the user has to select the menu point "*Delete?*" in the selection menu. Then a further window is shown, where the deletion of each file resp. of all files may be confirmed.

4.9 Function "Print"

With this function, it is possible to print out files from storage on a printer connected to the control system.

By the selection of the submenu "*Print*", a selection menu with all file groups from which another selection menu will be shown, where the files to be printed can be selected.



Navigate file group

Choose the selection

Abort

Navigate file

(Un)mark file for print

Mark all files for print

Start print function

Abort

4.10 Special function "Diffusion Automatic" (optional)

If this function block has been configured in the control system, an automatic C-level programming may be realized with this function.

4.10.1. System parameter settings

First, the carrier gas combination has to be inputted (see chapter 5.7).

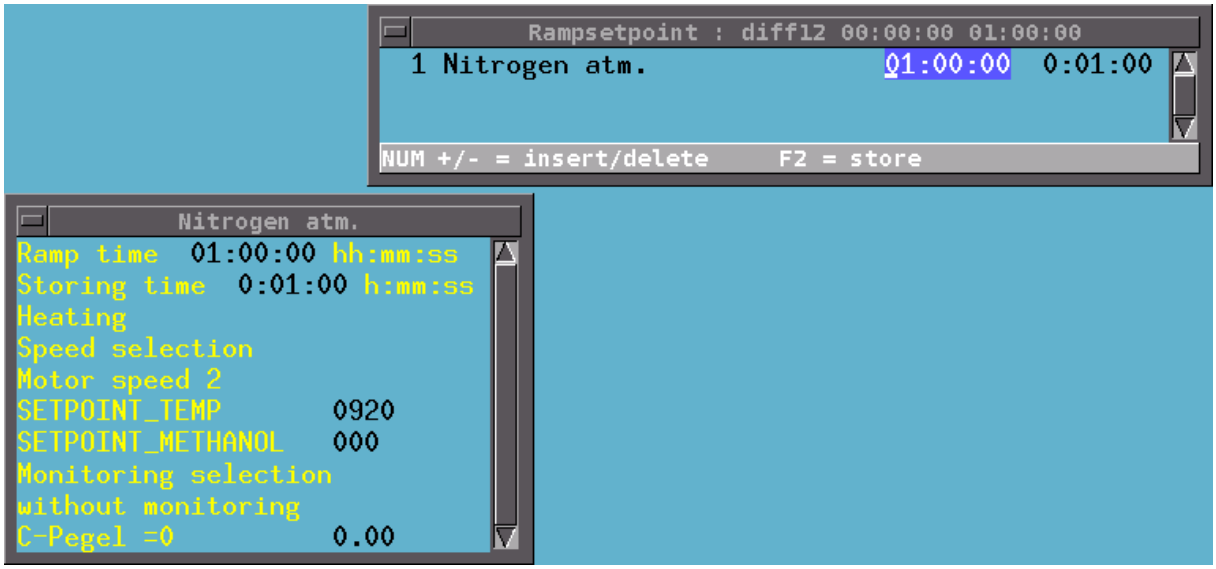
In the system parameter block 4 (CO-block) the CO-basic value, the ammonia content and the combination of the carrier gas have to be inputted. In case the carrier gas consists of a mixed gas, the content of both gases have to be inputted. By confirming with "OK", the submenu closes, and with the selection of the menu point "*Store?*", the inputs are stored in the system parameters.

4.10.2. Program creation with diffusion automatic

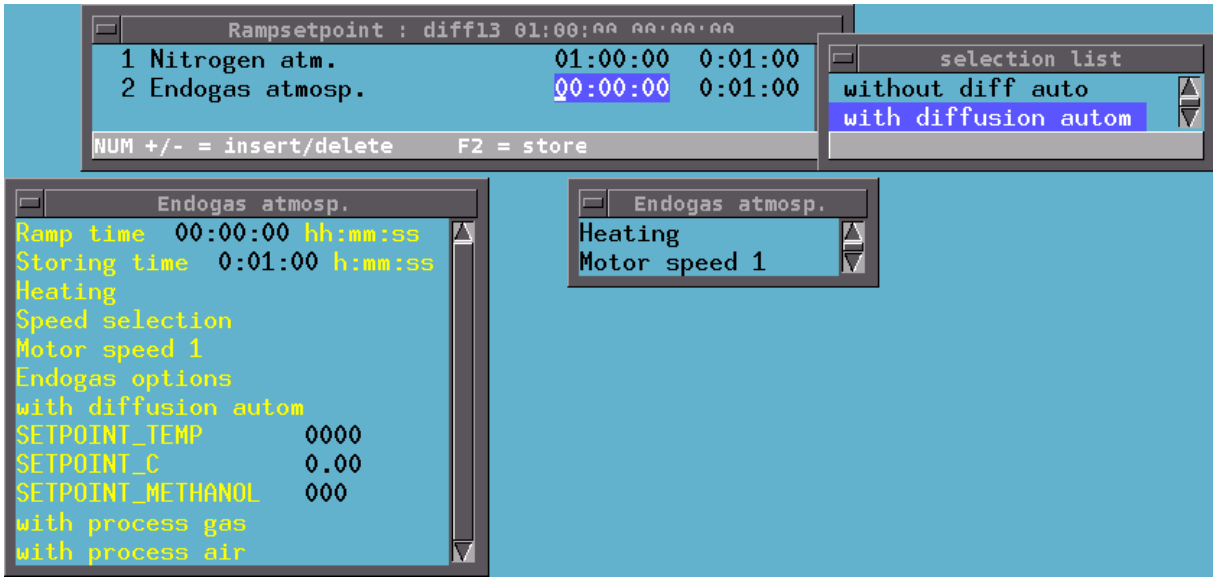
A new handling program has to be created in the submenu point "Program" (see chapter 4.3).

First, the program block "Preparation of the furnace" has to be inputted, e.g. the heating of the furnace up to a certain temperature in order to start the diffusion process. Therefore, the program blocks are programmed as usual. In this program module it is important always to select “without diffusion automatic.”

In the following example, the heating of the furnace to a temperature of 920°C is shown:



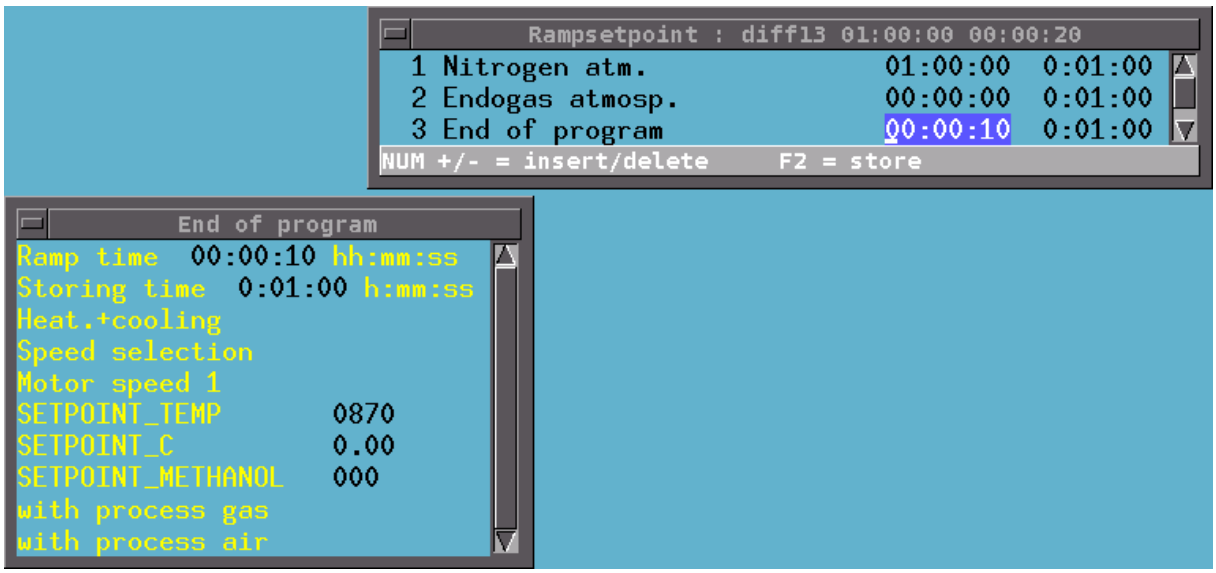
If the preliminary steps are programmed, a further program segment is selected and all setpoints are set to 0. The setting of the point "**with diffusion autom.**" is important!



> ⚠ **Notice:**
>
> If all setpoint are set to 0, the temperature and the C-level-setpoint will be taken from the program parameter.

Now any further program segments for the treatment of the charge in the furnace may be added as usual.

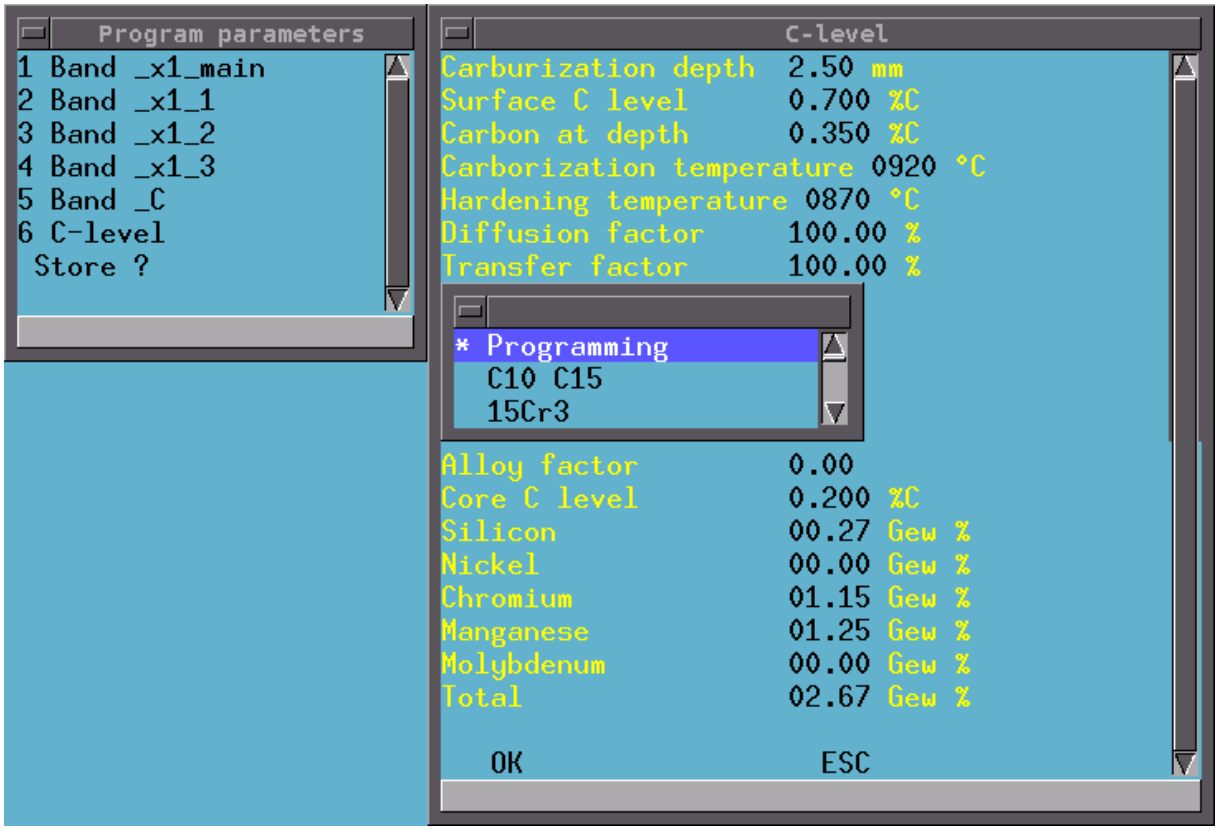
In the following example, the program point cooling follows the diffusion process:



Then store the created program as usual.

4.10.3. Parameter creation with diffusion automatic

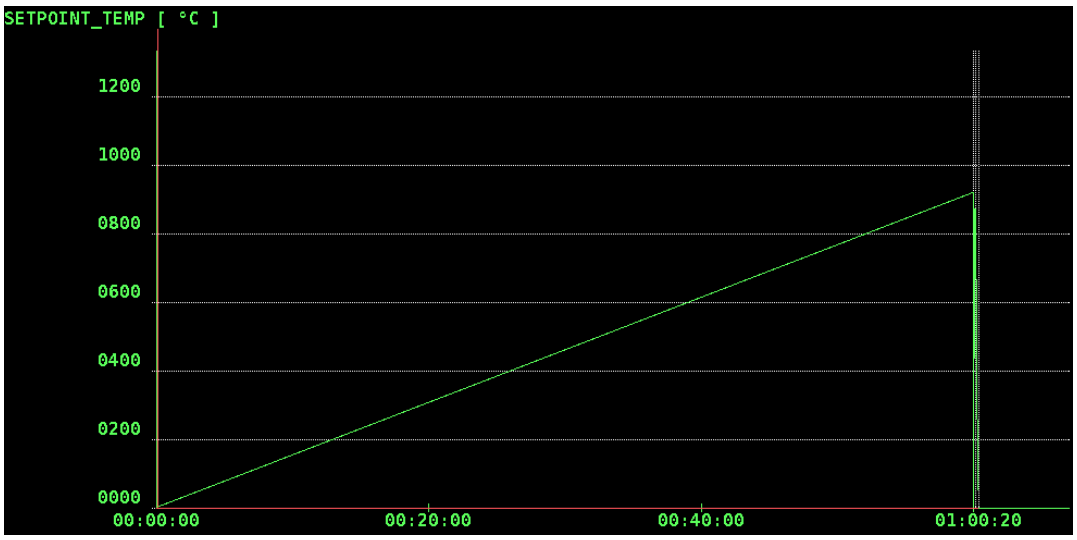
For the automatic diffusion calculation, a special program parameter set is necessary for the handling program. The programming of the program parameter is as usual (see chapter 4.6). Input "standard" parameters e.g. band widths as usual. Now the input of the required C-level in the program parameter point 0 (C-level) has to follow.



In this example, the standard values for the C-level parameters are used. After the input of these values the combination of the charge has to be programmed. This may be done "manually" by the input of the additions in percentage. Furthermore, the 24 most commonly used steel alloys are already programmed and may be selected by arrow keys and by key "**F4**". By selecting "**OK**", the settings are adopted and by selecting "*Store?*", the program parameters are stored. Now, a process program has to be created from the program parameters and the handling program that was just programmed (see chapter 4.7).

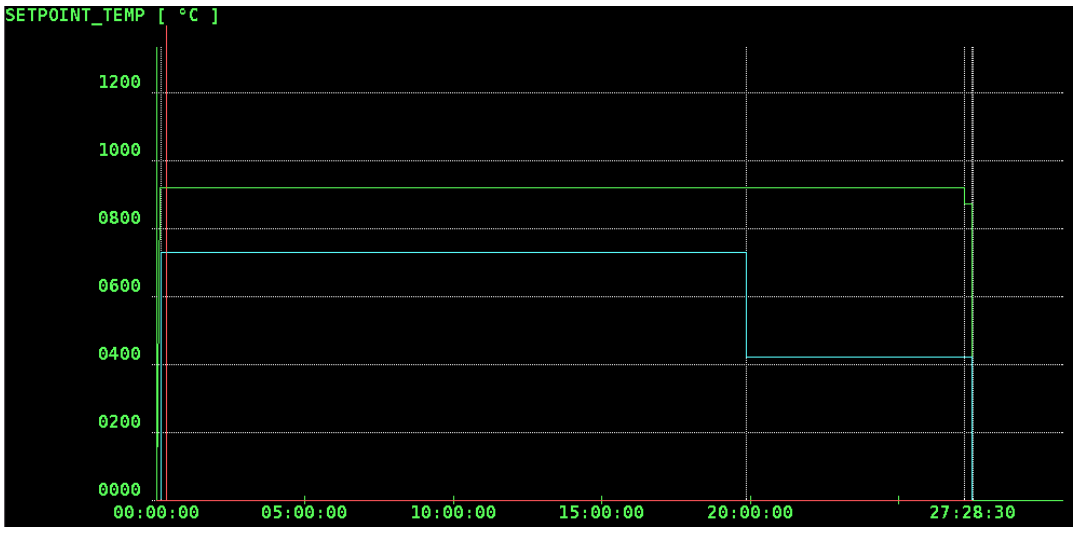
4.10.4. Start Diffusion Automatic

After loading the created process program, the following profile of a temperature set point is shown in this example (process display, see chapter 3.7):



After calling (for) (or selecting) the function "*Start*" in the submenu "*Command*" (see chapter 2.4) the C-level controlling is automatically calculated. This calculation is signaled with a message in the upper area of the screen.

After the calculation, the following process profile is shown in this example:



This is now the definite program which is used from the control system. The process has already started.

4.10.5. Manual modifications in the automatically created handling program

The automatically created program can be called by the menu "*Auxiliary programs*" - "*Current handling program*" and stored under another name. Also, manual modification of the automatically created program may be done here (see chapter 5.3).

4.10.6. Diffusion recorder

If this function block has been configured in the configuration of the control system, the diffusion recorder records the layer C-level, in comparison to the continuous recorder. It records the carbon concentration via the material depth. This allows an overview of the current status of the carburization process and may serve as quality proof after the heat treatment process.

5. Chapter: Auxiliary programs

5.1 Brief description

"Current handling program"

Change current handling program (changes may be immediately activated in the current handling program).

"Current parameters"

Change current parameter set (changes may be immediately activated in the current parameter set).

"Print"

Print data files e.g. treatment program, parameters, measurements etc. as well as events (alarms, messages).

"Delete"

Delete data files e.g. handling programs, parameters, measurements etc. as well as events (alarms, messages).

"System data"

Treatment of program independent system data defined in the configuration (e.g.: limit values, limites).

"Login"

Login of a user.

"Time"

Setting of system clock and date.

"Settings"

Define general settings (e.g.: screen saver, language, interface protocols).

"Backup/ Restore"

Backup (on external media) and data restoration (from external media).

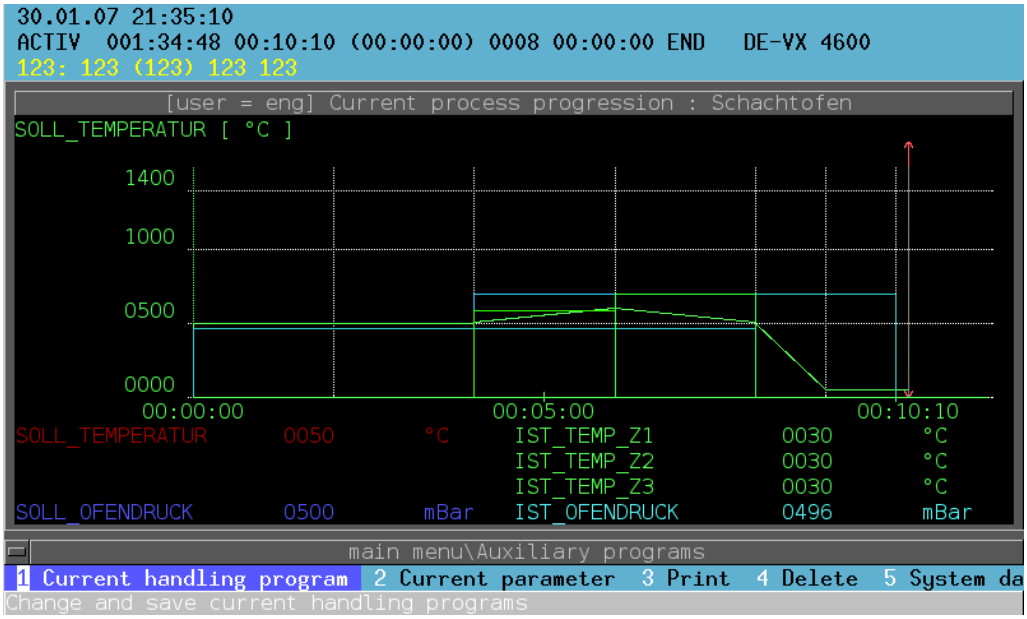
"Color Table"

Settings or changings of all used colors in the controller.

Warning:

The functions described in this chapter are **security functions!** If they are treated improperly by unauthorized persons system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

5.2 Menu selection



Z X Navigate the main menu "Auxiliary programs"

E T Choose

E T or automatic dialing

E T Choose the submenu in the menu "Auxiliary programs", or automatic dialing by:

1 M	"Current handling program"	6 J	"Login"
2 N	"Current parameter"	7 C	"Time"
3 O	"Print"	8 D	"Settings"
4 H	"Delete"	9 E	"Backup/ Restore"
5 I	"System data"	0 S ␣	„Color Table“

Notice:

All functions may be blocked for the user by PLC commands in the configuration or by authorizations.

5.3 Function "Current handling program"

With this function, changes in the current handling program can be made. These changes directly influence the current process, may be activated for the running treatment and may also be stored for future processes. This may be done with the original name of the handling program, but also a new handling program may be generated with a new name.

By the selection of the submenu "*Current handling program*", or after the selection of a ramp set point block, two menu windows are opened. In the upper window, the previous succession of the program modules of the selected ramp set point block is shown. In the lower window, the current input data of the selected program module are shown.

The handling and input resp. the modification of data will be done according to the description for the programming of a handling program (see chapter 4.3.1).

Warning:

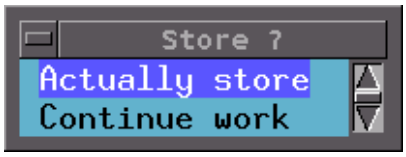
The function to modify the current handling program is a **security functions!** Wrong inputs can lead to system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

5.3.1. Activate changes

To activate the entered program changes for the current process, the following steps are necessary:

a) Start activation process

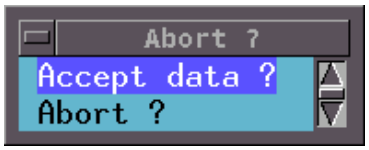
To finish the treatment use key "**F2**". A selection menu is shown.



The point "*Continue work*" goes back to the previous function.
The point "*Actually store*" activates resp. stores the input changes.

b) Activate the change

After the selection of "*Actually store",* the inquiry follows to adopt the data into the current handling program.



The point "*Accept data?*" adopts the changes into the current handling program.
The point "*Abort?*" aborts the function. **All changes are deleted.**

5.3.2. Store changes

After the adoption of the changed data in the current handling program, it is also possible to store them in the memory of the control system. The user may store the changed data under the original name of the currently loaded handling program, but it is also possible to generate a new file (see chapter 4.3.5.1).

5.3.3. Abort input

Input may be aborted at any time with "**ESC**". First there will be a safety request.

> ⚠ **Notice:**
>
> The existing inputs since the last storage get **irrecoverably** lost!

5.4 Function "Current parameters"

With this function, the current parameter set may be changed in order to directly influence the current process. The changes may be activated for the current treatment process and/or they may be stored for future processes. This may be done under the present name or under another/ a new name.

After the selection of the submenu "*Current parameters*", two windows are shown on the screen.

In the left window, the current program parameters are listed; in the right window, the corresponding input to the selected parameters are shown. The input and handling will be done according to the description programming of parameters (see chapter 4.6).

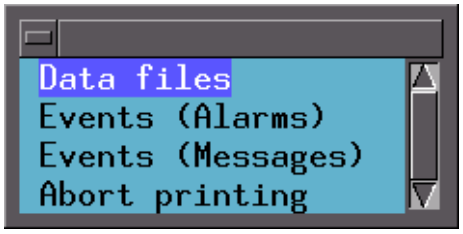
> ⚠ **Warning:**
>
> The function to modify current parameter sets is a **security functions!** Wrong inputs can lead to system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

To adopt or store the changes, or to abort the treatment, see chapter 5.3.1ff.

5.5 Function "Print"

With this function, all stored data (files) of the control system, as well as events (alarms and messages) may be printed out on a connected printer.

After the selection of the submenu "*Print*", a selection menu is shown on the screen where the user may select the printouts. For the setting of a printer see chapter 5.10.



Navigate menu point

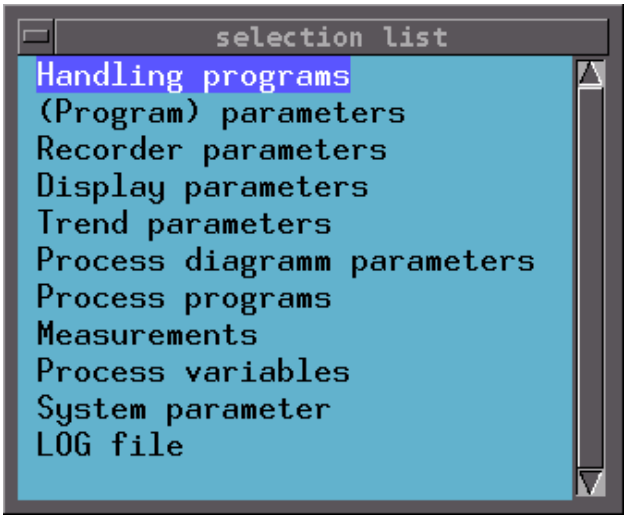
Choose menu point

Abort and quit this menu

The menu point "*Abort printing*" aborts the currently chosen printing.

5.5.1. Printout data

After the selection of the menu point "*Data*", a new selection menu is shown, where the user may select the data for print.



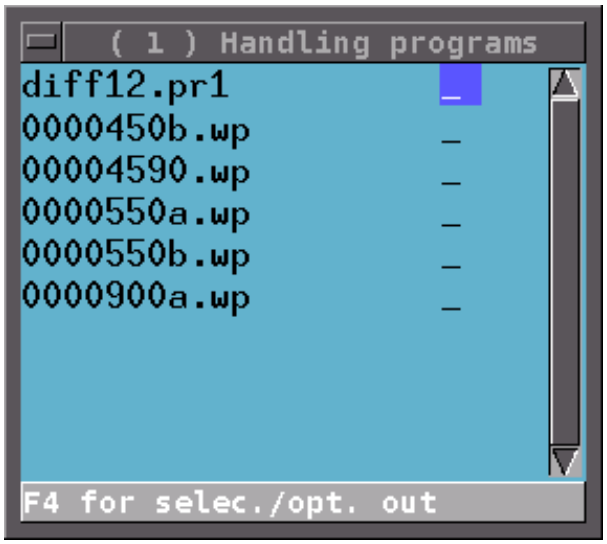
Navigate data type

Choose data type

Abort and jump back to the previous selection menu

After the selection of the required file type, a selection window with all files - available in the storage – is shown. Here, the user can select the required file(s) for printing. An example of process programs is shown.

Example (process program):



Navigate process program to be printed

F4 P — (Un)mark the program for printout

F8 Q — Mark all programs

F2 F — Start of the print process

ESC R — Abort and jump back to the first selection menu

After the start of the print process, the user has to select, in the next window, the menu point "*Print?*" in order to print the selected files. For the printout of handling programs, a request follows, asking if the function information (control tracks of the individual program section) should be added.

5.5.2. Printout events

With the selection of printout of events - effected by alarms or messages - a selection menu with the following selection possibilities is shown:

Print all events	All stored events are printed
Print events not yet printed	Only the events which are not marked as printed are printed now.
Mark events as printed	All stored events are marked. That means it is possible to printout new events separately.

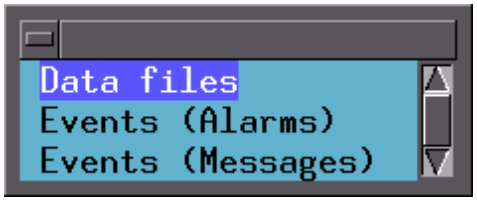
With the selection of one of the first two points, a request follows asking if the events should be printed out now. After the confirmation, the required events are printed on the connected printer. There are alarm events and message events.

If events are marked as printed, they are shown with a hook behind the event in the history display (key "**F3**" and than "**F5**").

5.6 Function "Delete"

With this function, all stored data (data files) of the control system, as well as events (alarms and messages) are deleted.

By selecting the submenu "*Delete*", a selection menu is shown where the user may select the events to be deleted.



Navigate menu point

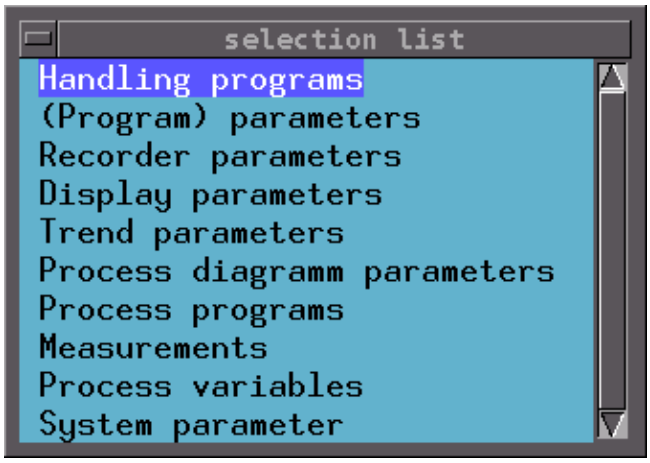
Choose menu point

Abort

5.6.1. Delete data

With the selection of the menu point "*Data*", a new selection menu is shown, where the user may select the data to be deleted.

> ⚠ **Notice:**
>
> Before deleting save the data files if necessary on an external data carrier (see appendix 4)!
>
> **After deleting the files are irrecoerbly removed!**



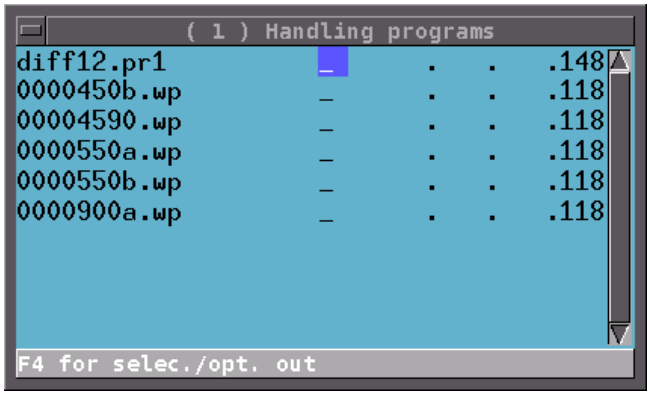
Navigate data type

Choose data type

Abort and jump back to the previous selection menu

After the selection of the required data file type, a selection window with all data of this type in the existing memory files are shown, where the user may select the required file(s) to be deleted.

Example (process program):



Navigate process program to be deleted

(Un)mark the program to be deleted

Mark all programs

Start of the deleting process

Abort and jump back to the first selection menu

After the start of the deletion process, the user has to select in the next window the menu point "*delete?*" in order to delete the selected files. After the adoption of this selection point, the deleting process may be confirmed for each single file or for all selected files.

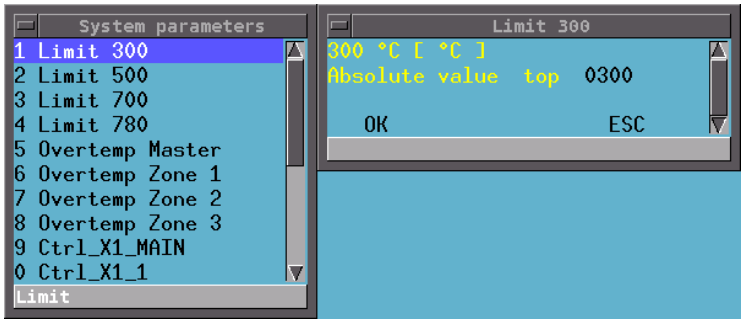
5.6.2. Delete events

After the selection of this function, the corresponding events effected by alarms or messages are deleted from the history **without further requests**.

5.7 Function "System data"

With this function, it is possible to set the general settings for the parameters which are valid for all process programs. The parameters created in the system configuration include normal security functions e.g. temperature and pressure limits, control parameters and limit values.

With the selection of the submenu "*System data*", two windows are shown on the screen. In the left window, the configured system parameters are shown. In the right window, the corresponding input fields are shown. The system parameter data are inputted in these fields and can be chosen with "**E**". In the footer, the limits are shown and the input are controlled correspondingly.



Y END / V HOME — Navigate the parameters

E T — Choose the parameters and adopt the input data

F2 F — Store, resp. via menu "*Store?*"

ESC R — Abort

Warning:

The treatment of the system parameters is a **security functions!** Wrong system parameters can lead to system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

5.8 Function "Login"

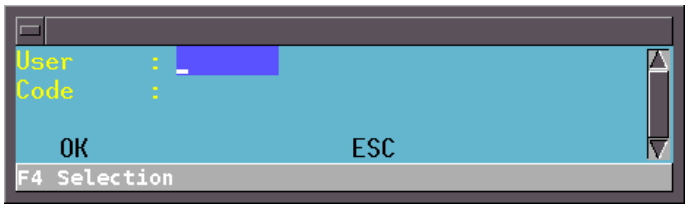
With this function, the user logs on in the system after a change of shift or during maintenance work. Therefore, an individual administration is warranted. That means a user without authorization is not allowed to select the menu point "S*tartup" t*o do changes.

This function may be called any time with key "**F7**".

For the setting of user, user groups and passwords, see chapter 8.11.

Notice:

To prevent that unauthorized persons use the system the authorized user should “logout” when leaving the system. Therefore call the function “*Login*” and leave the input by “**C**”. By this all functions except “*Login*” are inaccessible.



F4 P — Selection of a user from the selection menu

E T — Choose the input

After selecting the user, the code - corresponding to the selected user – has to be set in the field “*Code*”. The code is a combination of letters and numbers with up to 32 symbols. Capitaliziation and small letters are not considered. To create a user and to create a password see chapter 8.11.

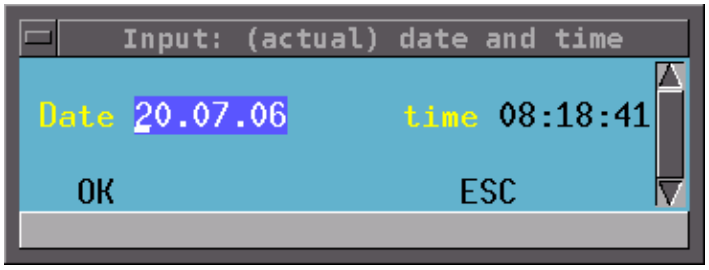
In case of incorrect input, an error message will appear. This message is to be confirmed with "**E**" and the log-in is to be repeated. There is no limitation to the number of log-ins.

Warning:

The function “*Login*” is one of the most **important security functions!** Wrong authorizations to security functions in the control system can lead to system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system.

5.9 Function "Time"

With this function, the time and the date of the system real-time clock is set. The correct setting of time and date is of great importance e.g. for the recording of measurement data. These data are stored in data files whose name is given automatically by the system and which contains the date of the recording (for the data file structure see chapter 3.3.2).



Navigate the cursor

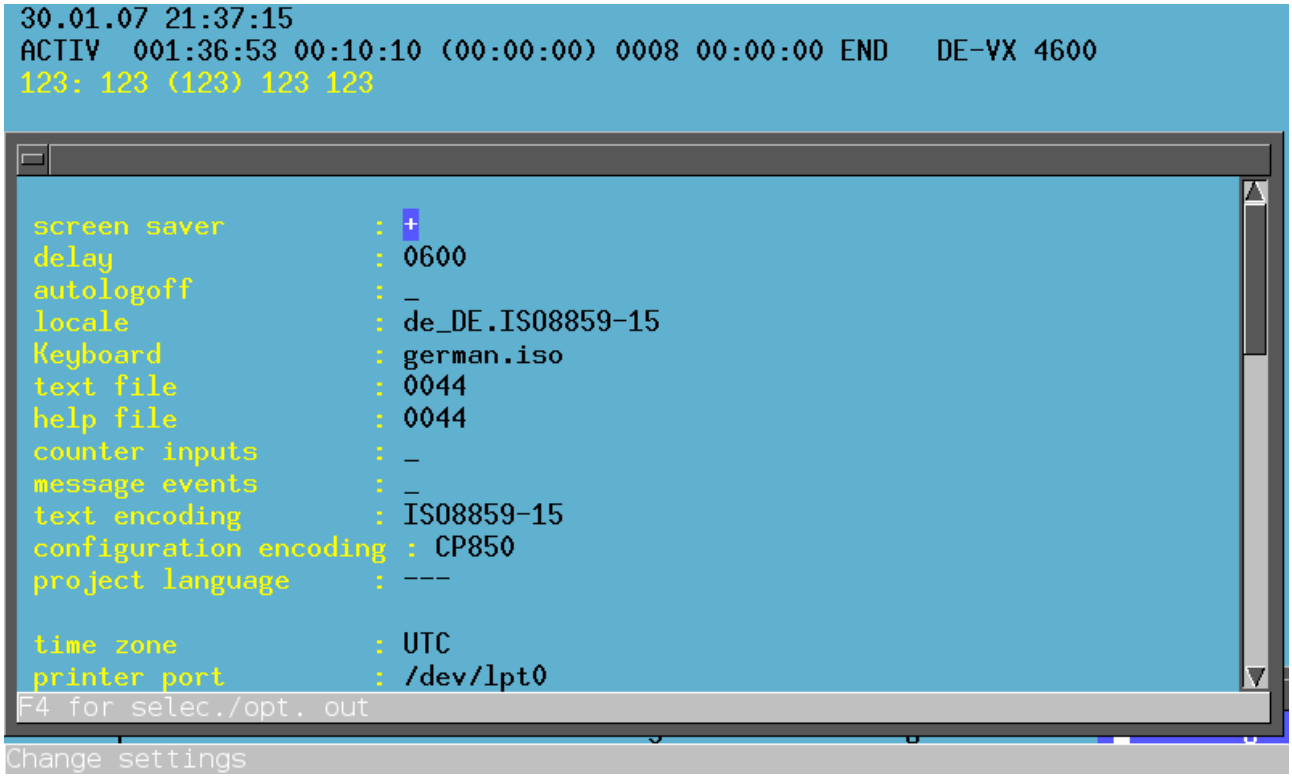
Choose input

The input of the time and of the date is done using the numbers of the keypad.

> ⚠ **Notice:**
> To avoid falsifications, the time should not be changed during a current measuring (recording)!

5.10 Function "Settings"

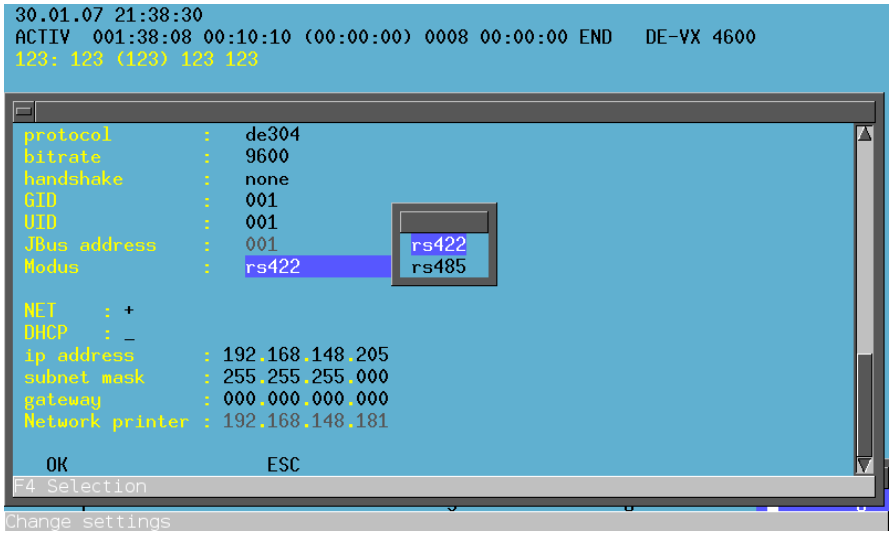
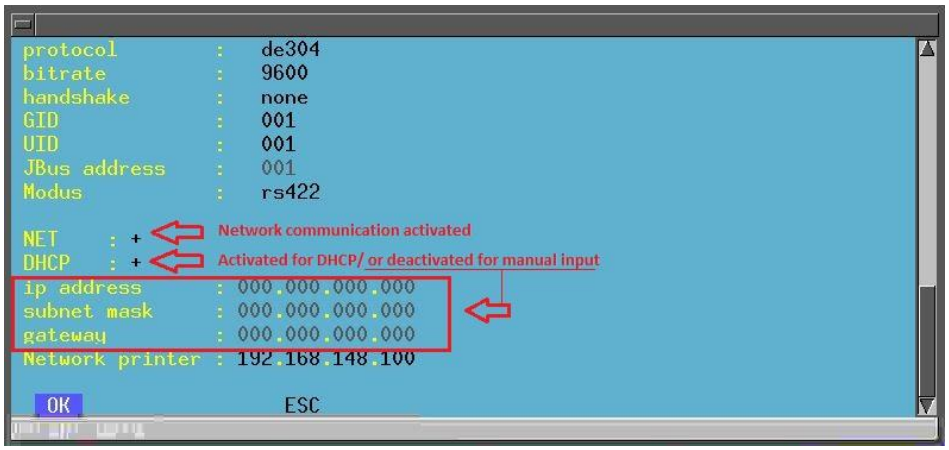
With this function, general system settings may be created. After the selection of the submenu "*Settings*", the following window is shown:



Functions in detail:

Screen saver	After activation (key "**F4**"), the screen will be dark if the keypad isn't used for a period which can be defined under "**delay**".
Delay	Definition of the delay time for screen saver
Automatic logout	After activation (key "**F4**"), without keyboard input the user will be automatically logged out after the specified delay time.
Locale	General definition of the language settings (special characters, display mode for date/ time, display mode for decimal point), e.g. de_DE.ISO8859-15 for Germany (List of local scheme see 12.3.1).
Keyboard	With key "**F4**", a selection menu with the country specific keyboard layout is shown. (List of keyboard layout see 12.3.2). A reset for the adoption of the change is necessary.
Text file/ help file	Setting of menu language and language for auxiliary texts. Selection menu with "**F4**" (language list see chapter 12.3.2). A reset for the adoption of the language change is necessary.
Counter inputs	Four inputs of the digital input board can be configured as counter inputs after activation by key "**F4**". A reset for the adoption of the change is necessary.

Message events	All alarms and messages are archived after activation by key "**F4**". A reset for the adoption is necessary
Character encoding	Setting of the individual script types for text files and for auxiliary files, e.g. ISO8859-15 for Western Europe. A selection menu is shown with "**F4**" (List of all script types see 12.3.2). A reset for the adoption of the changed script type is necessary.
Configuration encoding	Language encoding of the texts in the configuration. Presetting is CP850 for Western Europe. It is compatible to DE-VR 4008
Project language	In case the configuration is translated in different languages, here you can select the required existing project language. It will be adopted in the control system without restart.
Time zone	Time zone for the controller incl. summertime switch. **UTC** (not local time) is necessary for connection of prosys/2.
Printer port	**Selection between parallel printer, USB or network printer, *dev/lpt0* is for the parallel printer.**
Printer type	With key "**F4**" an input window opens for the selection of the connected printers. (List of all printer types see 8.10). A reset for the adoption of the printer is necessary.
Paper format	**A4** (European) or **Letter** (American)
Profibus-address	*Profibus-Slave only*
PB-Slave / PB-Master	With activating by key "**F4**" the communication of the control system as master or slave in a profibus network is possible.A restart is necessary. **Remark:** For this function, additional hardware in the control system is needed.
Interfaces	The functions of parameterization of the interfaces Comport (Master)/ (Slave), GID, UID, JBus-Address, Profibus-Address, protocol, bit rate, handshake, modem are only to be changed in agreement with the manufacturer resp. with demig Prozessautomatisierung GmbH!

Mode	The serial interface COM 3 supports the RS422 and RS 485 protocol (delivery status). The switchover is done by selection with key“F4“ No Hardware-termination is necessary: 
Net, DHCP	Connection of the controller to the network.  The selection • **+** network communication activated, • **-** network communication blocked will be activated by the button „**F4**“. After choosing „Net **+**“ you have to select if the IP-address should be fetched from a DHCP Server or entered manually (activation by button „**F4**“). After choosing „DHPC –„ (manual IP-address) you have to enter the IP-address as well as the additional parameters.

The new settings are adopted by selecting "**OK**" and reset of the controller.

With "**ESC**" the input is deleted and the changes are **not** adopted by the system.

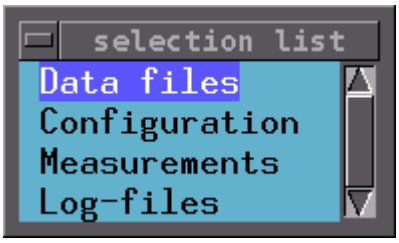
5.11 Function "Backup/ Restore"

Warning:

This function is intended for **internal purpose** only and requires a separate configuration and hardware installation!

With this function, it is possible to create copies from program files, parameter files, configuration files, measuring files and log files for the data storage on external data media (e.g. disk) resp. to restore data from this medium back to the storage of the controller.

With the selection of the submenu "*Backup/ Restore*", the user may restore the data or save the data. In the next menu the user is called to select a data file type.

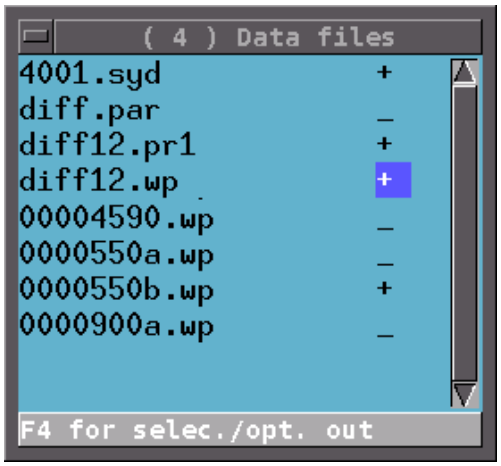


Navigate the data file

Choose the data file

Jump back to the previous selection

With the function "*Backup data files*", the user may select the data to be saved. With the function "*Restore data files*", the user is asked to insert a disk. When the disk is inserted, this index is shown:



Navigate data files to be saved

(Un)mark data files to be saved

Mark all data files

Start of the copy function

Abort and jump back to the first selection menu

After the start of the copy function, the status is shown. In case the storage medium is full, an error message is shown, indicating that the copy process has to be done with another storage medium.

In case a file already exists on the storage medium, a request follows to overwrite the file with the file to be copied.

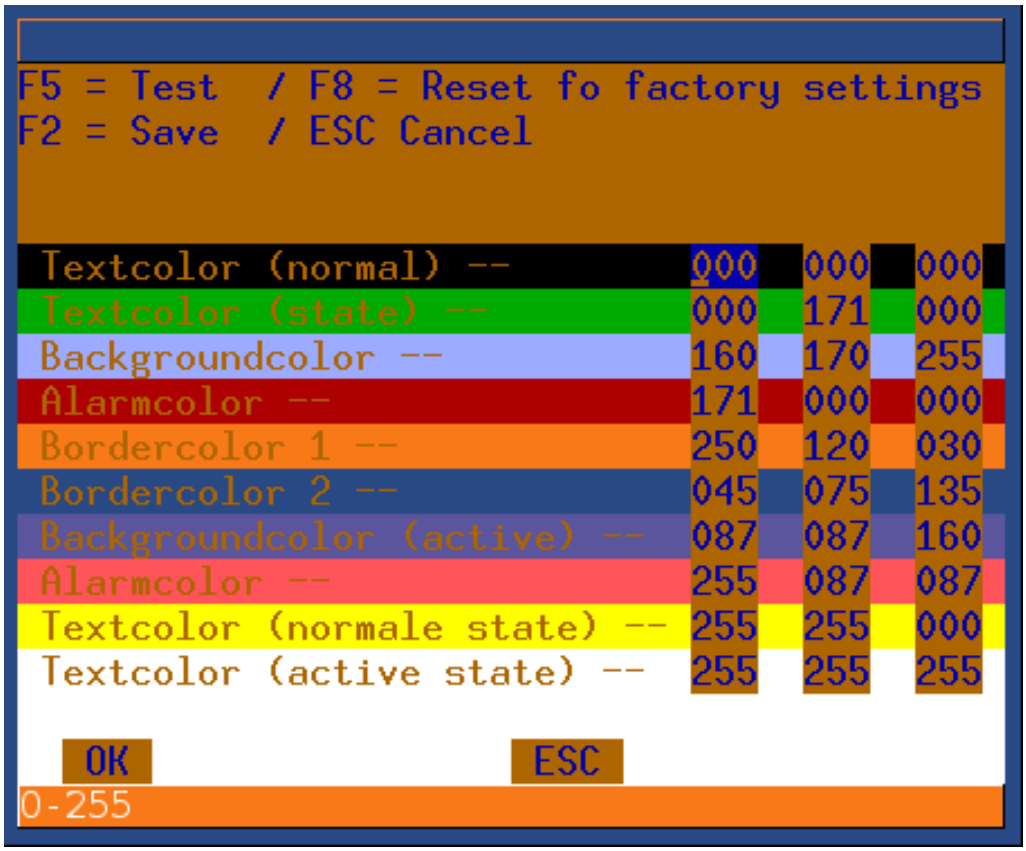
The success of the copying is shown on the screen.

Warning:

The function Backup/Restore is a **security functions!** Wrong handling can lead to system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

5.12 Color Table

With this function, all used colors in the controller can be set or changed.



The single parts of the used colors (column 1: red / column 2: green / column 3: blue) can be set or changed in the range 000 up to 255.

↑ V HOME ↓ Y END	Navigate ot the required line and column
F2 F	Store the changings
F5 B	Test the changed color settings
F8 Q	Reset to demig factory settings
ESC R ↵	Abort

6. Chapter: Manual

6.1 Brief description

In the main menu "*Manual*", the current process variables are displayed and manual operations are possible.

Depending on the system configuration, the following process variables are included: actual values, set points (fixed), ramp set points, limits, controlling variables, controller parameter, set point transducer, measuring transducer as well as other process variables (e.g. atmosphere).

The shift-in to the program-controlled normal operations is followed by the function: "*Automatic*"

"Manual"

Manual operation (manipulation) in process variables

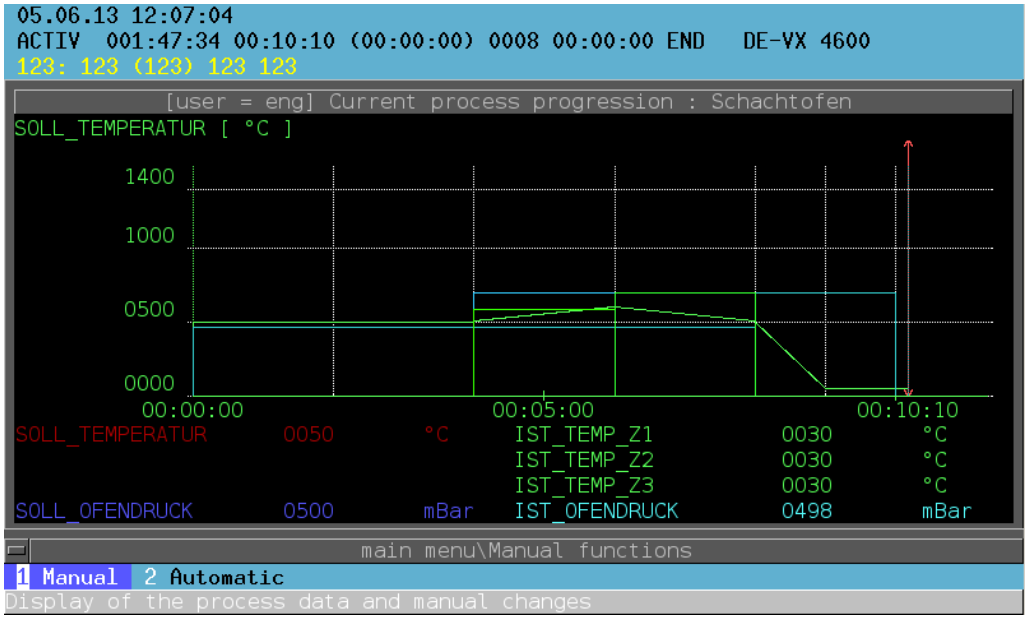
"Automatic"

Finish manual operations, start normal operations.

⚠ Warning:

The functions to intervene directly in running processes, described in this chapter, are **security functions!** If they are treated improperly by unauthorized persons system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system!

6.2 Menu selection



Z X Navigate the main menu "Manual"

E T Choose

5 I or automatic dialing

E T Choose the submenus in the menu "Manual" automatic dialing with:

1 M "Manual"

2 N "Automatic"

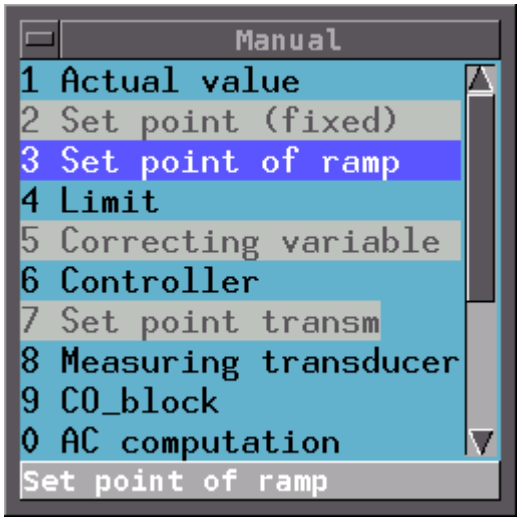
Notice:

All functions may be blocked for the user by PLC commands in the configuration or by authorizations.

6.3 Function "Manual"

With this function, it is possible to carry out manual manipulations in current processes. That means the user is able to change process variables of the current program. These changes are effective immediately. At the same time, the comment "**MAN**" (= manual mode) is shown in the upper status line (see chapter 1.-3.2).

After the selection of the submenu "*Manual*", a selection menu with a list of all process variables is shown. The process variables the user has no access right to resp. process variables that have not been configured are shaded in gray and may not be selected by the arrow keys.



Navigate the process variables

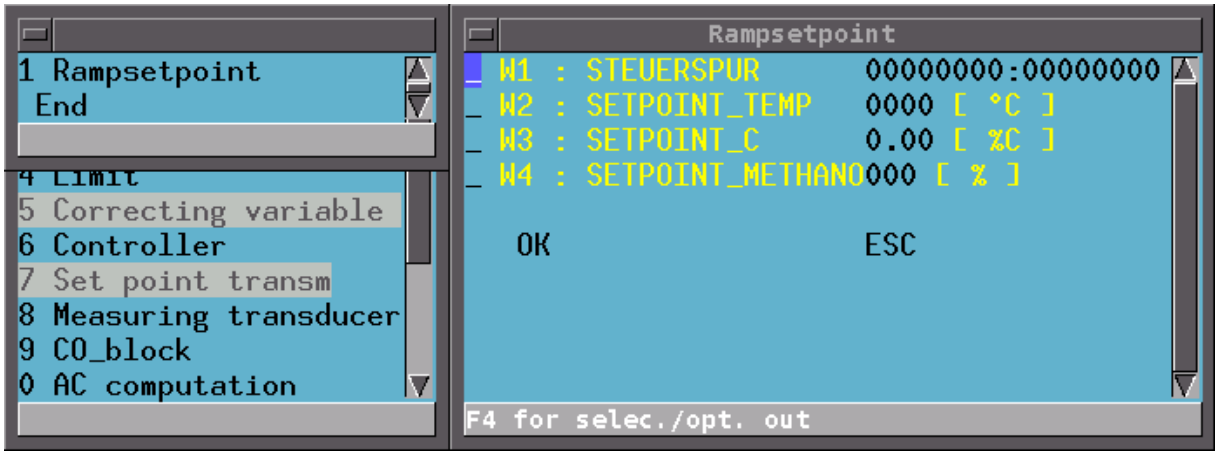
Choose the selected process variables

Abort

In the following two chapters, the manual manipulation in the system is described with two examples.

6.3.1. Example 1: Manual manipulation in the process Variable " Set point of ramp"

With the selection of the menu point "*Set point of ramp*", a list of all ramp set point channels created in the system configuration is shown. In the right window, the process data, e.g. control tracks or current set points corresponding to the ramp set point channel, are shown. In this example, only one ramp set point channel is configured.



By selecting a ramp set point channel, the right window is activated. In this window, the user may select the required process variable by the arrow keys. Two steps are necessary:

1. **Carry out input for the process variables**

> **Notice:**
>
> For security reasons, it is recommended to complete the input first, then check it and correct it if necessary, and in the next section, to manually activate the intervention by highlighting the changed values.
>
> When doing this, make sure not to leave the menu before highlighting the values, or else the “normal” value will be adopted again.

With the arrow keys, it is possible to select the required value and to input the new set point by the number keys. The system adopts the input only if all data for the respective process variable are complete and the input field has been closed. By pushing key "**ESC**", the input is deleted and no changes will be adopted.

2. **Mark the manual input data and activate them**

After the input of the required changes, activate them by marking them. Move to the desired field with the cursor and (un)mark it by means of key "**F4**". After all desired fields are marked, the cursors jumps with "**F2**" in the last input field. With key "**E**", all manual manipulations are adopted and immediately effective. In the upper status line, the display "**MAN**" is shown and the manually changed values are shaded blue.

> **Notice:**
>
> The markings/activations of input are only effective when an internal release condition for this variable exists. Depending on the system configuration, this can be done with the internal PLC.
>
> When a process program has been loaded but not yet started, the set point transmitters are not internally activated. After the input, manual functions are not adopted and therefore not activated. Also, manual inputs no longer have any effect when a previously active process variable becomes inactive during a running process. Then the manual inputs are no longer active.

6.3.2. Example 2: Manual Manipulation in the Process Variable "Controller"

With the selection of the menu point "*Controller*", a list of all controller blocks created in the system configuration are shown in the selection menu "*Controller*". When selecting a controller by means of the arrow keys, the process data: the actual value, the set point and the controlling variables are automatically shown in the right window.

The manual manipulation, like data input and marking (activation), is described in the following chapter.

Security functions during manual manipulation of the controller data:

The manual manipulation of this menu point are marked and chosen using key "**E**".

In the selection menu "*Controller*", other controllers may be selected and manually manipulated. These manipulations may be adopted. The already existing manipulations remain active.

In contrast to other types of process data, the manual manipulations stop (are no longer effective) after leaving the selection menu "*Controller*" with key "**ESC**", and the system runs with the original (process and program dependent) values!

⚠ Warning:

The function of manually changing process data is a **security function!** Incorrect input can lead to system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system!

6.4 Function "Automatic"

With this function all process variables are reset. The reset immediately follows the selection of the submenu "*Automatic*".

⚠ Warning:

Resetting manually adjusted process data is a **security function!** Incorrect input can lead to system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system!

7. Chapter: Compensation

7.1 Brief description

Disturbing influences such as variations in temperature, aging effects as well as tolerances of measuring transducers and (the incorrect) input wiring of data logging systems may be the reason for inaccurately measured actual data. In this case, the control system uses data which lead to poor quality of the treatment process.

Therefore, it is necessary to compensate these tolerances with a software compensation which has to be done according to a regular maintenance schedule.

The characteristics of the probes (e.g. no linearity) are considered. The compensation is done by inputting two measured data, which are recorded externally with calibrated measurement instruments at the position of the probe. These values should differ at least 50% of the measurement range! By entering both measured data, the system will generate a compensation algorithm which will correct all measured data in the future.

Further information about the principle procedure may be found in the appendix.

"Compensation"

Compensation of complete input blocks

"Compensation (card)"

Compensation of each input and output

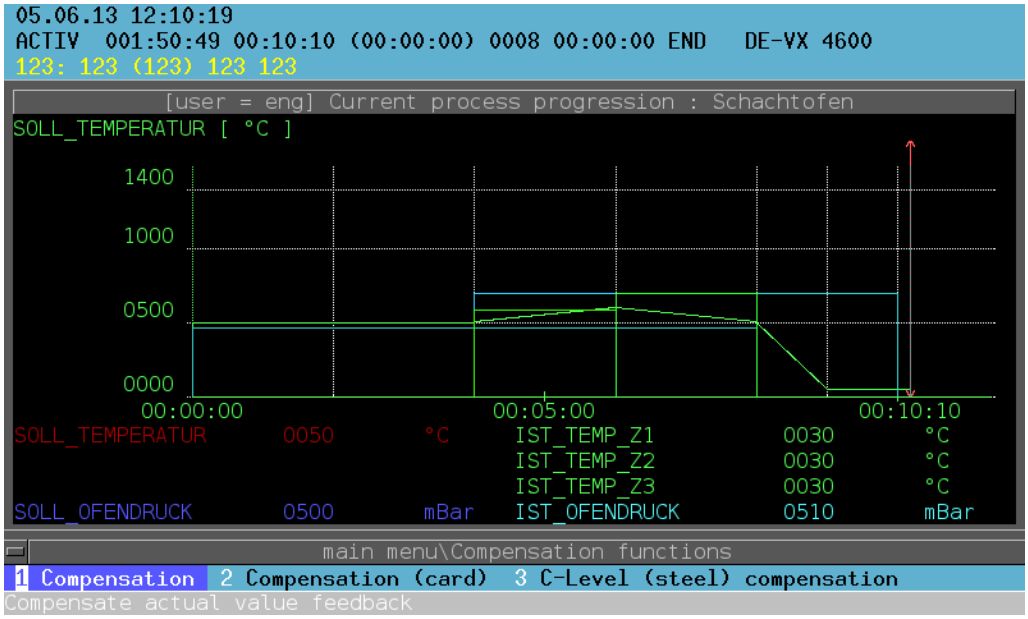
"C-Level (steel) compensation"

Compensation of the C-level controller by means of foils (pure iron foils)

Warning:

The functions described in this chapter are **security functions!** If they are treated improperly by unauthorized persons system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

7.2 Menu selection



Z X Navigate the main menu "Compensation"

E T Choose

6 J or automatic dialing

E T Choose the submenu "Compensation" automatic dialing with:

1 M "Compensation"

2 N "Compensation (card)"

3 O "C-Level (steel) compensation"

Notice:

All functions may be blocked for the user by PLC commands in the configuration or by authorizations.

7.3 Function "Compensation"

With the system configuration it is possible to connect a number of analog input variables by means of a compensation block (input block) to one measured value. This measured value is used as the actual value for the controller.

With this function, it is also possible to compensate the analog inputs of a configured input block in just one operation.

The compensation is analog to the function "*Compensation (card)*", where the user has to carry out the identical compensation procedure for each individual analog input.

In many cases as redundancy, probes are attached at the same place to constantly control deviations between the probes.

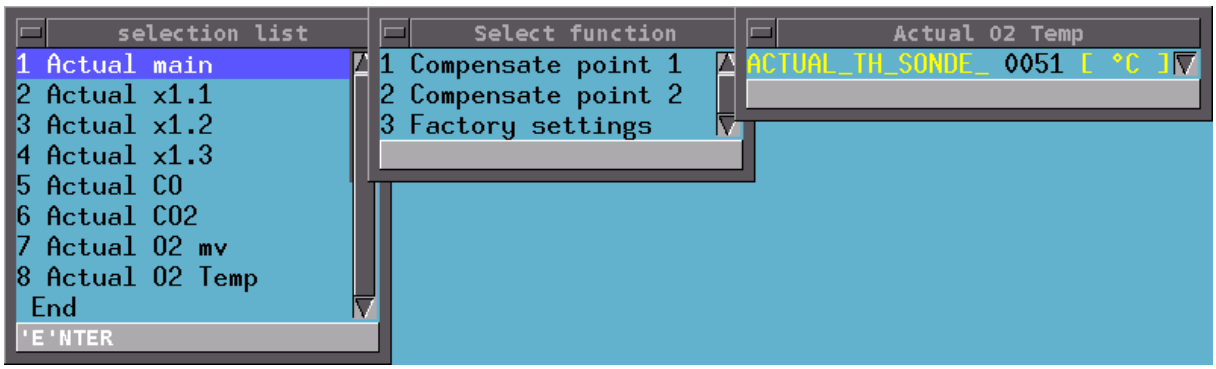
Therefore, it is possible to detect probe failures (e.g. thermocouple breaks) and to prevent negative consequences.

Since probes are sometimes delivered with large tolerances, the user may compensate all probes of a pooled input block at the same level.

General tolerances are allowed, therefore excluding false alarms by the probe monitoring. However, there is no influence on the partly nonlinear characteristics of the probe. The only result is a rise resp. amplification of the probe characteristic.

7.3.1. Compensation input block

By selecting the submenu "*Compensation*", a list of all configured input blocks follows. In the middle window the functions are shown. In the right window, the current analog measured values converted in digital data are shown.



Select the required input block by means of the arrow keys and choose with "**E**". Use key "**ESC**" resp. the menu point "*End*" to abort the function without adopting the changes.

Notice:

For the compensation of point 2 (Amplification), a offset correction (point 1) **has to** be done first!

Do not leave the compensation function during the compensation of point 1 and 2!

The actual compensation results from the input of measured values, which are measured by calibrated instruments at the position of the probe.

To compensate the first point, select the window "*Select function*". Select this measured value when the installation is in the lower measuring range. After the selection of this point, the user is asked to input the actual value of the calibrated instrument.

For the second compensation point, the installation should be in the upper measuring range. The difference of both measuring points should be at least 50% in order to obtain a more accurate measurement.

By means of the function "*Factory Settings*", all existing values are deleted and reset to the factory settings.

For further information concerning compensation see chapter 12.1.

⚠ Warning:

The function for the compensation of measured value input is a **security function!** Incorrect input can lead to system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

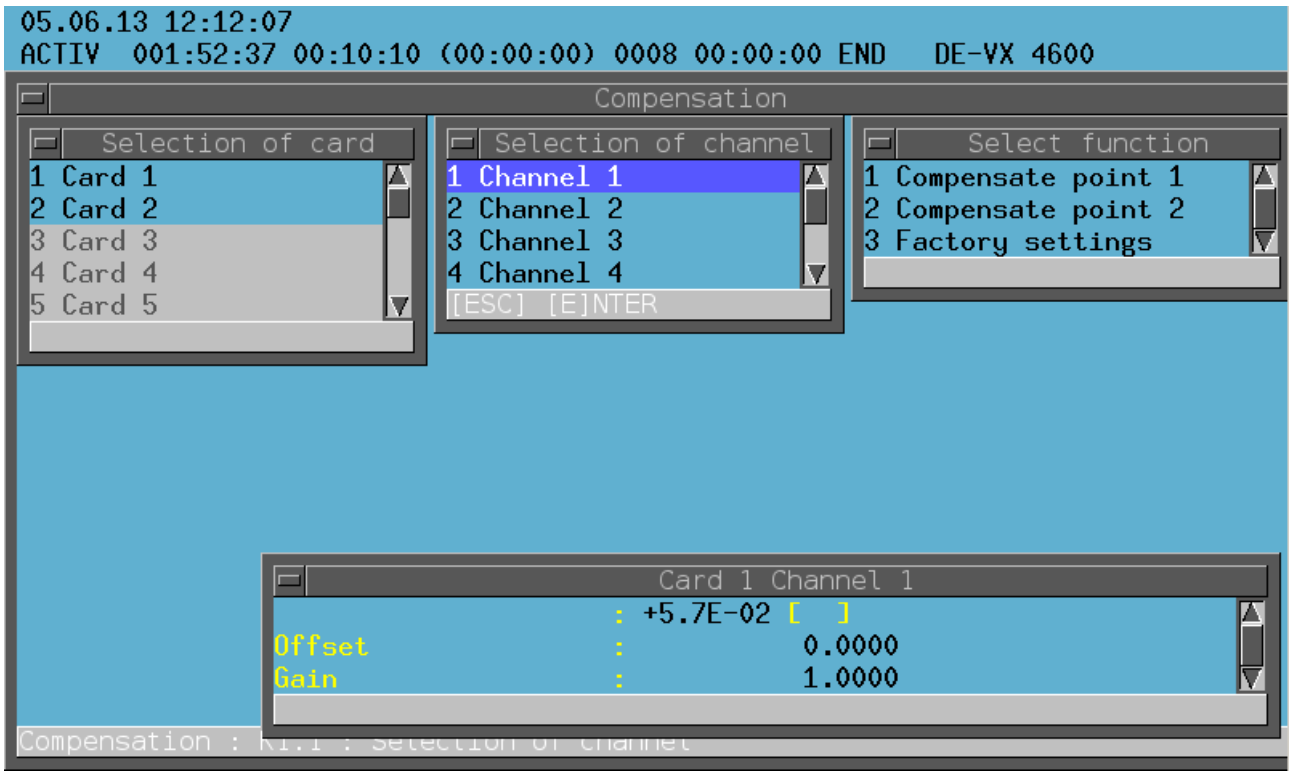
7.4 Function "Compensation (card)"

The analog inputs of the control system are factory-made compensations under laboratory conditions. Ideal surrounding conditions (e.g. temperatures) as well as exact tolerance-free measurement probes are the basis for this. In practice, these conditions are impossible. Changing temperature levels as well as probe tolerances are the reasons for incorrect measurements. That means the user has to adopt (to compensate) the analog inputs to the individual surrounding.

If the analog inputs are not connected to an input block (see previous chapter), each analog input has to be compensated separately under the functions "*Compensation (card)*".

The compensation is done by inputting two measured data, which are recorded externally with calibrated measurement instruments at the position of the probe.

The installation should be in the lower range for the compensation of the first measuring value, and in the upper range for the compensation of the second measuring value. (The difference between the both measuring points should be at least 50% of the measuring range). By means of the function "*Factory settings*", the existing data are reset to the factory-made compensation data.



Sequence:

1. Select card in the menu "*Selection of card*". The input signals are read through analog cards and they are transformed to digital information.
2. Select channel in the menu *"Selection of channel*". Eight analog inputs are available which may be defined individually.
3. Compensation point 1/ 2 in the menu "*Select function*". Input of both measured values.

Warning:

The function for the compensation of measured value input is a **security function!** Incorrect input can lead to system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

7.5 Function "C-level (steel) compensation"

This function serves to compensate the C-level calculation by means of a foil (pure iron foil) or of a comparable procedure.

Notice:
This type of C-level compensation is only meaningful in connection with an oxygen probe. For other measurements, the electrical compensation should be preferred. (see chapter 7.3).

Sequence:

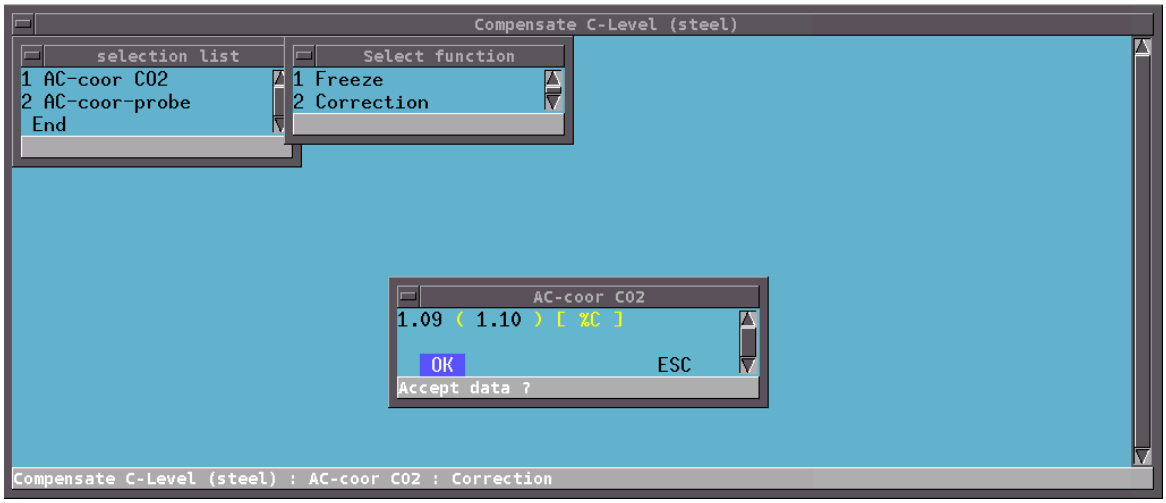
1. Insert the foil in the furnace.
2. After the dwell time in the furnace, take out the specimen and do the following instructions immediately:
   a. Select the C-level calculation block (several blocks can exist, e.g. in case of several control loops or of different measurement processes) by means of the arrow keys, and confirm with "**E**"

      Notice:
      All C-level calculation blocks – if existing – should be compensated!

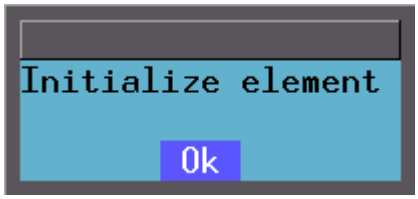
   b. Select the function "*Freeze*" and confirm the message, which shows that the selected element is frozen, with "**E**". Now the uncorrected pure C-level will be stored in the control system. It is possible to leave the menu point after the freezing and to do the correction later.

      Notice:
      The freezing has no influence on the C-level regulation. Only basic information for the compensatoin are stored. It is important to do the freezing at the same time with the extraction of the specimen for the relation of the stored basic information to the taken specimen.

3. Analyze the taken specimen and pure C-level.
4. Select the menu point "*C-Level (steel) compensation*" and the C-level calculation block to be compensated in the control system. Now select the function "*Correction*" in the new window and enter the pure C-level of the analyzed specimen.



The set value in the correction window is the calculated pure iron C-level without any compensation. The adoption of this value for a correction means a reset of the compensation parameters to the factory settings. In the brackets behind, the pure iron C-level before the current correction is shown for information. In case a previous correction of the C-level had been done, here the lastly corrected pure iron C-level is shown (depending on the current measuring values), otherwise the uncorrected value is shown.



Start the compensation and leave the input window with "**OK**". Abort the function and discard the inputs with "**ESC**".

Notice:
The function "*Freeze*" can be done several times, e.g. in case of faulty specimen. Always the value of the last freezing will be stored.

After the compensation, leave the function by means of the menu point "*End*" in the selection list.

7.6 Multipoint calibration

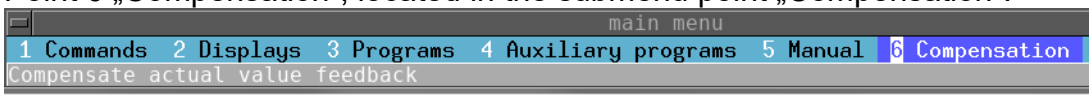
The new function “multipoint calibration“ is available for the following controller types:
- 41xx (device generation from 2014, software version from 12.14.0)
- 42xx (from 12.14.0)
- 46xx (from 2.14.0)

The function ”multipoint calibration” is also available for block inputs, which do not correspond to real actual values, at the following controller types:
- 41xx (from 12.17.4)
- 42xx (from 12.17.4)
- 46xx (from 12.17.4)
- 46xx (from 2.17.4)

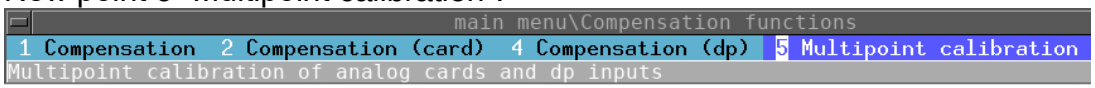
This function serves to an accurate compensation of input symbols of actual value blocks with a table for the selected block input.

Regarding to the plant safety, the function is equated to other compensation functions and needs the same safety instructions.

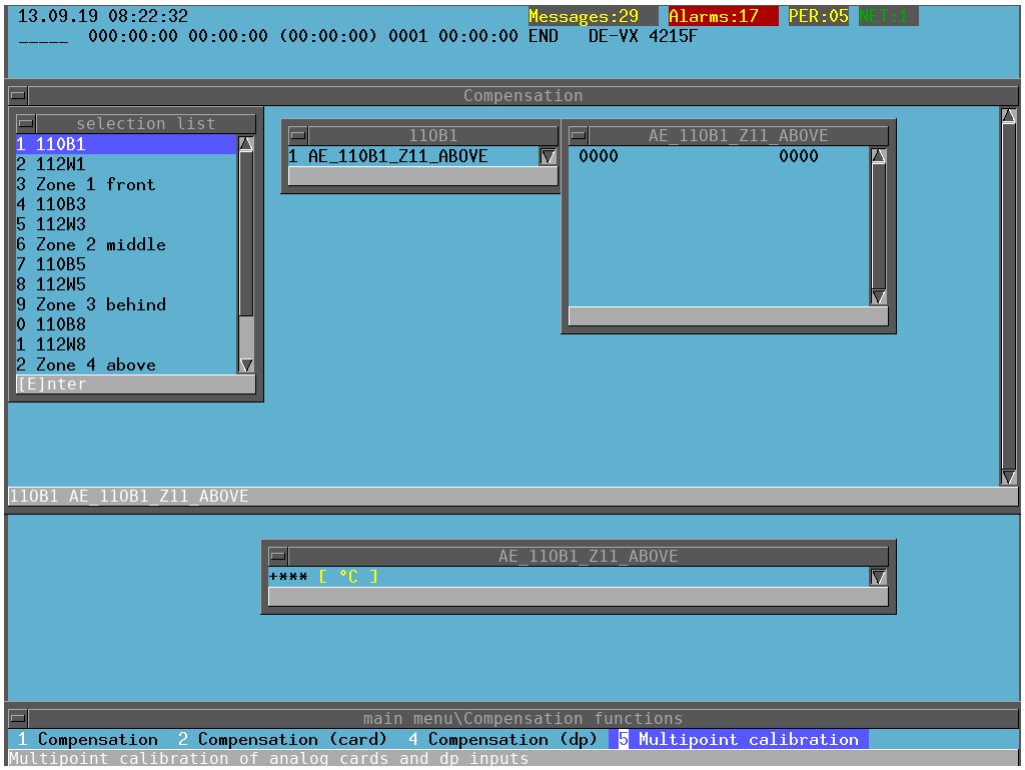
Point 6 „Compensation“, located in the submenu point „Compensation“:



New point 5 “Multipoint calibration“:



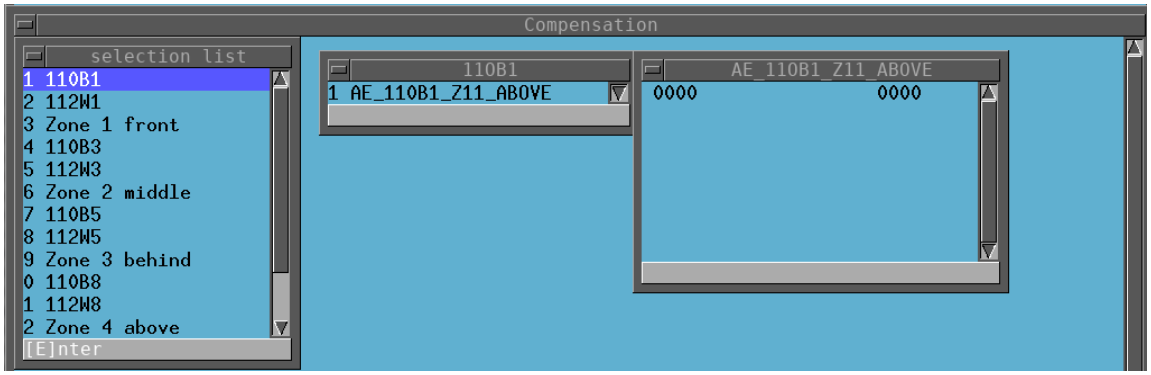
Overview and functions:

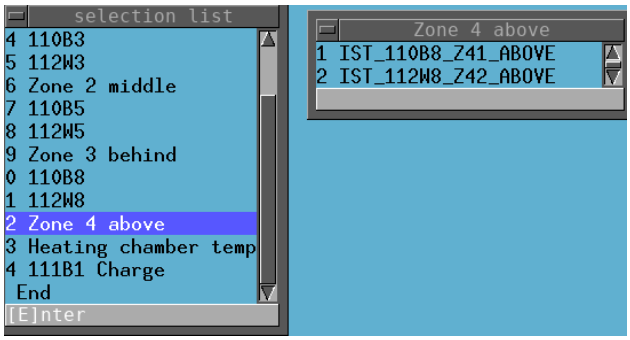


In the left window:
Selection list of the whole actual value blocks of the controller configuration.
Actual value blocks without any real actual value addresses are grayed out before version 12.17.4/2.17.4.

In the center window:
Selection list with the inputs of the selected block.
Not real actual value addresses are grayed out.

In the right window:
Table with compensation values for the selected element.





Operation left window (block selection):
Cursor high / down,
Page high / down
➔ Block selection
POS1 = 1. block
END
F2 = exit field

ESC Exit the function after request
Close on field Enter
Exit the whole function without request

Operation center window (symbol selection)
Cursor high / down,
➔ Symbol selection
Cursor left / right = change between the windows

Operation right window (value entry):
NUM Plus = add a value pair
NUM Minus = delete a value pair
F2 = save the table / provoke reset after request
ESC = Exit window after request
F5 = actual value is adopted in the left column of the actual row
F6 = manual sorting of the value pairs by ascending actual values, transfer even when saving
F7 = delete the table after query

Caution:

Less than two value pairs of rows make no sense for the compensation function. They are interpreted as a reset of the table for this symbol.
Please use minimum two value pairs.

8. Chapter: Startup

8.1 Brief description

The main menu item "*Startup*" contains basic adjustments which have to be defined during the start-up of the system, e.g.:

"Display parameters"

Generate and process data files for the definition of the numerical representation of process variables

"Recorder parameters"

Define the presentation of the process variables in the recorder mode and during the measurement recording

"Diagram parameters"

Generate and process data files for the definition of the presentation of process variables in the process view diagram

"Trend parameters"

Generate and process data files for the definition of the presentation of process variables as a bar diagram (trend barometer)

"Process variables"

Generate and process data files for the definition of the presentation of process variables in a line diagram. Define the scaling of the axes as well as define the process variables shown in the line diagram.

"Texts"

Process alarm and message texts as well as operator texts (auxiliary texts)

"Presentation"

Combine the definition parameter files "Display parameter", "Trend parameter" and "Process variables" for the current presentation mode

"Printer"

Select the printer type for printing from different menus

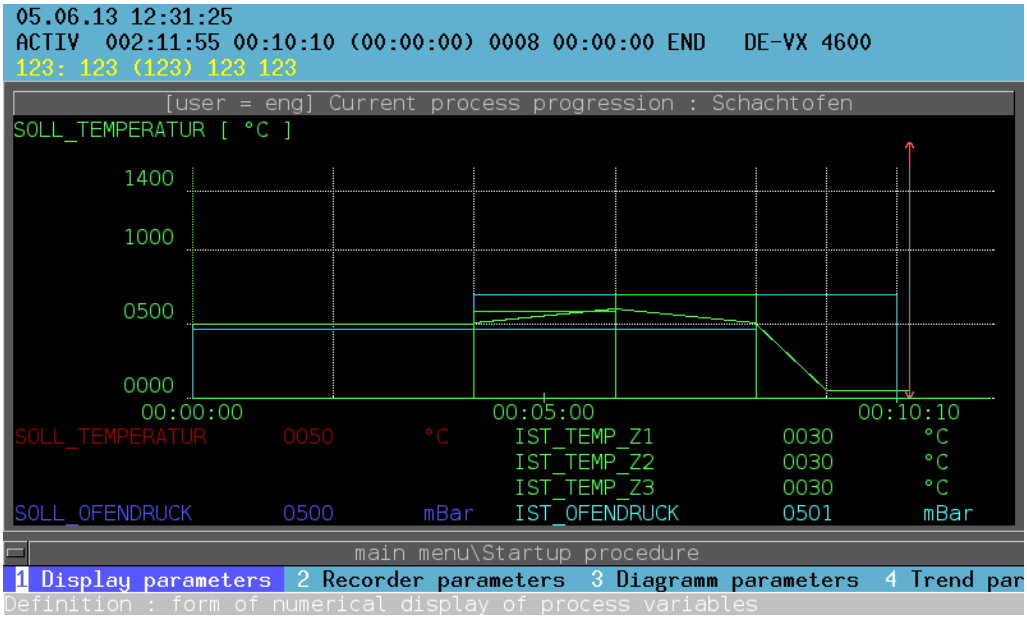
"Code"

Generate and modify access authorization for the user to the functions of the control system

"Softkeys"

Generate and modify sequence and/ or switch functions, which are processed after selecting a softkey presented on the screen in the menu "*Control*" (see chapter 9.3).

8.2 Menu selection



Z / X — Navigate the main menu "Startup"

E / T — Choose

7 / C — or automatic dialing

E / T — Choose the submenu in the menu "Startup", or automatic dialing by:

1 / M	"Display parameters"	6 / J	"Texts"
2 / N	"Recorder parameters"	7 / C	"Presentation"
3 / O	"Diagram parameters"	8 / D	"Printer"
4 / H	"Trend parameters"	9 / E	"Code"
5 / I	"Process variables"	0 / S ␣	"Softkeys"

Notice:

All functions may be blocked for the user by PLC commands in the configuration or by authorizations.

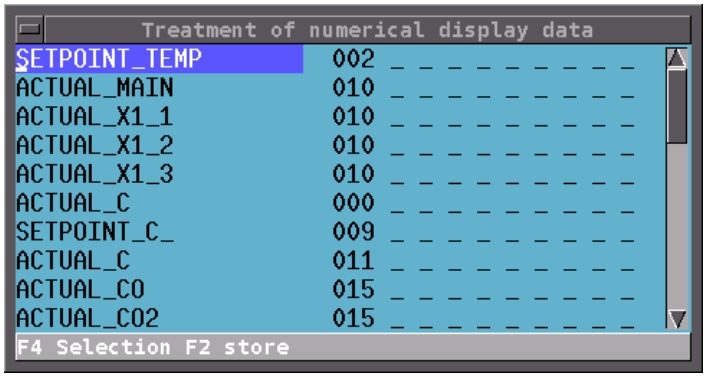
8.3 Function "Display parameters"

With this function, it is possible to generate and/ or change data files, in which process variables are defined to be shown during numerical presentation.

With the selection of the submenu "*Display parameters*", the user is asked to load an existing display parameter file, or to create new one (call the alphanumerical keypad using key "**F7**"). For the most part, only one file is required (standard name is 4001).

8.3.1. Generate display parameters

By loading a displayparameter file, a selection menu is shown on the screen, listing all of the previously recorded display variables. The order of appearance is identical to the display in the numerical process view. After each display variable is the number of the corresponding color code in which it is presented.



Navigate the cursor

Show the selection menu, and (un)mark the fields

Save

Abort and discard the changes

In the 9 selection fields, the opportunity is given to manually change these display variables in the numerical presentation (see chapter 3.4). Use the "**F4**" key to (un)mark. The first two selection fields represent the first user group in the controller. If one of these two fields is marked, the edit authorization for the first group is given. The fields 3-9 represent the user groups 2-8. If all user groups should have the edit authorization of the corresponding symbol, all fields have to be marked.

The display parameter files can be saved by pressing the "**F2**" key. Now it can be given a new name, and the old file will be overwritten.

It is possible to stop this function at any time by pressing "**ESC**". All input that has not been saved will be deleted. A safety request will be given beforehand.

8.3.1.1. Generate display variables

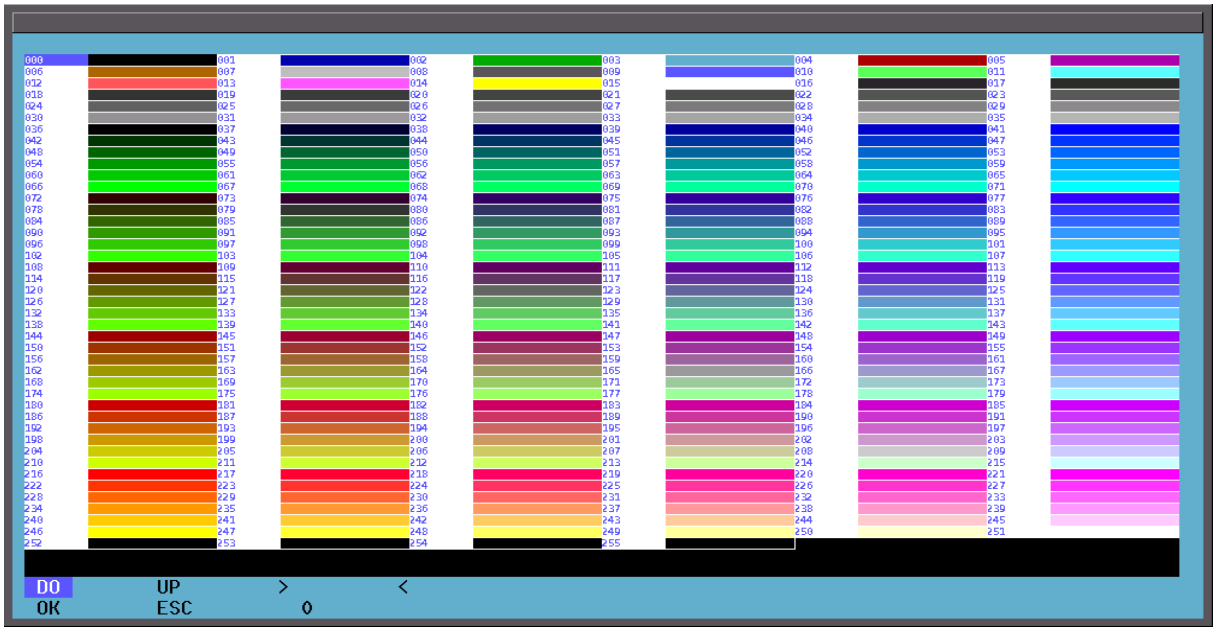
To change an already existing display variable, select the requested variable and press key "**F4**" to call the selection menu with all display variables. Select the requested variable and confirm by pressing the "**E**" key.

To enter a new display variable in the numerical indication, press the "**+**" key. It will appear again in the selection menu with all variables. The new variable will be inserted after the currently selected variable.

To delete an existing display variable, select the requested variable with the arrow keys and press the "**-**" key. **No** safety request will be given.

8.3.1.2. Color placement (Color code)

The color in which the variable in the numerical display is shown can be selected either by entering the colored number code, or by pressing the "**F4**" key and selecting from a menu.



The number at the bottom (in this example “0”) shows the choosen color code.

Notice:

For a better overview in the numerical display, it is recommended that variables that belong together in a block be displayed in one color. To achieve a separation between the blocks, a blank line should be inserted between them. This can be achieved by displaying a display variable in the color black (color code 0)

8.4 Function "Recorder parameter"

With this function the process variables, which shall be recorded during the program sequence in the measurement files, will be defined. For this, eight recorder blocks (here in example "PROCESS" and "DIFF") are available and can be activated, individually or together, using the PLC of the system. With this function up to eight process variables, which are recorded by the activation of the block, can be defined for each recorder block.

For every process variable, it is already defined whether the connected scale will be represented in the print-out. In order not to affect the clarity, it is advisable to activate no more than four scales per recorder block.

Navigate the recorder block

Choose the recorder block

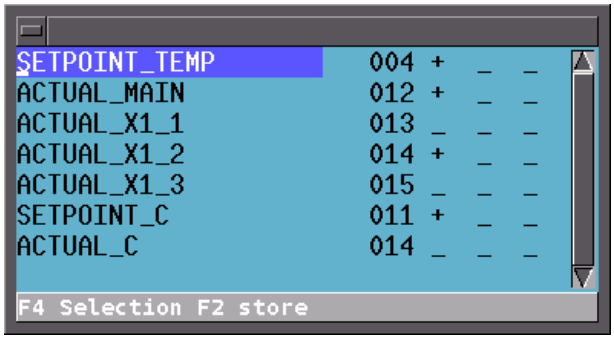
Abort

8.4.1. Editing the recorder parameters

The data in a recorder block determine if and in which color a process variable will be represented in the recorder display mode, as well as in the measurement files. If so, the process variable can be printed from "*Measurements*".

By loading a recorder block, a list of all the previously included parameters appears in the following input menu. These parameters include the symbol of the process variable, the connected color code and the display attributes of the scale.

To change the parameter files, follow the same procedures as described in chapter 8.3.1.1.



Cursor navigation

Show the selection menu, (un)mark fields

Save

Abort and discard the changes

Attributes can be assigned to the variables in the 3 selection fields after the color code. The first field indicates whether the scale of the process variable will be shown in the print-out, and the second field indicates if it will be presented logarithmically. By marking the third field, the process variable is taken as the X-axis denotation. This denotation applies then for all other process variables in this recorder block (e.g. total penetration depth in mm at a C-level-recording). Should no X-axis denotation be explicitly indicated, as a default the time will be displayed as X-axis value.

The recorder parameter file can be saved by pressing the "**F2**" key.

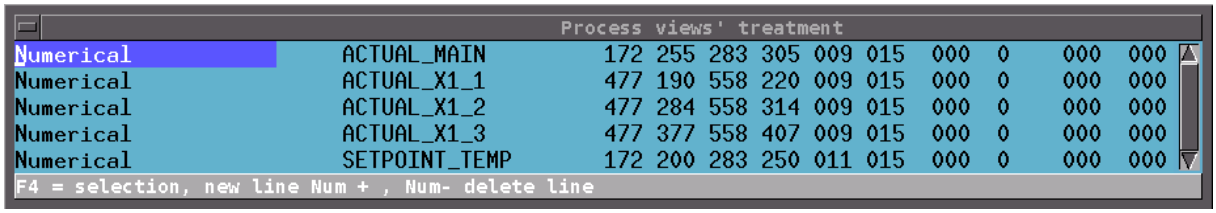
It is possible to stop this function at any time by pressing "**ESC**". All input that has not been saved will be deleted. A safety request will be given beforehand.

8.5 Function "Diagram parameters"

With this function, files are changed (e.g. regeneration, in which representation parameters from process variables are determined and can be displayed in an animated site view). The diagram parameters describe the display form (type and size), the position, as well as the color layout of the representation. The animated site views are generated in an external graphic program (PCX-format), and are transferred with the configuration to the control system.

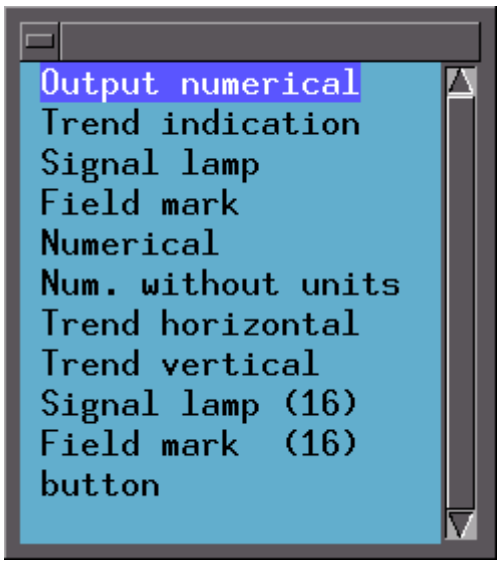
With the selection of the submenu "*Diagram parameters*", a selection menu with the names of all the animated site view in storage is shown. When an animated site view is selected, a new window will open and the diagram parameters can be set.

8.5.1. Handling of the diagram parameters for process views



The cursor can be moved using the arrow keys. By pressing "**F4**", a selection menu appears that is used to select the function or symbol that set the position of the elements in the animated site view to be created. Max. 220 elements per process view can be used. Abort and leave the function without saving the changes by pressing "**ESC**".

To accept a new element, press the "**+**" key. The new element will be inserted after the currently selected element. To delete an element, press the "**-**" key.



(1) In the first field of this window, select what is to be shown in the animated site view.

By pressing "**F4**", this selection menu will be shown, in which the user can select the desired representation format. For the meaning of each selection possibility, see chapter 8.5.1.1

In the next field (2), by pressing "**F4**", a selection menu will be shown with all of the suitable symbols used in the animated site view function, and with which type of representation they are used.

The next two fields (3) indicate where the X- and Y-start position or the top left corner of the element will lie in the animated site view. It is possible to directly input a numerical value, or by pressing "**F4**", to change a numerical value in the animated site view and then define the position with the cursor. After pressing the "**F4**" key again, the endpoint (size) of the element will be determined using the arrow keys. By pressing the "**+**" and "**-**" keys, the increment size of the cursor (distinguishable by the size of the cursor cross) can be increased or decreased. By pressing "**E**", the start and end position will be saved and the edit menu will reappear. To test the functionality of a generated element, press the "**F5**" key to start an automatic run of all elements, or press "**F6**" for a manual, step-by-step run (up and down with the arrow keys). The "**ESC**" key causes the edit menu to immediately return, without adopting the changes.

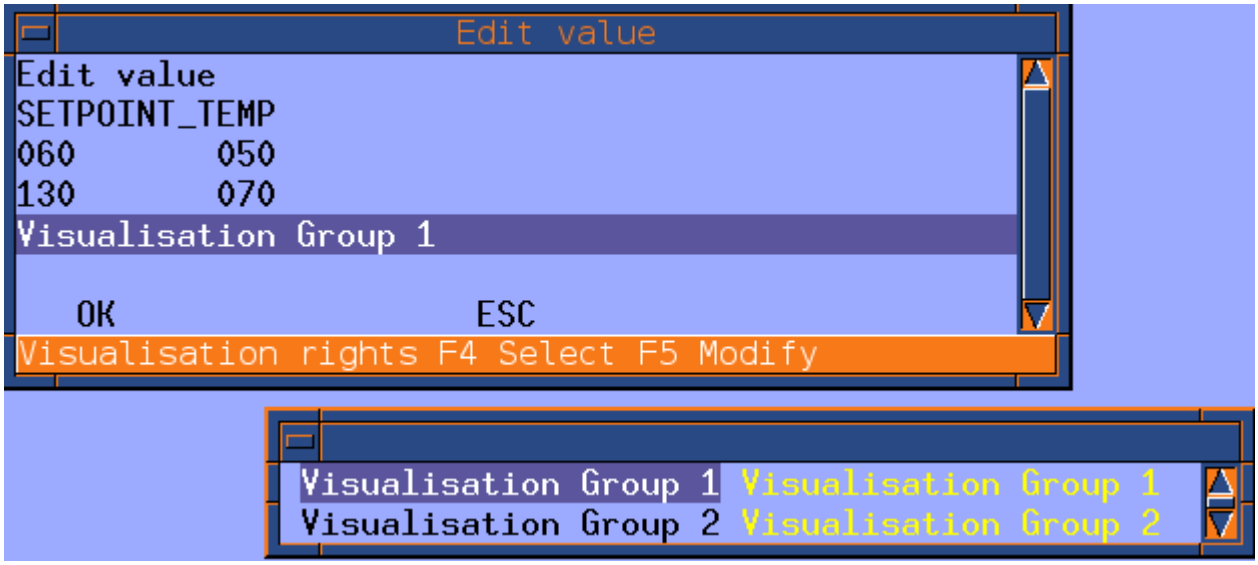
In the next two fields (4), the X- and Y- end positions will be displayed. Values will be automatically inserted into these fields if the start and end positions have been previously directly established in the animated site view.

The next 3 fields (5) are necessary for the color arrangement of the elements. In the first field is the font color, in the second is the background color and in the last one the margin color, which is definable according to the animated site view function (see chapter 8.3.1.2). In the field function, make sure to select a margin color that won't blend in with the selected field. Also keep in mind the information in the bottom line of the selection menu!

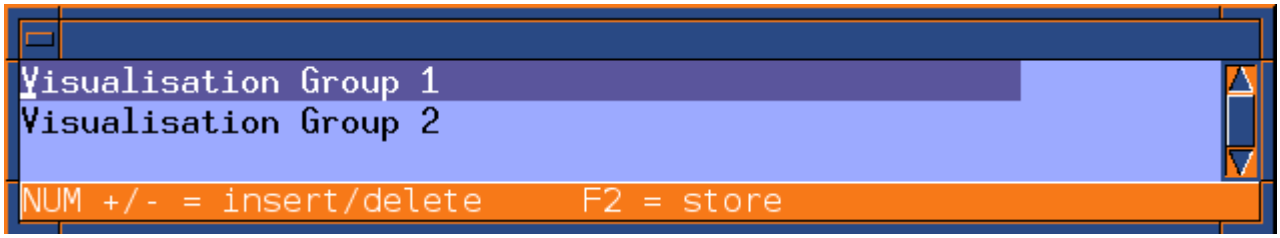
The last field is relevant to controllers made before 1/1995. It indicates whether a small or large font will be used.

The „**F7**“ key opens a dialog, which shows the characteristics of the selected animated site view.

Access rights can be assigned additionally for some animated site views, so that only authorized employees or groups can do changings or can initiate actions. The „**F4**“ key calls existing visualization access groups for a selection.



The „**F5**“ key opens a dialog to edit or create visualization right groups.



To create a new right group, press the "**+**" key. The new group will be added behind the marked one. To delete a group, press the "**-**" key.

To save the changings, press the "**F2**" key.

8.5.1.1. Description of the diagram parameters functions

1. **Output numerical**

   A framed data output with a unit of the selected symbols will be displayed in the animated site view.

2. **Trend indication**

   A framed display trend with number values and a unit of the selected symbols will be displayed in the animated site view.

3. **Signal lamp**

   A round Signal lamp with two different color conditions will be displayed in the animated site view.

4. **Field mark**

   Any framed selected field with two different colors will be filled in the animated site view.

5. **Numerical**

   A floating-point number with a unit (a binary value) will be displayed in the animated site view.

6. **Num. without units**

   A floating-point number without a unit (a binary value) will be displayed in the animated site view.

7. **Trend horizontal**

   A horizontally-oriented display trend will be indicated in the animated site view.

8. **Trend vertical**

   A vertically-oriented display trend will be indicated in the animated site view.

9. **Signal lamp (16)**

   A round Signal lamp with up to 16 different color conditions will be displayed in the animated site view. The current color (condition) will be determined by the association of the Signal lamp and the symbol.

10. **Field mark (16)**

    Any framed selected field with up to 15 different colors will be filled in the animated site view. The current color (condition) will be determined by the association of the field marking and the symbol.

11. **Button**

    Any rectangle is edited in the diagram, to which a function key or spezial key can be related to.By selecting this button in the diagram by mouse or touchscreen, the function is confirmed and carried out.

12. **Text list**

    Up to 8 free texts each with max. 20 signs can be entered. The currently shown text is depending on the variable value.

13. **Symbol with value**

    A symbol is shown completely with name, value and unit.

14. **Text field**

    A free text with max. 20 signs is shown.

15. **Value input field**

    An invisible, mouse sensitive field is created. If you click on it and the access is allowed, a dialogue is opened for value input.

16. **Set bit**

    An invisible, mouse sensitive field is created. If you click on it and the access is allowed, the assigned bit is set to 1.

17. **Change bit**

    An invisible, mouse sensitive field is created. If you click on it and the access is allowed, the status of the assigned bit is changed.

18. **Bit list**

    An invisible, mouse sensitive field is created. If you click on it and the access is allowed, a dialogue is opened for editing a bit list. M of n options are allowed.

19. Bit list (1of n)

An invisible, mouse sensitive field is created. If you click on it and the access is allowed, a dialogue is opened editing a bit list. 1 of n options is allowed.

20. Button (code)

An invisible, mouse sensitive field is created. If you click on it and the access is allowed, the assigned action is initiated.

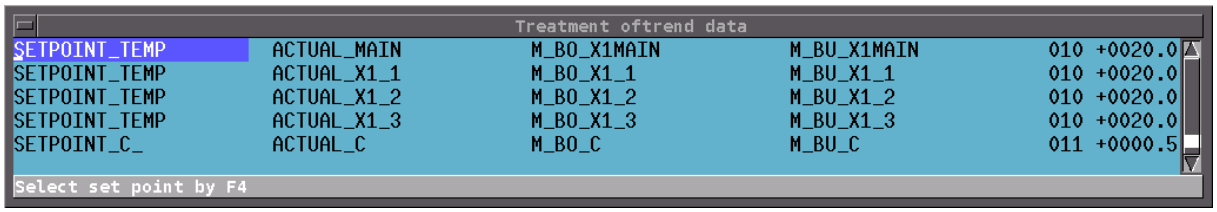
Warning:

This is a **security functions!** Wrong handling can lead to system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

8.6 Function "Trend parameters"

With this function, data files are changed and/ or newly generated. Here, the process variable deviations in comparison to the set point are represented as a bar chart (see chapter 3.6).

By selecting the submenu item "*Trend parameters*", the user is asked to enter an existing file, or to create a new one. Subsequently, the window "*Treatment of trend data*" is shown, in which the definitions of the trend parameters can be defined.



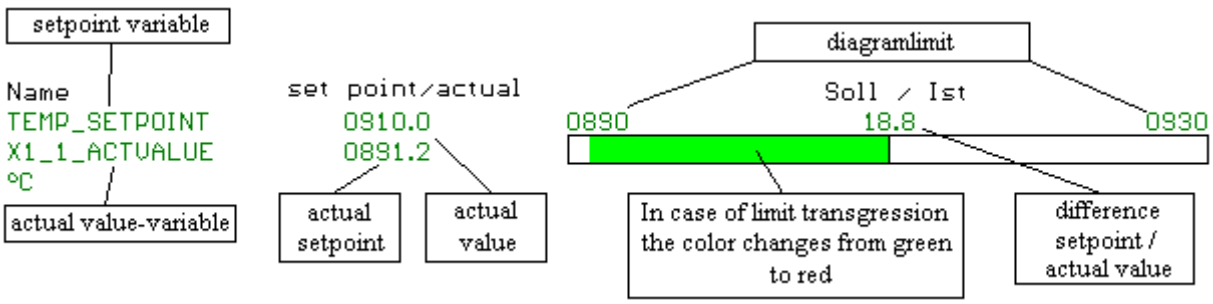
In this window, 6 parameters can be defined for each trend parameter (display can be scrolled in this window). The cursor is moved by using the arrow keys, and by pressing "**F4**", the applicable selection menu for each parameter will be shown. By pressing the "**+**" key, a new input will be generated after the currently selected one, and by pressing "**-**", the currently selected input will be deleted. **No** safety request will be given. To save the entries, press "**F2**". Press "**ESC**" to abort the function without saving the entries. A safety request will be given beforehand.

8.6.1. Editing trend parameters

In the first parameter field, select the set point of the trends to be represented. By pressing the "**F4**" key, a selection menu with all configured variables appears. In the second field, the relevant actual values for the set points can be selected from a selection menu. In the third and fourth fields, an alarm text can be selected. This alarm text will be triggered by exceeding the upper and/or lower borders of the presentation.

In the fifth field, the color of the set point presentation can be selected (see chapter 8.3.1.2). The last field indicates the deviation limits of the actual value (+/- in comparison to the set point).

The settings for the trend indications are represented in the trend display as follows:



8.7 Function "Process variables"

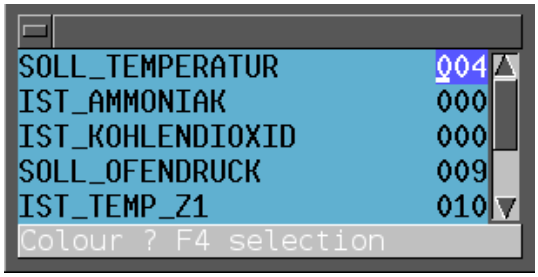
With this function, data files are changed or generated, and the process variables to be shown numerically below the line diagram (see chapter 3.7) are defined. The switchable scalings of the line diagram are defined in the same way. In addition, a presentation of the control tracks (digital controlling variables) of the program segments can be shown.

After the selection of the submenu "*Process variables*", the user is asked to select between the creation of process variables or the definition of scalings.

8.7.1. Definition of the process variables

After the selection of the point "*Process variables*", the user is asked to enter an existing process variables file, or to create a new one.

Subsequently, a window will be shown on the monitor, giving the user the opportunity to select the requested variables and assign them the color representation.



Cursor navigation

Show the Selection Menu

Save

Choose selection

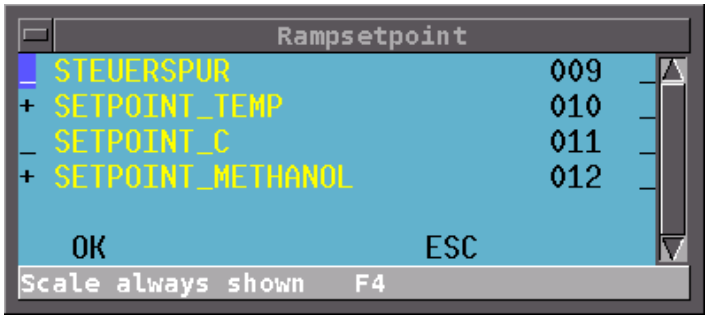
Abort and quit without changes. A safety request will be given.

In the first field of this window, by pressing the "**F4**" key, a selection menu with all configured variables will be shown. In the second field, the color in which the elected variable is to be shown on the monitor in the process presentation is selected (Color Code, see Chapter 8.3.1.2). To admit a new variable to the list, the "**+**" key must be pressed. The new input will be inserted after the currently selected input. To delete an existing input, press the "**-**" key. **No** safety request will be given.

8.7.2. Definition of the display parameter "Scaling"

With this parameter, the scales to the represented set points in a line diagram can be connected and switched off (see chapter 3.7).

After selecting the menu item "*Scaling*", the user will be asked to select a configured ramp set point block After selecting a ramp set point block (here in the example ramp set point block "set point"), a new window will appear, in which all variables that are configured for the ramp set point block will be listed.



Navigate the cursor

(Un)mark, and call the selection menu

Jump from the "**OK**"-field to Save

Choose Input

Jump from "**ESC**"-field to abort. **No** safety request will be given!

In the first field of this selection, the requested variable whose scales will be shown in a line diagram can be marked using the "**F4**" key. In the next field, the color in which the scale will be displayed is selected, and in the last field, select whether the scale will be represented logarithmically.

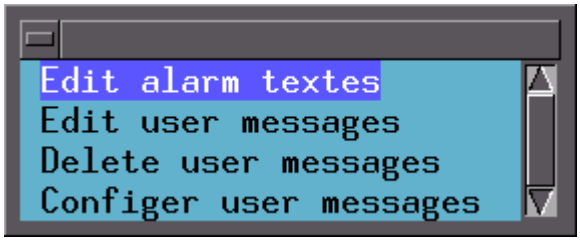
To select the input, select the "**OK**"-field. This causes a return of the previous menu, where the ramp set point block was selected. In this menu point, select "*Store?*" to save the changes.

To discard the changes and leave the function, select the "**ESC**"-field, and in the selection menu for the ramp set point block press the "**ESC**" key. **No** safety request will be given!

8.8 Function "Texts"

With this function, the alarm and message texts that were created in the system configuration can be changed or added to. Furthermore, the alarms and messages can be created by the operator texts (max. 4 lines with max. 50 characters). These operator texts occur during certain situations and may include more explanatory information. They are shown to the user with the activation of an alarm or message. Messages and alarms are each consisting of 8 blocks (text modules) and of up to 128 texts à 40 characteristics. With the selection of the submenu "*Texts*", a list with the possible functions is displayed.

The functions „Delete or configer user messages“ is only possible in the original project not in a translation.



Navigate function

Choose function

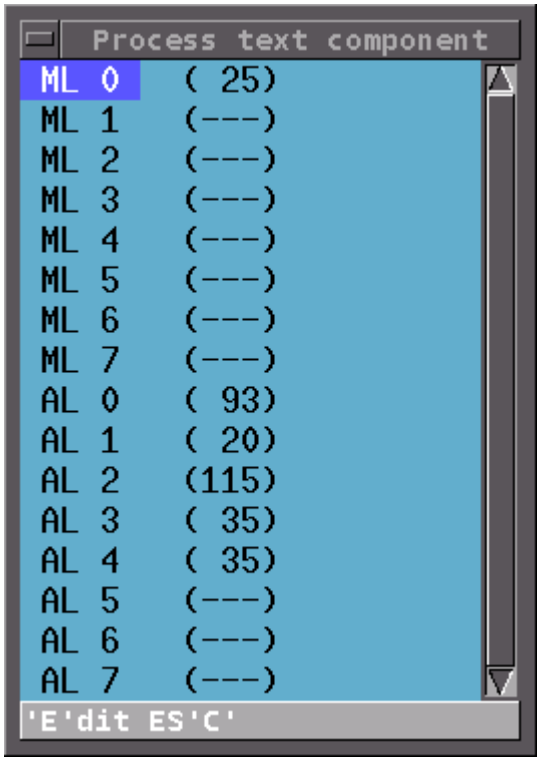
Abort

Warning:

The editing of alarm and message texts, as well as help texts, is a **security function!** Incorrect texts and especially alarm allocations can lead to system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

8.8.1. Edit alarm and message text

With the selection of the submenu "*Edit alarm texts*", the selection menu "*Process text component*" will be displayed on the monitor. All 8 message (ML0 - ML7) and alarm modules (AL0 - AL7) are displayed in this menu.



Text module navigation

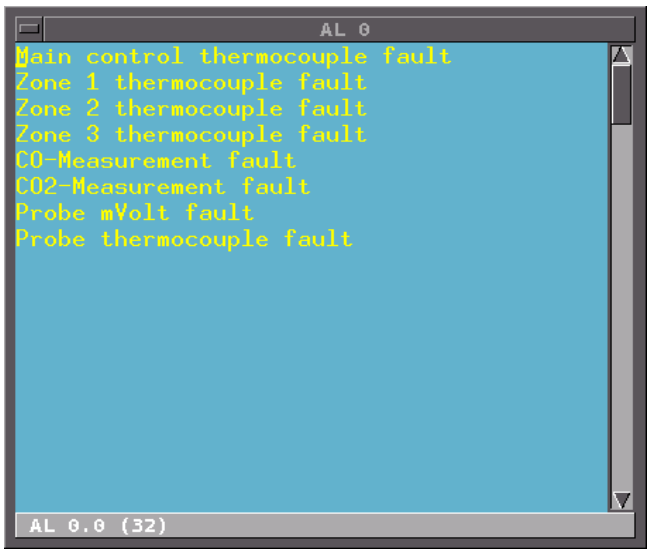
Choose text module

Abort and return to the main menu. **No** safety request will be given!

The representations in the parentheses behind the respective module have the following meanings:

- (0): (grey highlighted) Text module is not set up in the configuration; no input possible.
- (0): (blue highlighted) Text module is set up, but no texts are present; input possible.
- (74): 74 lines with texts present; more input possible.

8.8.1.1. Edit alarm and message text modules



Cursor Navigation

Save

Call the alphanumerical keypad

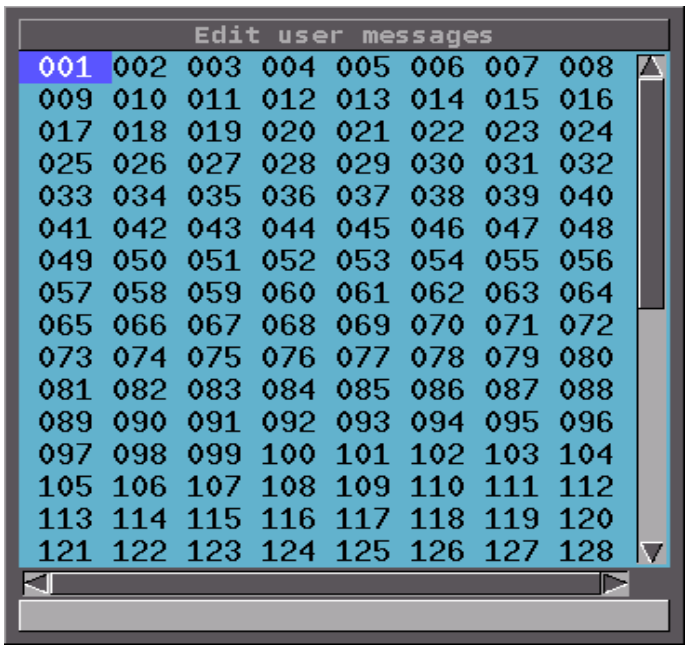
Abort and discard the new entries

In this window, the alarm and message texts can be entered or changed. That means that by triggering (exclusively through the configuration of the PLC!) the alarm Al_1.0 in the alarm representation (using key "**F3**"), this text will be displayed (see Chapter 3.8).

When leaving this edit window, press "**F2**" to save the input made. To abort this function and discard the changes, press "**ESC**". A safety request will be given beforehand.

8.8.2. Edit user messages

With the selection of the submenu "*Edit user messages*", a selection menu will be shown, from which up to 254 help texts that can be edited may be selected.



Cursor navigation

Choose number to edit.

Quit function

When a number is white, it means that an operator text has already been created.

8.8.2.1. Edit operator texts

With the selection of an operator text number, an edit window is opened, in which the help text (max. 4 Lines and 50 characters) can be entered.

In the bottom margin of the window, the operator text number, line position, and the number of the characters entered is displayed.

By pressing "**ALPHA**", the display is switched to the alphanumerical keypad. However, when editing the operator texts, it is recommended that an external PC-Keyboard be attached to the controller.

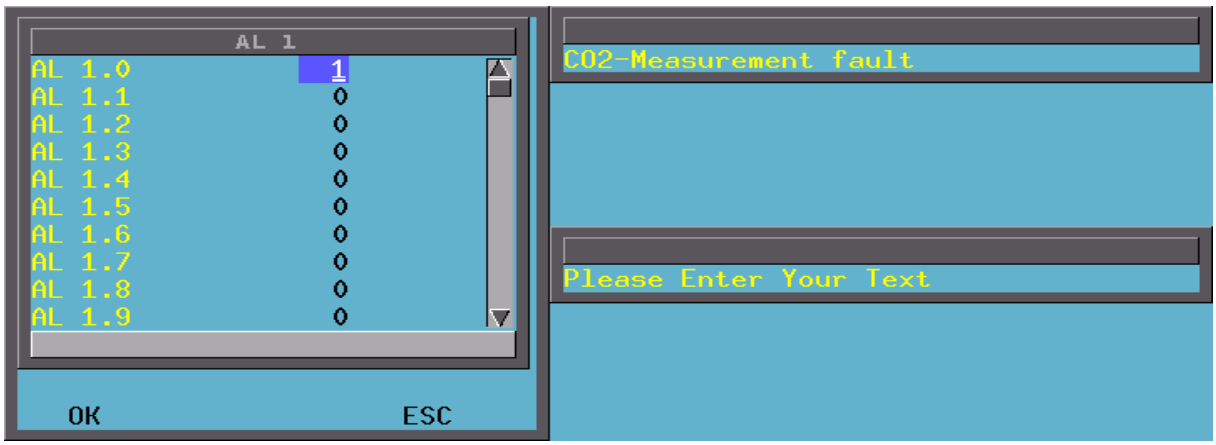
To adopt the input and leave the edit window, press "**ESC**". The input will be automatically saved.

8.8.3. Delete user messages

To delete an existing operator text, select the menu item "*Delete user messages*". A selection menu with all operator texts (shown numerically) will be displayed on the monitor. With the arrow keys, select the operator text to be deleted, and initiate the erasing procedure by pressing "**E**". Next, a security request will be given, to determine if this text should really be deleted. With the selection of the field "OK", the operator text will be erased for good. By pressing "**ESC**", this function will be aborted.

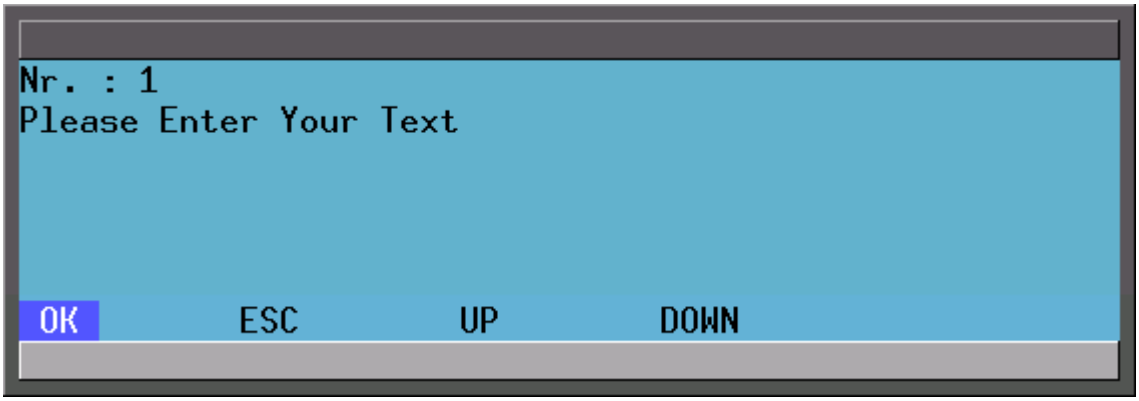
8.8.4. Allocate user messages

This function is necessary to allocate an alarm or message to an operator text. By selecting the submenu "*Configure user messages*", a selection menu is shown, from which the user can select the requested alarm or message module.



In the left window, select the desired alarm or message number using the arrow keys. In the right window, the associated alarm text will be displayed. User texts that have already been allocated to an alarm number will also be displayed in another window. “0” means that no user text has been allocated to this alarm number.

After the requested alarm or message number has been selected, the operator text can be allocated. The number of the operator text can be directly entered, or by pushing "**F4**", a selection menu can be used.



By selecting the "**OK**"-field, the currently displayed operator text will be adopted and this window will be closed. By selecting the "**ESC**"-field, the window will be closed without adopting the changes. With the fields "**UP**" and "**DOWN**", the operator text of the next row (up or down) will be displayed.

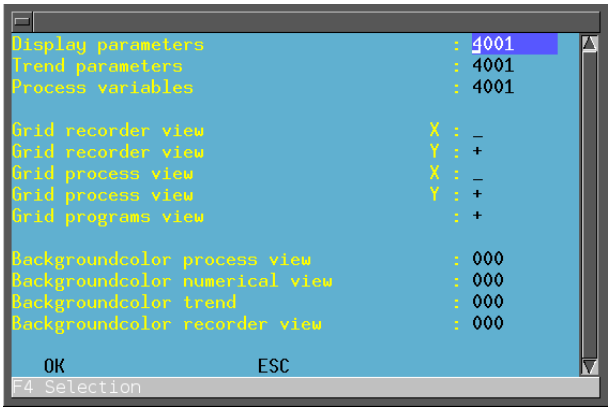
After the operator text has been adopted, the input can be saved by pressing "**F2**" (go to the "OK"-field). To return to the module selection and discard the changes, press "**ESC**". **No** safety request will be given!

8.9 Function "Presentation"

With this function, the presentation forms that are to be displayed on the screen of the control system are defined. Here, one file from the fields "*Display parameters*", "*Trend parameters*" and "*Process variables*" can be selected and be defined with grid and background color. These files must be created beforehand in the respective submenu of the main menu "*Startup*".

8.9.1. Select the parameter files

By selecting the submenu "*Presentation*", a menu used to define all presentation parameters will be shown on the screen.



Cursor movements

Call the selection menu or select grid settings

Jump to "**OK**"-field to save

Adopt the data

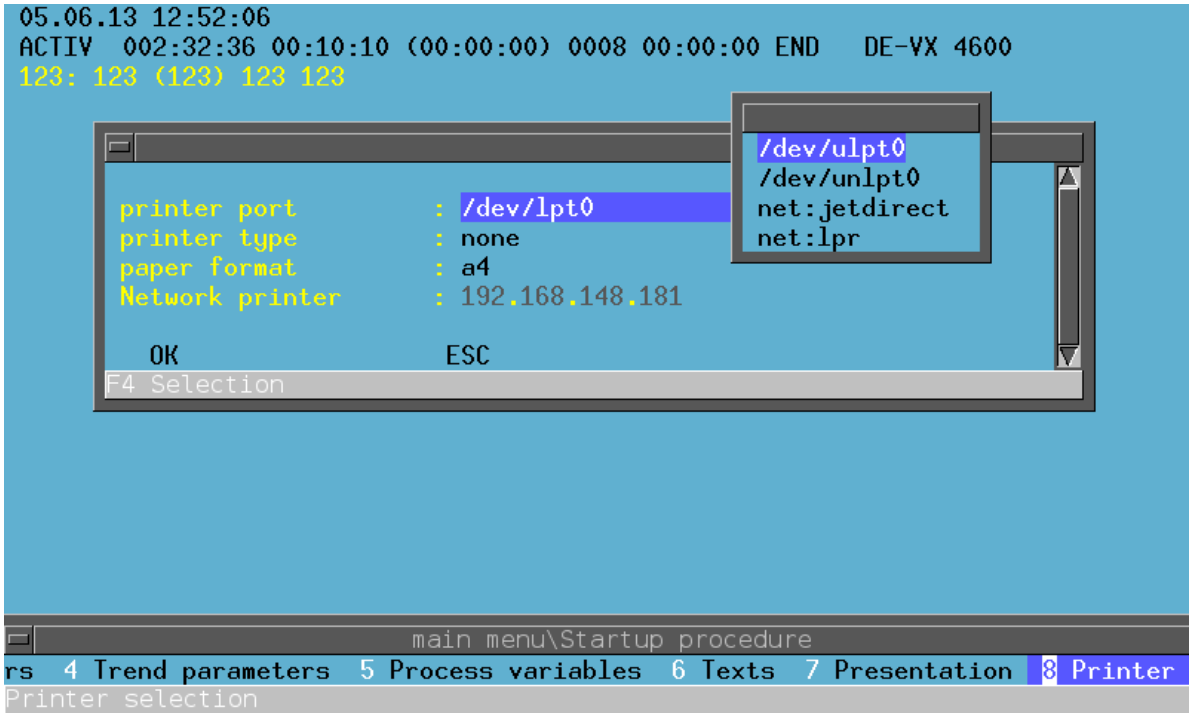
Abort, Quit without changes. Jump to "**ESC**"-field

The standard data (4001.*) are for the most part already adjusted in this menu. After the changes are made, they must be saved by selecting the "**OK**"-field. By selecting the "**ESC**"-field, this function will be aborted and all changes will be discarded. **No** safety request will be given!

8.10 Function "Printer"

With this function, the printer to be connected to the control system is determined. As a result, printouts from different functions of the control system are possible.

After selecting the submenu "*Printer*", an overview with the set printer types will be shown on the screen.



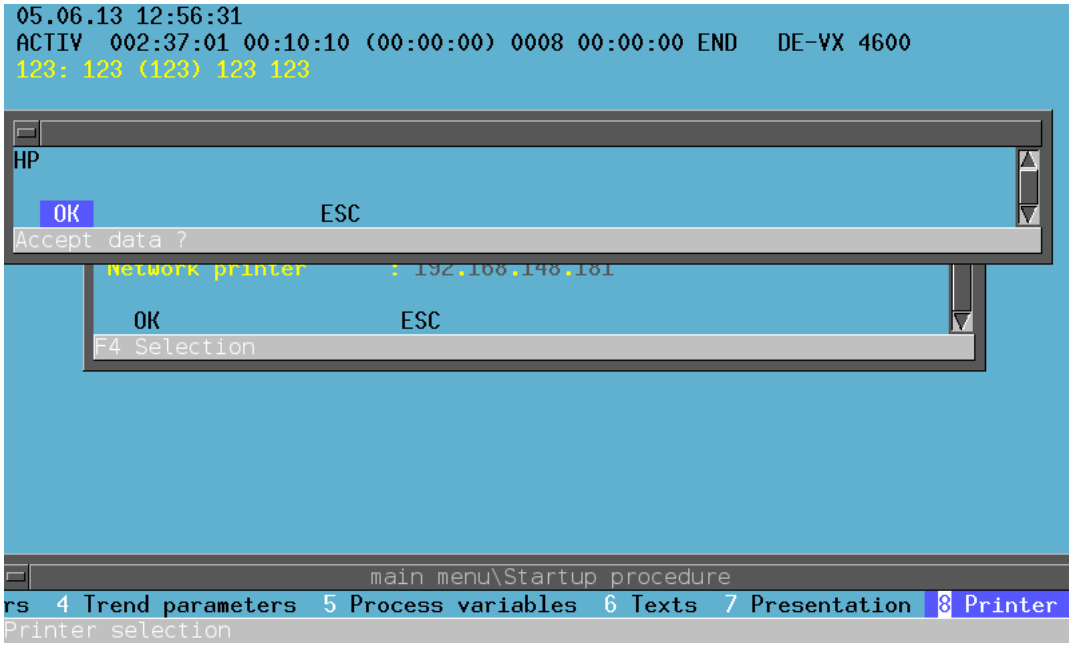
Navigate to the required setting

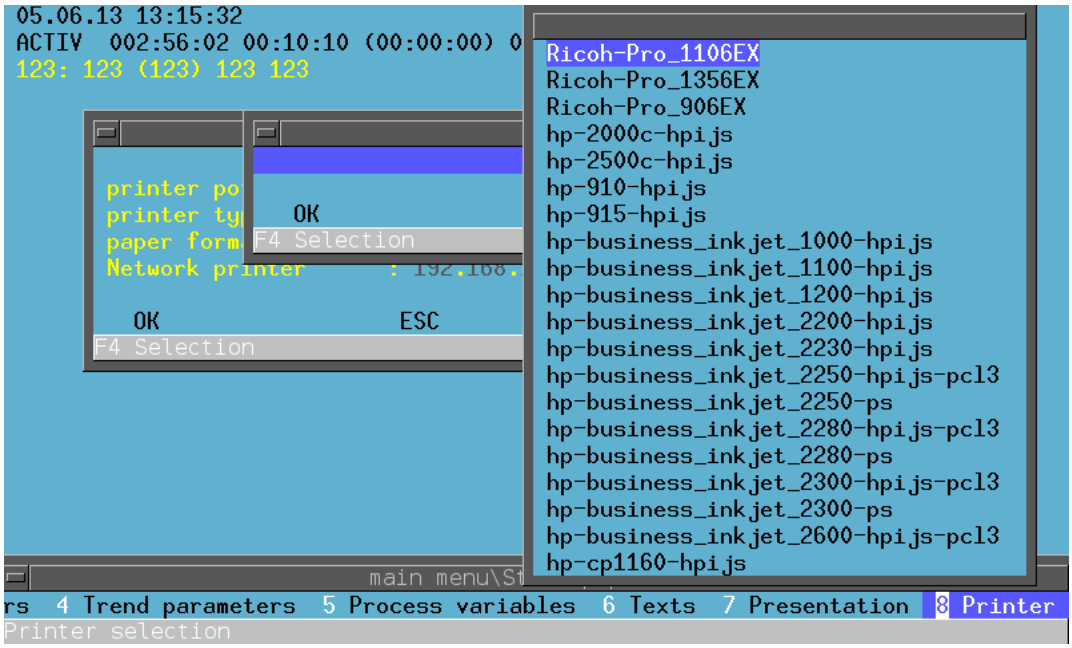
Call required selection list

Jump to the "**OK**"-field to save

Abort without adopting. **No** safety request.

By pressing **„F4“** a selection list is opened in which the name and/or the type can be entered. The entry is to be adopted with „**OK**“.To abort and discard the input press "**ESC**".





Select the required printer from the list (scroll the window so that other printer types can be shown) and highlight by pressing "**E**" (only 1 printer possible!) to acknowledge and save. To abort and discard the input press "**ESC**". **No** safety request will be given!

In the field „Network printer“ the IP-address of the network printer will be put entered.

In case the controller is not connected to a network ort he selected connection is not beginning with **net:** the field „network printer“ is disabled.

This function can also be conducted using the menu item "*Auxiliary programs*" - "*Settings*".

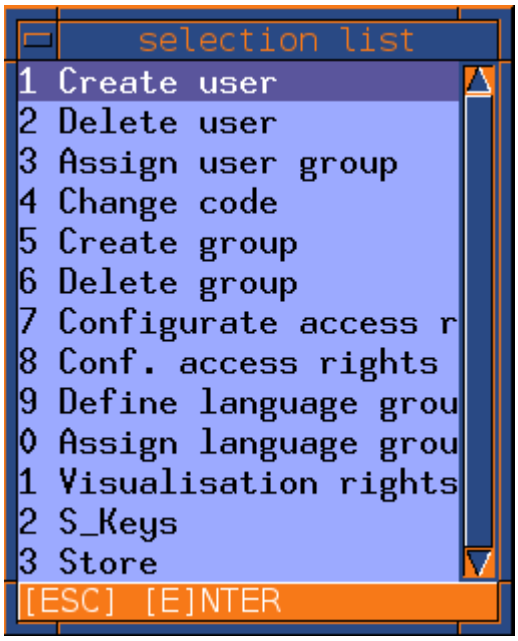
8.11 Function "Code"

With this function, the access rights of the user of the control system in a user administration can be created or changed. Because of job distribution, qualification, as well as for security reasons, it is necessary to individually assign functions and menu items in this function to each user. Therefore, faulty operations and input, as well as their consequences, can be eliminated to the greatest possible extent. So called "User Groups" can be created, to whom certain authorized staff user rights are allocated, (e.g. 1. Group: "System Attendant", 2. Group: "Master", 3. Group: "User", etc.).

With the selection of the submenu "*Password*", the user is asked to enter his identity and password in order to access the user administration. This is also described and performed in the function "*Auxiliary programs*" - "*Login*".

8.11.1. Functions in the user administration

After the user has verified access to the user administration, a selection menu with all of the functions in this menu is shown on the screen. These can be navigated with the arrow keys and chosen with the "**E**" key.



Create user
Enter a new user's name and password into the administration.

Delete user
Delete user from the administration

Assign user group
Assign user access rights

Change code
Change the password of an existing user

Create group
Create names for new user groups

Delete group
Delete user groups from the administration

Configurate access rights
Set up user group access rights to menu items

Conf. access rights
Set up user group access rights to parameters

Define language groups
Assign text/help files and translations created by Config.exe

Assign language groups
Assign language groups to the users

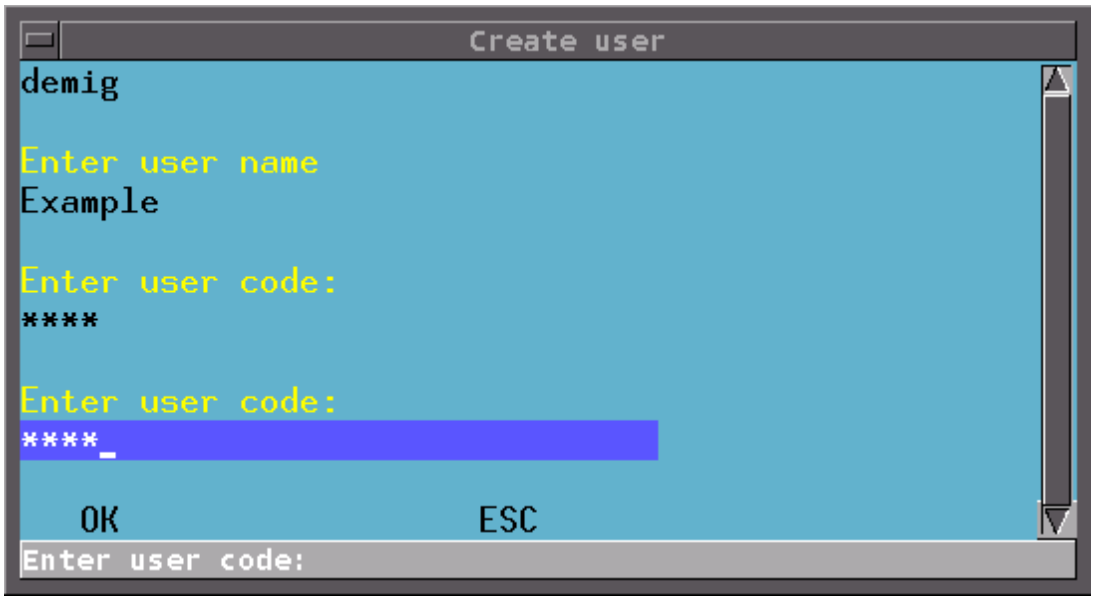
Visualization rights
Assign rights for the visualization

Special keys
Assign rights for the operation of special keys

Store
Store all entries

8.11.2. Create user

With the selection of this function, the names and passwords of all users are created so that double-entries are avoided. The names of the users that have already been set up are displayed in the upper area of the newly opened input window.



To create a new user, the new user name (Keypad with key "**ALPHA**") must be entered in the "*Enter user name*" field. In the field "*Enter user code*", the code for the user is a combination of letters and numbers with up to 32 symbols. To prevent faulty entries, this code must be entered again in the next field. By confirming with the "**OK**"-field, the user is created and the message: "*User created*" will appear.

To abort and discard the input, select the "**ESC**"-field.

8.11.3. Delete user

With this function, the created users and their defined access rights can be irrevocably removed from the user administration.

After selecting the menu item "*Delete user*", a selection window used to delete a user is opened. In the upper section of the windows, all of the saved users are shown.

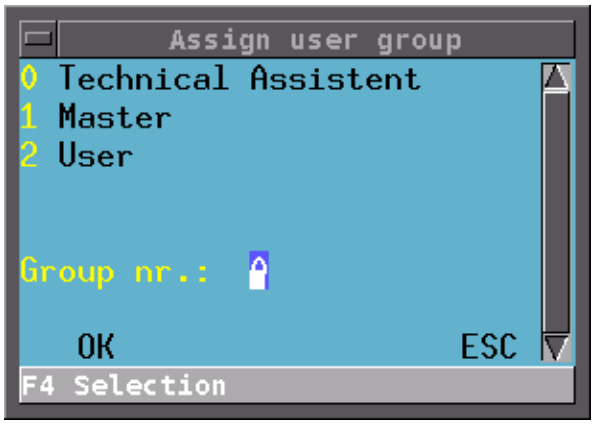
F4 P	Open selection menu with all users
E T	Choose user in the selection menu
"OK"	Delete selected user
"ESC"	Abort without changes

The selected user will be irrevocably deleted, **without a safety request**!

8.11.4. Assign user group

To ensure that a created user also obtains access to the functions, he must be allocated to a user group.

By selecting this menu item, a selection window will open. From this window, the user that is to be allocated to a user group can be selected. Subsequently, another window will open, from which the user groups for the previously selected user can be selected.



F4 P

Open a selection menu with all existing user groups.

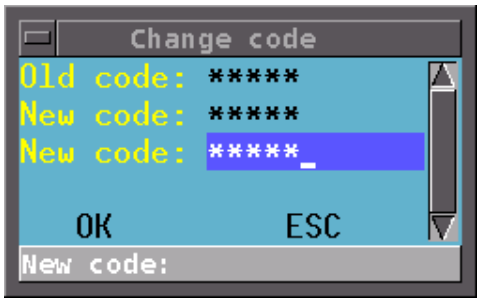
Alternatively, the respective number of the requested user groups can be directly inputted using the membrane keypad

By selecting the "**OK**"-field, the input will be adopted. By selecting the "**ESC**"-field, the input will be discarded and the function will be aborted. **No** safety request will be given!

> ⚠ **Notice:**
>
> If a user is not assigned to a user group, that user will be automatically assigned to the first (“0”) user group!

8.11.5. Change code

This function serves to change the passwords of existing users. After selecting the menu item "*Change code*", the user whose password will be changed must be selected from a selection menu. Subsequently, a new window will appear.



For security purposes, the user's old password must be entered, and subsequently, the new one must then be entered twice. The second input of the new password serves to guarantee to the greatest possible extent that typing errors are eliminated.

By selecting the "**OK**"-field, the new password is adopted. By selecting the "**ESC**"-field, the changes are discarded and the procedure is aborted.

8.11.6. Create group

With this function, up to 8 user groups with different access rights can be created, each labeled with a distinct name. The created users are then allocated to these groups (see Chapter 8.11.4). Initially, all functions and menu items are released to the newly created user groups. The restrictions must first be defined under the menu item "*Configurate access rights*" and/ or "*Conf. access rights*".

After selecting the menu item "*Create group*", an input window will appear on the screen. In the upper section of this window, the user groups that have already been created are shown.

In the field that is highlighted blue, the name of the newly created user group can be inputted (press "**ALPHA**" to switch to alphanumerical keyboard). By selecting the "**OK**"-field, the new groups are inserted. The "**ESC**"-field aborts the procedure and discards the input. **No** safety request will be given.

8.11.7. Delete group

With this function, an existing user group and its defined access rights will be irrevocably removed from the user administration.

After selecting the menu item "*Delete group*", an input window will appear on the screen. In the upper section of the window, all existing user groups will be shown.

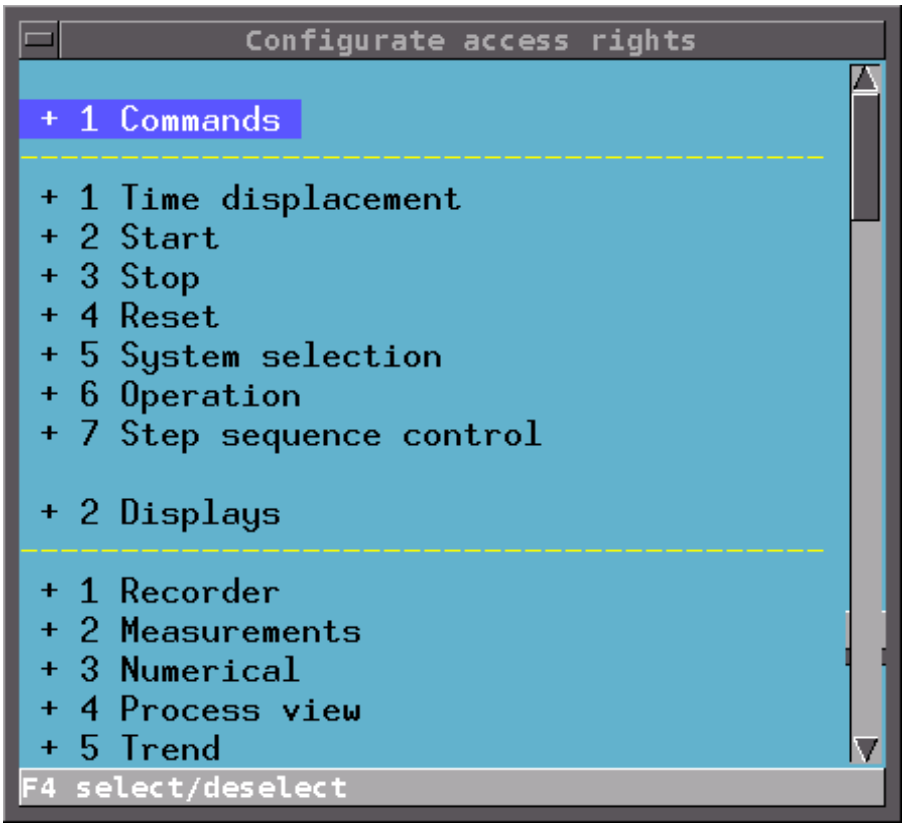
By pressing "**F4**", a selection menu is shown, from which the user group to be deleted can be selected. Using the "**OK**"-field, the user group will be irrevocably deleted. The "**ESC**"-field aborts the procedure without changes. No safety request will be given. If the deletion was successful, a message stating so will appear on the screen.

> ⚠ **Notice:**
>
> If a user is not assigned to a user group, that user will be automatically assigned to the first (“0”) user group! A new allocation of the user to a different access group is necessary!

8.11.8. Configurate access rights

With this function, the access rights to the individual menu items and functions can be allocated for individual user groups.

By selecting the menu item "*Configurate access rights*", a window will be shown on the screen, in which all functions of the control system will be listed. Use the arrow keys to navigate the cursor, and with the "**F4**" key, the respective function can be (un)marked. Initially, for a newly created user group all of the functions will be marked.



If a main menu item is unmarked, then the all submenu items of that main menu will be automatically unmarked. Individual submenu items in a main menu can also be unmarked.

An unmarked function, main menu item, as well as a submenu item will then be displayed in gray for the user of this user group in the menu navigation of the control system, and will not be able to be selected. The contents of the window can be scrolled by moving the cursor, so that the other menu items can also be displayed.

By pressing "**F2**", the cursor jumps to the lower most bottom of the window to the "**OK**"-field. By selecting this field, the input will be adopted. By selecting the "**ESC**"-field, the input will be discarded and the function will be aborted. **No** safety request will be given.

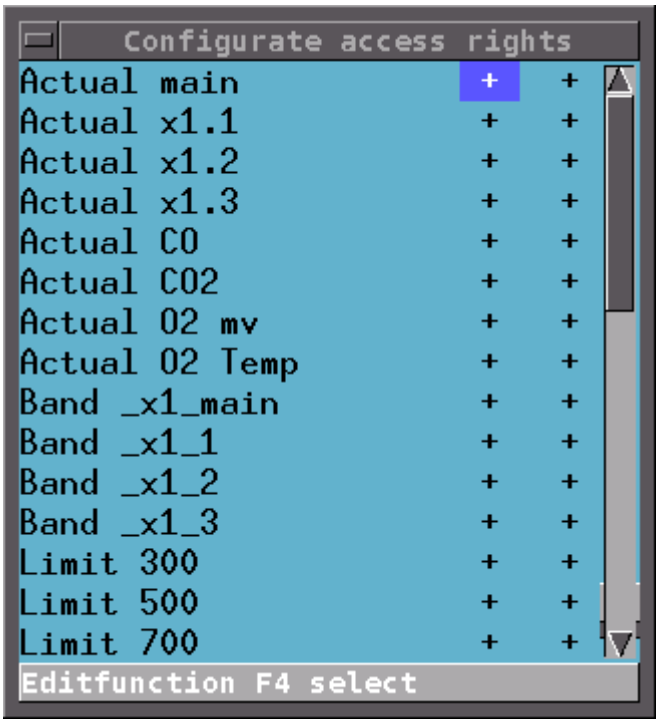
8.11.9. Configurate block rights

With this function, a user group can be allocated access rights to the blocks created in the configuration.

By selection the function "*Configurate access rights*", a selection window is opened, from which the corresponding user group can be selected. Subsequently, a new window will be displayed on the screen, in which the individual block rights can be assigned. When a user group is created, all the units are initially marked. For each unit, two selection fields are present. The selection of the left field allows the field to be edited, and the right field converts the units to the manual function.

Edit function When this function is blocked, it is not possible for the corresponding user group to change this value. The blocking of the edit function from a block of the type "*ramp set point block*" has no effect. A blocking of the edit function of this block type is now possible by blocking the corresponding menu function.

Manual function When this function is blocked by a block, it is not possible for the corresponding user group to switch this block to the manual mode using the "*Manual*" function



Navigate the cursor

(Un-)mark

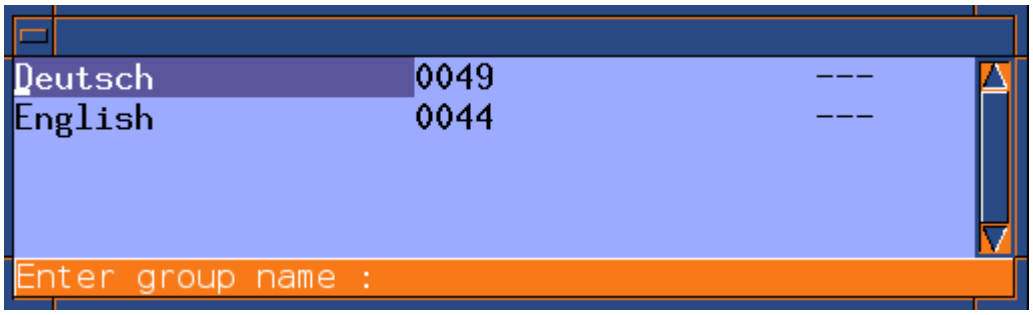
Save

Abort without safety request

8.11.10. Define Language Groups

Language groups have an assignment of test- and help-files and existing translations, created by „Config.exe“. These groups can be assigned to users, thus they can operate the controller in the assigned language.

First, the language group name is entered in the input field. Then, the assignment to the text- and help-files ((00XX) is done by means of the selection menus as well as to the project translation file, if existing (here en_GB).



Add a new language group

Delete a language group

Selection menu

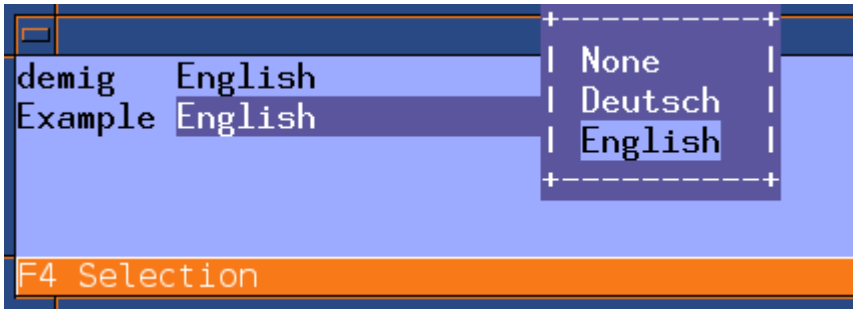
Save the input

Abort without saving

Leaving the input field a saftey request follows.

8.11.11. Assign Language Group

Then, the language groups can be assigned to the corresponding users. Selecting a menu point, the input window is opened.



Add an new assignment

Delete an assignement

Selection menu

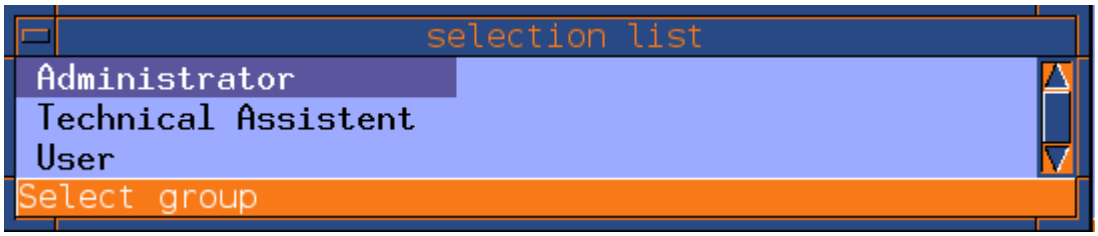
Save the input

Abort without saving

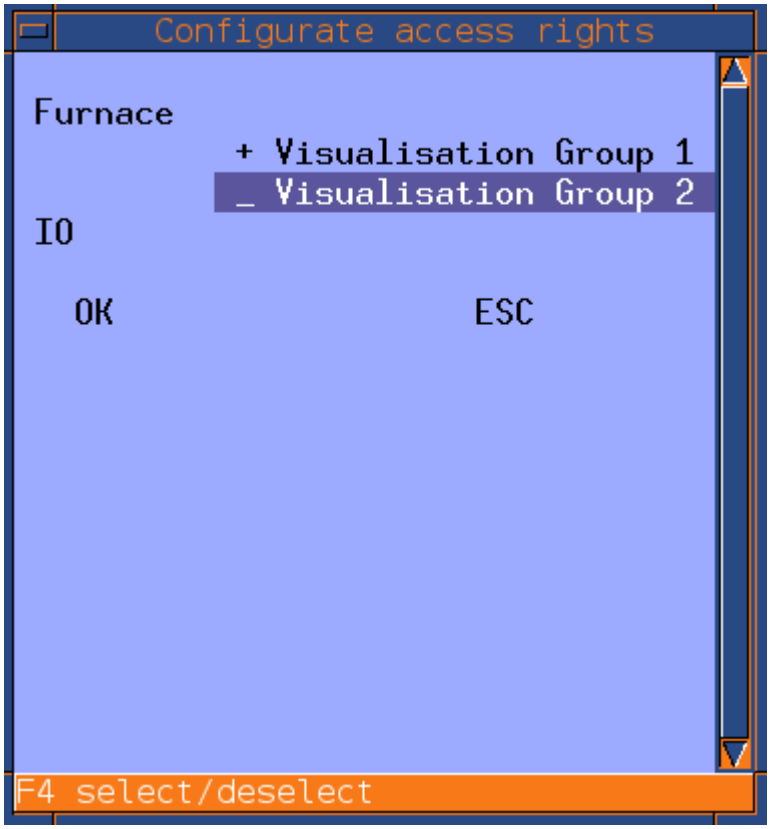
Leaving the input field a saftey request follows.

8.11.12. Visualization Rights

For the selection of different animated site views, the access can be restricted by access rights. After activating a dialogue box is opened.



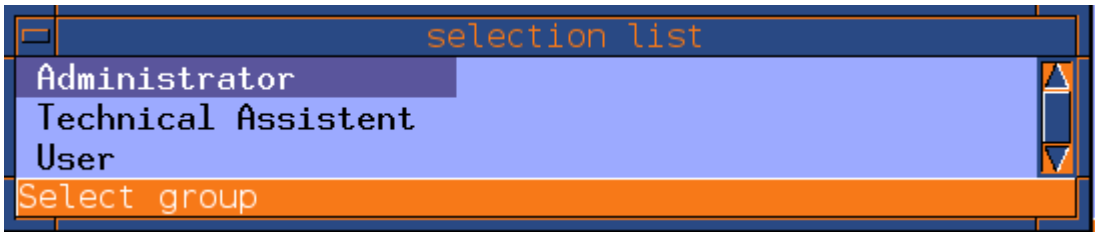
Here, one of the configured right groups can be choosen and additional visualization rights can be assigned to it.



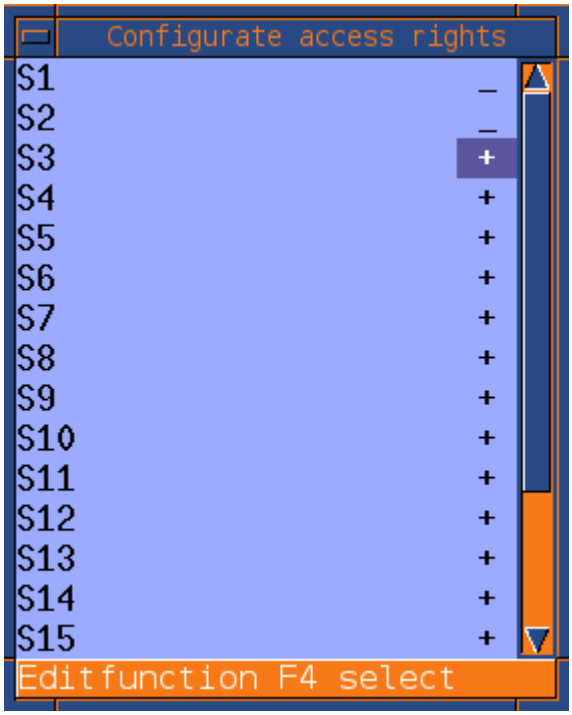
By the „**F4**“ key, visualization right groups (see chapter 8.5.1) can be assigned. With the „**F2**“ key save the assignment. Quit with „**ESC**“ the dialogue field without saving.

8.11.13. Special Keys

Even the special keys „**S1 – S10**“ (De-VX 4110) or „**S1 – S20**“ (DE-VX 4115) on the front keypad can be blocked or released with access rights as some animated site views. After activating a dialogue box is opened.



Here, one of the configured right groups can be choosen to assign special keys.



By the „**F4**“ key special keys can be released **(+)** or blocked **(-).** By the „**F2**“key save the assignment. Quit with „**ESC**“ the dialogue field without saving.

8.11.14. Save

By selecting this menu item, all changes that were made in the submenu "*Code*" will be saved.

Press "**ESC**" key to leave the user administration. A safety request will be given.

After leaving the user administration, the user must log on to the system again (see Chapter 5.8).

⚠ Warning:

If the “*Save*” function has not been called before leaving this function, all entries made since the last save will be irrecoverably lost!

8.12 Function "Softkeys"

With this function, up to 9 (sequence and switch) funtions can be configured. They are worked off by selecting the function term (Softkey) from the main menu item "*Control*".

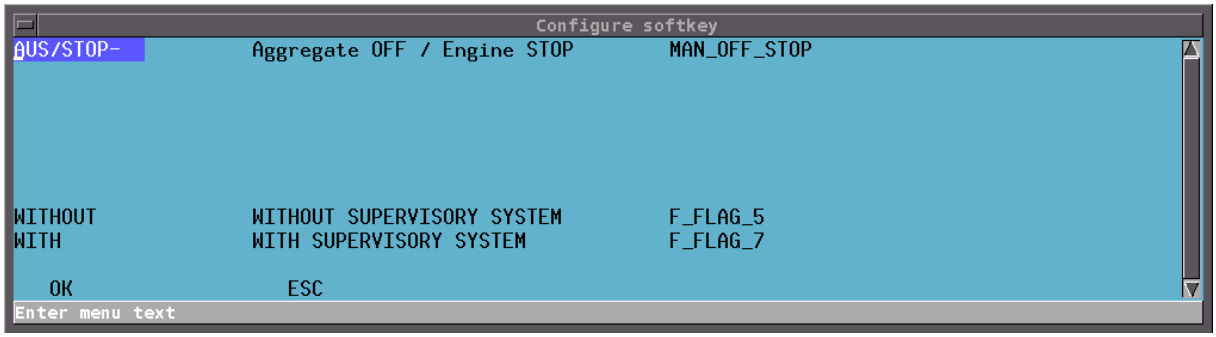
The softkeys configured in this menu are displayed and selected in a line in the menu "*Control*". Submenus may be selected from this line in other main menus.

After selecting the submenu "*Softkeys*", a window is shown in which nine lines (one for each possible softkey) and 3 input fields per softkey are present.

In the first field the name of the softkey is inputted (keyboard using key "**F7**", maximal 11 characters).

In the second field, a brief description about the function of the softkey can be inputted (maximum 29 characters).

In the third field, a bit-symbol is selected by pressing "**F4**" from a selection menu of all symbols. By pressing the softkey, the allocated bit is set in the storage.



To save the input, press "**F2**". The cursor will jump to the "**OK**"-field. Select this field by pressing "**E**" and the changes will be saved. Now the controller must be restarted, so that the changes can be adopted. For this, no inquiry will be given.

By pressing "**ESC**", the cursor will jump to the "**ESC**"-field, and, by pressing "**E**", this function will be aborted and the changes will be discarded. **No** safety request will be given!

Warning:

The function for creating switching functions, which have a direct influence on the current process and/ or plant when selected, is a **security function!** Incorrect definition of the Softkeys can lead to system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

9. Chapter: Control

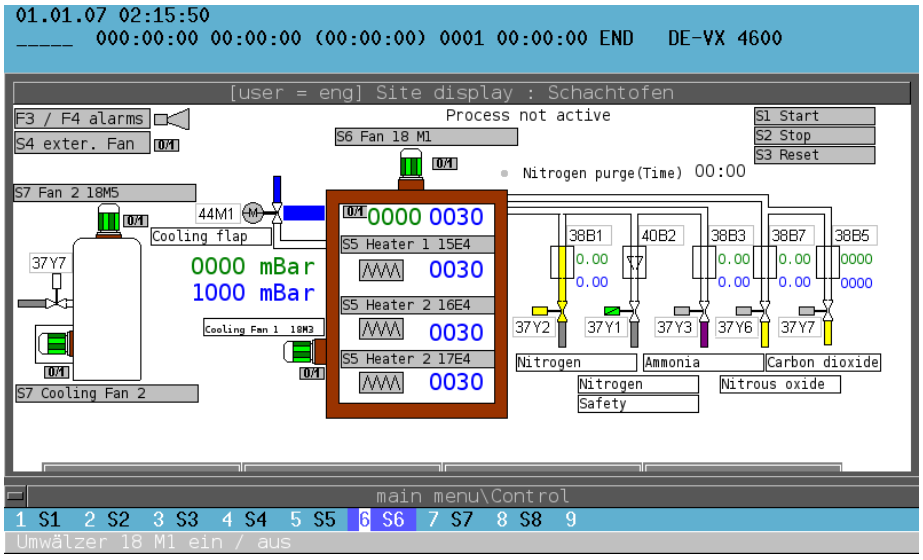
9.1 Brief description

Using the main menu point "Control", it is possible to switch states of binary configured symbols with the help of "*Softkeys*". These states are analyzed by an internal as well as an external PLC, and therefore start actions in the system.

In the main menu point "*Start-up*" - "*Softkeys*" up to 9 Softkeys can be freely configured.

That means that manual as well as system-independent sequences and functions, which have a direct influence on the system and process, can be performed. The user selects one of the configured softkeys and thus changes the states of binary configured variables by which functions (e.g. motion sequences, valve switchings) in the system can be triggered.

9.2 Menu selection



Z → Navigate the main menu "Control"

X ←

T E Choose

J 6 or automatic dialing

S1 … S8 Alternatively, the softkeys can be called directly by the membrane keypad.

10. Chapter: Programming

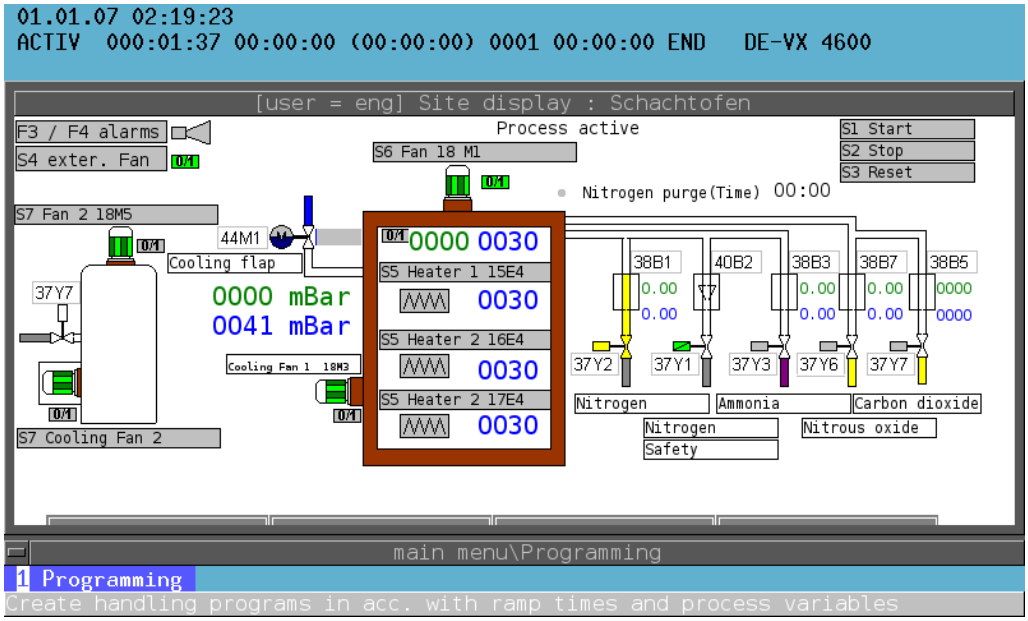
10.1 Brief description:

In this menu, it is possible to create or change handling programs manually - contrary to the process-orientated (symbolic) programming as described in the menu "*Programs*" - "*Program*". This means set points, ramp times, control tracks etc. are entered numerically by the user.

Warning:

The functions, which can be created with the manual handling programs, is a **security function!** If treated by unauthorized persons system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

10.2 Menu selection



Navigate the main menu "Programming"

Choose

or automatic dialing

Choose the submenus in the menu "Programming", or automatic dialing by:

"Programming"

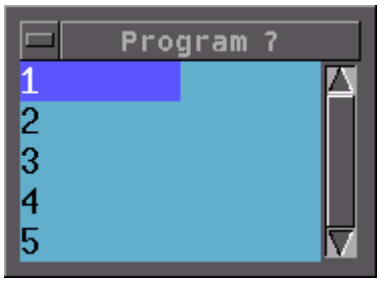
Notice:

All functions may be blocked for the user by PLC commands in the configuration or by authorizations.

10.3 Function "Programming"

With this function, handling programs may be created or changed. All process-dependent parameters must be inserted manually. Even those programs, which are created under the menu point "*Programs*" - "*Program*" with the help of symbolic programming, may be changed here.

With the selection of the submenu "*Programs*", the user is asked to create or change a program (in this example an existing program is loaded).



Program navigation

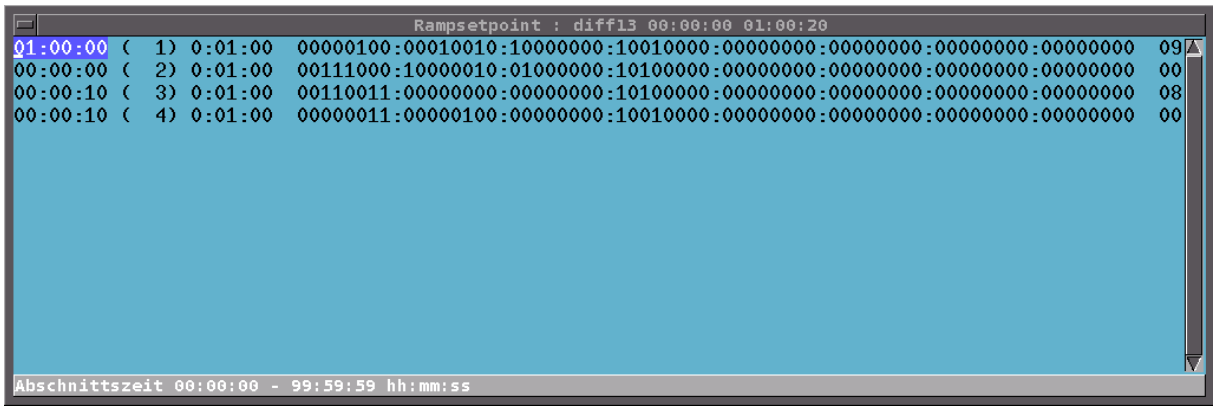
Choose program

Abort function

Then a list of all ramp set point blocks follows - created during the configuration - for which the handling program should be created or changed.

10.3.1. Create/ change ramp data

After the selection of a ramp setpoint block, a list with all created program segments will appear.



All program set points may be inserted or changed here. In case there is a great number of entries, they may be scrolled through by moving the cursor.

Notice:

For every program parameter that is selected with the cursor, a designation will be displayed in the lowermost line of the window. This facilitates the input, particularly with the control tracks.

To enter a new line (program segment) press "**+**". A new line, where entries can be made, will be added after the currently selected line. The currently selected line will be deleted with "**-**" There will be **no** safety request!

To save the modifications press "**F2**" (see chapter 4.3.5.1). Entries may be deleted at any time with "**ESC**". There will first be a safety request.

Information for the easier treatment of handling programs see chapter 4.3.4.

⚠ Warning:

By means of this function manual handling programs, which have been created with symbolic programming and thus under safety aspect, can be changed. For this reason it is a **security function**! Faulty inputs can lead to system disturbances, system damages, quality losses as well as danger to persons and environment. To avoid these risks it is necessary to make sure that only instructed and authrorized persons operate the system!

11. Chapter: Service and technical data

11.1 Brief description

Warning:

To avoid the loss of treatment programs and measurement recordings, a backup is recommended before an intervention into the system's hardware!

This chapter describes:

- How to do necessary maintenance work,
- How to react during a disturbance of the control system,
- How to do the change of the operating system or an update of the control system's software.

Furthermore, there is a list of technical data of the control system this chapter.

Warning:

The service information described in this chapter are strictly to be respected and are to be considered as **security functions!** Faulty operation can to system disturbances, system damages, quality losses as well as danger to persons and environment. To avoid these risks it is necessary to make sure that only instructed and authrorized persons operate the system!

11.2 General service

11.2.1. Cleaning and care of the keypad and of the screen

The front panel with the keypad is a laminated surface (according to DIN EN 60529 IP protection 65). This surface, as well as the screen of the display, may be cleaned with a damp cloth and customary neutral detergent (glass cleaning agent).

⚠ Warning:

Absolutely to be avoided:

- Dripping wet treatment
- Aggressive cleaning agents
- Treatment of the keypad with peaked things

11.3 Disturbances

Hardware disturbances can vary greatly. The spectrum includes a complete failure of the system as well as the faulty indication of process variables:

11.3.1. Possible measures for error removal

11.3.1.1.

Symptom	*Check*	*To Do*
Complete failure, dark display, control is not working	Check the 24V power supply.	Check power supply unit for 24V supply, change if necessary.
Occasional disturbance and/or complete failure.	Check the protective ground wire connection, grounding cable, line filter and switchgear – if everything is correctly connected?	Reinstall the protective ground wire connection; check the contact resistance. Otherwise, inform demig or the manufacturer.
Dark display, Control is working	Screen saver active?	Press “ESC” in case of active screen saver.
Disturbances of digital inputs and/or outputs	Check the external power supply for the digital I/O cards, min. 18V	Check power supply unit for 24V supply, change if necessary.
Disturbances of digital and analog inputs and outputs	Check if the position of the Phoenix connectors is correct	Remove the connectors and install again.
Communication error between the controller and other connected systems. In the status line, the display of "COM1" or "COM2" is no longer visible!	Check the cable connection; check if the attached system is in accordance with the manufacturers instructions. Loose contact?	Change the cable or the interfaces if necessary. Exchange defective modems; otherwise inform demig or the manufacturer.
Communication error USB-interface	Check connections and cabling.	e.g. switch the USB-printer off and on. Check the printer settings in the "*Settings*" menu.
Actual value display is "****"	Check wiring and thermocouples, check polarity.	If necessary, change the thermocouples, renew the compensation wiring, and reverse the polarity.

Symptom	*Check*	*To Do*
Controller only shows a white screen		Switch device off and on, connect the external VGA monitor, otherwise inform demig or the manufacturer
Disturbance of PLC program	Inputs and outputs are no longer handled properly	Switch device on and off; during the booting procedure (as from demiglogo) press the “**ESC**” button at seconds interval and press in the subsequent menu key “2”.

11.3.2. Direct support

We offer the following possibilities for a direct support:

a) Telephone support

Many malfunctions are caused by incorrect settings or improper handling. They may often be corrected in cooperation with the service technician via telephone. Before calling, send a copy of the check list (visit www.demig.de) by fax or e-mail. Using this list helps our technicians to find the problem and work out possible solutions.

b) E-Mail-support

For the support via e-mail, we also need the check list. This information helps the technician to identify the device and take the appropriate action.

c) Repair and spare parts

In some cases, the complete control system must be sent to the manufacturer. In order to ease the job of the technician, a detailed explanation of the error is needed. Please use a copy of the check list to explain the error.

d) Support with devices as a loan or substitute

While the device is being repaired, it is possible to offer a device as a loan or substitute at our customer's disposal. Due to the close cooperation with our system and furnace manufacturers, it is also possible to deliver configured process controllers which were not originally configured by demig. In this case, we kindly ask you to provide us the backup to ensure optimal support. Normally, the devices on loan are free of charge.

e) Service on-site

You may request the help of a service technician directly at demig or at the manufacturer. This relates to all software and hardware questions.

11.3.2.1. Contact:

Telephone: +49 271 77202-25 or +49 271 77202-26 Fax: +49 271 74704

E-Mail: service@demig.de URL: www.demig.com

11.4 Update of the system software

11.4.1. Necessary material

- External PC or Laptop with COM-interface (RS 232, min. 3-wire connection)
- serial connection cable (RS 232)
- Update file (e.g. via E-Mail) from demig Prozessautomatisierung GmbH (example for the file: 200540de.tbz). There are 4 different update types:

File name:	**update for:**
200727os.tbz	Operating system and Kernel modules
200727ps.tbz	Printer driver
200727xs.tbz	User interface and VNC
200735vx.tbz	Controller program

- The first 6 figures of the file name describe the release date (year and calendar week) of the update. Depending on the current software status of the controller it is not necessary to install all 4 update types. In case of several updates the following sequence of the updates is useful:

***os.tbz → *ps.tbz → *xs.tbz → *vx.tbz**

11.4.2. Update with FileTransferManager

The program „FileTransferManager (FTM)“ is available for download on the homepage demig Prozessautomatisierung GmbH. Thus the update is substantially facilitated.

The explanation of the procedure is shown in a separate manual, which is also available for download.

11.4.3. Updatehistory

Delivery date ex works: _____

Serial number control system: _____

Software status at delivery: _____

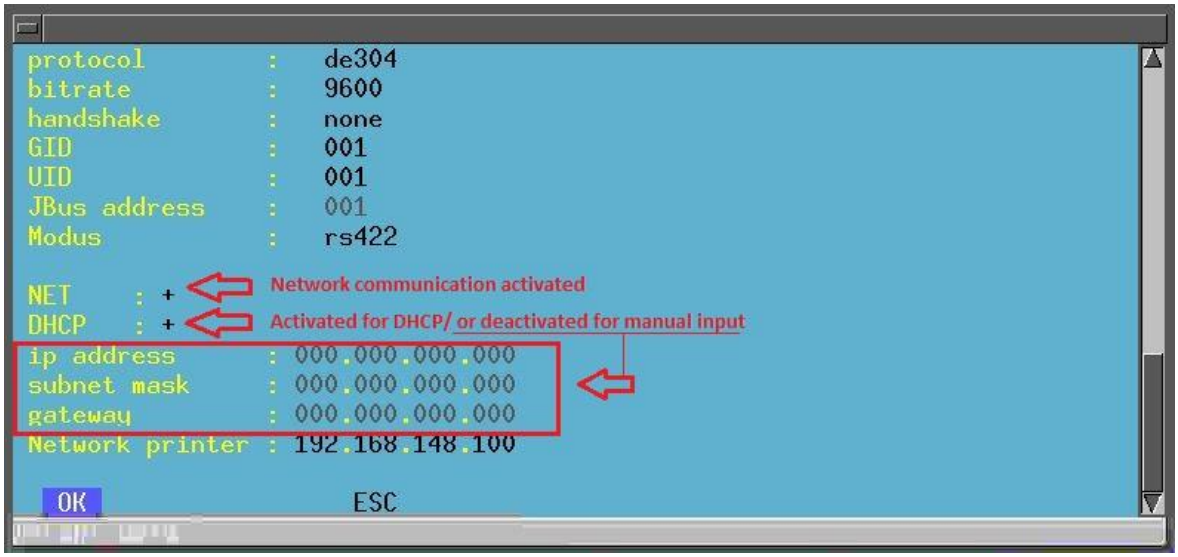
No:	Date	Installed file	Software status after update
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

11.5 Communication interfaces of the control system

11.5.1. Data transmission network connection (Ethernet)

The control system of the series DE-VX 4600kann can either be integrated in a network by a static IP, or get assigned a dynamic IP by a DHCP-Server.

The adjustments will be effected in the menu „Auxiliary programs-Function Settings“ (Chap. 5.10).



11.5.2. Serial Connection

11.5.2.1. Direct serial connection

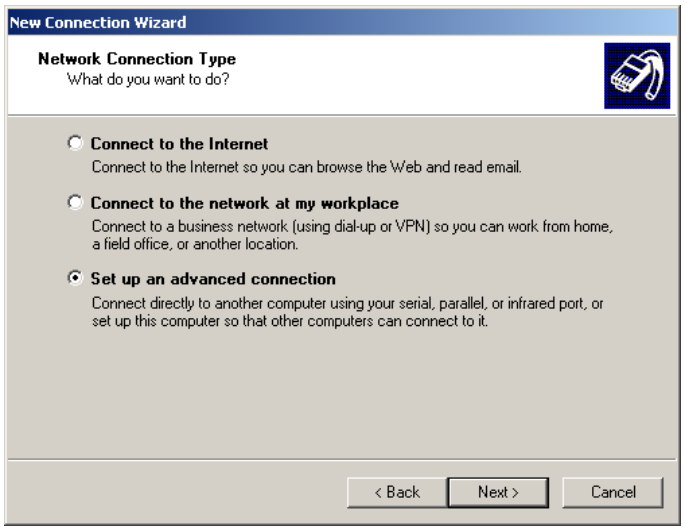
Notice:

The here described settings for the creation of a connection with the control system of the series DE-VX 4600 referring to a PC with the operating system Windows XP Professional. Please note that the settings for other operating systems can be different!

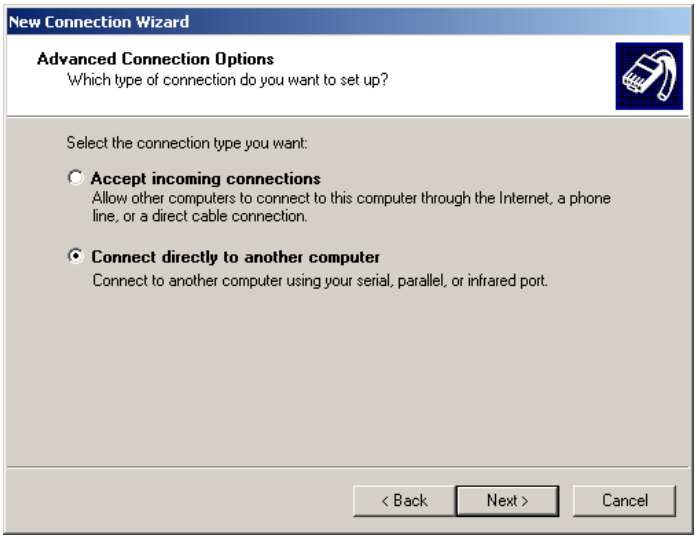
•

1. To create a new data transmission network connection, start the assistant for new connections ("**Start**" – "**Settings**" – "**Network connections**" - "**New Connection Wizard**") of Windows and confirm the welcome display with "**Next**":

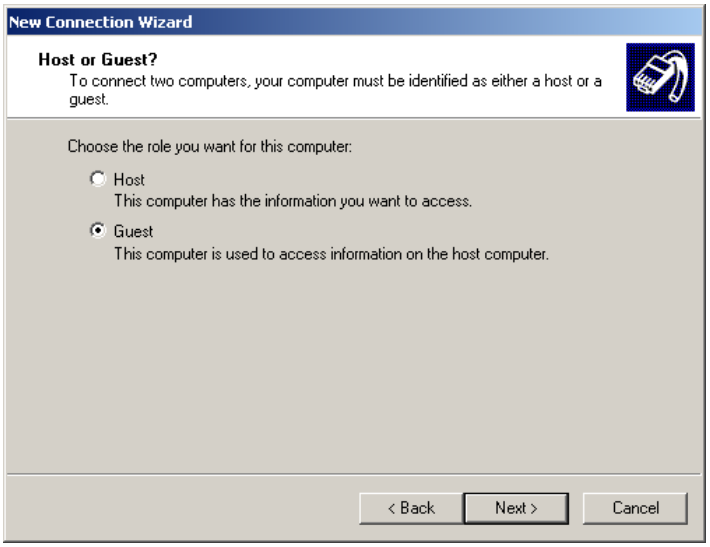
2. Select as network connection type an extended connection:



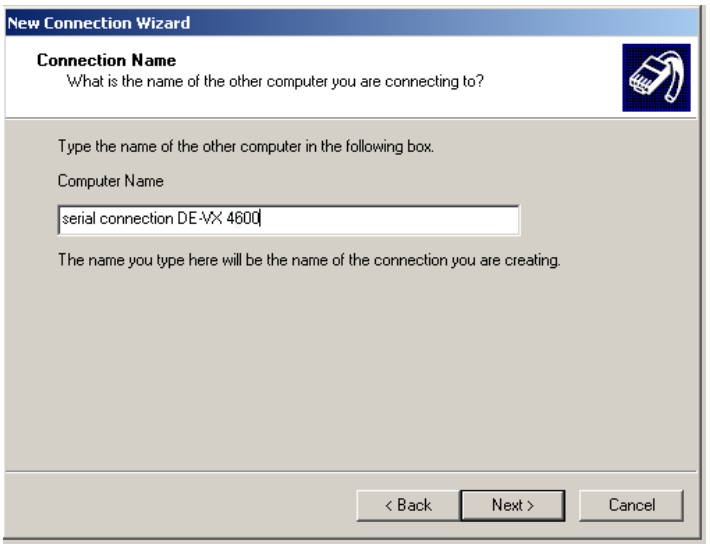
3. Connect directly to another computer:



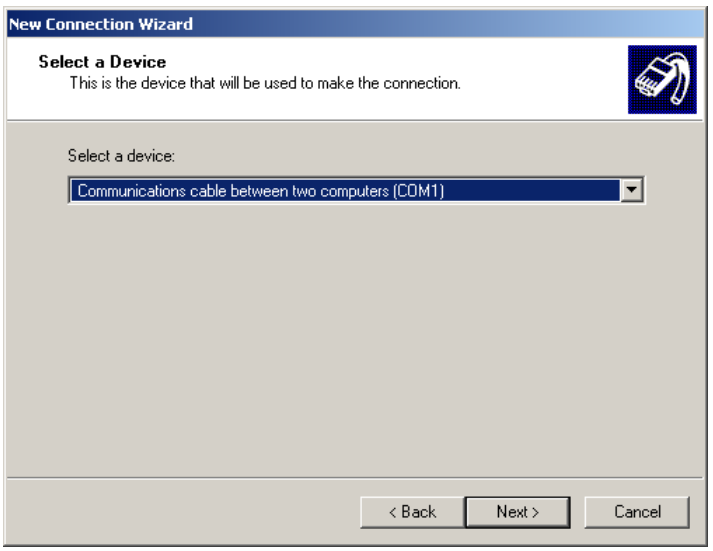
4. Please select a guest account:



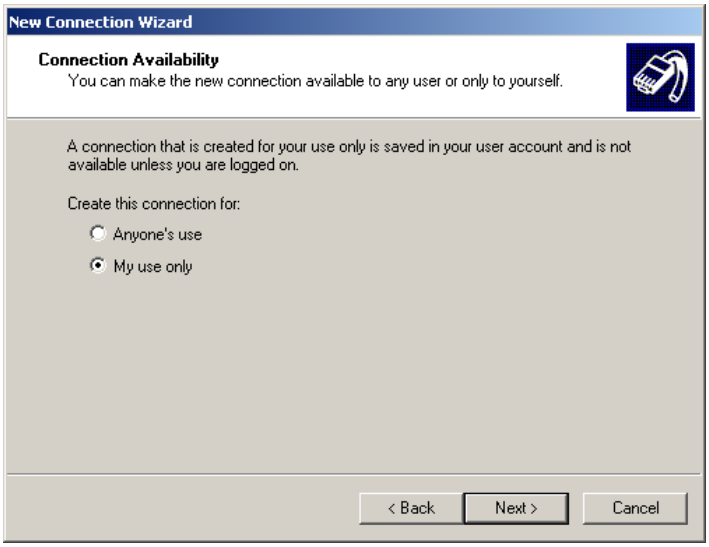
5. Indicate a connection name in the next step:



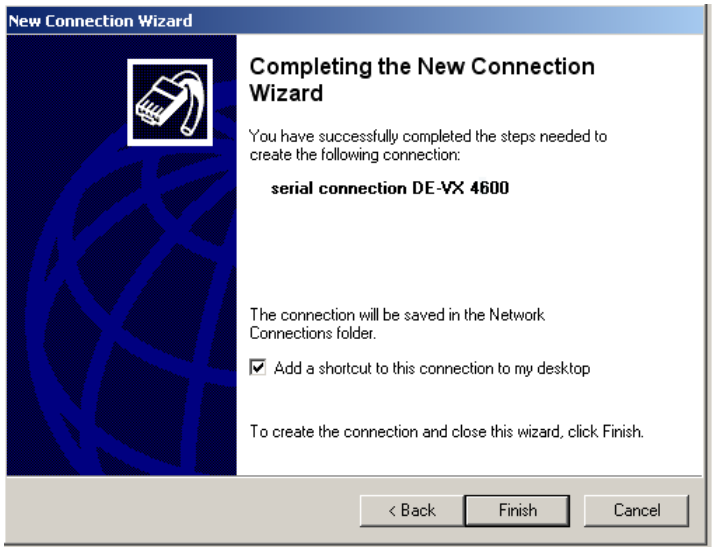
6. Than select the required interface of the PC:



7. Indicate for which user of PC the connection should be available:



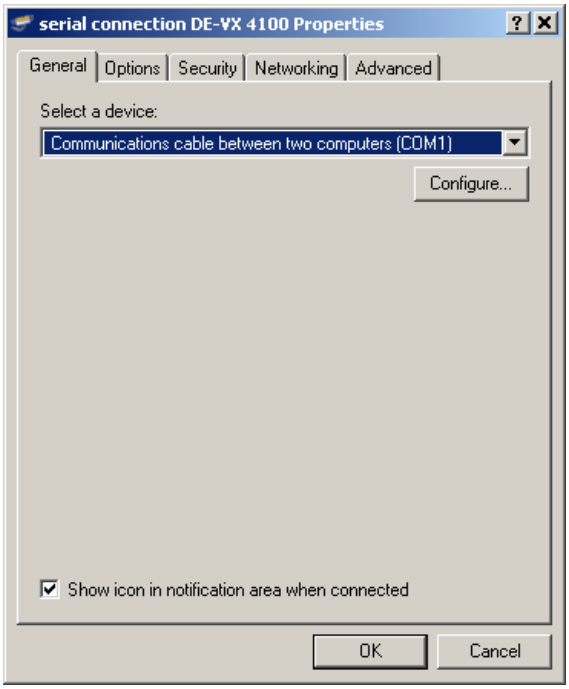
8. Completing the new connection you can select if a shortcut of the connection is to be added on the desktop of the PC.



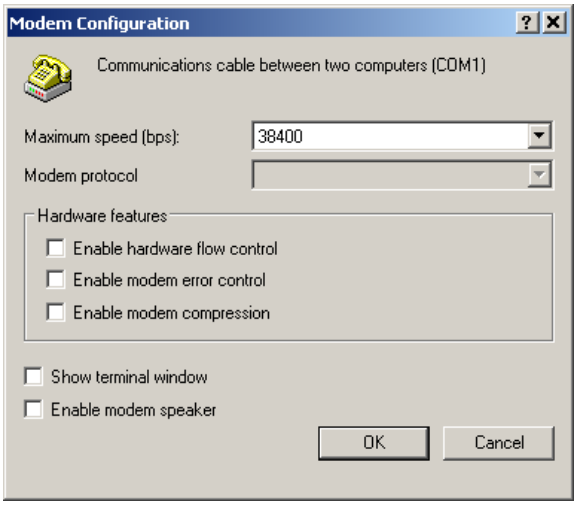
After the creation of the connection it is immediately active:

The user name and the password is "**devx4600**" (case-sensitive!)

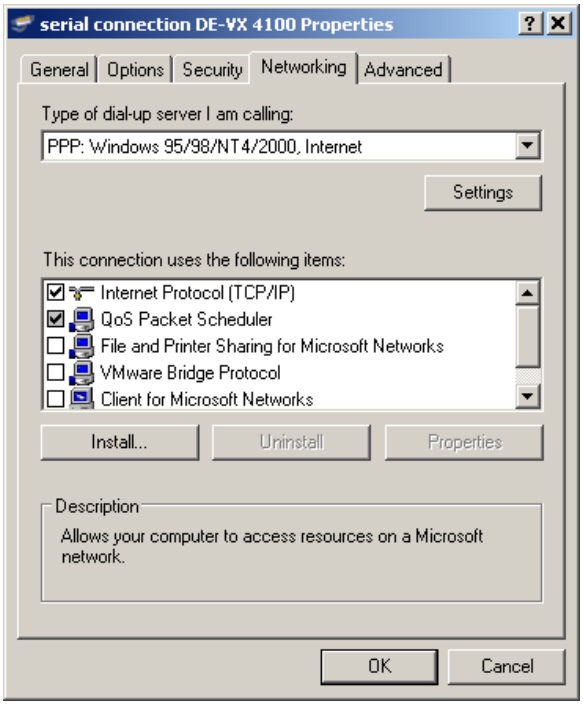
Before creating a connection, the properties have to be adapted.



Select in the tabbed window"**General**" thebutton "**Configure**"



Here, set the maximum speed to 38400 (Bit/s), deactivate the field "**Enable hardware flow control**" and quit this setting with "**OK**".

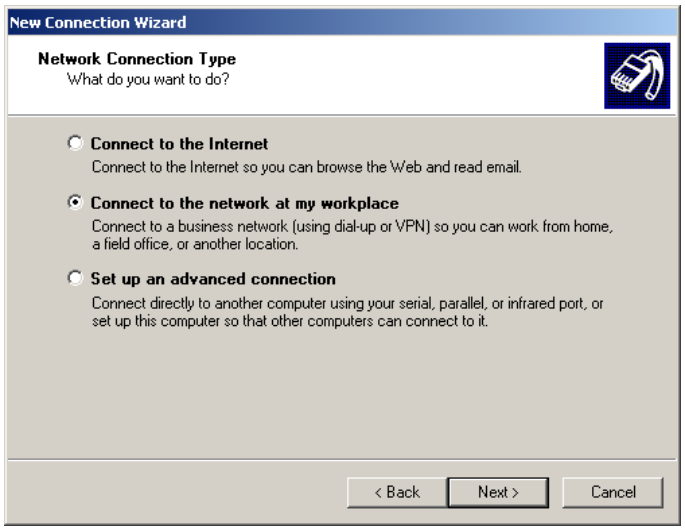


Deactivate in the tabbed window"**Networking**" the „*File and Printer Sharing for Microsoft Networks*" and the „*Client for Microsoft Networks*". Adapt the settings with"**OK**".

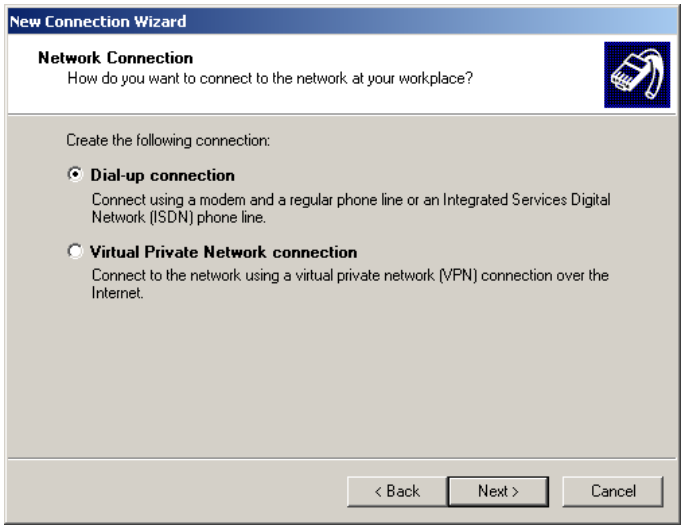
Ensure the following settings in the communication settings of the controller (Auxiliary programs – Settings, see chapter 4.10) for the corresponding COM-port:

11.5.2.2. Dial-up connection via modem

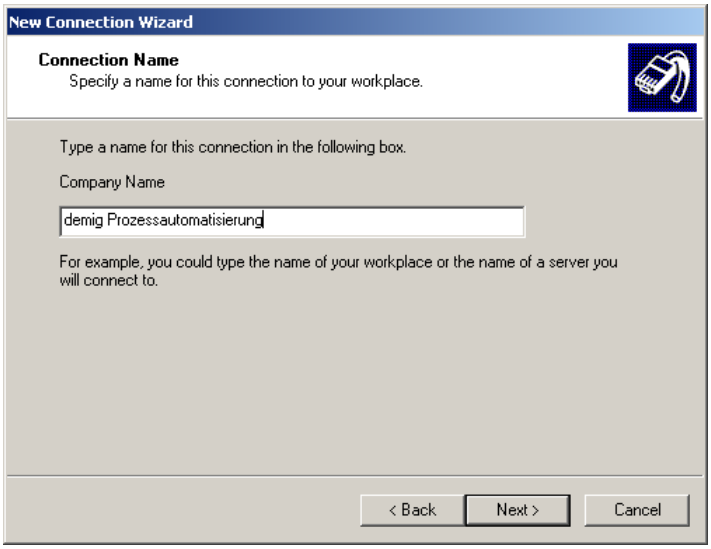
1. To create a new dial-up connection, start the assistant for new connections ("**Start**" – "**Settings**" – "**Network Connections**") of Windows and confirm the welcome window with "**Next**".
2. Select the type "**Connect to the network my workplace**":



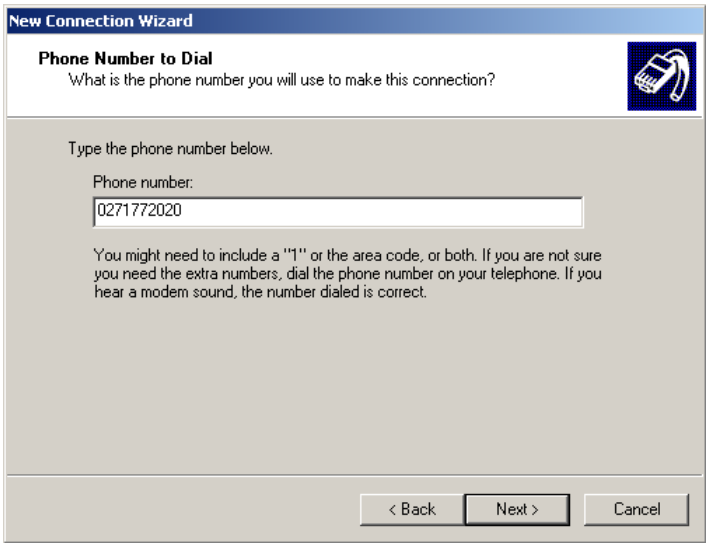
3. As network connection select the dial-up connection:



4. Type a name for the connection:

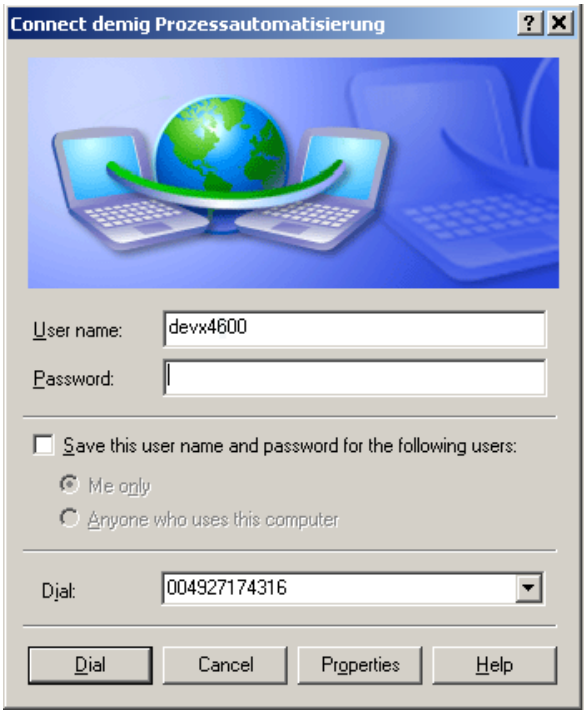


5. Indicate the Telefone number of the modem which is connected to the control system



6. Indicate in the next window the user for which the PC connection should be available and select if a desktop link should be installed. und

After the creation of the connection it is immediately active:



With the button“**Properties**“ the parameters for the used modem can be set. They are described in the description of the corresponding modem.

The user name and the password for the dial-up is “**devx4600**“ (case sensitive!)

The connection is created by the button “**Dial**“.

Ensure the following settings in the communication settings of the controller (Auxiliary programs – Settings, see chapter 4.10) for the corresponding COM-port

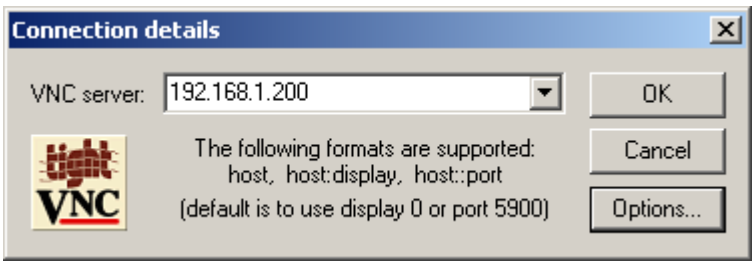
Regard that the connected modem and the corresponding protocol are correctly selected.

11.5.3. Remote Control with VNC

There is the possibility to create a connection to the control system with a VNC program. By means of this program, the control system can be supervised and operated from an external workplace.

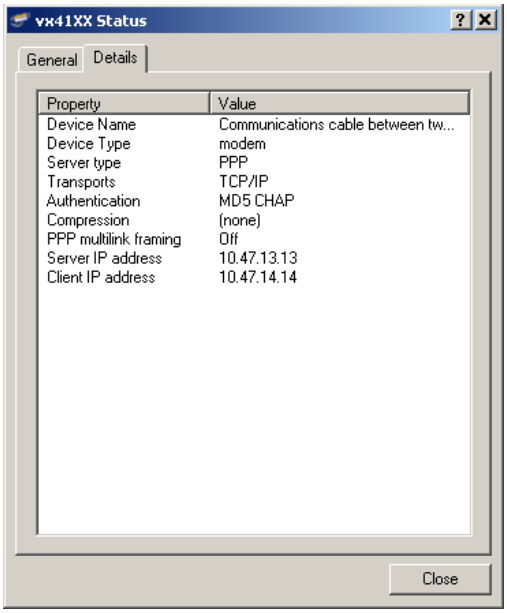
11.5.3.1. Connection with VNC

Create a connection to the control system (see chapter 11.5.1f) and start any VNC-viewer. In the example the TightVNC viewer is used and the connection of the control system is created via Ethernet.



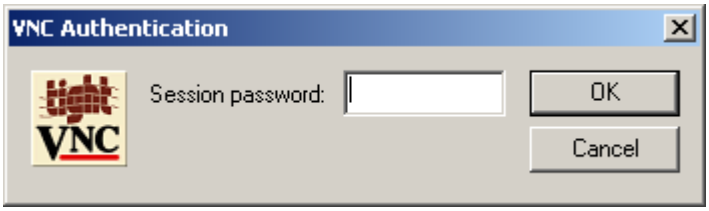
Enter the controller´s IP at the "**VNC server**" and click "**OK**".

The controller´s IP in an Ethernet connection is written in the menu "**Network+**" (see chapter 11.5.2) next to the MAC address of the network adapter.



For dial-up connections it is shown in the connection details (standard value 10.47.13.13).

As soon as the connection between the PC and control system is created, the access password is asked.



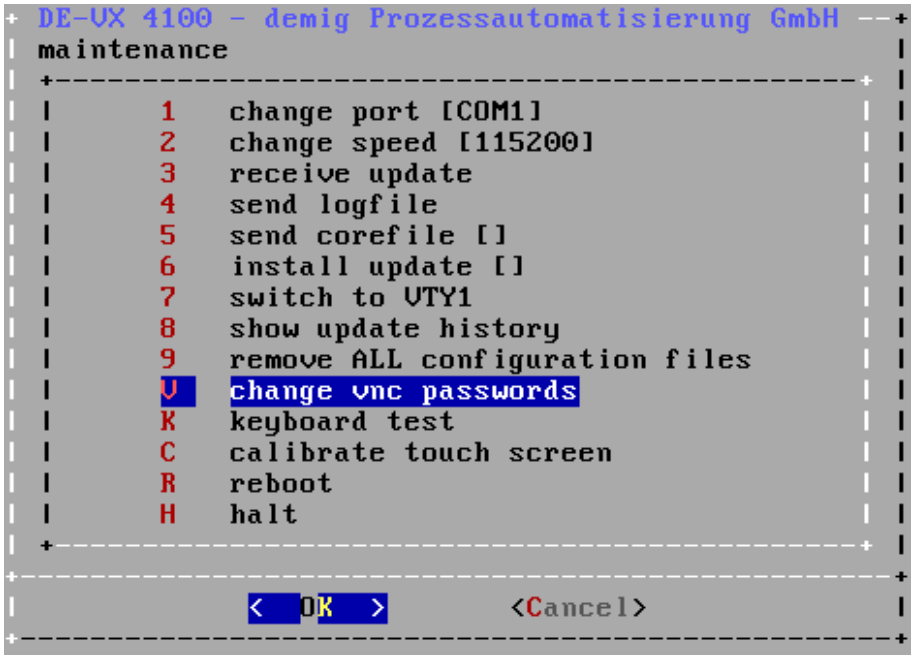
Password for read access: **demig**

Password for complete access: **devx4600**

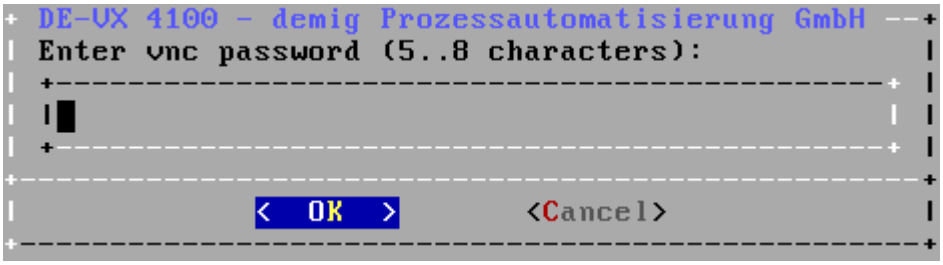
With "**OK**" the password is transmitted and the controller screen is shown on the PC.

11.5.3.2. Change VNC-passwords

The passwords for the read access and the complete access can be changed in the control system. Therefore quit the controller program. Quit the controller program with **„Alt" + „X"** (external keyboard) or with **„SHIFT" + „F8"** on the membrane keyboard and then enter code **„7076"** in the upper right display corner. Now select the menu "**Maintenance**"

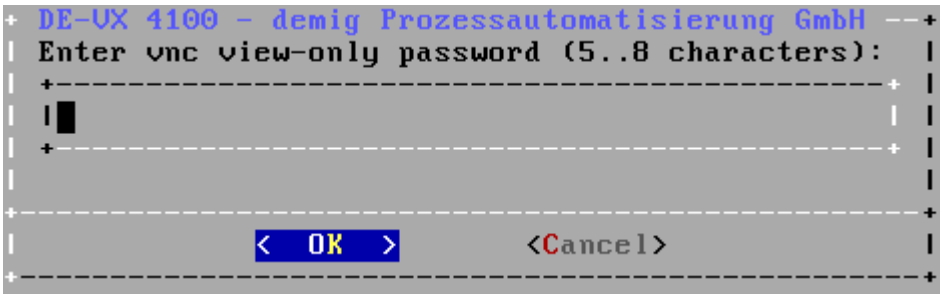


After the selection of the menu point "**change vnc passwords**" enter – after a security query - the new password for the complete access:



The new password can be set here (consiting of 5-8 numbers and/or characters, case sensitivity!) For verification repeat the new pasword in the next step.

In the following screen, enter the new password for the read access:



This password must be also consisting of 5-8 numbers and/or characters and it has to be repeated, too.

Note:
To enter an „empty" password is **not** allowed!

11.6 Technical data

11.6.1. Control system

- Industrial computer system with high-capacity Intel Atom processor
- Integrated PLC, S5 and S7 compatible instruction set, max. program length:
  - 60.000 instructions, time requirement of < 0,2ms per 1.000 Bit orders,
- up to 256 timer, 1024 messages, 1024 alarms (optional on delay)
  -

11.6.1.1. Storage

- 1 GB working memory
- 4 GB Flash for operating program and configuration storage
- 4 MB RAM (battery-buffered for current process status store, treatment programs and measurement recording)

11.6.1.2. Interfaces/ Connections

11.6.1.3. All interfaces (incl. USB) are electrically isolated from the supply and system potential.

-
- 1x DIN-RS232
- 1xserially switchable RS422/RS485
- 1xGigabit Ethernet, TCP/IP protocol for configuration, telemaintenance, connection of supervisory system, Modbus/TCP
- Protocols, e.g. RK 512, Modbus, 3964R
- 3xUSB 2.0 for external keyboard or printer
- Operating voltage 24V DC +/- 15%, max. 50 W
- 1 X Profibus-DP-Slave/Master (EN 50 170/DIN 19245 Teil 1) 9,6Kbit/s – 12Mbit/s, automatic bit rate recognition, EIA RS 485 cabling, DSUB-9-plug connector, electrically isolated. Max. each 244 Bytes input and output data (optional)

11.6.1.4. Display

- 7" color LC display, resolution 800x480 pixels

11.6.1.5. Operation

- Membrane keyboard (according to DIN EN 60529 IP protection 65), with alpha-numeric functionality
- Externally connectable USB keyboard
- Externally connectable USB mouse
- Unicode language support

11.6.1.6. Security

- Dual security functions by global and local watchdog functions
- Power failure monitoring
- Copy and know-how protection

11.6.1.7. Installation/ Assembly

- Front panel with integrated sealing IP65
- Ambient temperature 0...+45°C
- Relative humidity 0...90% non condensing at +40°C and under 3000m
- Storing temperature -20...+60°C
- Overvoltage category III (according to DIN EN 60664-1)
- Soiling stage 2 (according DIN EN 60664-1)

11.6.1.8. Inputs/Outputs

- 8 analog inputs
- 4 analog outputs
- DE-VX 4601/4602: 32/64 digital inputs/outputs
- DE-VX 4604/4608: 64/128 digital inputs/outputs

11.6.1.9. Programmer/Controller

- Set points: 192
- Control tracks: 512
- Control loops: 1.024
- Limit values: 1.024
- Alarms: 1.024 (on delay) with alarm history
- Recorder: 64 process variables recordable

11.6.2. Input and output cards

11.6.2.1. Analog inputs (8):

- All 8 analog inputs are electrically isolated among each other from the system potential
- 20 bit resolution
- DC measuring possible
- Free combination of input types by configuration software
- Min. scanning interval 20ms
- Cold junction temperature measurement in connector

Inputs configurable: 0 – 100mV, 0 - 500mV, 0 - 2V, 0 - 10V, 0 - 20mA, 0 - 400Ω (2/3/4-wire technique) (error < 0,1% of measuring range)

Linearization/ Thermocouples:

Cu-CuNi Type U (-200 ... +600 °C)	PtRh10-Pt Type S (0 ... +1760 °C)
Fe-CuNi Typ L (-200 ... +900 °C)	PtRh30-PtRh6 Typ B (0 ... +1800 °C)
NiCr-CuNi Typ E (0 ... +1000 °C)	WRe3-WRe25 (0 ... +2400 °C)
Ni-CrNi Type K (-200 ... +1370 °C)	WRe3-WRe26 (0 ... +2500 °C)
PtRh-AuPdPt (-100 ... +1300 °C)	NiCrSi-NiSi Typ N (-270 ... +1400 °C)
PtRh13-Pt Typ R (0 ... +1740 °C)	and Pt 100 (-200 ... +800 °C)

11.6.2.2. Analog Outputs (4):

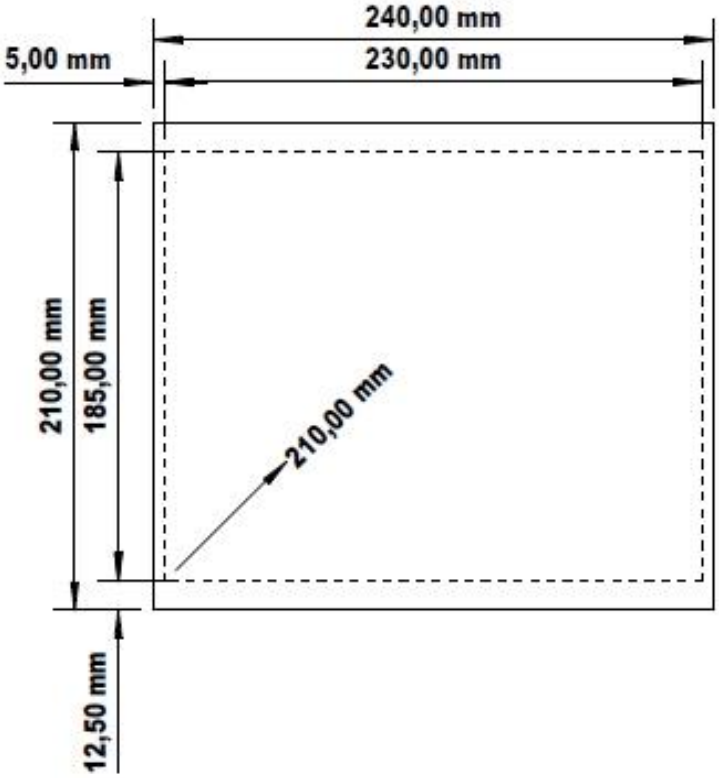
- All analog outputs are electrically isolated from the system potential
- Output rate depending on configuration (min. every 100ms)
- Local watchdog function integrated
- Outputs: 0-10V load ≥ 1kΩ, 0(4) - 20mA burden ≤ 500Ω
- Resolution: 12bit/0,025%

11.6.2.3. Digital IN/OUT (32/64 or 128 depending on device)

- All inputs/outputs 24VDC, data direction freely configurable
- Electrically isolated in groups of 32 among each other and from the system
- State display by LED for each channel
- Integrated counter function with incremental encoder
- Hardware debouncing of all inputs, variable debouncing time
- All outputs are loadable with max. 0,5A (ohmic load), protected in groups of 8
- 20-30 V external supply for outputs with low voltage indication

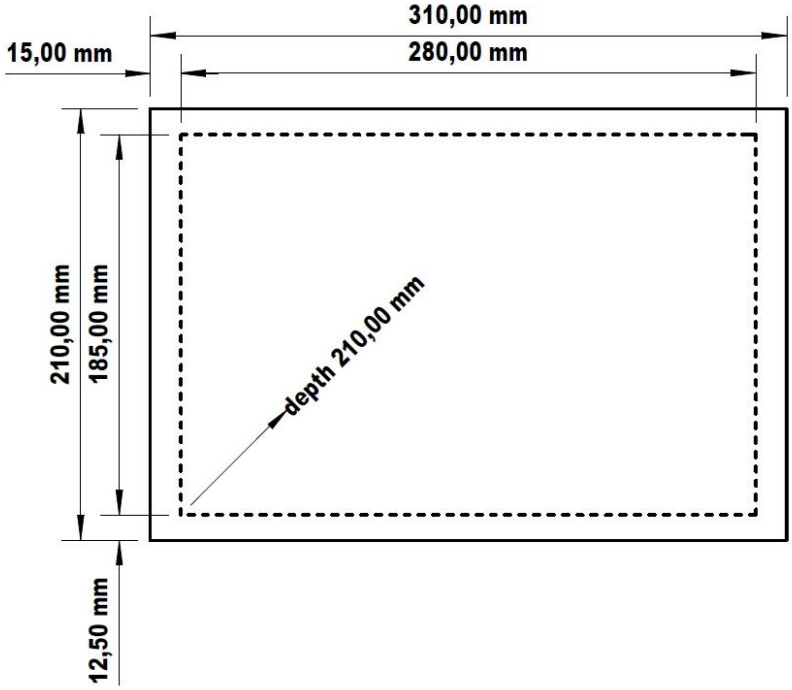

24V DC
GND
PE
Haardtstr. 40
D-57076 Siegen
Tel: (0271) 772020
Type: DE-VX 4608
Ser.Nr.: 1214363713004
LAN
USB1
USB2
USB3
COM1
COM2
CAN
PB

11.6.3. Installation dimensions and measurements of rack-housing



Weight:
approx. 5,0 kg

DE-VX 4601/4602

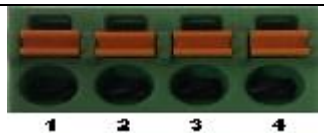


DE-VX 4604/4608

Note:
Prescribed installation distance to the top and the bottom 150 mm!

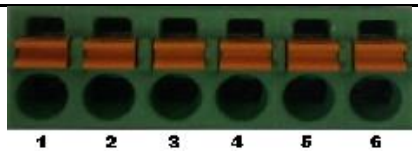
11.6.4. Pin Assignment

Analog Outputs



Connection	Function
DAx 1	Output 0-20mA / 4-20mA (max. burden 500Ω)
DAx 2	Ground for output 0-20mA / 4-20mA
DAx 3	Output 0-10V (min. bürden 1kΩ)
DAx 4	Ground for output 0-10V

Analog Inputs



Connection	Function
ADx 1	PT1: Voltage source 1 for PT100/resistance measurement
ADx 2	PT2: Voltage source 2 für PT100/ resistance measurement
ADx 3	PT3: Ground for PT100/ resistance measurement
ADx 4	U: Measurement input +
ADx 5	AA: Input current measurement burden (100Ω)
ADx 6	GND: Measurement input -

Voltage metering (incl. thermocouples):

Connect measuring line to U and GND

Current measurement:

Connect measuring line to U and GND

Connect U and AA directly

Resistance measurement (incl. PT100):

2-wire technology:

Connect measuring line to U and GND

Connect PT1 and U directly

Connect PT3 and GND directly

3-wire technology:

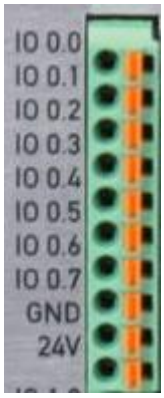
Connect measuring line to U and GND

Connect PT1 and U directly

Connect PT2 and GND where the measurement is taken

Connect PT3 and GND directly **4-wire technology**: Connect measuring line to U and GND Connect PT1 and U where the measurement is taken Connect PT2 and GND where the measurement is taken Connect PT3 and GND directly

Cold junction sensors	
Connection	Function
VGx	Cold junction temperature sensor deliverd as connector

Digital IO		
Connection	Function	LED
IO x.0	Digital Input or Output*	green = input/ouput active or logic 1 
IO x.1	Digital Input or Output*	
IO x.2	Digital Input or Output*	
IO x.3	Digital Input or Output*	
IO x.4	Digital Input or Output*	
IO x.5	Digital Input or Output*	
IO x.6	Digital Input or Output*	
IO x.7	Digital Input or Output*	
GND	Power supply ground connector	orange = warning: over/underload
24V	20-30V DC power supply	red = error: unsufficient voltage
The digital inputs and outputs are electrically isolated from each other and from the system. Output load: max. 0,5 A (Ohmic load)		

*depending on configuration

Recommended Connector Types	
Phoenix Contact Combicon FMC 1,5/xx-ST-3,81	Clamp connection (scope of delivery)
Phoenix Contact Combicon MC 1,5/xx-ST-3,81	Screw connection and marking space

12. Chapter: Appendix

12.1 Compensation instructions

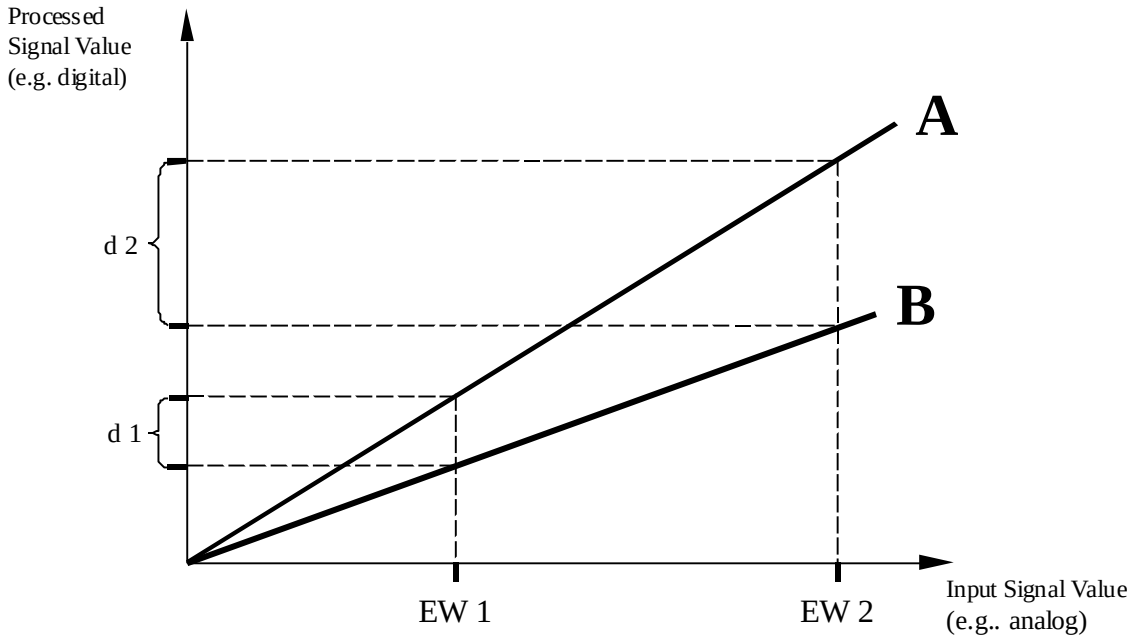
12.1.1. Why a compensation?

The analog input cards contain circuits which, through environmental temperature influences and component tolerances, provide varying values when compiling analogous variables (e.g. 0-20 mA) in legible and processable digital values for the processor. Thereby, tolerances can occur in the areas of **offset** (point 1) and **amplification** (point 2).

12.1.1.1. Example 1 - Amplification

Under the term "**Amplification**", the increase of the characteristic curve is known.

In this example, 2 characteristic curves with different increases are plotted. These characteristic curves are representative of the same amplification input circuit of two different AD cards.

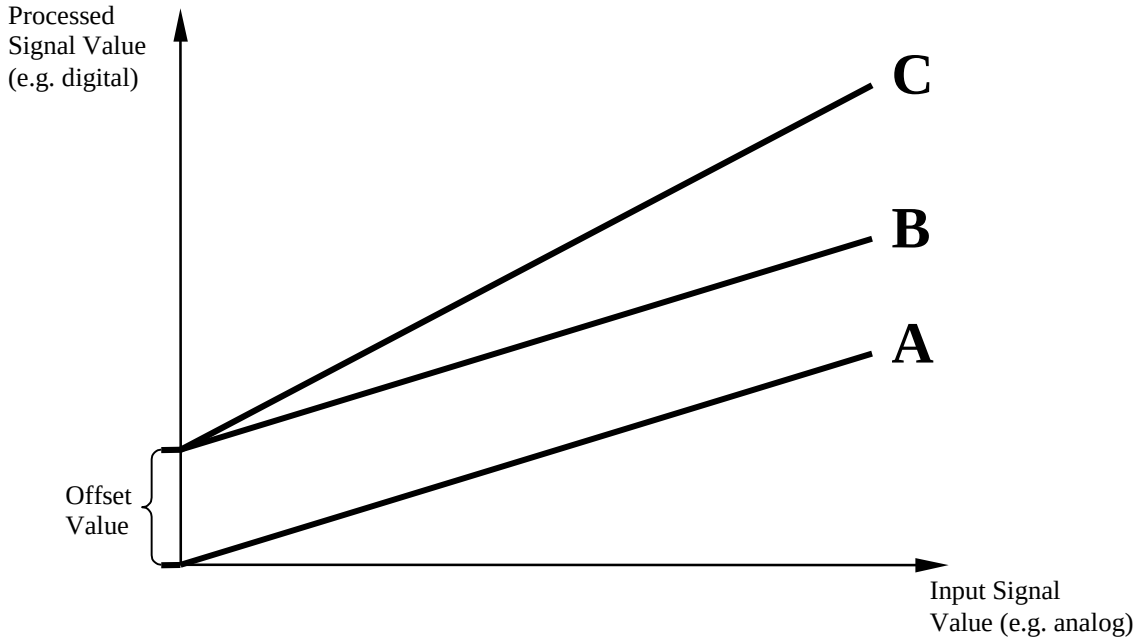


As a result, the input values (EW1, EW2) of the characteristic curve **A** have a clearly higher output value (processed signal value) than is the case with characteristic curve **B**. Hence, the resulting tolerances (d1, d2) are not negligible and must be accounted for compensation.

12.1.1.2. Example 2 - Offset

Under the term "**Offset**", the different output value of an amplifier circuit is shown in comparison to an input value of 0 V. This means that an amplifier, even though it is controlled by a 0 V value, can have an output value different from 0 V.

In this example, the characteristic curve A would be the requested characteristic curve with the offset = 0 (processed signal value = 0, with an input signal value = 0) and a defined amplification. The characteristic curve B starts with a defined processed signal value (the offset value), but with the same amplification as characteristic curve A. Here, only a correction of the offset value would be necessary. With characteristic curve C, the offset as well as amplification must be compensated.



12.1.2. Compensation for the DE-VX 4600

The process controllers DE-VX 4600 offer a combined compensation process for offset (point 1) and amplification (point 2) for the exact processing of the analog input values. These two measuring values are combined for the calculation of amplification and of the offset value (see chapter 7.3).

Warning:

The function of compensating measurement input is a **security function!** Incorrect input can lead to system disturbances, system damages and quality losses, as well as danger to persons and the environment. To avoid these risks it is necessary to make sure that only instructed and authorized persons operate the system (compare code function)!

12.1.2.1. Procedure

It is necessary that a calibrated mA/ mV-transmitter be attached to the analog input of an AD-Card to be compensated. Alternative, e.g. for a temperature compensation, a referencial thermometer can be given into the furnace. This method offers the advantage to read the “real“ temperature directly and to insert it in the menu “*Compensation*“ of the control system. The compensation of the C-level calculation should never be done by measurement voltage of the O_2-probe, resp. of the CO_2-analyzer but with the menu point “*C-level (steel) compensation*“(see chapter 12.1.3: ”Particularities: C-level compensation“).

What happens with "*Restore factory settings*"?

When this function is selected, the previously inputted compensation values are deleted. That means that the offset is set to 0 and the amplification is set to 1. Then, only the hardware-dependent processing properties are applied.

The "*Restore factory settings*" should be done before a compensation, to ensure that old compensation data has definitely been deleted.

What happens with "*Compensation*"?

When this function is selected, two measured values must be inputted:

- A measured value for the "Offset-Compensation" ("*Point 1 Compensation*")
- A measured value for the compensation of the "Amplification" ("*Point 2 Compensation* ")

To implement the compensation, the following points must be implemented:

1. To compensate Point 1, adjust a value to the mA/ mV-transmitter. This value corresponds to a specific variable (e.g. temperature). At the same time, a value in the lower measurement range should be selected (approx. in 25% of the Measurement range).
   Example: If the measurement range is 0 - 20mA for 0 - 200°C, then a measurement value for the Offset-Compensation would be 4mA for 40°C.

   Notice:

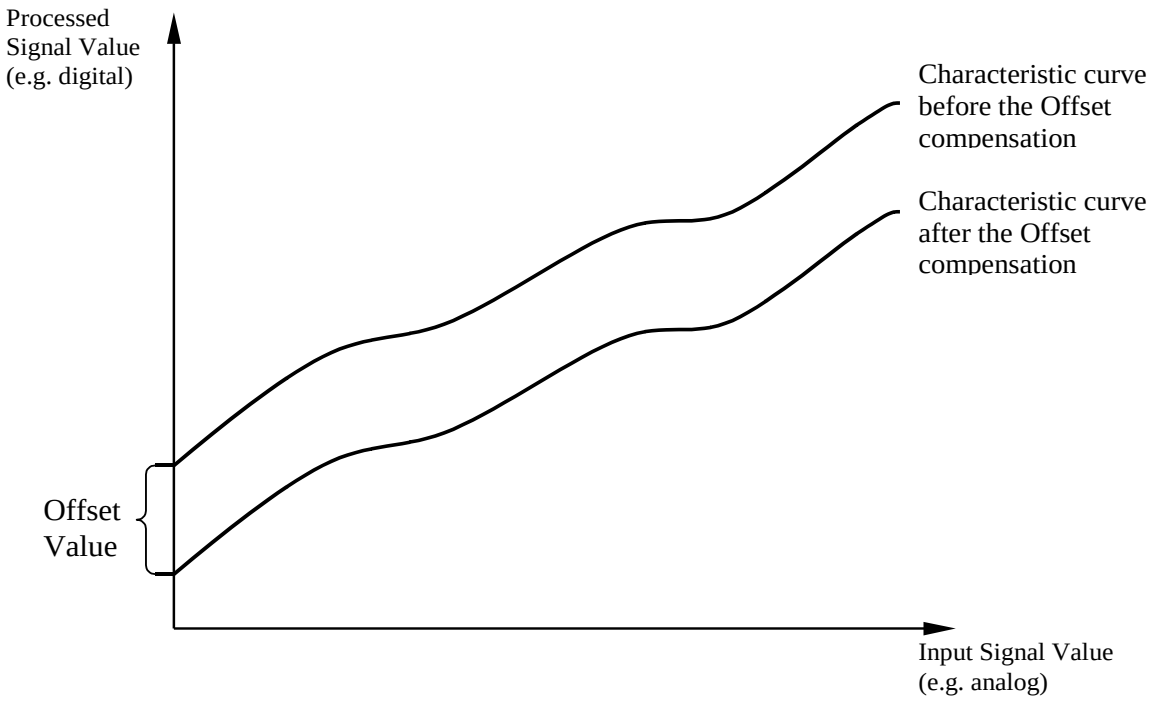
   The analog input variables (mA) are representative of the measurement variables (°C) in the transducer table. Therefore, it should be kept in mind, that the characteristic curve of a transducer must not be linear and that a computation of the analog input variables can lead to errors.

2. Input this value (40°C) as the first actual value in the control system. In doing so, overwrite the indicated value and confirm the input by pressing "**E**".
3. To compensate the point 2, a different value must be adjusted to mA-/ mV-transmitter. This value should be a minimum of 50% of the measurement range larger than the first value (approx. 75% of the measurement range). The implementation is identical to that of the first point.

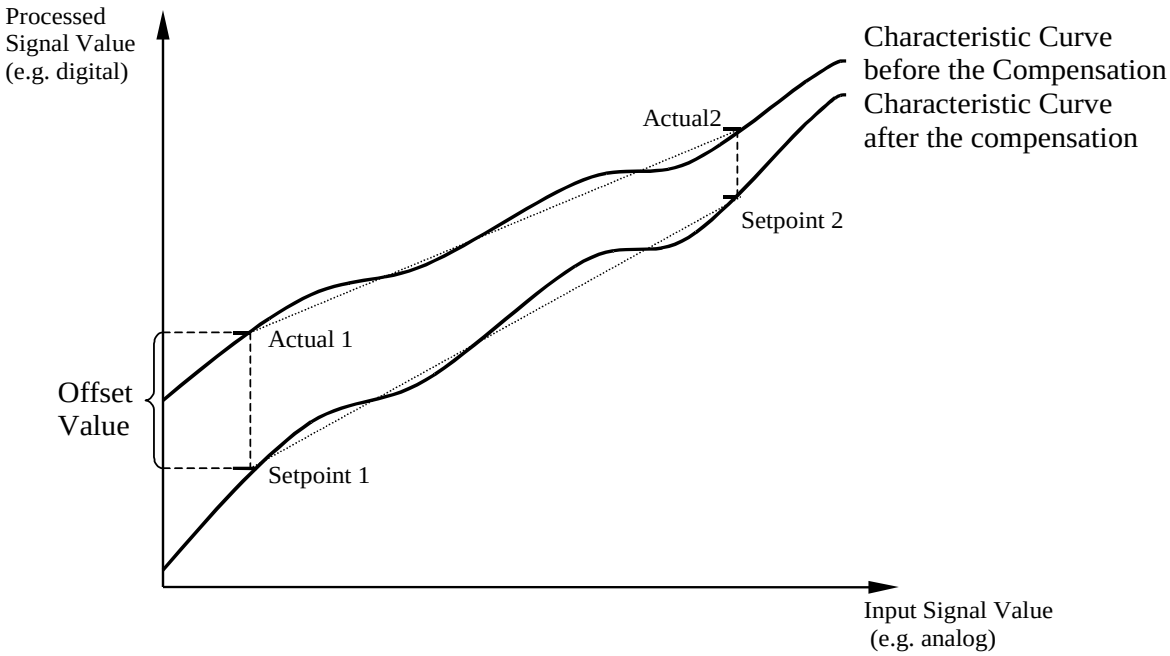
12.1.2.2. Calculation of the control system after the compensation

The process controller contains a table in which the distinguishing properties of the characteristic curve are saved. (Allocation of the processed signal values to an input signal value). Thereby, non-linear characteristic curve processes are compensated.

After inputting the first set point and the adapting with the "**E**" key, then subsequently ending the compensation, the data can be simply corrected using the offset value, which is calculated from the difference of the indicated actual value and the inputted set point value. A change of the characteristic curved (amplification) does not take place.



In this example, the calculated offset value was subtracted from the output value of the table.



With a complete compensation (compensation of both points), the values of the table of the distinguishing properties of the characteristic curve after offset and amplification are corrected:

(Value of the table) * amplification factor + offset value = corrected value

The amplification factor is calculated from the amplification difference of both lines through the respective set point and actual value.

The offset value is calculated from the difference of the processed signal values from IST1 and IST2.

Result With every newly set-up analog value (input signal), the table values, amplification factor and offset values to be calculated are now included in order to calculate the corrected processed signal values

12.1.3. Particularity: C-level (steel) compensation

In this chapter the compensation of the furnace atmosphere is described in detail. This compensation is particular because of the C-Level of the furnace atmosphere, which only can be analyzed in an indirect measuring process, in comparison to e.g. the temperature. The procedure of the C-Level compensation should be described by means of a foil specimen (the only direct measuring method). Other atmosphere measuring processes like e.g. dew point measurement, CO_2-analyzer, O_2-probe and Lambda-probe are also suitable for the analyze of the furnace atmosphere.

> ⚠ **Notice:**
> In order to receive an accurate measuring result, and thus an accurate correction value, it is obligatory to respect precisely the measuring instructions of the single measuring processes.

12.1.3.1. C-level compensation, example of a foil specimen

This method for the direct measuring of the C-Level in the furnace atmosphere consists e.g. of 0,05 mm thick foil of pure iron at a **constant termperature** and a **constant C-level** for 15 to 20 minutes. It is very important that the C-Level and the temperature are selected in that way that there are no carbides in the foil. After the dwelling time the foil will be taken out of the furnace and will be cooled rapidly. At the same time, the current C-Level value in the control system has to be frozen (see chapter 6.5). The carbon content of the foil will be determined by an analyze (burning) or by weighting. This content, expressed in volume-%, is equivalent to the pure iron C-level, which is needed for the compensation.

In case of C-level contents out of the limits of solubility, corresponding to the individual temperature, this content is not to be used and the foil specimen has to be done once again. This is also valid for high differences between the analyzed pure iron C-level of the foil and the shown pure iron C-level in the control system.

If only one foil is analyzed as reference value, it is recommended to take the average between the analyzed and the shown uncorrected pure iron C-level. Example:

Analyzed pure iron C-level of the foil:	0,9% C
Shown uncorrected pure iron C-level in the control system:	1,0% C

⇒ recommended correction value: 0,95% C

The compensation of the C-level value only has to be done at one position, i.e. at one temperature and one C-level. The internal mathematics is able – due to the one correction value - to transfer the correction also to other temperatures and other C-levels.

12.1.3.2. Measuring process for C-level specification

In this operating manual, the functional descriptions of the different measuring processes, to determine the furnace atmosphere, are not detailed. For further information we recommend the following literature:

„*Die Prozeßregelung beim Gasaufkohlen und Einsatzhärten*“, AWT-expert committee 5, working team 4 – Renningen-Malmsheim: expert publ. house, 1997; ISBN 3-8169-1454-3

Chapter 4 and 5 of this literature describes the function and handlings of the different methods for determine the C-level.

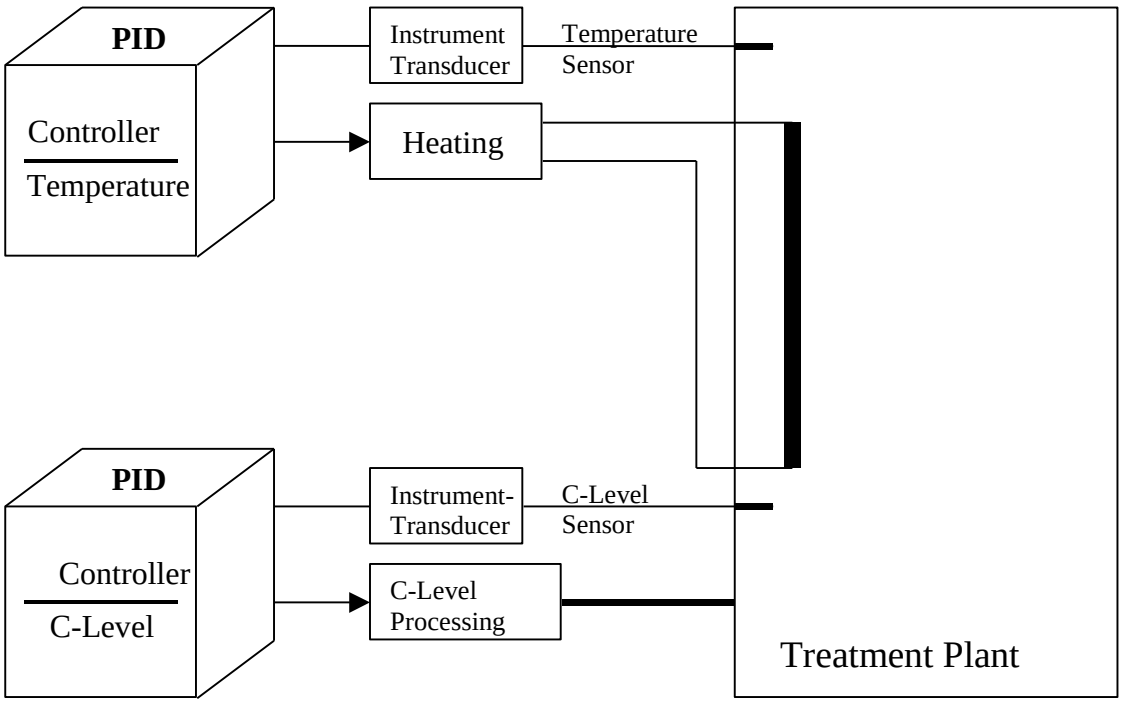
12.1.3.3. mV-Compensation

The compensation of the mV-input of the AD8-card of the conrol system (menu point "*Compensation*", resp. "*Compensation (card)*" is not suitable for the compensation of the furnace atmosphere. By means of this compensation only the circuit and the output voltage of the probe is compensated. Errors of measurement (e.g. aging appearances) of the probe are **not** registered!

12.2 Instructions for adjusting the controller parameters (PID)

12.2.1. The DE-VX 4600 in the loop

First, as a brief instruction in the technical control application area of the controllers DE-VX 4600, here is a schematic display of the closed loop.



The DE-VX 4600 contains independent loops, so that every loop, depending on configuration, possesses its own:

- Set point programming,
- actual value monitoring, as well as
- controlling variable output.

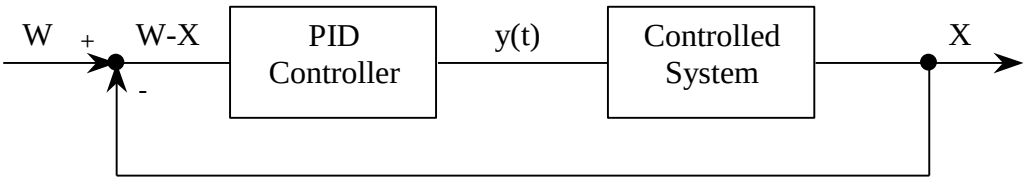
For the operation of the controller, also see the "*Program*" - "*Parameters*" function.

⚠ Warning:

The editing of parameters is a **security function!** Incorrect parameters can lead to system disturbances, systems damages, quality losses as well as danger to persons and environment may be the result of it. To avoid these risks it is necessary that only instructed and authorized persons operate the system (compare code function).

12.2.2. Design of the Loop and PID-structure

Every single loop is structured as follows:



The loops (e.g. the temperature in a furnace) which define the range to be controlled, are partly dependent on very different natural laws in their dynamic behavior, e.g. the charge will be heated at a different time than the furnace. In order to guarantee an optimal controller efficiency, these different properties of the loop are taken into account in the setting of the controller parameters (PID). That means that the actual value (e.g. the charge temperature) approaches the set point as fast as possible,

- without long delay times,
- without exceeding the set point,
- non-oscillatory and
- cost-optimized (prevention of the permanent connection of an energy consumer).

Comment These criteria are in their entirety not completely realizable. The user decides, through the selection of the control parameters, which criteria are to be emphasized. The controller attempts, through set point and actual value comparisons, to adjust a consistent controller difference to 0. In doing so, the following law is applied:

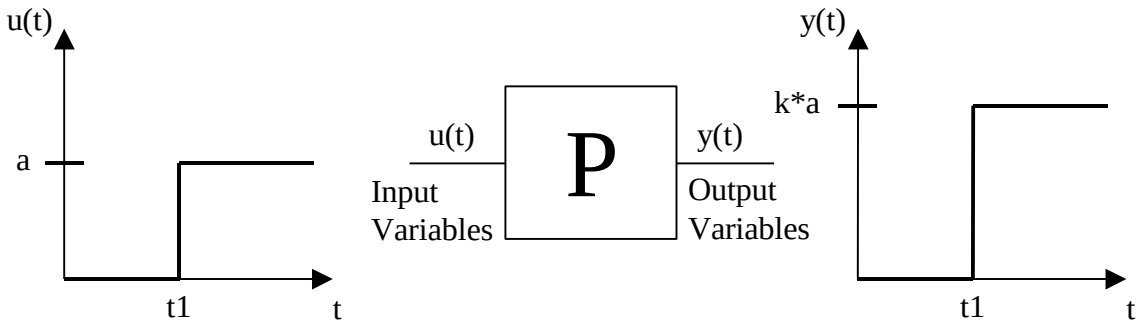
Setpoint(w) - Actual Value(x) = Control Difference

12.2.2.1. What means PID?

To better understand the setting of the controller parameters, first a few explanations of the PID-Character of the control system.

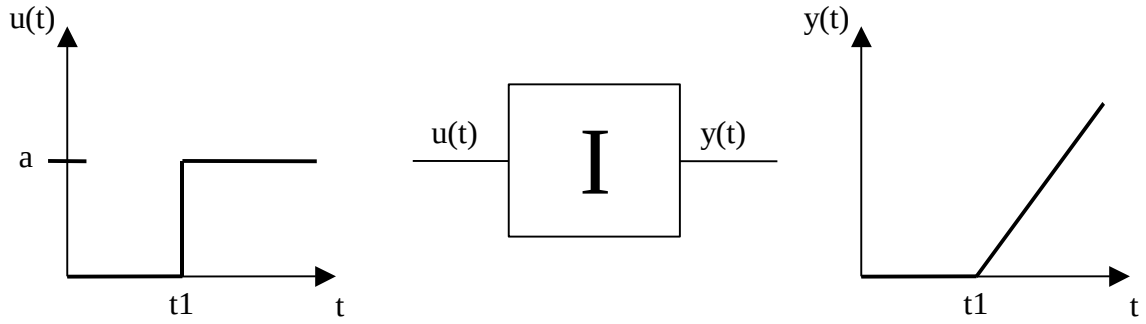
PID-controllers consist of three components, which work together to achieve the best possible controller efficiency. They are shown below for clarification (however without timers):

P = Proportional part Effects the amplification (k) of the controller difference from input u(t) to the output y(t).



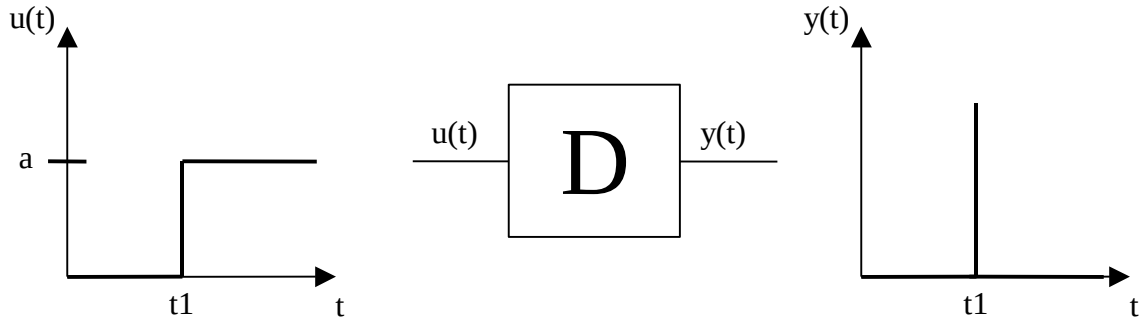
I = Integrated part (T_N)

Effects the adjustment-consistent controller differences.

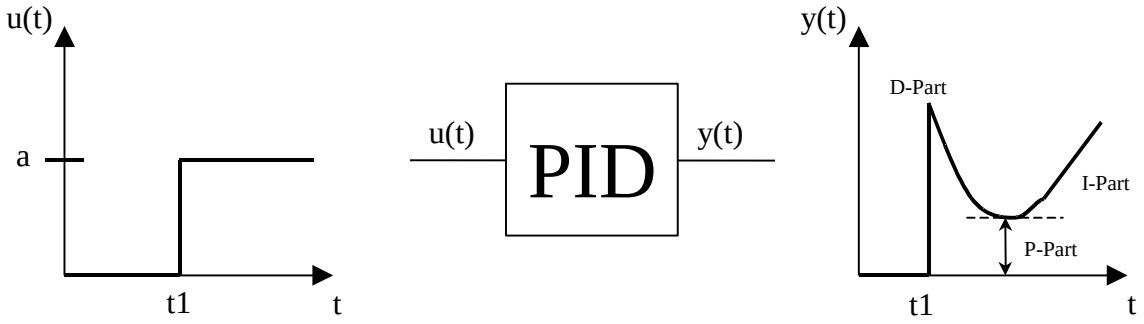


D = Differentiating part

Effects the reaction speed of the controller to the output y(t) when changing the input variables u(t). In addition, the D-share has a derivative effect on regulations of the set point ramps.



If these three components are combined under consideration of a time component, which will not be mentioned here in detail, the following curve progression will result at the output of the controller after an erratic change of the input.

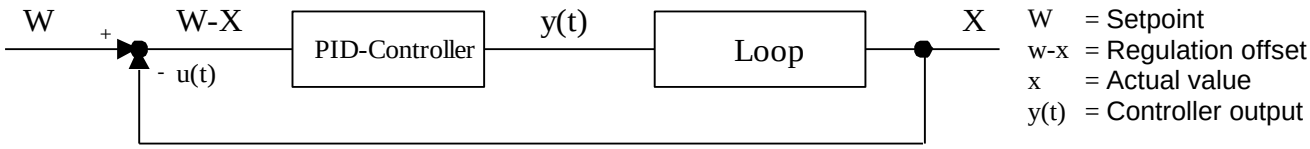


The output of the PID-Controller continually increases with a time t towards infinity. That means, the controller attempts to regulate, through the constant increasing of its output (control variables) to the regulatory variables (e.g. temperature) to the designated set point ("I"-part). A reduction of the controlling variable would therefore only be possible if the input, which stands for the controlling difference (controlling difference = w-x), has a lower value.

A PID-controller tries to regulate the actual value exactly to the setpoint. The D-part enables the controller react to input changes faster than a normal PI-controller could.

Here, it is already clear to recognize, that the proper setting of "I"- and "D"-part have an important impact.

The transient function of a PID-Controller is displayed as follows:



With the following formula, the control variables can be mathematically calculated:

$$y(t) = Kp * [(w - x) + \frac{1}{TN} * \int (w - x)dt + TV * \frac{d(w - x)}{dt}]$$

In practice, this formula is not as important as the variables to be adjusted.

K_p (=) P-Part X_p (in ‰) = 1000 ‰/ K_p

T_N (=) I- Part

T_V (=) D- Part

In practice, this ratio $TV = \frac{TN}{5...8}$ has been proved useful.

X_p (in ‰) corresponds to the maximum power which can be used in accordance with the controlling difference (w-x), e.g. heater power. As an example, X_p (in ‰) =

250 → max. power (controlling variable) at ¼ of max. controlling difference

500 → max. power (controlling variable) at ½ of max. controlling difference

750 → max. power (controlling variable) at ¾ der max. controlling difference

1000 → max. power (controlling variable) at max. controlling difference

3000 → Limit maximum power to 1/3 at max. controlling difference

12.2.3. Experimental designation of the controller parameters

The literature describes more possibilities for optimizing the controller parameters, but not all of them are suitable for this purpose. The problem is that the loop is not known in its dynamic behavior. It must be analyzed with the help of a test.

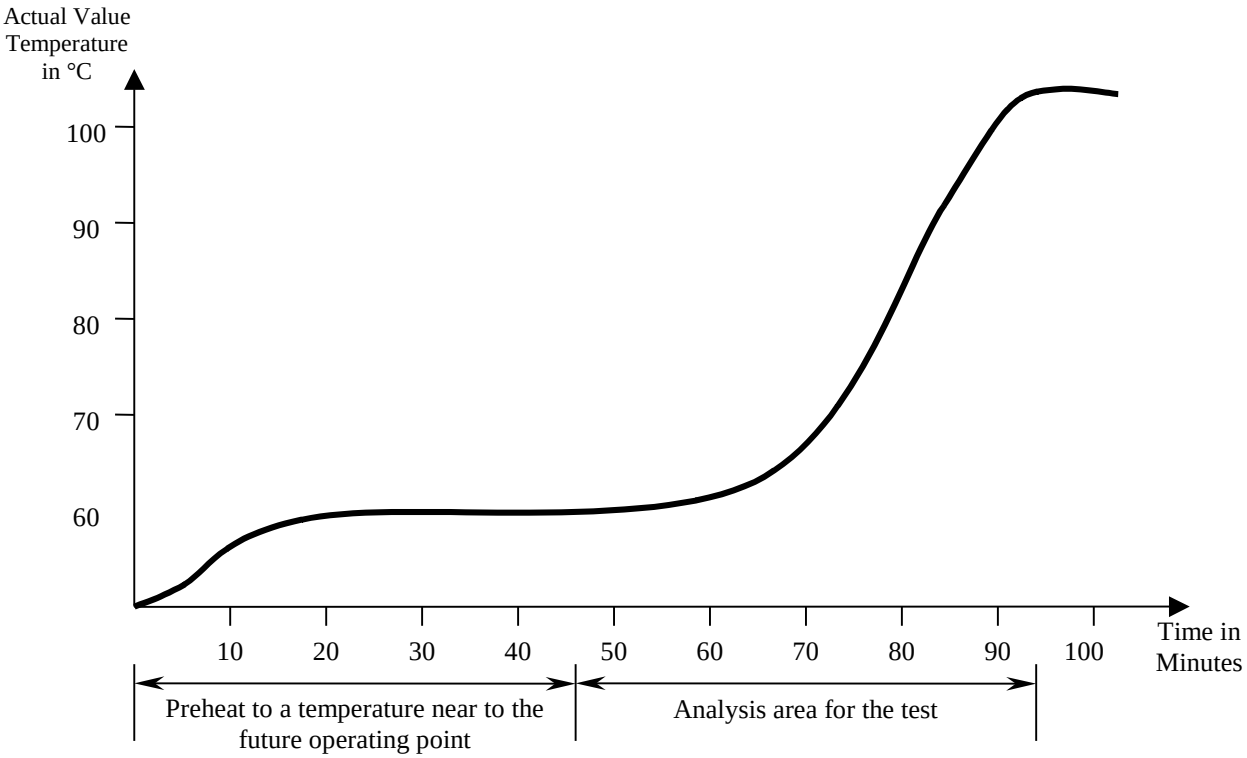
12.2.3.1. Implementation

1. Recording the course of the variables to be controlled during the test.
2. Put the controlling variables in the area of the subsequent operating point (e.g. operating point lies at 80°C, thus preheat the temperature beforehand to 60°C).
3. Adjust the set point to a high value; so that 100% of the controlling variables are constantly generated (e.g. adjust the temperature set point to 160°C).

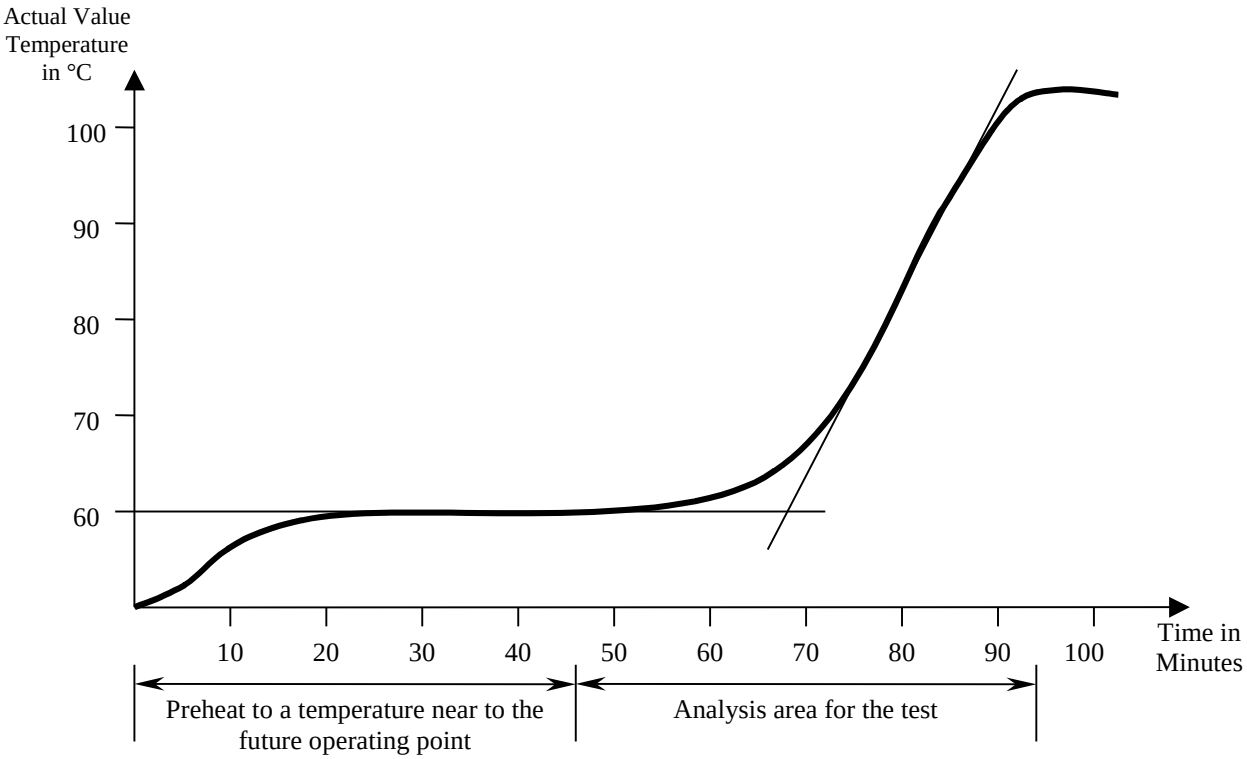
Attention:

The incorrect adjustment of PID Parameters can result in that not 100% of the process variables are issued. Before the test, check that P = 1, I=0 und D=0.

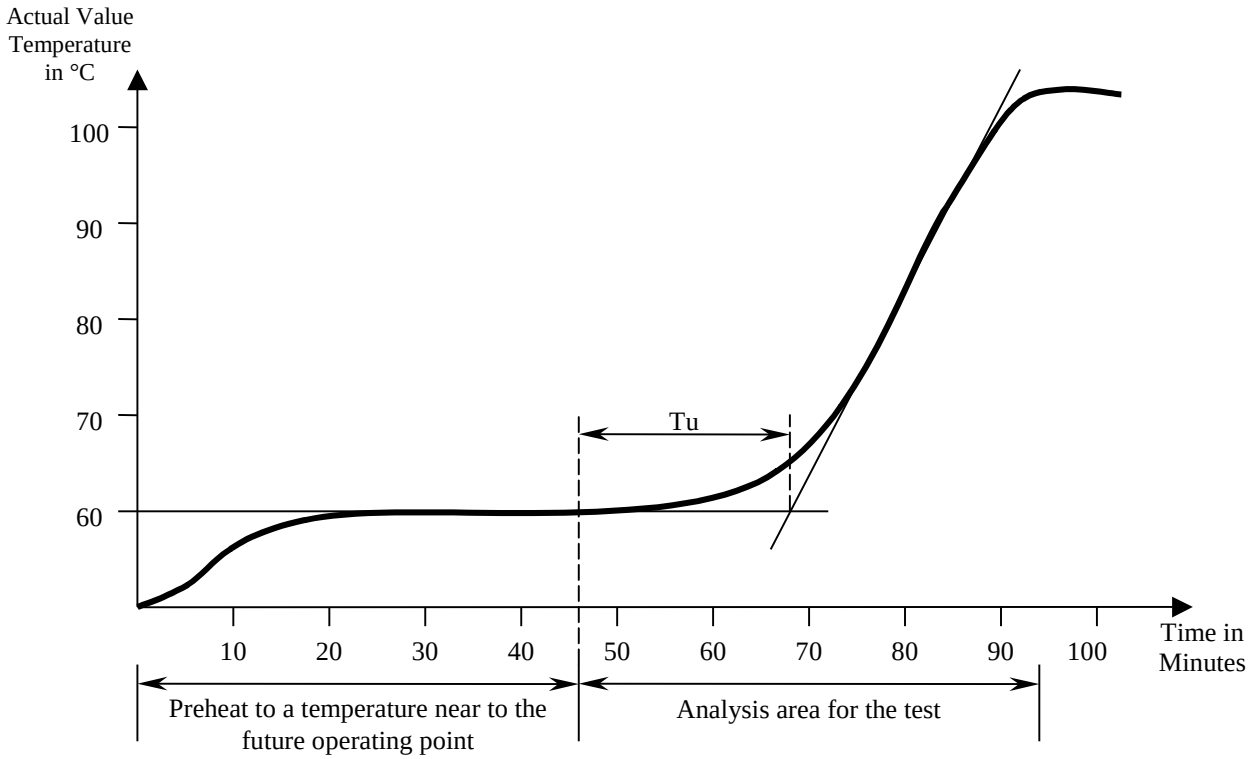
4. The actual value now increases. Interrupt the test at a higher actual value than the previously mentioned operating point (e.g. by reaching 100°C, the procedure will be discontinued, meaning a lower set point can now be reset)
5. Now analyze the existing recorder results:



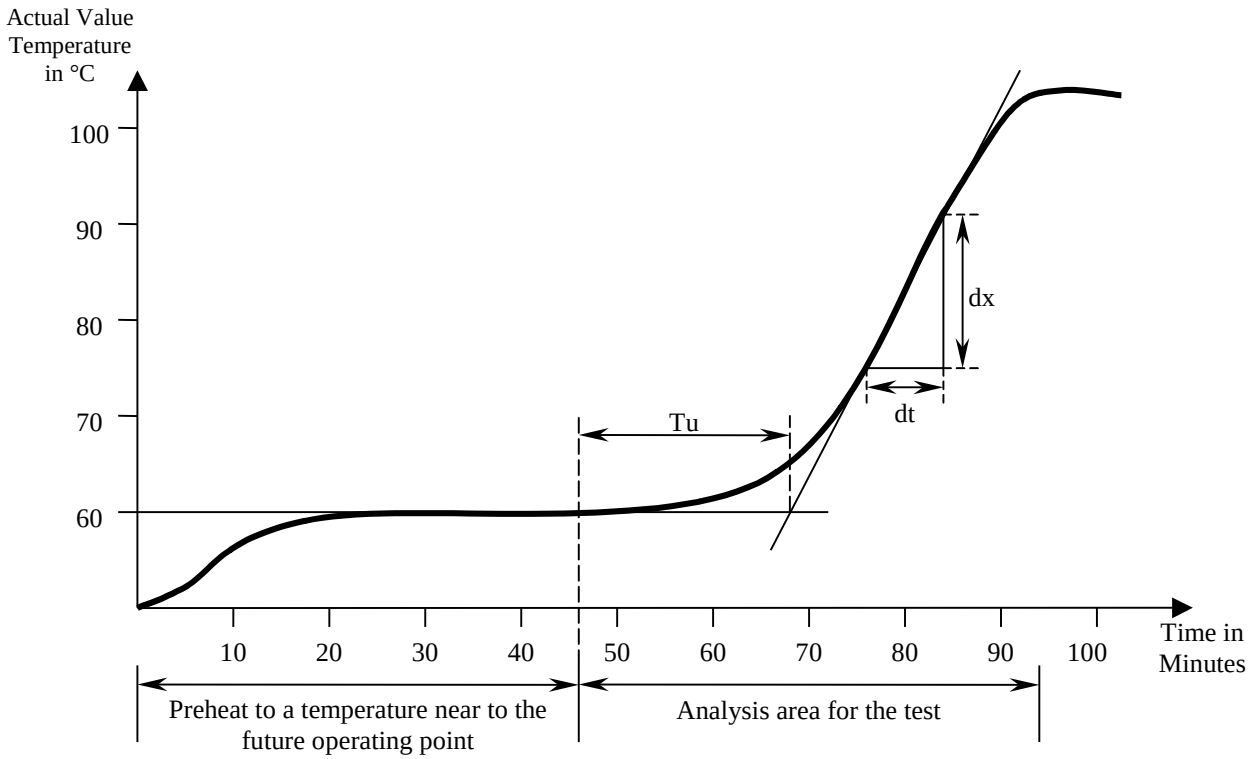
6. Draw a straight line parallel to the timeline, through the actual value that was set before the test (here 60°C). Subsequently, draw another straight line on the rising characteristic curve in the analysis area.



7. Draw a vertical line from the test start and from the intersection of both straight lines. The time between these two lines is the time "**T_u**" (here, approx. 12 min.).



8. Now, draw a gradient triangle (right-angled) on the diagonal straight line. Read the value "**dx**" (temperature change) and "**dt**" (time change).



With the help of these two values, the increase speed V_{max} can now be calculated:

$$V_{max} = \frac{dx}{dt}$$

In this example, "**dx**" is approx. 16°C and "**dt**" is approx. 10 minutes. Therefore, a V_{max} of 1,6°C/min results.

The controlling parameters X_p, T_N and T_V can now be determined with the extracted values using the following calculation formula:

$$Xp = 0{,}83 * V_{max} * TU$$

$$Xp = \frac{Xp}{Meas.\ Range} * 100\%$$

$$TN = 2 * TU$$

$$TV = \frac{TU}{6}$$

In the Example:

$$Xp = 0{,}83 * 1{,}6 \frac{°C}{\min} * 12\,\min = 15{,}9°C \qquad TN = 2 * 12\,\min = 24\,\min = 1440\,\text{sec.}$$

$$Xp = \frac{15{,}9°C}{100°C} * 100\% = 15{,}9\% = 159\ per\ \ mill \qquad TV = \frac{1440\,\text{sec}}{6} = 240\,\text{sec}$$

12.2.3.2. Further settings in the controller block

In the controller block of the control system not only PID parameters may be set, but also further settings may be done.

By means of the value "**dY**" the output of the controller block (the controller output) can be limited temporarily. In case of a jump of the setpoint, this effects that the controller output does not jump up but it adjusts itself slowly. The set value for "**dY**" causes a percentage changing of the controller output per second. Example:

dY = 10%: The controller block calculates a controller output of 100% in order to reach the setpoint. The 100% controller output is not immediately at the output of the controller block, but it increses 10%/s, i.e. if the controller output was 0% it takes 10 seconds to reach 100% at the output of the controller block. One consequence is e.g. the limit of the starting current of an electrical heating.

With the values 0% and 100% the controller output is set without limits.

For configurations with cascade control the values “**KF**“ and “**KF2**“ are required in the parameter settings. It is important to differ which option of cascade control is used. The option I need only the cascad factor **KF** and the option II needs additionally the factor **KF2**.

For parameter optimization follow this instruction:

Start with the optimization of the PID parameters of the tracking controller. Therefore the action of the guiding controller has to be switched off. This will be done by setting **KF=100%** (option I), or **KF=0%** (option II). Normally it is recommended to parameterize the tracking controller as PI-controller with **T_V=0s.** The parameter should be set with an optimized control response to setpoint. A slight overshooting at a setpoint jump is tolerable. The PID-parameters are to be set after the optimization of the tracking controller, as follows:

KF=50% (option I) or **KF=50%** and **KF2=100%** (option II)

The result of the optimization should be that the guiding controller is slowlier than the tracking controller, i.e. that e.g. **T_N** of the guiding controller should be as large at least three times as at the tracking controller. The cascade parameters are to be optimized at last.

The influence of the cascade parameter is as follows:

Option I: Reduction of **KF** increases the controller response at an increased overshooting of the actual value **X_i** of the tracking controller.

Option II: Enlargement of **KF** increases the controller response at an increased overshooting of the actual value **X_i** of the tracking controller. Normally, the value **KF2** should be kept at 100%.

12.3 Languages

12.3.1. Country code

Language file	Language	Code DE-VX 4XXX	Code DE-VR 400X
0007.txt	Russian	ISO 8859-5	CP 866
0031.txt	Dutch	ISO 8859-1/15	CP 850
0033.txt	French	ISO 8859-1/15	CP 850
0034.txt	Spanish (Castillano)	ISO 8859-1/15	CP 850
0036.txt	Hungarian	ISO 8859-1/15	CP 850
0037.txt	Lithuanian	ISO 8859-4	
0039.txt	Italian	ISO 8859-1/15	CP 850
0042.txt	Czeck	ISO 8859-2	CP 852
0040.txt	Romanian	ISO 8859-2	
0421.txt	Slowak	ISO 8859-2	
0044.txt	English	ISO 8859-1/15	CP 850/437
0045.txt	Danish	ISO 8859-1/15	CP 865
0046.txt	Schwedish	ISO 8859-1/15	CP 850
0047.txt	Norwegian	ISO 8859-1/15	CP 865
0048.txt	Polish	ISO 8859-2	
0049.txt	German	ISO 8859-1/15	CP 850
0055.txt	Portuguese (Brazil)	ISO 8859-1/15	CP 850
0090.txt	Turkish	ISO 8859-9	CP 857

	Spanish (Castillano, old)		
0099.txt		ISO 8859-1/15	CP 850
0934.txt	Spanish (Catalan)	ISO 8859-1/15	CP 850

12.4 External data backup

To avoid the loss of data located in the RAM of the control system, regularly save the data to an external data medium. This can be carried out in two ways.

12.4.1. Supervisory system "prosys/2"

Among the many possibilities offered by the supervisory system prosys/2, a data backup function is naturally included. This is the most convenient way to protect against the loss of measurement records that serve as quality assurance.

The data back-up is carried out using an external PC that is connected via a modem. Through the simple management of the Windows-based software and a few mouse clicks, all the data or certain selected data are carried over from the control system to the PC. From there the data can be saved as archival storage to a data medium such as a CD, disk, or streamer.

12.4.2. FileTransferManager (FTM)

This software is included in the package of the free of charge Windows-configuration software. The current version of the software package “**ConfigPlus**“ can be downloaded, after the registration on the homepage of demig Prozessautomatisierung GmbH.

By means of this tool, all files of the control system may be safed and restored on an external PC. A connection with a serial cable (RS232) is necessary. The description and handling of the software is in the operating manual and help function of the file transfer manager.

12.5 File structure of the control system

The system software with the associated configuration as well as the process-dependent data are filed in the files with the following file endings in the memory of the control system:

12.5.1. Process dependent files

Ending	*Content*
*.PRG	Handling programs (see chapter 4 "Edit")
*.PAR	(Program) parameters (see chapter 4 "Parameters")
*.WP	Process programs (see chapter 4 "Process programs")

12.5.2. Startup files

Ending	*Content*
*.NUM	Indication parameters (see chapter 8 "Display parameters")
*.PXD	Process view parameters (see chapter 8. "Process view parameters")
*.BKP	Trend parameters (see chapter 8. "Trend parameters")
*.PGZ	Process variables parameters (see chapter 8 "Process variables")
4001.YFC	Scaling parameters (see chapter 8 "Process variables")
*.DID	Display parameters (see chapter 8 "Display")
*.KEY	Definition of softkeys file (see chapter 8 "Softkeys")
*.PDA	Recorder parameters (see chapter 8 "Recorder parameters")

12.5.3. Recording files

Ending	*Content*
*.ST1	Process recording (measurement files) (see chapter 8 "Recorder parameters")
*.DF1	Identification of the associated measurement file concerning measurement beginning, measurement ending, parameter set

12.5.4. System configuration files

Ending	*Content*
*.AW8	Instruction set for the configuration of the analog-input card(s)
*.AD8	from AWL8.EXE translated program
*.LS8	Program listing
*.AWL	Instruction sset for the SPS-Program
*.O	from AWL.EXE translated SPS-Program

*.XRF	Symbol cross-reference list
*.LST	Program listing of the SPS-Program
*.MAP	Symbol table of the SPS-Program
*.SYM	Symbols from SPS and CONFIG
*.PRJ	Project administration file
*.CFG	Block configuration data
*.FMT	Defined data formats
*.DAT	Alarm and message texts (see chapter 8 "Texts")
*.REL	Symbolic programming data
*.PCX,PC2-8	Picture/ graphic files
*.COL	Color tables for color conversions
*.PCY	Summary of all edited pictures
*.PXD,PC2-8	Object data (symbols in pictures)
*.MSG	Error help texts
*.ABL	Operation programs (source codes) (see chapter 2 "Operation")
*.OBL	Compiled operation programs
*.IBX	Compiled, linked operation programs
*.IBT	Applied program sequences for the creation of operation programs
*.SKD	Configuration for the step sequence module

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