

Operating instructions

Control system of the series DE-CP



V.24/06/001

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1. Chapter: Introduction

1.1 Introductory notes

1.1.1. General handling

Before installing, commissioning or operating control systems of the DE-CP series, please read this operating manual completely in order to avoid dangerous situations or damage caused by incorrect operation. This instruction manual is limited to the handling of the control system, not to its field of application. Due to the variable use and the associated complexity of the control system, this instruction manual cannot replace instruction by trained personnel.

Therefore, please note:

- This instruction manual is not a guide for your process engineering application
- Consider the consequences of a malfunction for your process engineering applications
- Only have the control system operated by qualified personnel.

1.1.2. CE conformity

The control systems of the DE-CP series comply with the standards and directives listed in the declaration of conformity. In order to ensure that these are adhered to, the following must be observed by you:

- It is the responsibility of the commissioning engineer to comply with all standards and guidelines for the use, installation, and commissioning of the control system.
- Have the installation of the control system carried out only by qualified personnel
- Ensure that all measures listed in the chapter "Instructions for commissioning" are carried out

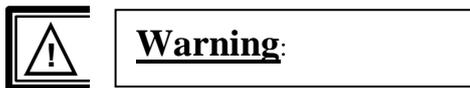
- Customer repairs to the control system are not permitted
- In case of improper use of the regulatory system, as well as violation of the listed provisions, the company demig process automation assumes no liability, and the associated declaration of conformity loses its validity.

1.1.3. Installation instructions

When delivering your control system, inspect it for damage. In case of damage, the device must not be put into operation. During installation, observe the installation and installation conditions listed in the additional instructions (and technical data). Service

1.1.4. Structure of this instruction manual

This instruction manual is structured according to the menu structure of the user interface of the control system. Each main menu item has thus been assigned its own chapter. All safety instructions given are marked with the following symbol:



Extended information is shown in a box with the keyword Note. In the case of security information, it shall be marked with the following symbol:

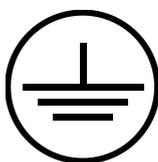


1.1.5. Security icons

The following safety symbols are affixed to the control system:



Attention! Incorrect connection of the device can lead to system malfunctions or damage, quality losses as well as hazards to people and the environment. The connections of the device that are not marked on the device can be found in the corresponding documentation (operating instructions, pin assignment cards).



PE connection (min. 6mm² wire cross-section!)

1.1.6. Disclaimer

Any errors in this instruction manual cannot be excluded. The company demig Prozessautomatisierung GmbH assumes neither legal responsibility nor any liability for printing errors, incorrect information, omissions, etc. and the resulting or incurred damages. The editors are grateful for suggestions for improvement and information on errors.

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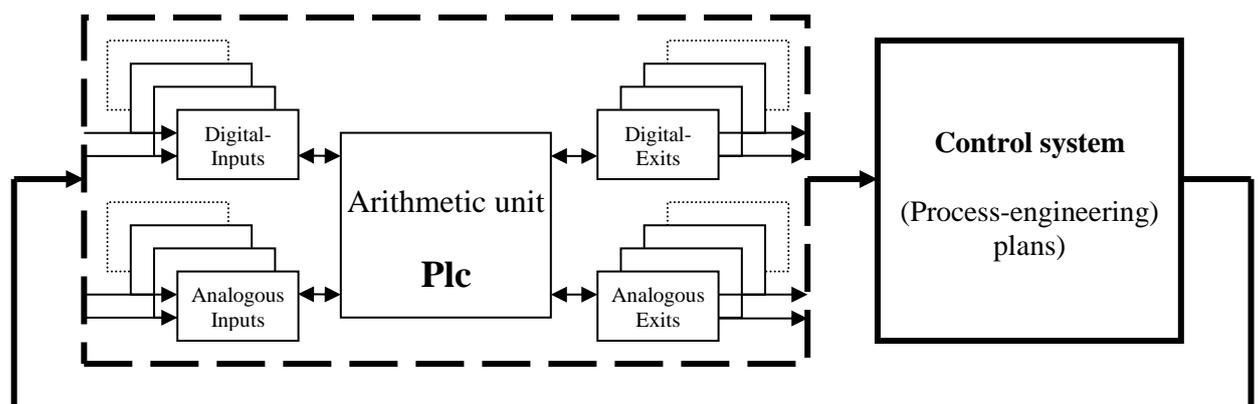
1.2 Brief description of the control system

1.2.1. General system description

The process controllers of the DE-CP series have been developed on the basis of many years of experience from both control and process engineering aspects, whereby great attention has been paid to adaptability to the tasks set and operability.

The adaptation work (configuration) takes place on an external PC. After the configuration phase, the configuration data is transferred to the process controllers.

Due to the internal links to all other program blocks, the integrated PLC can be used for corresponding tasks as with an external PLC. In addition, structures can also be built in the controller itself, such as logical links of internal signals and states. Thus, entire processes in the controller structure can be realized via algorithms that can be created using the PLC functions.



Traceability of process variables

The operation of the configuration software for the configuration of the displayed function blocks such as digital/analog inputs and outputs, internal PLC as well as the definition of the controller structures and the symbolic programming can be found in the operating instructions "Operation and service description configuration software". The technical data of the control systems are listed in the chapter "Service and technical data".

1.2.2. The Program Structure

Programs that include the treatment method are composed of different components in the structure of the process controller. This flexible structure is described below.

The principle of this programming philosophy is that **process programs** each consist of a **sequence program** and a **parameter set**.

Sequence program contains the actual process phases ("heating", "cooling", etc.) with the associated process data (setpoints, section times, etc.).

Parameter set contains additional data that is equally valid for all process phases (bandwidths, limit values, etc.).

For the creation of process programs, their components, namely the flow programs and the parameter sets, are first created.

The flow programs and parameter sets are created individually and stored in separate files. Thus, when compiling process programs, the sequence programs and parameter sets can be combined as desired. This means that different parameter sets can be assigned to the same sequence program in different process programs.

Process programs are therefore merely the compilation of flow programs and parameter sets.

1.3 General information on the operation of the control system

The control system of the DE-CP series is operated by a multi-level menu. Depending on the type, the entries are made via the touch screen, a connected mouse, the internal membrane keyboard or an externally connected PC keyboard. This allows the user to operate the control system quickly and easily.

The control systems are usually operated on plants that have to meet high safety standards. Control systems as automatic monitoring and intervention systems are subject to special requirements. For this reason, visual and dialogue-driven displays have been implemented in the process controller for the operator, which make it possible to monitor the process or to actively warn or inform the operator in certain process or plant situations. These functions are freely configurable.

1.3.1. Menu

1.3.1.1. Menu bar

The selection of a main or submenu item is done via a menu bar, which is displayed at the edge of the screen. The position can be adjusted individually.

Touchscreen

The menu items (functions) are called up directly by finger press on the touch screen.

Keyboard/mouse control

These menu items (functions) can be selected with the **arrow keys/cursors** and executed with confirmation by pressing the "E" key. By entering the function number (number before the function), a point is selected directly.

1.3.1.2. Input menu

Input menus can be very different. Depending on the function, sometimes only certain positions have to be marked or complete alphanumeric entries are required.

Touchscreen

The entries are made via automatically appearing input fields, which are completed with "Input".

Keyboard/mouse control

The input is made via the keyboard of the controller. If there are several options to choose from, selection windows are displayed on the screen in which values are selected with the **arrow keys/cursors** and the "E" key are applied. Selection menus are usually accessed with the "F4" key.

1.3.2. Status Rows

1.3.2.1. Work bar

The system work bar is located above the process screen.

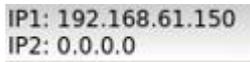


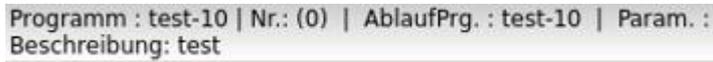
Meldungen: 3 Alarme: 3 22.04.22 11:55:25 IP1: 192.168.61.150 IP2: 0.0.0.0 Programm : test-10 | Nr.: (0) | AblaufPrg. : test-10 | Param. : Beschreibung: test

Here you will see...

 ... the number of alarms and messages. By pressing with [finger pressure](#) or mouse you get directly into the processing area.

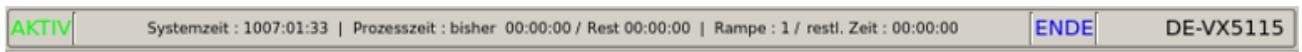
 ... Date and time.

 ... the IP addresses of the plant controller. By pressing with [finger press](#) or mouse, the IP addresses are updated.

 ... the information about the current treatment program.

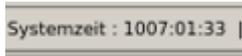
1.3.2.2. Status bar

The status bar is located below the process screen.

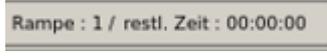


Here you will see...

 ... the program status in the process controller.

 ... the time since the start of the program.

 ... the time in which the program was active as well as the programmed total active remaining time.

 ... the active program section and its remaining time.

1.3.3. System for alarms and messages

During the configuration and configuration of the control system, the safety-related specifications are implemented with the help of the configuration software. The alarm and reporting system is designed in such a way that certain plant and process-related situations, e.g., via the internal PLC, trigger alarms or messages. In the work bar, the number of pending alarms/messages is displayed.

By pressing with [finger pressure](#) or mouse you get directly to the processing area, in which the alarms and messages with date and time of their occurrence are displayed.

1.3.4. General key assignment

1.3.4.1. Membrane keyboard on the controller and external PC keyboard

<i>Membrane keyboard</i>	<i>Function</i>	<i>PC keyboard</i>
	<p>Help system (display of topic-related help texts)</p> <p>Special function key (see respective specification in the menu), e.g.:</p> <ul style="list-style-type: none"> • Initiating Save Operations 	"F1"
	<ul style="list-style-type: none"> • Jump to the last input field • Jump to OK field • Switching scaling in the process screen display 	"F2"
	<p>Alarm/message display</p> <p>Special function key (see respective specification in the menu), e.g.:</p>	"F3"
	<ul style="list-style-type: none"> • Open drop-down menus • Select or deselect checkboxes • Switching to plant diagram <p>Special function key (see respective specification in the menu), e.g.:</p>	"F4"
	<ul style="list-style-type: none"> • Event display for alarm/message display • If characters are selected: one character before • Zoom in all graphs <p>Special function key (see respective specification in the menu), e.g.:</p>	"F5"
	<ul style="list-style-type: none"> • Switching the display of several • Ramp setpoints of a plant • If characters are selected: one character back 	"F6"

- Switch to Testing

Special function key (see respective specification in the menu), e.g.:



- Change access permission
- Copy the program module & paste it behind it
- Show an alphanumeric keypad

"F7"

Special function key (see respective specification in the menu), e.g.:



- Select everything in drop-down menus
- Move back by an input field in input menus
- Switching back from the previous help text in the help system

"F8"

Special function keys



Can be assigned various functions as part of the configuration, e.g.:

- Speed dialing of menu items
- Softkey function

none



Special function button

Switches to the secondary function of a button.

"Shift"

Special function button



Permanently switches to alphanumeric keyboard. Pressing again turns this function off again.

--

Special function key (see respective specification in the menu), e.g.:



- Switch between Graphic, Trend, Process, and Numeric screens

"Page Up"
"Page Off"

Special function key (see respective specification in the menu), e.g.:



- Selecting Functions (Menu Items)
- Confirm entries made and selected data

"Enter"

- Forward movement between input fields

Special function key (see respective specification in the menu), e.g.:



- Abort of input operations without data transfer
- Exit the current menu level to the next higher
- Jump to ESC field
- Pause and End Operations expression

"ESC"



Backspace button

Deletes the character before the current cursor position

Backspace



Switching between plant diagrams

If several plant diagrams are available, they can be changed using these keys

Arrow up - down



Selection and motion functions

Cursor movement in the screen masks

Arrow keys



Jump functions

Jump to the first or last function

"Pos 1" "End"



Number keys

"0" - "9"



Space

"Space"



Tab

"Tab"



Special function keys (see respective information in the menu), e.g.:

"+", "-"

- Change of sign
- Insert or delete rows

Delete button



Deletes the character after the current cursor position. "Del"

1.3.5. The Help System

The control system help system is designed in such a way that the operator presses the "F1/?" is displayed on the screen, which refers to the functional area that is currently being processed (context sensitive).



Go to the help system

When the help system is called up in the main menu, the functions in the submenu with a short description in the help window are displayed for the function selected by the operator in the main menu with the **arrow keys**.

From each help window, the index function can be selected, which has the following functions:

- general information on the regulatory system
- Description of the keyboard layout (see Chapter 1. 3.5.1)
- Description of the status line (see Chapter 1. 3.2) as well as
- Listing, with the possibility to directly select all functions of the main menu and their submenus

1.3.6. Definitions

1.3.6.1. Programs

Sequence program	Program consisting of preconfigured program blocks (process phases) (see 4. Chapter: "Edit")
Program blocks	preconfigured process phases (e.g., program start, heating, cooling) from which sequence programs are created (see 4. Chapter: "Edit")
Parameter set	Program parameters (e.g. setpoint stroke, bandwidths, limit values, tolerances) that are assigned to individual sequence programs and are only valid for this program (see Chapter 4: "Parameters")
Program parameters	see parameter set
Procedure program	Compilation of comment text, program number for external program call, sequence program and parameter set. Process programs are ready-made programs that can be loaded for the execution of treatment processes
System parameters	Parameters (e.g., setpoint stroke, bandwidths, limit values, tolerances) that apply equally to all process programs (general setting)

1.3.6.2. Representations / Displays

Num. Display	of numeric display of selected current process variables
Recorder display	graphical recorder display (line chart) of selected, current process variables
Process representation	graphical display (line diagram) of the process variables of the entire current treatment process, as well as numerical display of the current values
Diagram	Illustration of the plant diagram with display of current process variables

Measurements	Measurements graphical display (line diagram) of the process variable curve of completed, stored treatment processes
Trend	bar chart display as trend barometer of current processsize deviations (see 3. Chapter: "Trend")
Alarms	Important events in the process flow that must be acknowledged by the operator (see 8. Chapter: "Texts")
Messages	Events in the process flow of minor importance. They disappear from the display as soon as the event is over (see 8. Chapter: "Texts")

1.3.6.3. Parameter

Display parameters	Definition of the numerical representation of process variables (see 8. Chapter: "Display parameters")
Recorder parameters	Definition of the display of process variables in recorder mode and measurement recording
Process variable param.	Definition of the process variables that are numerically displayed below the line diagram representation ("recorder representation", "process representation")
Diagram parameters	Definition of the representation of process variables in plant diagrams
Trend parameters	Definition of the display of process variable deviations as a bar chart
Param. "Display"	Defines which display parameters, trend parameters and process variables are displayed directly to the operator.

1.3.6.4. other terms / functions

Softkeys	freely programmable menu items with which functions of the system can be controlled
-----------------	---

Manual	function, through which manual interventions are possible for current process variables
Automatic	function, which resets manual interventions to automatic mode for current process variables
Compensation	Compensation function with which the analog inputs of a configured actual encoder can be adjusted
Compensation (card)	Compensation function, with which analog inputs can be individually adjusted
Step chain	<p>Term for functional sequences in a system that are executed one after the other, e.g., in a vacuum lock:</p> <p>Open the lock > open the front door > load the lock chamber > close the front door > evacuate the lock chamber > open the inner door > unload the lock chamber > close the inner door > equalise pressure in the lock chamber > free lock</p>

2. Chapter: GUI

2.1 Submenu: Commands

The following  Commands steps are offered in the submenu:



 back to previous menu

 Operation of the controller with start, stop and reset of the current process program.

 Time Shift The current temporal position in the process program can be changed by shifting the process time bar.

 Manually Enables manual intervention in the current process variables.

 Controls

Shows a drop-down menu with configured operating programs.



Step chains Configured step chains to control processes.

2.1.1. Time difference



With this function, the current temporal position in the process program can be changed by shifting the process time bar.



Close back to the previous menu.



Left Right Move the process bar by the set increment.



Increase step size Decrease step size Change of step size (in seconds).



Set value The set value is adopted.

2.1.2. Manual



Commands -> Manually : : Commands -> Manually : back to the previous menu.



Manually manual intervention during the running process. The operator can change process variables of the current process program.

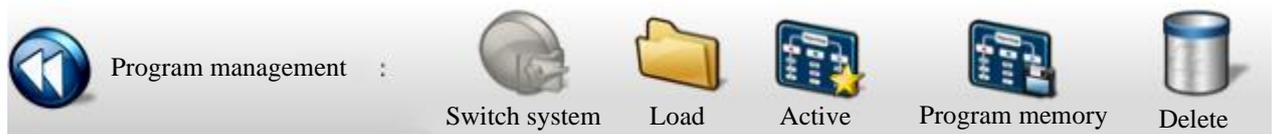


Automatic Downshift to automatic.

2.2 Submenu: Program Management



The following steps are offered in the submenu:



back to previous menu



Switch system

Switch to a different control system.



Load

Load a process program from the data memory into the memory of the control system.



Active

Creating or modifying the current flow programs



Program memory

Creating or modifying executables in program memory



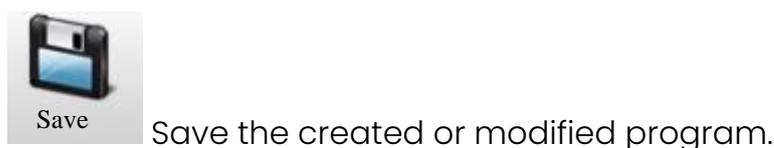
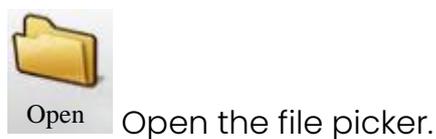
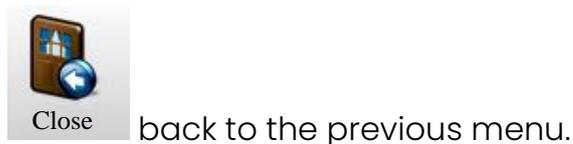
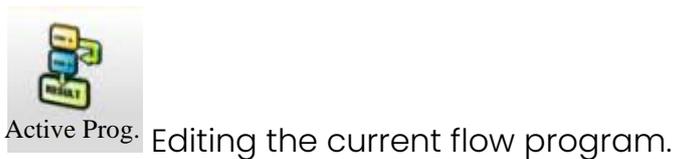
Delete

Delete program files, parameters, process programs, or log files

2.2.1. Active



With this function, a current sequence program consisting of preconfigured program modules (process phases) can be created or changed. The operator is automatically guided to the necessary entries of the variable data. Phase-dependent basic settings such as monitoring, and safety functions are already stored for these program blocks in the system configuration and do not require any further processing. This eliminates incorrect entries and illogical constellations.





Test

Test the created or modified program.

With this function, the curves of ramp data of the individual setpoint channels created in the sequence programs can be displayed graphically and numerically for test purposes.



Close

back to the previous menu.



Open

Open the file picker.



Scale

Select Scaling.



Left



Right

Select the program section.

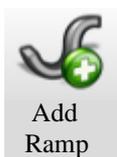


Zoom



Zoom Reset

Toggle zoom on and off.



Add Ramp

Insert a new ramp into the existing program.



Remove Ramp

Delete ramp from existing program.



Error window

Open the error window to display program errors.



Active Param

Editing the current parameter set



Sys. Param.

Editing of system parameters

2.2.2. Program memory



With this function, a program can be created or changed in the program memory of the controller. The operator is automatically guided to the necessary entries of the variable data. Phase-dependent basic settings such as monitoring, and safety functions are already stored for these program blocks in the system configuration and do not require any further processing. This eliminates incorrect entries and illogical constellations.



Proc.Progr..

This function is used to load a process program from the data memory into the main memory of the control system for the execution of a new process.



Parameter

With this function, parameter sets for the sequence programs can be created or edited. These are generally valid data for the process programs, such as bandwidths or fixed setpoints.



Program

With this function, a sequence program can be created or changed from the program memory, which consists of preconfigured program blocks (process phases).



Close

back to the previous menu.



Open

Open the file picker.



New

Create a new flow program.



Save

Save the created or modified program.



Test

Test the created or modified program.

With this function, the curves of ramp data of the individual setpoint channels created in the sequence programs can be displayed graphically and numerically for test purposes.



Close

back to the previous menu.



Open

Open the file picker.



Scale Select Scaling.



Left Right Select the program section.



Zoom Zoom Reset Toggle zoom on and off.



Add Ramp Insert a new ramp into the existing program.



Remove Ramp Delete ramp from existing program.



Error window Open the error window to display program errors.



Table With this function, sequence programs can be created, or existing ones can be changed. All process-dependent parameters are entered manually into a table. Even the programs that have been created with the help of symbolic programming can be edited.



Close back to the previous menu.



Open Open the file picker.



New Create a new flow program.



Save Save the created or modified program.



Test Test the created or modified program.

With this function, the curves of ramp data of the individual setpoint channels created in the sequence programs can be displayed graphically and numerically for test purposes.



Close Go back to the previous menu.



Open Open the file picker.



Scale Select Scaling.



Left Right Select the program section.



Zoom Zoom reset Toggle zoom on and off.



Switch RSG Switching to other ramp setpoints



Add Row

Append a new row to the selected one



Up

Move selected row up



Down

Move the selected row down



Delete Row

Delete row

2.2.3. Delete




Close Go back to the previous menu.


Select all Select all offered files.

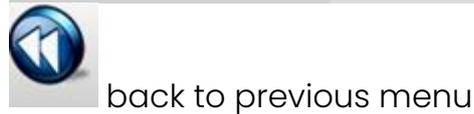

Deselect all Deselect all offered files.


Delete Delete selected files.

2.3 Submenu: Measurements



The following steps are offered in the submenu: Measurements



Active

After selecting the desired recorder, the active recording is displayed in a line chart.



Archived

After selecting the desired recorder, a selection menu with all or recorder-specific measurement files stored in the memory of the control system is displayed. For the respective file, an information window is displayed in the right screen area, which shows the start or end point of the measurement. After selecting the measurement file, the recording is displayed in a line chart.



Config.

After selecting the desired writer, it can be configured.



Delete

Measurement files can be selected and deleted.



2.4 Submenu: Alarms



The following steps are offered in the submenu:  Alarms



The alarm and reporting system is designed in such a way that certain plant and process-related situations trigger alarms or messages, e. g., via the internal PLC.



back to previous menu



Alarms

With this function, alarms with the date and time of occurrence can be retrieved.



Acknowledge

Alarms are security-relevant and must be acknowledged by authorized users.



Disp. Hist. on/off

This displays a history of alarms, user accesses and program changes.



Messages

This function can be used to retrieve messages with the date and time of occurrence.

3. Chapter: Service and technical data

3.1 Abstract



Warning:

In order to prevent loss of treatment programs and measurement recordings, a data backup should be carried out before any intervention in the hardware of the system!

This chapter describes how

- necessary maintenance work is carried out,
- plug-in cards are inserted or removed from the device during system expansions,
- in the event of disturbances in the regulatory system,
- an operating system change or an update of the controller software must be carried out.

Furthermore, a list of the technical data of the control systems is contained in this chapter.



Warning:

The service instructions described in this chapter must be observed and are considered **safety functions!** Improper operation by unauthorized personnel can lead to system malfunctions, damage, loss of quality, as well as endangerment of people and the environment.

In order to avoid these risks, ensure the service of the control systems only by trained and authorized personnel!

3.2 General maintenance

3.2.1. Memory buffering maintenance

The loss of the memory content, e.g., due to a power failure, is prevented by the use of an integrated USP. This is maintenance-free, but can be repaired in our house in case of problems caused by wear and tear of the capacitors.

3.2.2. Cleaning and maintenance of the membrane keypad and screen

The front panel with the membrane keypad is a plastic-coated surface (according to DIN 40050 protection class IP65). This surface, as well as the screen of the monitor, can be maintained with a damp cloth and commercially available neutral cleaners (glass cleaner).



Warning:

It is essential to avoid:

- Dripping Wet Treatment
- Aggressive Cleaning Agents
- Operation of the membrane keypad with sharp objects

3.3 Cards/ Power Supply

3.3.1. Types and position in the device

The flexibility of the control systems of the DE-CP series is not only due to the configuration and commissioning software, but also to the large number of available hardware extensions. These expansion cards can be combined with each other as desired. Also, the position of the individual cards in the device is not important, as they are addressed via a common bus system.

Only the power supply and the communication backplate have their fixed place.

3.3.2. Exchange of cards (DE-CP X2X only with external ECB bus)

Possible reasons for changing cards:

- Replacement of the card in case of defect
- Additional card for e.g., plant expansion, modernization, automation

The replacement of cards, which are inserted into the device from behind and screwed, can be carried out by the personnel themselves, taking into account the following procedure. Service

- I. **De-energize** the control system (unplug the power supply) and wait until the LED on the power supply is extinguished.

 **Hint:**

If the cards are pulled out of the device under voltage or plugged into the system, there is a risk that electronic components will be destroyed by voltage peaks!

- II. Loosen the screw connection of the card
- III. Pull out the card (if necessary, carefully lever it out with a small screwdriver)
- IV. Insert the card again, insert the card into the guide rails and slide it into place until it clicks into place. Do not misjudge the card and **do not** use violence!
- V. Turn the control system back on.

 **Hint:**

Further work is only to be carried out according to the manufacturer's instructions!

3.3.3. Disturbances

Hardware-related faults can have very different characteristics and can be detected in different ways. The spectrum ranges from a total failure of the entire system to the incorrect display of process variables.

Possible measures for troubleshooting

<i>Description</i>	<i>Control</i>	<i>Measure</i>
Dead loss	Checking the status LEDs on the panel and on the ECB unit (if present)	If the LED is not lit, de-energize the controller and contact the Demig Support
Display dark, control works	Knock test on the display unit, screen saver active?	Controller restart. Attention the process will stopped!! If the controller still does not respond, contact Demig Support.
Display dark, control does not work	Control of the power supply and the status LEDs	Switch the mains off and on, control of the LED. Otherwise contact the Demig Support
Temporary malfunction or temporary total failures	Control of the protective earth connection, grounding cable mains filter - control cabinet available?	Establish PE connection, check contact resistances, Otherwise contact the Demig Support
Fault at digital inputs and outputs	Control of the external power supply for digital input and output cards, min 18V required	Check power supply for 24V supply, replace if necessary

Interference with digital and analog inputs and outputs	Checking the mating plugs for correct fit	Disconnect the mating plug and plug it in again
Communication errors between controllers and other connected systems. In the status bar, the display COM1, NET, PB, PBM is no longer visible!	Check cable connections, check connected systems according to manufacturer's specifications, loose contact?	If necessary, replace cables or interfaces, dive defective modems, Otherwise contact the Demig Support
Actual value display is "****"	Check cables or thermocouples, check polarity	If necessary, replace thermocouples, replace the compensating cable, if necessary, reverse the polarity of the cable if necessary
Controller shows only a white image	Check power supply, knock test display unit	Switch the device off and on, otherwise contact the Demig Support

3.3.3.1. Particularities

The mating connector of the analog 8-fold input card (AD8) as well as the analog 4-fold single/2-fold off (AD4/DA2) contains one or two temperature sensors for measuring the plug temperature as a reference point value. When using one of these cards, only the mating plug provided for this purpose must be used. If a sensor is defective or is not present due to swapping the plugs, a plug temperature of 40°C is automatically assumed.

Manufacturer Direct Service

demig Prozessautomatisierung GmbH offers the following options for fast support in the event of malfunctions:

a) Telephone support (+49 (0)271/77202-25)

Many malfunctions are based on incorrect settings or are due to incorrect operation and can often be eliminated by direct contact with the technicians on the phone. Before that, it is advisable to copy the fault checklist (see www.demig.de) from the operating instructions and fill it out and send it to our technicians by email (Support@demig.de). In conversation, the technician can use the checklist and specific questions to narrow down the fault location and initiate measures more easily more effectively.

b) Email Support (Support@demig.de)

The same applies to email support as to telephone support. It is possible to complete and send the fault checklist online. This allows technicians to quickly identify the devices and take further action immediately.

c) Repair and spare parts service

In some cases, the complete control system or individual components (cards, power supply, etc.) must be sent to the manufacturer. In order for the technicians to be able to perform the service as quickly as possible, you also need a description of the fault(s). The fault checklist can be used for this. If the customer wants a spare part, the delivery time is chosen according to the customer's wishes. It is possible to deliver spare parts on the same day of the order. Otherwise, if the spare part is directly available, we have a 24-hour spare parts service as standard.

d) Loaner and replacement equipment support

By arrangement, it is possible to provide the customer with a loan or replacement device for the duration of the repair of the original device. In close cooperation with our plant and furnace manufacturers, it is also possible to configure and deliver process controllers that have not been configured by us. This requires the backup you have created from the device to be repaired. As a rule, loaner devices are provided free of charge.

e) Serviceuse

Of course, technicians can also be requested directly from demig Prozessautomatisierung GmbH or via the respective plant manufacturers. This refers to the task areas software or hardware.

3.3.3.2. Reachables:

Contact Support: +49 0271 77202-25

Email: Support@demig.de

URL: www.demig.de

3.4 Update of the system software

3.4.1. Required tools

- External PC or laptop with Ethernet Port
- Ethernet Cable
- Update file (e.g. via e-mail) from demig Prozessautomatisierung GmbH.
 - **Filename:** 202424qx.tbz
 - **Update for:** All DE-CP Controller Systems
- The first 6 numbers of the file name indicate the release date (year and calendar week) of the update.

3.4.2. Performing the update with "FileTransferManager"

The program "FileTransferManager (FTM)" can be downloaded from the website of demig Prozessautomatisierung GmbH. This makes it much easier to perform an update.

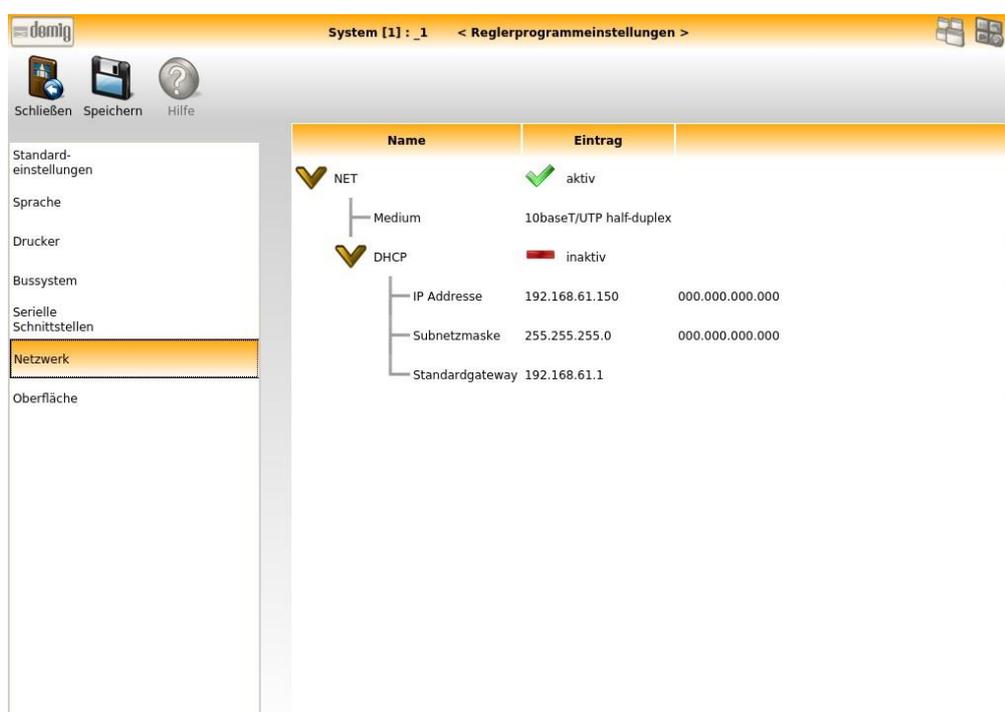
The description of the procedure is presented in a separate operating manual, which can also be downloaded.

3.5 Connection Types with the Control System

3.5.1. Network connection (Ethernet)

The control system of the DE-CP series can either be integrated into a network via a fixed IP or assigned a dynamic IP via a DHCP server.

The settings are made in the menu "Utilities function Settings".

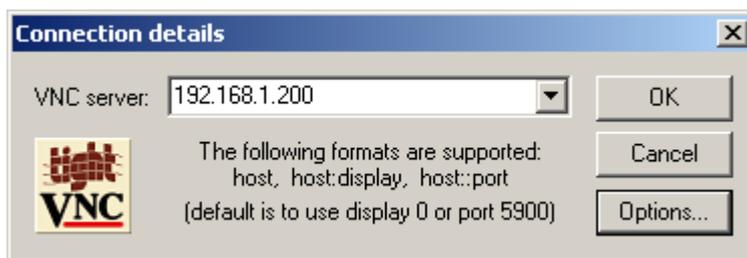


3.5.2. Remotcontrol with VNC

It is possible to establish a connection to the control system with a VNC program. This allows the control system to be monitored and operated from an external workstation.

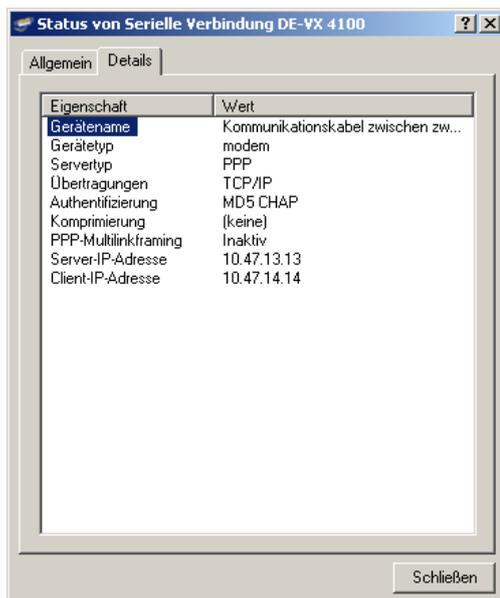
3.5.2.1. Connection establishment with VNC

Connect to the control system and launch any VNC viewer. In this example, the TightVNC Viewer is used and the connection to the control system is via Ethernet.



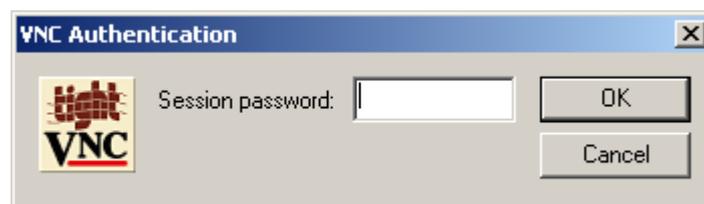
For "VNC server", enter the IP of the controller and click "OK".

The IP of the controller for an Ethernet connection is located in the "Network+" menu next to the MAC address of the network adapter.



If you have a dial-up connection, this is displayed in the connection details (default value: 10.47.13.13).

Once the connection between the PC and the control system has been established, the access password will be asked:



Password for read access: **demig**

Password for full access: **DEcontrol**

With "OK" the password is transferred and the slider screen is displayed on the PC.

3.5.2.2. Changing VNC Passwords

The passwords for read or full access can be changed in the control system. To do this, exit the control program with "Alt" + "X" (or "Shift" + "F8" on the membrane keyboard). Then enter the code "7076" (top right of the slider screen).

```
+ DE-UX 4100 - demig Prozessautomatisierung GmbH --+
( U 20070410 )
+-----+
|          1*  de4100
|          2   de4100-null
|          3   show log file
|          4   network+
|          5   maintenance+
+-----+
|
|          < OK >
|
+-----+
```

Switch to the "Maintenance" menu item.

```
+ DE-UX 4100 - demig Prozessautomatisierung GmbH --+
maintenance
+-----+
|          1  change port [COM1]
|          2  change speed [115200]
|          3  receive update
|          4  send logfile
|          5  send corefile []
|          6  install update []
|          7  switch to UTY1
|          8  show update history
|          9  remove ALL configuration files
|          J  change vnc passwords
|          K  keyboard test
|          C  calibrate touch screen
|          R  reboot
|          H  halt
+-----+
|
|          < OK >          <Cancel>
|
+-----+
```

After selecting the menu item "change vnc passwords", the new password for full access is required after a security prompt:

3.6 Order numbers for spare parts

Sales contact details:

Phone +49 (0) 271 77202-32

E-mail: vertrieb@demig.de

3.6.1. Power supplies

<i>Article</i>	<i>Designation</i>	<i>Description</i>
340 435	24V Power supply	120W/24V 5A

3.6.2. I/O Cards

<i>Article</i>	<i>Designation</i>	<i>Description</i>
601 613	AD8 Card Dual Sensor	8 analog inputs
601 615	DA8 Card DC/DC	8 analog outputs, 12 bit
601 614	AD4/DA2 card (combo)	4 analog inputs / 2 analog outputs
601 616	AD4/DA2 card with SA	how 601409 with 1xshift output
601 611	32-fold digital input card	32 digital inputs
601 612	32-fold digital output card	32 digital outputs (transistor)
601 608	24IN/ 16OUT	24 digital inputs, 16 digital outputs

3.6.3. Communication

<i>Article</i>	<i>Designation</i>	<i>Description</i>
551 408	Profi-Bus connector axial	with switchable termination
551 416	Profi-Bus plug 90°	with switchable termination
602 600	Plug DP with Pt100	analog connection DP
602 618	DP connection cable	Connection Module DP

3.6.4. Connector

<i>Article</i>	<i>Designation</i>	<i>Description</i>
602 601	Output connector standard	
602 612	M connector AD4/DA2	Connection to 601 614
602 604	M connector AD4/DA2 m. S.	mA switching output
602 605	M connector AD4/DA2 m. S.	V-switching output
602 614	Mating connector AD8/DS	Connection to 601 613

3.7 Specifications

3.7.1. System Computer Unit

- Intel® Dual Core 2 GHz
- 4GB DDR4 Random access memory
- 40GB M.2 Flash Memory
- All data incl. programs, measurements and process status in flash
- UPS for Data Integrity
- Multi-level watchdogs, system health, voltage and temperature monitoring
- Real-time clock RTC, battery-backed
- Integrated PLC (compatible with other PLCs, such as Siemens Simatic S5 and S7), max. PLC program length: 60,000 instructions with time required for 1,000 bit instructions of < 0.2 ms up to 256 timers, 1024 messages, 1024 alarms (optionally switched on delayed)

3.7.1.1. Interfaces/ Connections

- 2x Ethernet 2.5GbE with TSN
- 1 COM DE9 DIN-RS232 (galvanically isolated)
- COM DE9 DIN-RS232/RS422/RS485 externally expandable
- 1x USB 3.1 Gen.2 Type-C
- 2x USB 3.1 Gen.2 Type A
- 1x USB Demig IO
- Various protocols integrated: e.g. ModBus TCP and RTU (Master/Slave)
- Profibus/Profinet communication "optional" (Master/ Slave)
- **BUS system** for:
 - 10 In- or Outputcards (DE-CP X4X)

 **Hint:**

In the DE-CP Control Systems, all serial interfaces (COM1) are galvanically connected to the internal device ground.

In contrast, the shielding is galvanically isolated from the internal device ground.

Interference possibilities are given when electrical devices (e.g., printer, PC) are connected to the interfaces of the DE-CP, in which no galvanic isolation from the internal ground to the shielding / protective conductor is present.

3.7.1.2. Display

DE-CP 3XX-01:

- 10.4" TFT LCD colour display with extra-large viewing angle
- XGA resolution 1024x768 pixels, 65536 colors

DE-CP 5XX-01:

- 15" color touch display with extra-large viewing angle
- XGA resolution 1024x768 pixels, 65536 colors

3.7.1.3. Operation

- Membrane keypad (according to DIN EN 60529 protection class IP65) (DE-CP 3XX-01 only)
- Touch display (according to DIN EN 60529, protection class IP 65) (DE-CP 5XX-01 only)
- Externally connectable USB keyboard and mouse

3.7.1.4. Safety

- double security function through global and local watchdog functions
- Power failure monitoring

3.7.2. Installation and mounting

- Operating ambient temperature 0...+45°C
- relative humidity 0 - 90% non-condensing at +40°C and below 3000m
- Storage temperature -20...+60°C
- Overvoltage category III (according to DIN EN 60664-1)
- Degree of contamination 2 (according to DIN EN 60664-1)
- Installation distance in the control cabinet upwards and downwards 15 cm

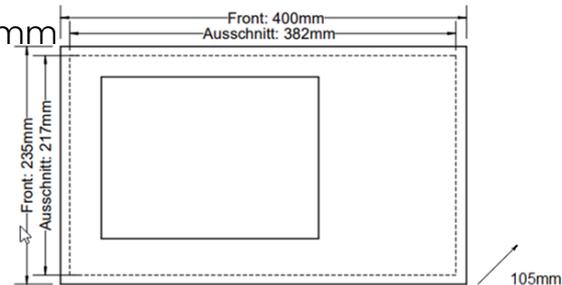
3.7.2.1. Potentials

In order to ensure trouble-free operation (EM compatibility), the device shield must be connected to the protective conductor at the ground point on the back of the device. (Minimum diameter 6 mm², better mass braided tape)

3.7.3. Installation dimensions and aperture dimensions

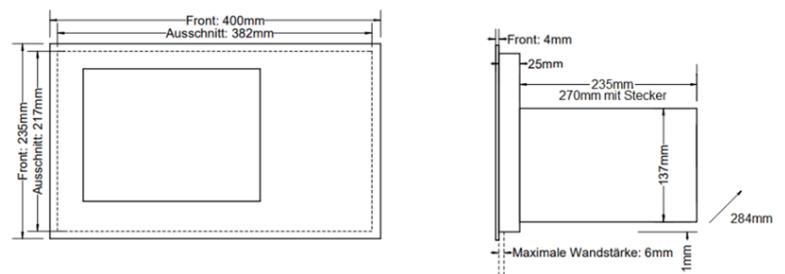
3.7.3.1. DE-CP 32X-01

- Aperture dimension 10" approx. 400x235x4mm
- Cutout 10" 382x217mm
- Installation depth: approx. 105mm
- max. wall thickness 6mm
- Weight 10" approx. 4.3 kg



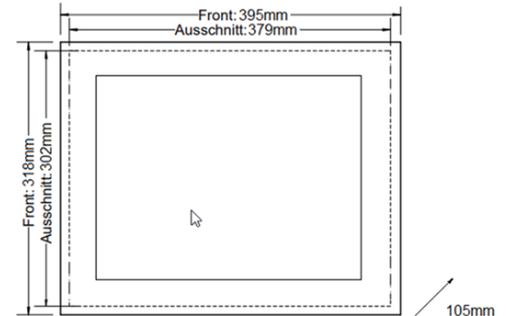
3.7.3.2. DE-CP 34X-01

- Aperture 10" approx. 400x235x4mm
- Cut-out 10" 382x217mm or 284x137mm (adapter frame)
- Installation depth: approx. 235mm (270mm with plug)
- Max. wall thickness 6mm
- Weight 10" approx. 6.0 kg



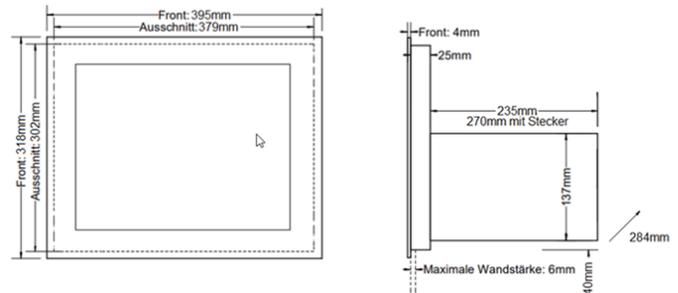
3.7.3.3. DE-CP 52X-01

- Aperture 15" approx. 395x318x4mm
- Cut-out 15" 379x302mm
- Installation depth: approx. 105mm,
- Max. wall thickness 6mm
- Weight 15" approx. 5.6 kg



3.7.3.4. DE-CP 54X-01

- Aperture 15" approx. 395x318x4mm Cut-out 15" 379x302mm
- Cut-out 15" 379x302mm or 284x137mm (adapter frame)
- Installation depth: approx. 235mm (270mm with plug)
- Max. wall thickness 6mm
- Weight 15" approx. 7.1 kg



3.7.3.5. Installation material

10" and 15" panel housing mounting kit

Article number: 394210

Adapter frame 10"

Item number: 390998

Mounting kit adapter frame 10"

Article number: 394210

Adapter frame 15"

Item number: 390975

Mounting Kit Adapter Frame 15"

Item number: 394215



4. Chapter: Appendix

4.1 Compensation

4.2 Compensation instructions

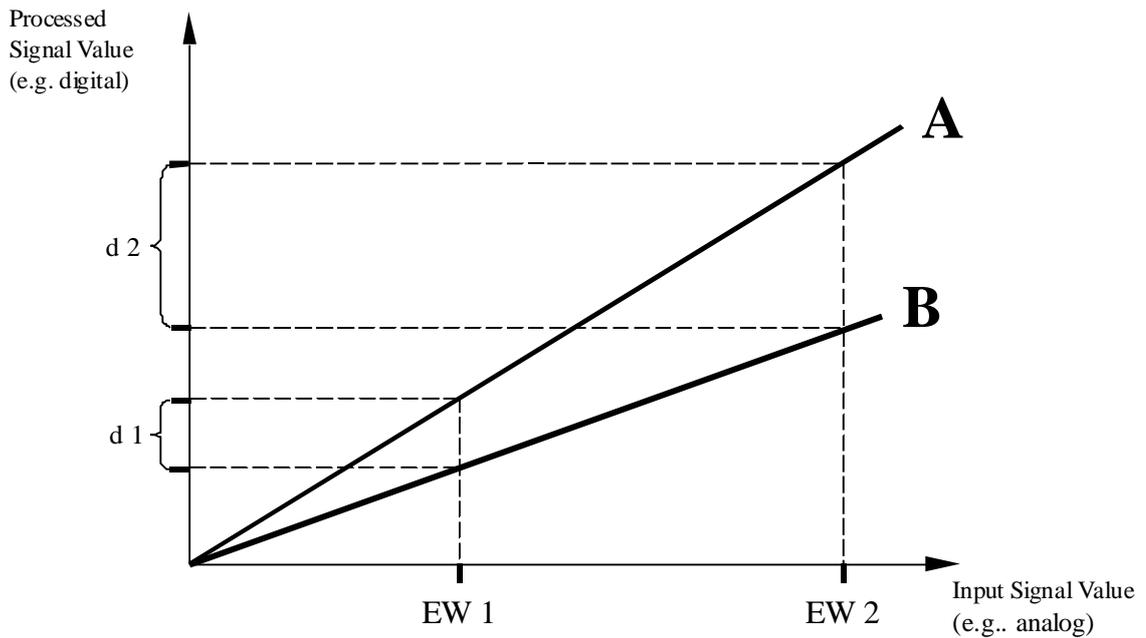
4.2.1. Why a compensation?

The analog input cards (e.g. AD8-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).

4.2.1.1. 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.

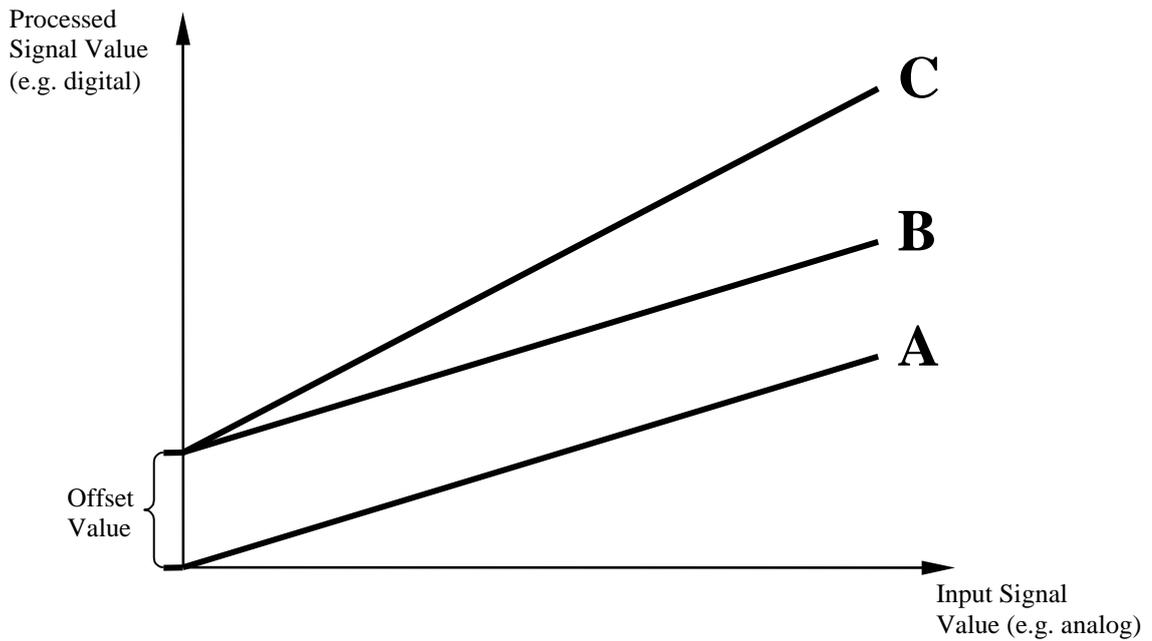


As a result, the input values (EW1, EW2) of the characteristic curve **A** have a clearly higher output value (processed signal value) than is the case with characteristic curve **B**. Hence, the resulting tolerances (d1, d2) are not negligible and must be accounted for compensation.

4.2.1.2. 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.



4.2.2. Compensation for the DE-CP

The process controllers DE-CP 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.

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 people and the environment. To avoid these risks it is necessary to make sure that only instructed and authorized people operate the system (compare code function)!

4.2.2.1. 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 referential 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 O₂-probe, resp. of the CO₂-analyzer but with the menu point "*C-level (steel) 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.

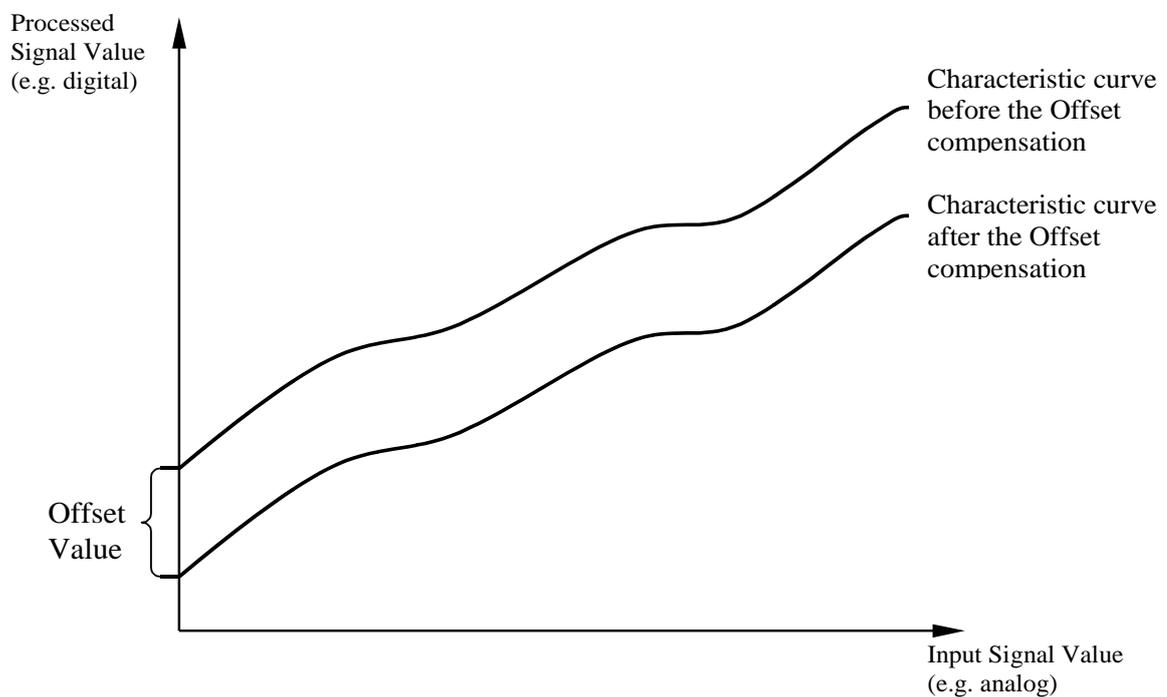
2. Input this value (40°C) as the first actual value in the control system. In doing so, overwrite the indicated value and confirm the input by pressing "E".
3. To compensate the point 2, a different value must be adjusted to mA-/ mV-transmitter. This value should be a minimum of 50% of the

measurement range larger than the first value (approx. 75% of the measurement range). The implementation is identical to that of the first point.

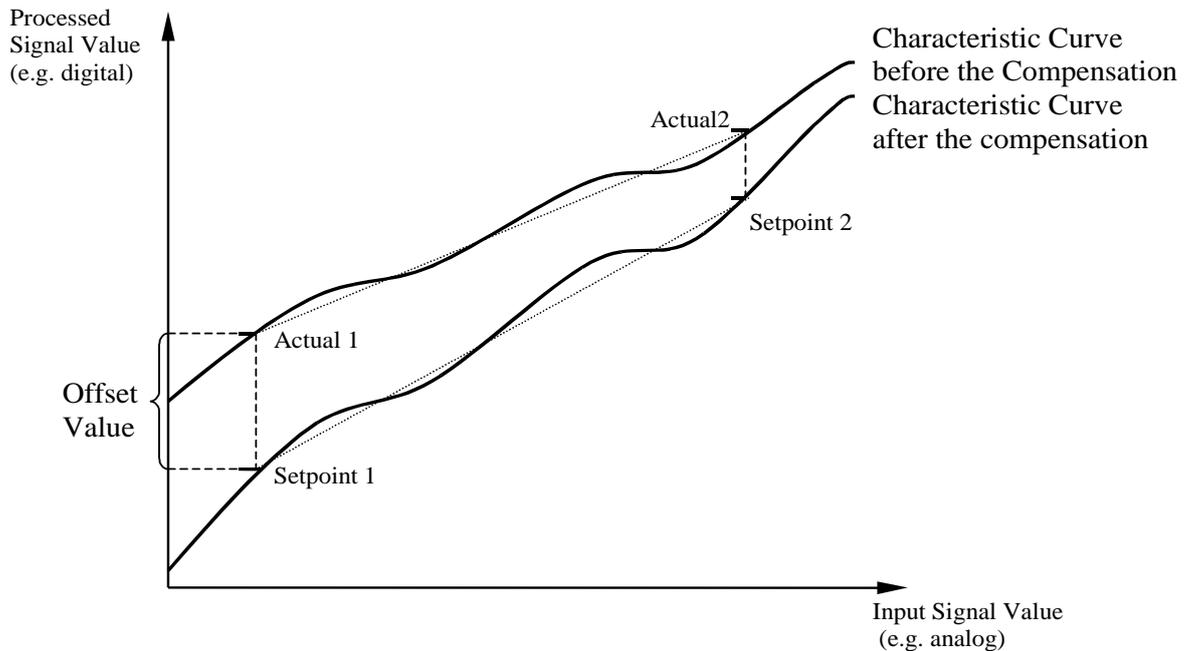
- Calculation of the control system after the compensation

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:

$$\text{(Value of the table)} * \text{amplification factor} + \text{offset value} = \text{corrected value}$$

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

4.2.3. 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, CO₂-analyzer, O₂-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.

4.2.3.1. 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 temperature** 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.

4.2.3.2. 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 and 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.

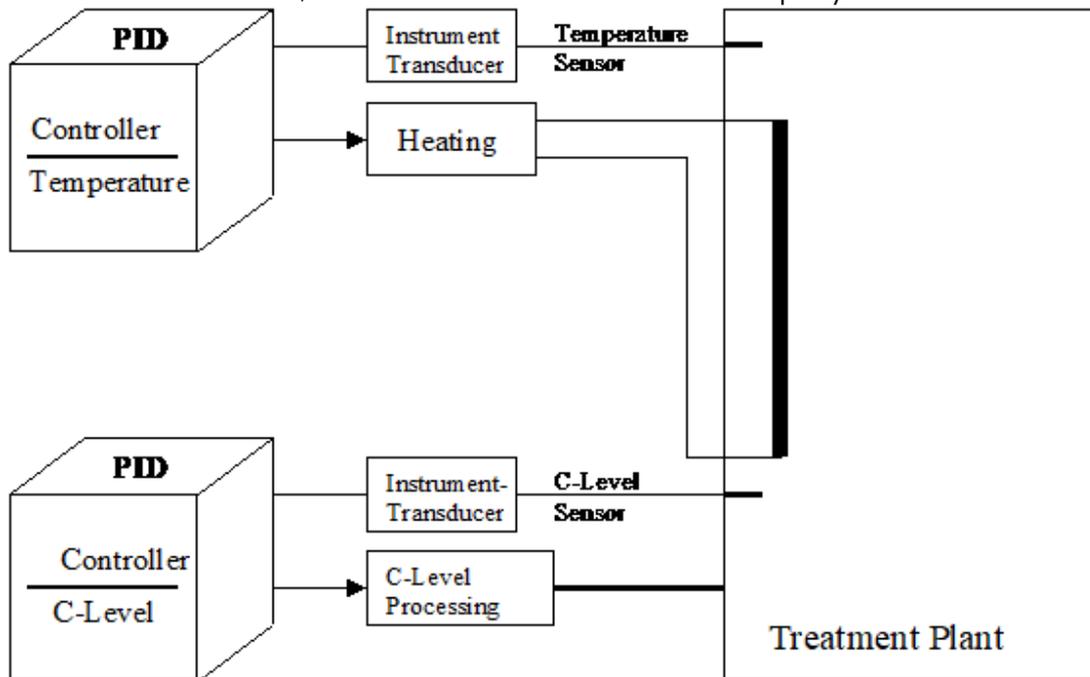
4.2.3.3. mV-Compensation

The compensation of the mV-input of the AD8-card of the control 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!

4.3 Instructions for adjusting the controller parameters (PID)

4.3.1. The DE-CP in the loop

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



The DE-CP 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.

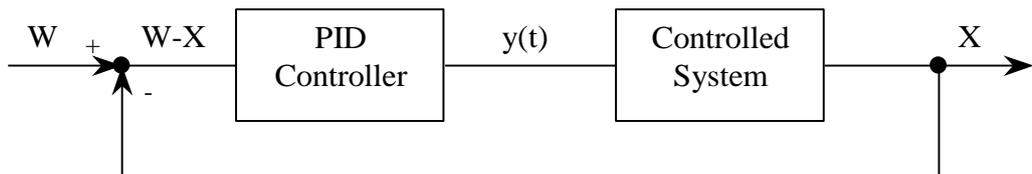


Warning:

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

4.3.2. 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:

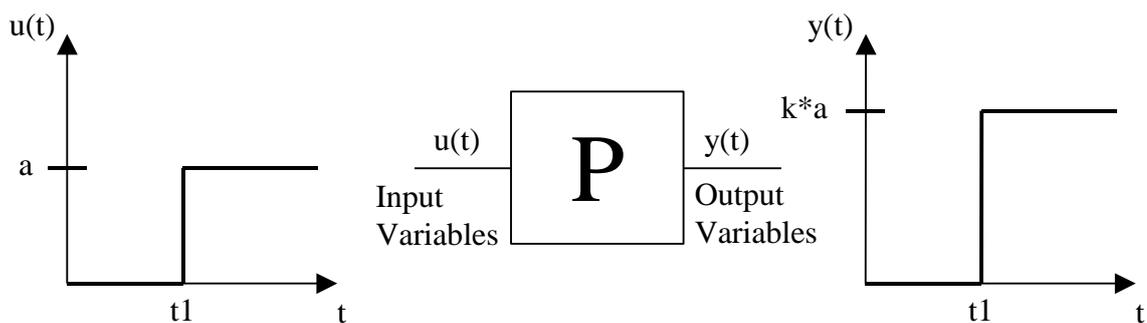
$$\text{Setpoint}(w) - \text{Actual Value}(x) = \text{Control Difference}$$

4.3.2.1. What means PID?

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

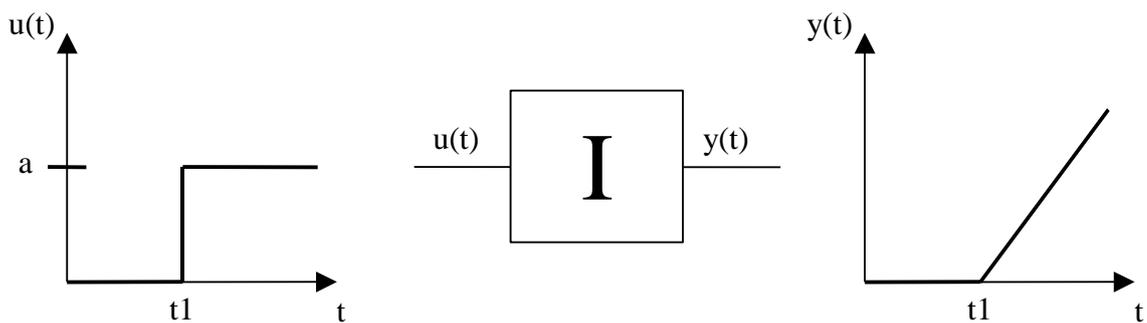
PID-controllers consist of three components, which work together to achieve the best possible controller efficiency. They are shown below for clarification (however without timers):

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



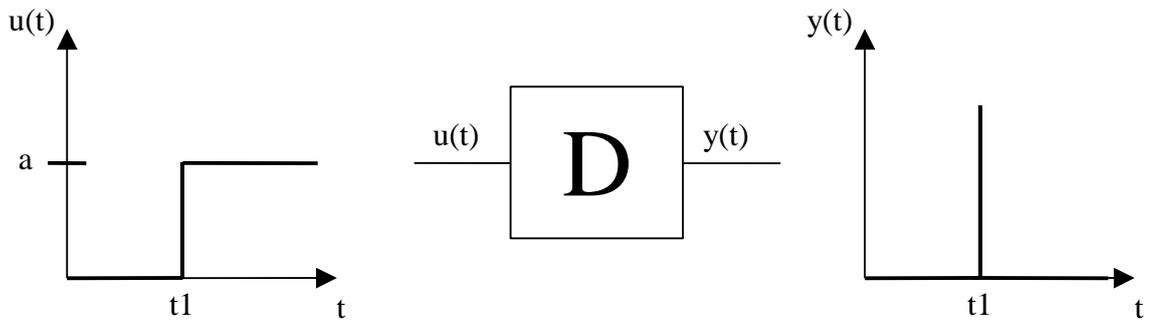
I = Integrated part (T_N)

Effects the Compensation-consistent controller differences.

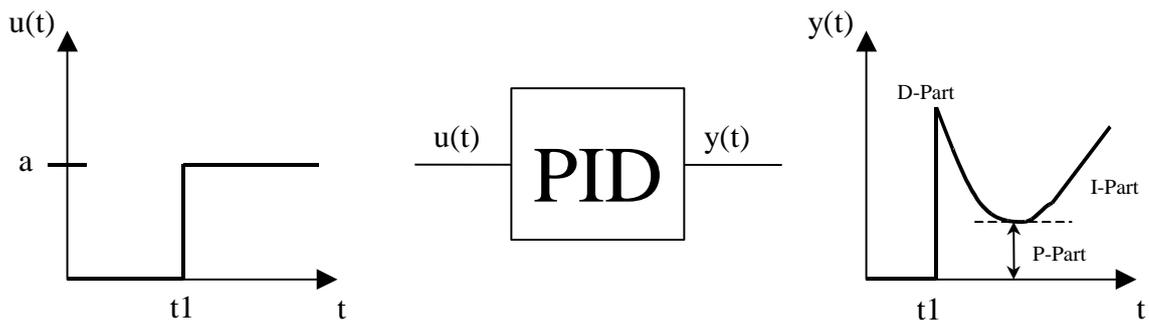


D = Differentiating part

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.



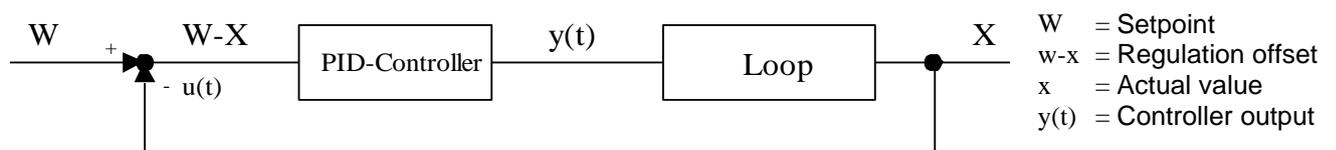
If these three components are combined under consideration of a time component, which will not be mentioned here in detail, the following curve progression will result at the output of the controller after an erratic change of the input.



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:

$$y(t) = K_p * [(w - x) + \frac{1}{T_N} * \int (w - x) dt + T_V * \frac{d(w - x)}{dt}]$$

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 $T_V = \frac{T_N}{5...8}$ 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

4.3.3. 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.

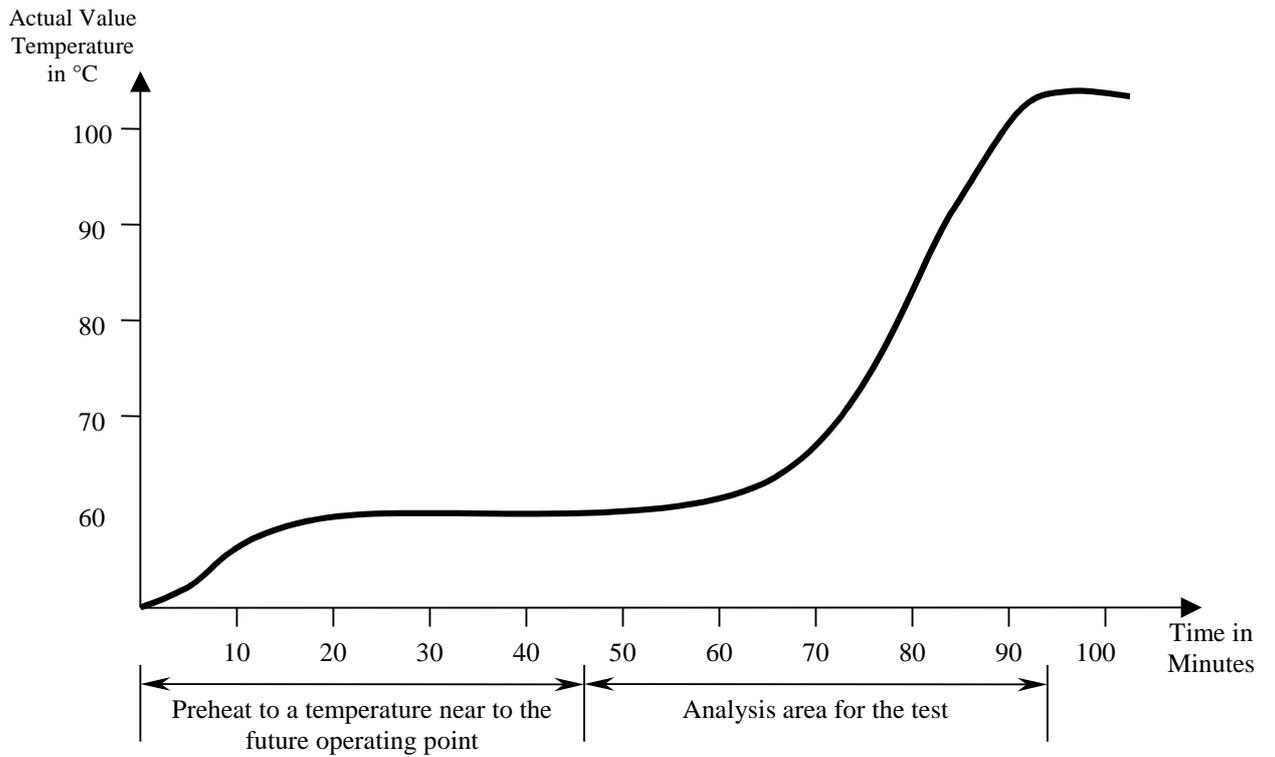
4.3.3.1. Implementation

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).

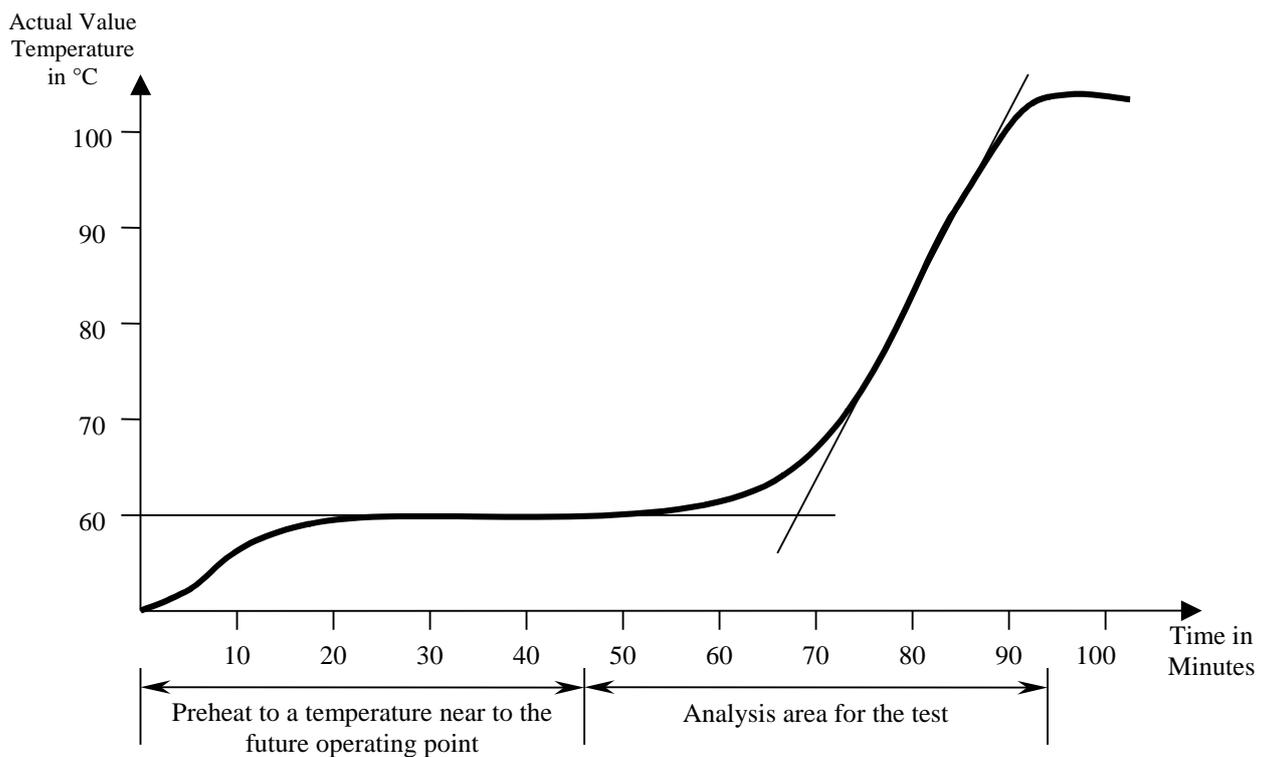
Attention:

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

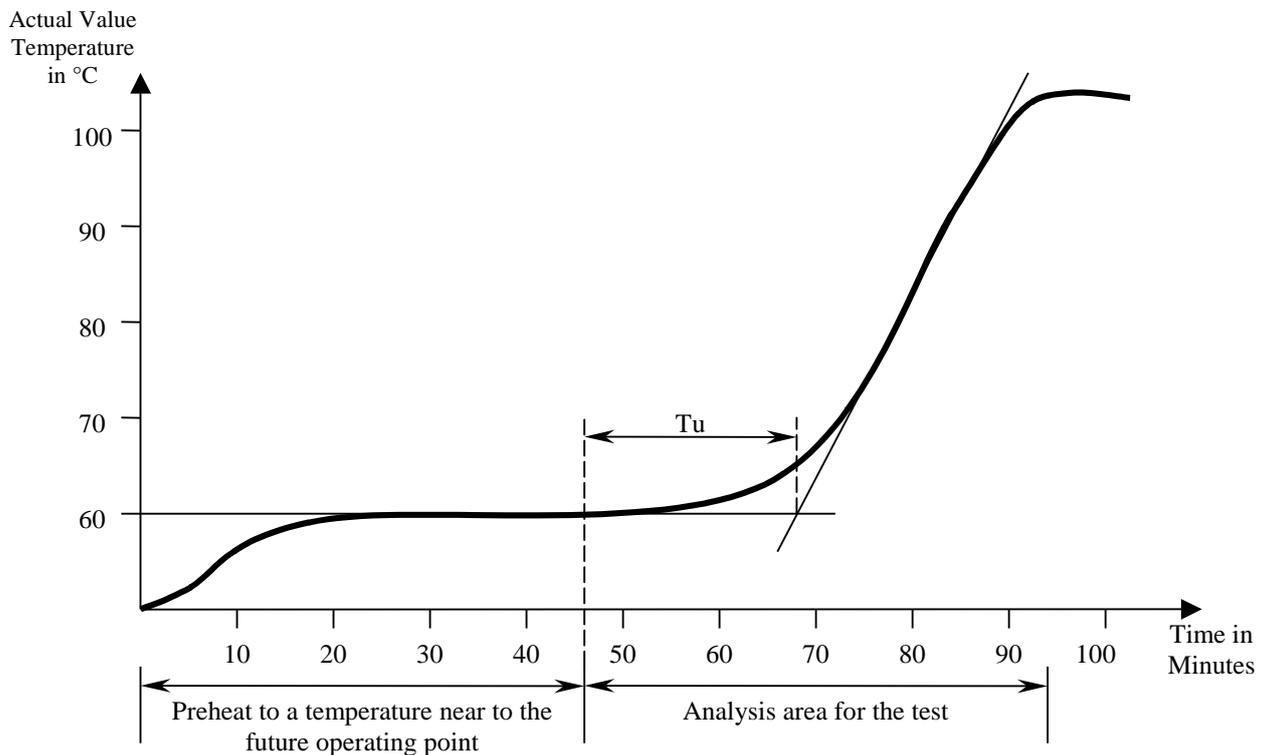
4. The actual value now increases. Interrupt the test at a higher actual value than the previously mentioned operating point (e.g. by reaching 100°C, the procedure will be discontinued, meaning a lower set point can now be reset)
5. Now analyze the existing recorder results:



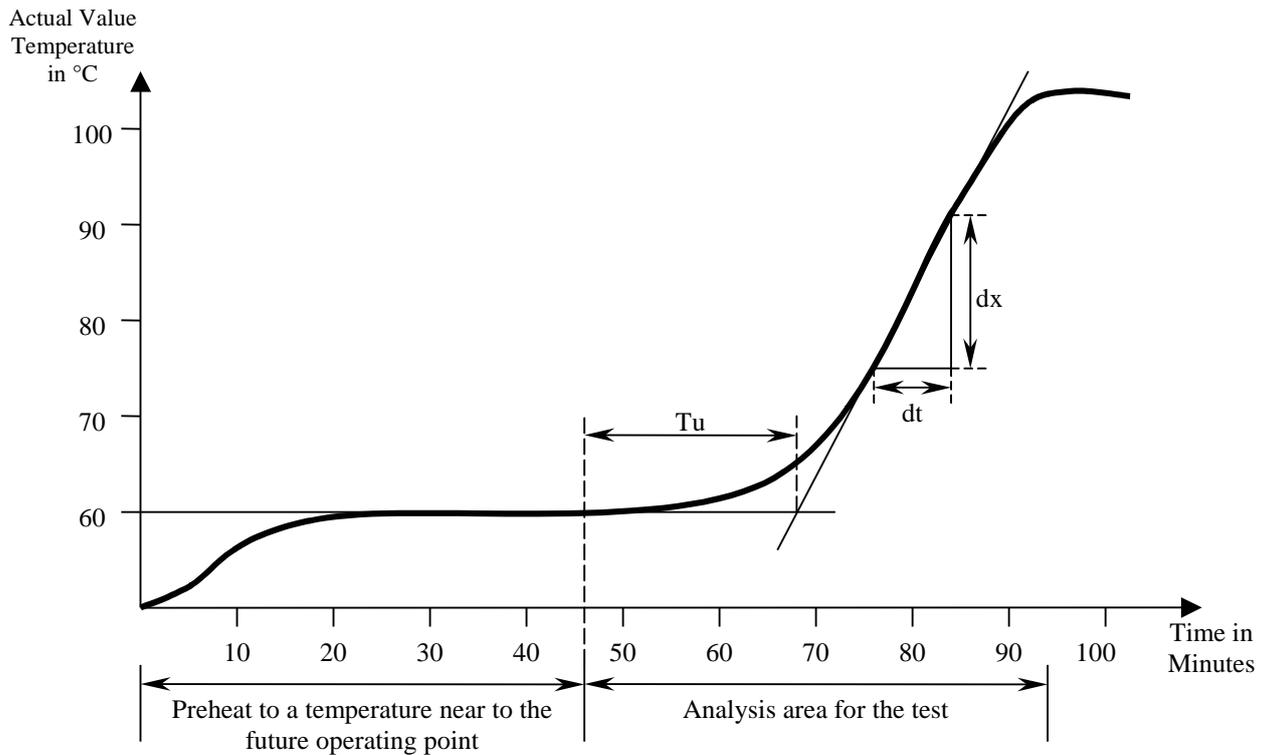
6. Draw a straight line parallel to the timeline, through the actual value that was set before the test (here 60°C). Subsequently, draw another straight line on the rising characteristic curve in the analysis area.



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:

$$X_p = 0,83 * V_{\max} * TU$$

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

$$T_N = 2 * TU$$

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

In the Example:

$$X_p = 0,83 * 1,6 \frac{^{\circ}\text{C}}{\text{min}} * 12 \text{ min} = 15,9^{\circ}\text{C}$$

$$T_N = 2 * 12 \text{ min} = 24 \text{ min} = 1440 \text{ sec.}$$

$$X_p = \frac{15,9^{\circ}\text{C}}{100^{\circ}\text{C}} * 100\% = 15,9\% = 159 \text{ per mill}$$

$$T_V = \frac{1440 \text{ sec}}{6} = 240 \text{ sec}$$

4.3.3.2. 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.

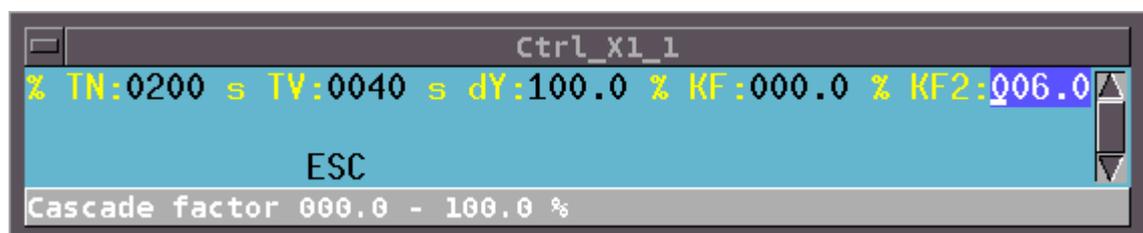


By means of the value "dY" the output of the controller block (the controller output) can be limited temporarily. In case of a jump of the setpoint, this effects that the controller output does not jump up but it adjusts itself slowly. The set value for "dY" causes a percentage changing of the controller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

4.4 Languages

4.4.1. Country code

Sprachdatei	Sprache	Kodierung DE-VX 4XXX	Kodierung DE-VR 400X
0007.txt	russisch	ISO 8859-5 ¹⁾	CP 866 ²⁾
0031.txt	niederländisch	ISO 8859-1/15	CP 850
0033.txt	französisch	ISO 8859-1/15	CP 850
0034.txt	spanisch (Castellano)	ISO 8859-1/15	CP 850
0036.txt	ungarisch	ISO 8859-1/15	CP 850
0037.txt	litauisch	ISO 8859-4	
0039.txt	italienisch	ISO 8859-1/15	CP 850
0042.txt	tschechisch	ISO 8859-2	CP 852
0040.txt	rumänisch	ISO 8859-2	
0421.txt	slowakisch	ISO 8859-2	
0044.txt	englisch	ISO 8859-1/15	CP 850/437
0045.txt	dänisch	ISO 8859-1/15	CP 865
0046.txt	schwedisch	ISO 8859-1/15	CP 850
0047.txt	norwegisch	ISO 8859-1/15	CP 865
0048.txt	polnisch	ISO 8859-2	
0049.txt	deutsch	ISO 8859-1/15	CP 850
0055.txt	portugiesisch (Brasilien)	ISO 8859-1/15	CP 850
0090.txt	türkisch	ISO 8859-9	CP 857
0099.txt	Spanisch (Castellano, alt) 	ISO 8859-1/15	CP 850
0368.txt ³⁾	slowenisch	ISO 8859-2	
0934.txt	spanisch (Catalan)	ISO 8859-1/15	CP 850

4.5 Offsite backup

In order to avoid the loss of data that is in the RAM of the control system, it is recommended to perform a backup to external data carriers at regular intervals. This can be done in two ways.

4.5.1. Process control system "prosys/2"

Among the many possibilities offered by the prosys/2 process control system, there is of course also the function of backing up data from the control system. This is the most convenient way to protect yourself from the loss of, for example, measurement records that are used for quality assurance.

The data is backed up from an external PC connected via a modem. Due to the simple handling of the Windows-based software, all or selected data is transferred from the control system to the PC with just a few mouse clicks, from where it can then be stored on a data carrier such as CD, floppy disk or streamer for archiving.

4.5.2. FileTransferManager (FTM)

This software is bundled with the free Windows configuration software. The latest version of the software package "ConfigPlus" can be downloaded after registration on the homepage of demig Prozessautomatisierung GmbH.

Through this tool, all files from the control system can be backed up and restored to an external PC. This requires a connection via a serial cable (RS232) or via network. The description and handling of the software can be found in the operating instructions and help function of the file transfer manager.

4.6 File structure of the control system

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

4.6.1. Procedure-dependent files

<i>Ending</i>	<i>Content</i>
*. Prg	Flow programs (see Chapter 4: "Editing")
*. Par	(Program) parameters (see Chapter 4: "Parameters")
*. Wp	Procedural programmes (see Chapter 4: "Procedural programmes")

4.6.2. Commissioning files

<i>Ending</i>	<i>Content</i>
*. Num	Display parameters (see Chapter 8: "Display parameters")
*. PxD	Graph parameters (see Chapter 8: "Graph parameters")
*. BKP	Trend parameters (see Chapter 8: "Trend parameters")
*. PGZ	Process variable parameters (see Chapter 8: "Process variables")
4001.YFC	Scaling parameters (see Chapter 8: "Process variables")
*. Did	Display parameters (see Chapter 8: "Display")
*. .KEY	File for defining the softkeys (see Chapter 8: "Softkeys")
*. PDA	Recorder parameters (see Chapter 8: "Recorder parameters")

4.6.3. Recording files

<i>Ending</i>	<i>Content</i>
*. ST1	Process recording (measurement file) (see Chapter 8: "Recorder parameters")
*. DFI	Marking of the associated measurement file with regard to measurement start, end, parameter set,....

4.6.4. System configuration files

<i>Ending</i>	<i>Content</i>
*. AW8	Instruction list for configuring the analog input card(s)
*. AD8	program translated by AWL8.EXE
*. LS8	Program Listing
*. Awl	Instruction list for the PLC program
*. O	PLC program translated by AWL.EXE
*. XRF	Symbol Cross-Reference List
*. Lst	Program listing of the PLC program
*. MAP	Symbol table of the PLC program
*. Sym	PLC and CONFIG symbols
*. PRJ	Project management file
*. .CFG	Block Configuration Data
*. Fmt	defined data formats
*. .DAT	Alarm and message texts
*. Rel	Symbolic Programming Data
*. PCX, PC2-8	Image/ graphic files
*. Col	Color tables for color conversions
*. PCY	List of all edited images
*. PXD, PX2-8	Object data (symbols in images)
*. .MSG	Error help texts
*. OJ	Operating programs (source code)
*. Obl	compiled operating programs
*. IBX	compiled, linked operating programs
*. IBT	Created program sequences for the creation of operating programs
*. SKD	Stepper Chain Module Configuration

4.6.5. Feature

In the case of multi-system control, certain files are plant-related; their endings then change as follows:

<i>1. Appendix</i>	<i>2. Appendix</i>	<i>until</i>	<i>8. Appendix</i>
*. Prg	*. PR2	...	*. PR8
*. Par	*. PA2	...	*. PA8
*. Wp	*. Wp	...	*. WP8
*. PDA	*. PD2	...	*. PD8
*. ST1	*. ST2	...	*. ST8
*. DF1	*. DF2	...	*. DF8

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