VIPA HMI

VIPA®
art of automation

Note

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- 2004/108/EC Electromagnetic Compatibility Directive
- 2006/95/EC Low Voltage Directive

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Contents

About this Manual

This manual describes the structure, project engineering and the handling of the Operator Panel OP 03 from VIPA.

Overview

Chapter 1:   Hardware description

In this chapter the hardware components of the OP 03 are described. Besides of a description of the single components, the dimensions that are required for the installation may also be found. The chapter closes with the technical data.

Please consider the safety hints at the beginning of the chapter.

Chapter 2:   Deployment OP 03

This chapter explains the deployment and the project engineering of the OP 03.

After the fast introduction there are information about the installation of the OP 03 and the configuration by the OP-Manager. This is followed by the description of commissioning and operation of the OP 03. The chapter closes with a description of the firmware update.

Chapter 3:   Functions OP 03

This chapter informs you about the functionalities of the operator panel. Especially referred to is to the functions that are part of the standard project.

The text describes how you access screens, use operating keys, react to messages, alter values and use the password protection.

Chapter 4:   General installation guidelines

The chapter gives you information about the interference-free installation of Programmable Logic Controls (PLC) together with a OP 03.

Here we describe possible paths how interference can enter the controller, how you ensure the electromagnetic compatibility (EMC) and how to approach shielding and screening issues.

Objective and contents

This manual describes the Operator Panel from VIPA. The manual consists of chapters. Every chapter provides the description of one specific topic.
It describes the installation, project engineering, usage and the technical data.

This manual is relevant for:

Product	Order number	ab Stand: HW	FW
OP 03	VIPA 603-1OP00	03	114
	VIPA 603-1OP10	01	115

Guide to the document

This manual provides the following guides:
- An overall table of contents at the beginning of the manual
- An overview of the topics for every chapter

Availability

The manual is available in:
- printed form, on paper
- in electronic form as PDF-file (Adobe Acrobat Reader)

Description conventions

[Button]	Buttons are put in brackets e.g. [NEXT] or [OK].
[Key]	Key entry are put in brackets e.g. [STRG]+[A].
`Display output`	Display outputs are illustrated as `Courier` e.g. `\flashdisk>`
`Keyboard entry`	Keyboard entries are illustrated as **`Courier bold`** e.g. `\flashdisk>` **`Dir`**
Terms	Menus, Display elements, terms are *italics*.

Icons Headings

Important passages in the text are highlighted by following icons and headings:

Danger!
Immediate or likely danger.
Personal injury is possible.

Attention!
Damages to property is likely if these warnings are not heeded.

Note!
Supplementary information and useful tips.

Safety information

Applications conforming with specifications

The Operator Panels are constructed and manufactured for:
- VIPA CPUs 11x, 21x, 31x, 51x and S7-300/400 from Siemens
- communication and process control
- general control and automation applications
- industrial applications
- operation within the environmental conditions specified in the technical data
- installation into a cubicle

Danger!
This device is not certified for applications in
- in explosive environments (EX-zone)

Documentation

The manual must be available to all personnel in the
- project design department
- installation department
- commissioning
- operation

The following conditions must be met before using or commissioning the components described in this manual:

- Modification to the process control system should only be carried out when the system has been disconnected from power!

- Installation and modifications only by properly trained personnel

- The national rules and regulations of the respective country must be satisfied (installation, safety, EMC ...)

Disposal   **National rules and regulations apply to the disposal of the unit!**

Chapter 1   Hardware description

Overview   In this chapter the hardware components of the OP 03 are described. Besides of a description of the single components, the dimensions that are required for the installation may also be found. The chapter closes with the technical data.

Please consider the safety hints at the beginning of the chapter.

Safety information for Users

Handling of electrostatic sensitive modules

VIPA modules make use of highly integrated components in MOS-technology. These components are extremely sensitive to over-voltages that can occur during electrostatic discharges.

The following symbol is attached to modules that can be destroyed by electrostatic discharges:

The symbol is located on the module, the module rack or on packing material and it indicates the presence of electrostatic sensitive equipment.

It is possible that electrostatic sensitive equipment is destroyed by energies and voltages that are far less than the human threshold of perception. These voltages can occur where persons do not discharge themselves before handling electrostatic sensitive modules and they can damage components thereby, causing the module to become inoperable or unusable.

Modules that have been damaged by electrostatic discharges may fail after a temperature change, mechanical shock or changes in the electrical load.

Only the consequent implementation of protection devices and meticulous attention to the applicable rules and regulations for handling the respective equipment can prevent failures of electrostatic sensitive modules.

Attention!

- If your panel is to be supplied externally, you have to make sure that the communication cable does not have any power allocation. Otherwise the connected devices could be damaged.
- Before commissioning, the device has to be brought in environment temperature.
- With condensation you may only switch on the device after complete dryness.
- To prevent overheat during operation avoid direct sun contact of the device.
- After opening of the control cabinet or panel, parts of the system are available that may lead dangerous voltage.
- All signal connections require screened cables.
- Signal cores may not be lead within a cable shaft of high-voltage cores.
- Please take care for sufficient ground of the operating device. For this a ground screw is to be found at the backside of the device.

**Shipping of
electrostatic
sensitive modules**

Modules have to be shipped in the original packing material.

**Measurements
and alterations on
electrostatic
sensitive modules**

When you are conducting measurements on electrostatic sensitive modules you should take the following precautions:

• Floating instruments must be discharged before use.

• Instruments must be grounded.

Modifying electrostatic sensitive modules you should only use soldering irons with grounded tips.

Attention!

Personnel and instruments should be grounded when working on electrostatic sensitive modules.

Properties

General

The here shown operating device allows you to visualize and alter operating states and recent process values of a connected PLC. For the entry of values and navigation, the operating device is provided with an integrated keyboard and a 2x20 character display. The link-up to your PLC happens via MPI.

The project engineering takes place in the project engineering tool "OP-Manager" from VIPA that enables the online project engineering via MPI. The OP 03 allows you the access to up to 2 CPUs.
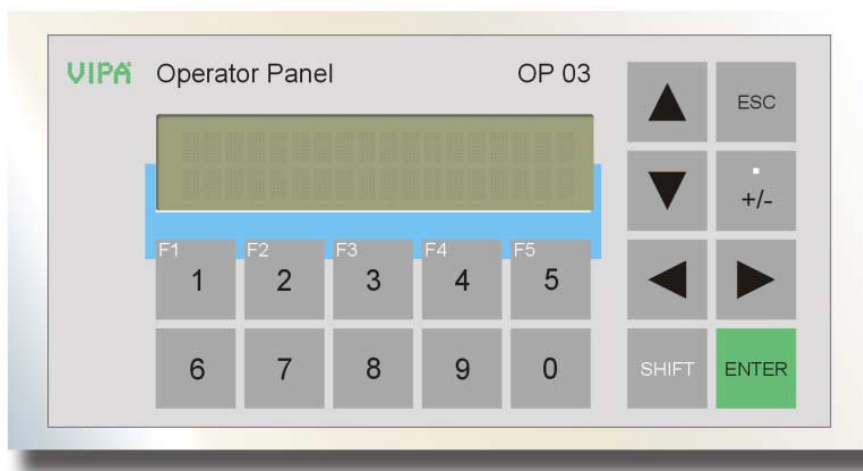
OP 03
603-1OP00

- Die-cast aluminum case
- Protection type: front side IP65, back side IP20
- Display with 2 x 20 characters
- 256kB user memory, 4096 variables
- MP^{2}I interface for online project engineering, CPU link-up and firmware - update
- Project engineering via VIPA OP-Manager or ProTool from Siemens
- Visualization of max. two CPUs via MPI
- Menus and input requests in 8 languages
- Read and alter time and counter value
- Monitoring of messages
- Easy installation via non-looseable rocker arms

603-1OP10

as like as VIPA 603-1OP00 with differences as follows:

- Project engineering in Russian only with OP-Manager from VIPA
- Menus and input requests in German, English, Russian

Order data

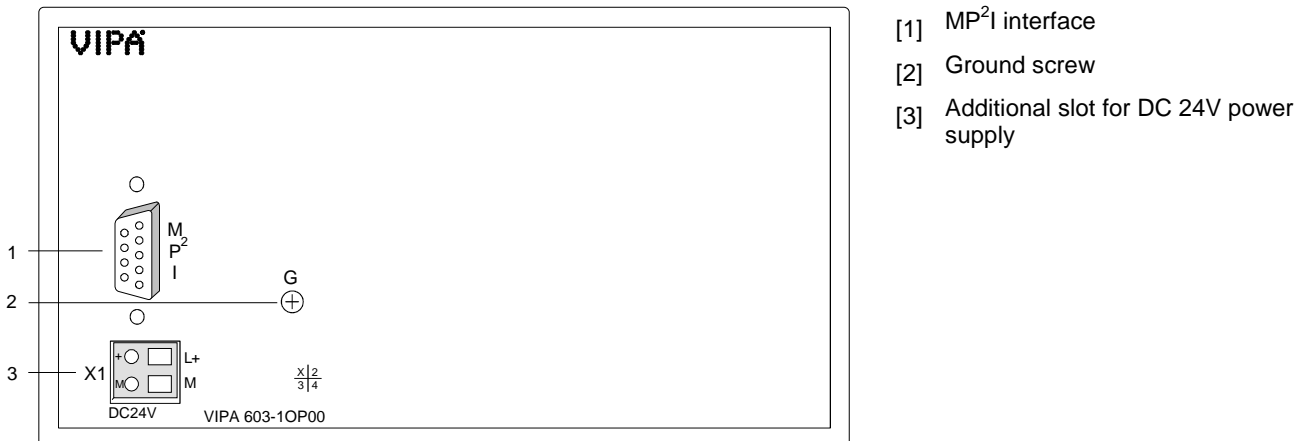| Type	Order number	Description
OP 03	VIPA 603-1OP00	2x20 characters, MP^{2}I, DE, EN, FR, ES, IT, SV, NO, DA
	VIPA 603-1OP10	2x20 characters, MP^{2}I, DE (w/o Umlaut), EN, RU
MPI cable	VIPA 670-0KB00	OP/AG cable 0°/90° with PU-/Diagnostic port, 2.5m

Structure

Front view

At the front side of the Operator Panel OP 03 are the foil keyboard and the display with 2x20 characters.

[1] Display
[2] Function keys
[3] Navigation keys
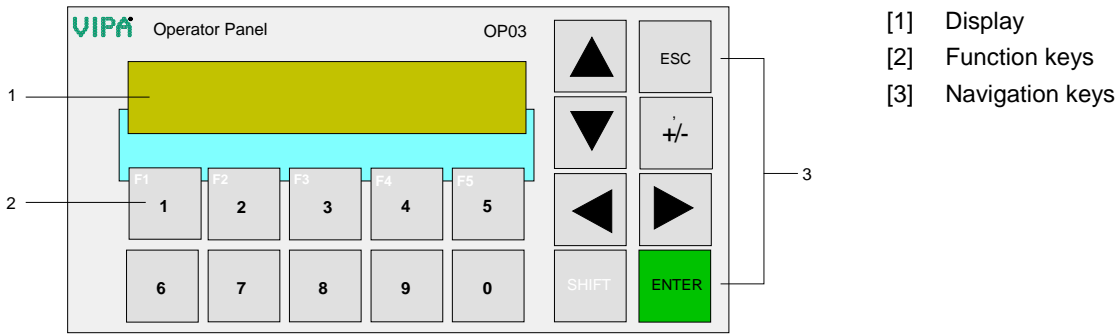
Back view

At the OP 03 the connectors are located at the backside.

[1] MP^2I interface

[2] Ground screw

[3] Additional slot for DC 24V power supply

⚠ **Attention!**

The simultaneous usage of external power supply and the delivered MPI cable 670-0KB00 is not allowed and damages the OP 03 and the CPU!

Components

LC-Display

The OP 03 monitors values and messages via a STN text display with LED back lighting. It displays 2 rows with max. 20 characters with a line height of 5mm.

Keyboard

At the front side is a foil keyboard with 18 short click keys. 8 keys are serving the navigation and 10 keys are for numeric input.

The numeric keys F1 ... F5 are configurable as soft key with display depending functions via the VIPA project engineering tool.

MP^{2}I

The OP 03 is provided with a MP^{2}I (**M**ulti-**P**oint-**I**nterface) for connection to your CPU via a MPI network and for serial connection to a PC using the Green Cable from VIPA

The MP^{2}I jack has the following pin assignment:
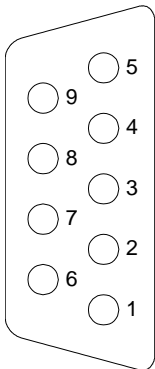
9pin jack

Pin	Assignment
1	reserved (must not be connected)
2	M24V
3	RxD/TxD-P (Line B)
4	RTS
5	M5V
6	P5V
7	P24V
8	RxD/TxD-N (Line A)
9	n.c.

Additional Power supply
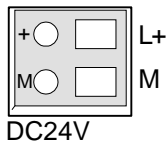
If you use a MPI cable without power allocation instead of the delivered MPI cable 670-0KB00, the OP 03 may externally be supplied with DC 24V (20.4 ... 28.8V) using this addition power supply slot. The power supply is protected against inverse polarity and over-current.

The simultaneous usage of external power supply and the delivered MPI cable 670-0KB00 is not allowed and damages the OP 03!
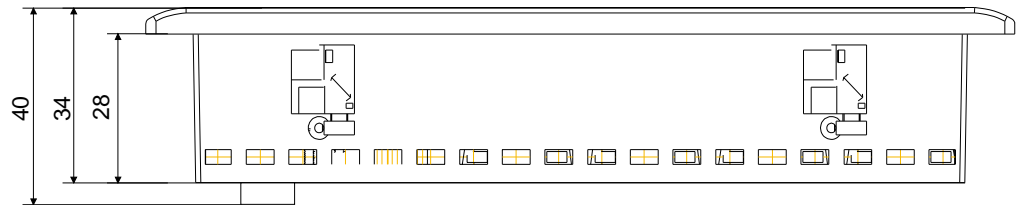
Dimensions

Installation dimensions

For the installation of the OP 03, an installation cutting with the dimensions 156mm x 78mm is required.
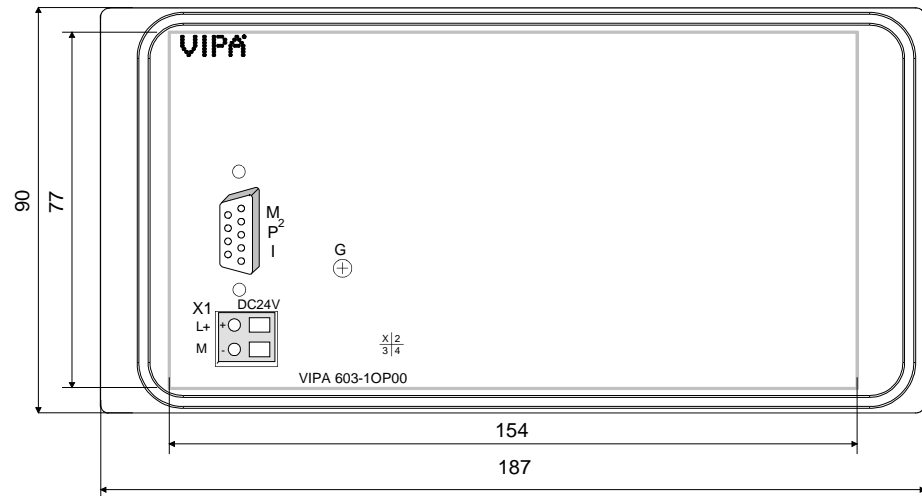
Installation values for control cabinets and desks:

Front panel width:	2.5 ... 6mm
Installation cutting (W x H):	156mm x 78mm
Installation depth plus cabling	34mm

Top view

Back view

Technical data

Order number	603-1OP00
Type	OP 03, Operator Panel
Display	
Number of rows	2
Characters per row	20
Character height	5 mm
Type of display	STN with LED backlighting
OP functionality	
User memory	256
Number of variables	4096
Language	DE/EN/FR/ES/IT/SV/NO/DA
Operating controls	
Touchscreen	-
Keyboard	Membran keyboard
Mouse	-
Number of system keys	8
Number of soft keys	5
Technical data power supply	
Power supply (rated value)	DC 24 V
Power supply (permitted range)	DC 20.4...28.8 V
Current consumption (rated value)	80 mA
Inrush current	3 A
Time	
Real-time clock	✓
Clock buffered period (min.)	-
Accuracy (max. deviation per day)	-
Functionality Sub-D interfaces	
Type	-
Type of interface	RS485
Connector	Sub-D, 9-pin, female
Electrically isolated	-
MPI	✓
MP²I (MPI/RS232)	✓
DP master	-
DP slave	-
Point-to-point interface	-
Mechanical data	
Housing / Protection type	
Material	die-cast aluminum
Mounting	via integrated pivoted lever
Protect type front side	IP 65
Protect type back side	IP 20
Dimensions	
Front panel	187 x 90 x 6 mm
Rear panel	154 x 77 x 55 mm
Installation cut-out	
Width	156 mm
Height	78 mm
Minimum	-
Maximum front panel thickness	6 mm
Weight	600 g
Environmental conditions	
Operating temperature	0 °C to 60 °C
Storage temperature	-20 °C to 70 °C
Certifications	
UL508 certification	yes

Order number	603-1OP10
Type	OP 03, Operator Panel, en, ru
Display	
Number of rows	2
Characters per row	20
Character height	5 mm
Type of display	STN with LED backlighting
OP functionality	
User memory	256
Number of variables	4096
Language	DE (w/o umlauts)/EN/RU
Operating controls	
Touchscreen	-
Keyboard	Membran keyboard
Mouse	-
Number of system keys	8
Number of soft keys	5
Technical data power supply	
Power supply (rated value)	DC 24 V
Power supply (permitted range)	DC 20.4...28.8 V
Current consumption (rated value)	80 mA
Inrush current	3 A
Time	
Real-time clock	✓
Clock buffered period (min.)	-
Accuracy (max. deviation per day)	-
Functionality Sub-D interfaces	
Type	-
Type of interface	RS485
Connector	Sub-D, 9-pin, female
Electrically isolated	-
MPI	✓
MP²I (MPI/RS232)	✓
DP master	-
DP slave	-
Point-to-point interface	-
Mechanical data	
Housing / Protection type	
Material	die-cast aluminum
Mounting	via integrated pivoted lever
Protect type front side	IP 65
Protect type back side	IP 20
Dimensions	
Front panel	187 x 90 x 6 mm
Rear panel	154 x 77 x 55 mm
Installation cut-out	
Width	156 mm
Height	78 mm
Minimum	-
Maximum front panel thickness	6 mm
Weight	600 g
Environmental conditions	
Operating temperature	0 °C to 60 °C
Storage temperature	-20 °C to 70 °C
Certifications	
UL508 certification	-

Chapter 2   Deployment OP 03

Overview

This chapter explains the deployment and the project engineering of the OP 03.

After the fast introduction there are information about the installation of the OP 03 and the configuration by the OP-Manager. This is followed by the description of commissioning and operation of the OP 03. The chapter closes with a description of the firmware update.

Content

Fast introduction

Installation

Build the CPU system and install the OP 03. For the installation in operating tables and control cabinet fronts a front panel cutting of 156mmx78mm (LxW) is needed.
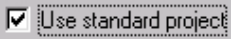
Configuration

The project engineering takes place in the configuration tool "OP-Manager" from VIPA that enables the online project engineering via MPI. The OP 03 allows you to access up to 2 CPUs.

Deployment OP-Manager

Start the OP-Manager via click on opmngr.exe .

Open the dialog window for a new project via **File** > *New*. Enter a name and the according operating device and click on Next > . For the first start, you should work with the standard project. Click on ☑ Use standard project. The project window opens with the standard project that is already stored in the OP.

Now you may change the values of the object groups "Screens", "Messages", "Tags" etc. by clicking on the according group and preset their objects in the object window.

Create, alter and delete an object

Within an object group you may create a new object via , alter it via and delete it with . These functions are equal to the context functions *Insert*, *Open* res. *Properties* and *Delete*.

Controllers

Insert a CPU (control) with and set the according MPI communications parameter.

Create tag

With Tags you define all variables that refer to memory areas of the PLC and that have to be processed in the OP.

To create a new variable, click on . Enter a name for the variable and a corresponding memory area of your PLC. The OP 03 can control up to 2 CPUs (Controllers).

Messages	The display of a message happens event triggered. As soon as an event occurs in the specified CPU, the according message is monitored sorted after priority that can be acknowledged with ENTER. The definition of the events happens under "Area Pointer" on project level. Here you assign a memory res. bit memory area of your PLC. The object groups "Messages" allow you to enter the according messages.

Create screen	Click on the object group "Screens" and create a new screen with . Screens consist of entries. Every screen can contain up to 20 entries. Always one entry is monitored per display page in a 2x20 character mask where you can branch if needed. You may enter the following elements in an entry:
	
	• Alpha numeric texts (no umlaut)
	
	• Variables for in- res. output via {F} as:
	  - Tag: Variable that is linked to a value in the PLC with settable in- res. output format. You may also output plain text from a list that concerns to a PLC value. The list for the text assignment is stored in the object group "Text/Graphics Lists".
	  - Date, Time: internal date and time-of-day
	
	• Soft key ⊠1 □2 that allows to execute programmed functions like e.g. a jump in a special entry.

Compile and emulate	After you have finished the presetting, you save your project with , compile it with and start it with an emulator with . The emulator creates an OP 03 on your PC and gives you the opportunity to test your programming without additional hardware. ENTER brings you to the screen defined as start screen. The lower part of the emulator allows you to simulate events via PLC 1 res. PLC 2 that are later coming from the real CPU. Please take care that the according events are programmed in your project engineering under "Area Pointers". You may also use the menu option "Switch to Green Cable Mode" to directly connect your PC with the CPU via Green Cable and test your programming on the emulator.

Note!

The online project engineering requires a licensed version of the OP-Manager! More information may be found at the online help of the OP-Manager.

Commissioning

For commissioning the OP 03 is to be connected to the PC. Since here the OP 03 is to be served by DC 24V there are the following possibilities:

- Transfer by Green Cable
- Transfer by MPI converter

Transfer via Green Cable

Here the transfer is executed via an exclusively directly connected Green Cable from VIPA and external power supply.

The external power supply must be disconnected before operating with the CPU by means of the delivered MPI cable (VIPA 670-0KB00).
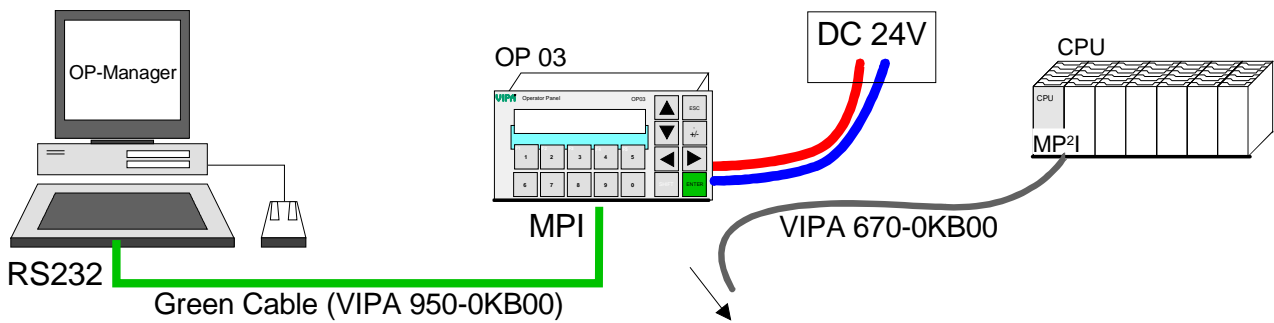
Attention!

- Simultaneous voltage supply by MPI and external connection is not allowed and damages the hardware!
- The Green Cable may exclusively deployed <u>directly</u> at the concerning jacks of the VIPA components (in between plugs are not permitted).
- The lengthening of the Green Cable with another Green Cable res. The combination with further MPI cables is not permitted and causes damages of the connected components! The Green Cable may only be lengthened with a 1:1 cable (all 9 Pins are connected 1:1).

Transfer by MPI adapter

With this transfer method the OP 03 is powered by the power supply of the CPU when connecting this by the delivered MPI cable (VIPA 670-0KB00) to the CPU. For project engineering a MPI converter from VIPA may be attached to this cable.
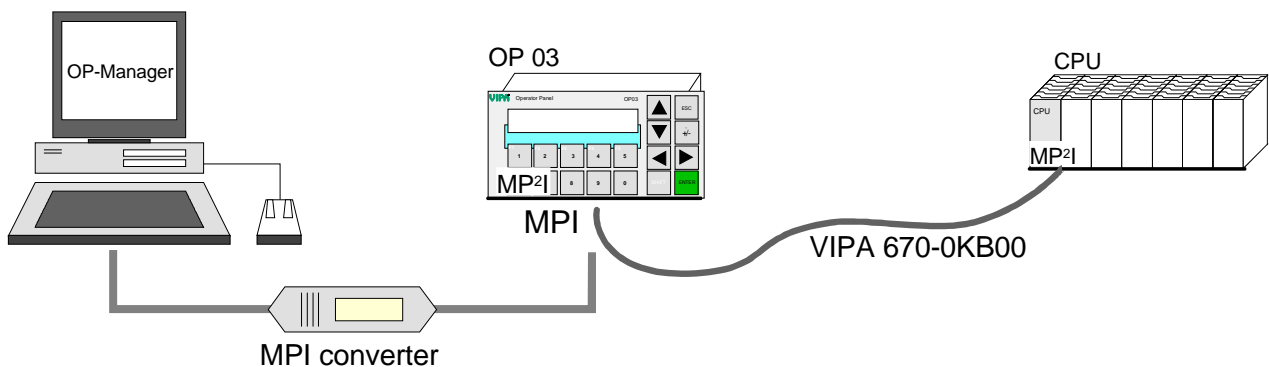
Preparation of OP 03 for data

If the standard project is in the OP 03, you may set the OP mode "Operat. mode Transfer" via **System** > *OP-Mode* > `SHIFT` + ▼ , entering the password 100 and confirm with `ENTER`.

Now the OP 03 awaits data with "Ready for Transfer".

If the standard project is not yet present the setup menu may be connected with the following proceeding:

Push the key combination ▶ + ▼ + `ESC` on the OP 03 and turn it on again. Hold the keys until the OP 03 branches to the "Setup menu". Choose with ▼ "Perform Download from PC" and push `ENTER`. The OP 03 now awaits data with "Ready for Transfer".

This operation may always be aborted by `ESC`.

Start transfer at OP-Manager

Load the OP-Manager with your project on your PC. You may only access the OP 03 online, if you work with a licensed version.

Call the transfer function with a click on 🖥.

Select MPI and set the transfer parameters like COM port, baud rate 38400 via `Settings...` and confirm your entry.

With `OK` configuration is confirmed and the transfer is started. After the transfer, the OP 03 starts with the new project.

Operation

Connect after transmission the MPI jack of CPU and OP 03 by means of the delivered MPI cable. As soon as the power supply of the CPU is switched on, the OP 03 is power supplied via MPI and starts automatically with the project.
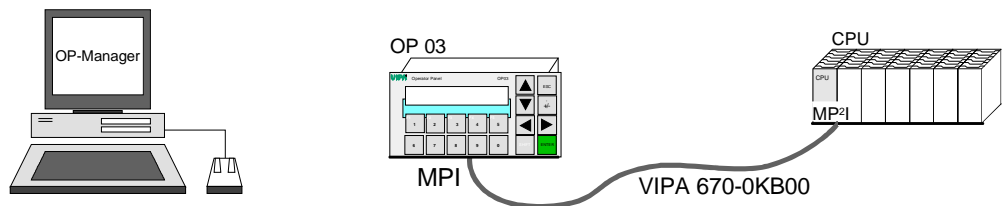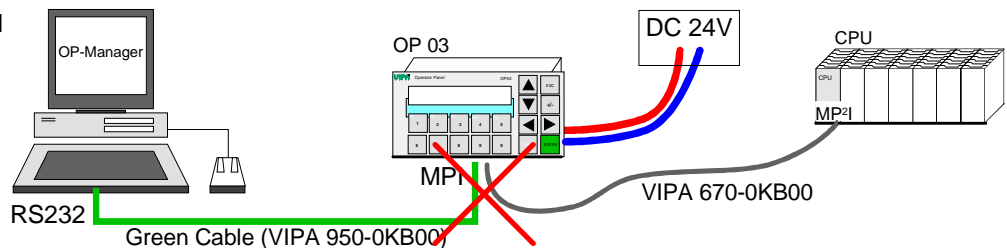
These steps of the fast introduction are more described at the following pages.

Installation

Overview   The OP 03 is suitable for the installation in operating tables and control cabinet fronts. The installation happens via the back side. The OP 03 is provided with a patented integrated fixing technique that allows an easy connection with a simple screwdriver.
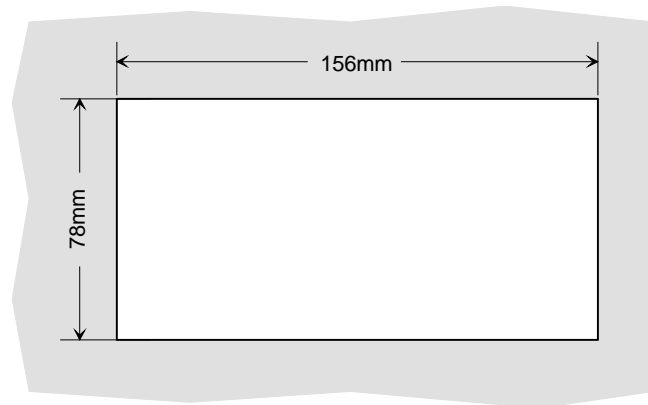
Note!
Please also regard the "General installation guidelines" in this manual.

Installation cutting For the installation in operating tables and control cabinet fronts, you need the following front panel cutting:

Installation   The fixing technique is integrated in the casing of the OP 03 and accessible via the back side.

For the installation, a small slit screwdriver is required. Push the operator panel [3] from the front side into the front panel cutting [1] until it touches the panel with the seal [2]. Now bolt the lever [5] clockwise with the screwdriver [4] until it rotates to the outside. Further screwing bolts the lever to the front panel until it holds the OP 03 to the control cabinet front.
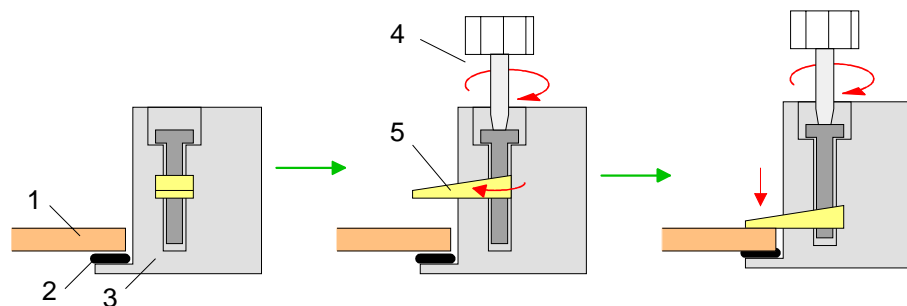
Project engineering - Overview

Overview   The OP 03 allows you the access to up to 2 CPUs. From the software side the link happens by means of a project stored in the OP 03. For the project engineering of the OP 03 operating surface you may use the OP-Manager from VIPA or ProTool from Siemens. Your project is transferred via MPI from the PC into the OP 03.

During operation the OP 03 communicates with the concerning CPU control and responds to the application processing of the PLC according to the engineered presetting. With concerning project engineering, you may monitor respectively alter process values via the display and transfer them to the CPU.
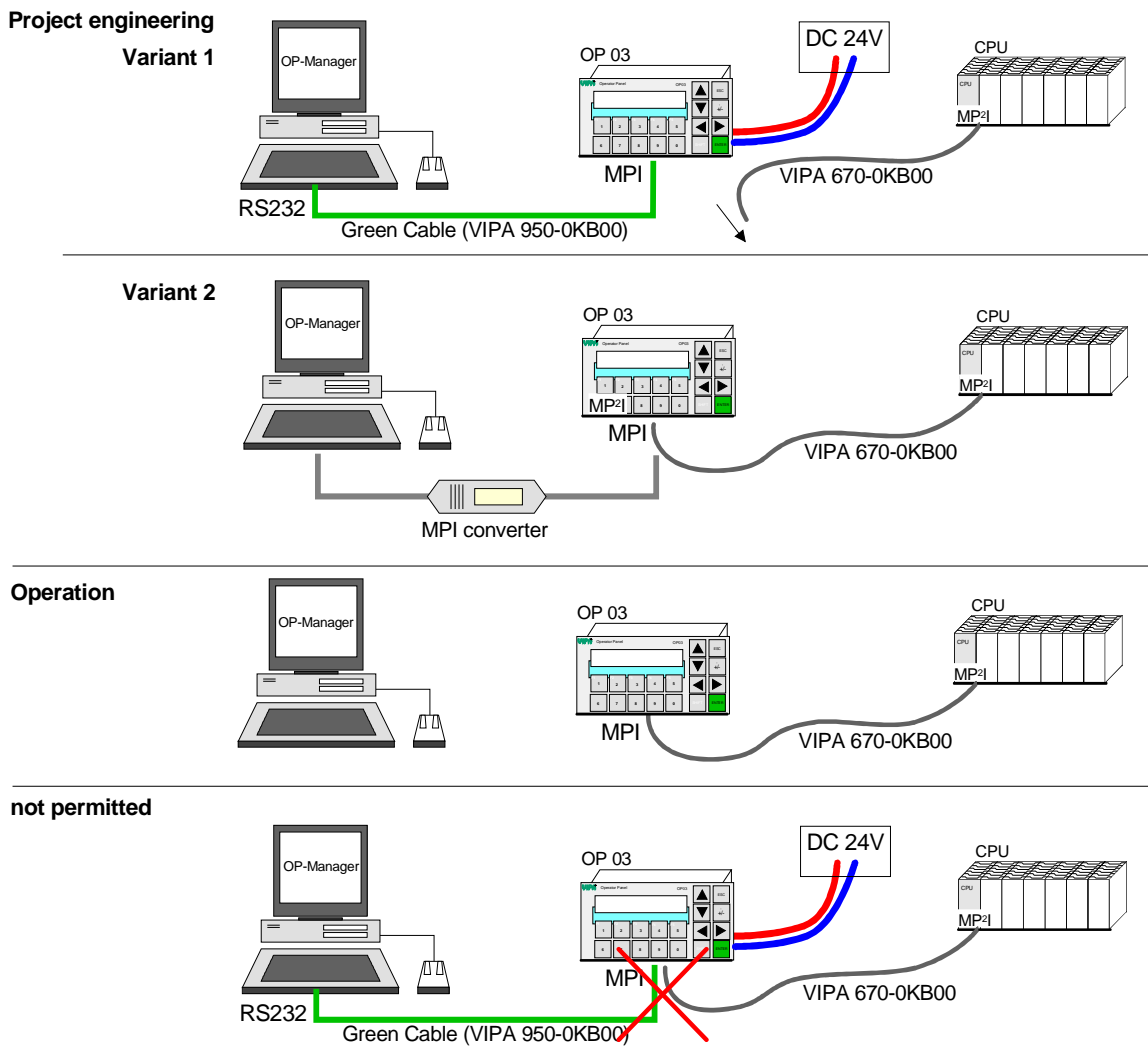
Attention!

Please note the VIPA Green Cable and the delivered MPI cable 670-0KB00 may not be used simultaneously at the MP^{2}I interface of the OP 03.

Otherwise CPU and OP 03 are damaged!

Project engineering - Deployment OP-Manager

Overview

For the project engineering of the OP 03 operating surface you may use the OP-Manager from VIPA or ProTool from Siemens.

Please note the OP 03 with order number VIPA 603-1OP10 may exclusively be configured by the VIPA OP-Manager.

For both tools are similar in structure and operation, the project engineering is illustrated in the OP-Manager from VIPA.

The OP-Manager runs with Windows 2000 and XP. The OP-Manager offers you a fully graphical user interface that allows you a comfortable project engineering in 3 different languages.

You transfer your project engineering into your OP 03 via MPI.

Differences to ProTool

In opposite to ProTool, the OP-Manager has an integrated emulator that simulates an operation panel on your PC. You can test your project engineering without additional hardware. You may also use the COM interface to connect a CPU via MPI that can be accessed by the emulator.

The area pointers are to find in the OP-Manager in the register "Area Pointer".
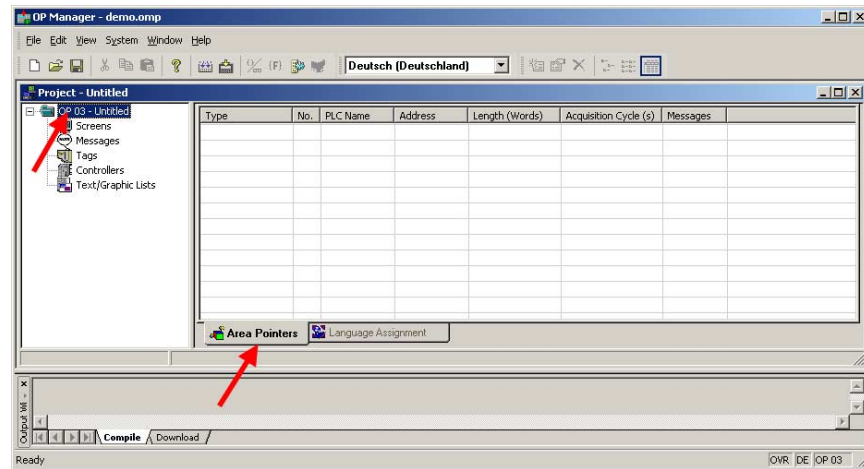
The languages that are available in your project are set in the register "Language Assignment".

Glossary

The following table lists the terms that are used for the project engineering in the OP-Manager.

Meaning	*Term*	*Meaning*	*Term*
Pictures	Screens	PLC	Controllers
Messages	Messages	Symbolic lists	Text/Graphic Lists
Variables	Tags	Area Pointer	Area Pointer

Create project

Start the OP-Manager by clicking on `opmngr.exe` .

Open the dialog window for a new project via **File** > *New*. Enter a name and the according operating device and click on `Next >`. For the first start, you should work with the standard project. Click on `☑ Use standard project`. The project window opens with the standard project that is already stored in the OP.

You may alter the name for your project or add a description via **File** > *Project Information* at any time.
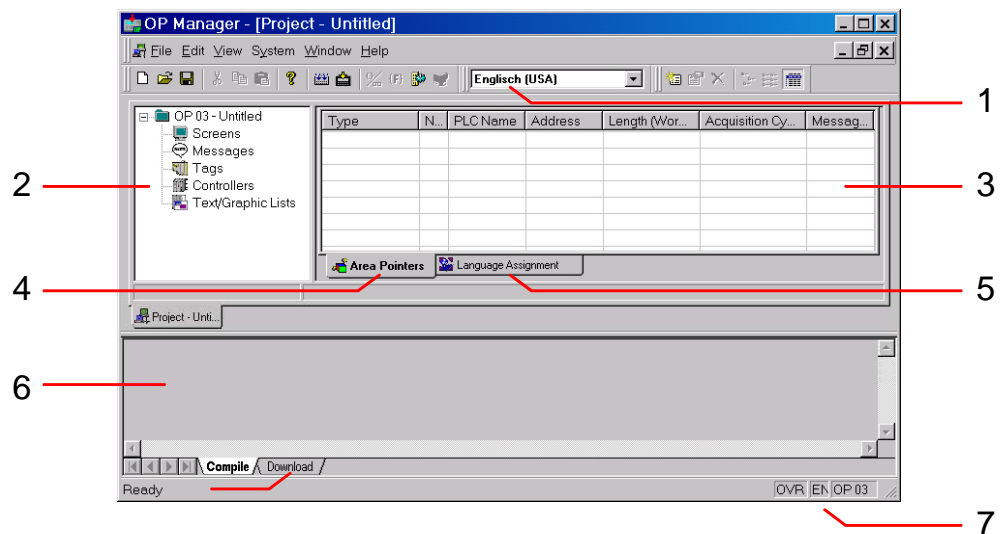
The project window contains the following important elements:

[1]   Symbol bar with the most important functions. Here you also set the language that is to be altered.

[2]   This area shows your project with the concerning object groups in a tree structure.

[3]   Here you see the objects of an object group.

[4]   As soon as you choose your project as object group, among others, the register "Area Pointer" is available. Under "Area Pointer" you may assign certain events in your CPU to a state in your OP like e.g. open a screen or throw one of the messages that you can define under "Messages".

[5]   As soon as you choose your project as object group, among others, the register "Language Assignment" is available. Depending on the used OP 03 up to 3 languages may be fixed here, which are available in your project.

[6]   Here are the status messages that are creates at a compiler run res. Download.

[7]   OP-Manager information window. Information about the entry mode (OVR=Overwrite), the chosen language and the type of the operating panel.

Insert objects

Within an object group you may create a new project via in the symbol bar, alter it with and delete it with . These functions are equal to the context functions *Insert*, *Open* res. *Properties* and *Delete*.

Object overview

The following objects are available:

- Controllers (CPU and MPI communication parameter)
- Tags (Variables referring to PLC areas)
- Messages (messages that can be thrown event triggered)
- Screens (output areas on the operator panel)
- Text/Graphic Lists (Plain text assignment for tags)

Controllers (CPUs)

When you create a new project, a controller is automatically created too. With a double click on this controller, you reach the "PLC" dialog window.
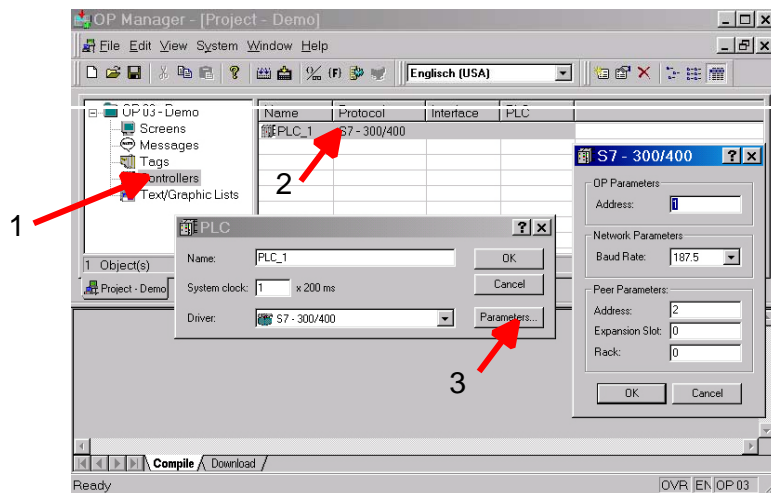
Here you can enter a label for your CPU, set the polling rate and set res. alter the following parameters via Parameters... :

OP Parameters: Address: 1 (MPI address of the operating device)
Network Parameters: Baud rate: 187.5 (MPI baud rate)
Peer Parameters: Address: 2 (MPI address of the CPU)
                      Expansion Slot: 0 (Number expansion slot)
                      Rack: 0 (Number of the rack)

The OP 03 allows you access to up to 2 CPUs.

To include a 2. CPU, click on and enter the according MPI communication parameter.

Tags (Variables)   Under "Tags" you define all variables that refer to memory areas of your PLC and have to be processed by the OP.

Click on ⬛ to create a new variable. Enter a name for the new tag and a corresponding memory area of your PLC. The OP 03 controls up to 2 CPUs (Controllers).
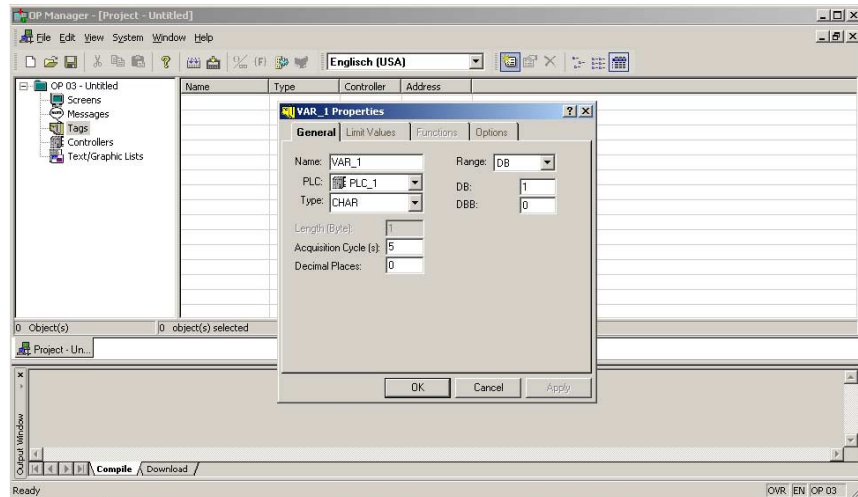
Via the register "Limit Value" you may define areas for input variables. When you enter a value exceeding this range, the input is rejected.

Some variable types can be configured via the register "Functions".

"Options" allows you to enter a comment to the variables.

Messages   The output of a message happens event triggered. As soon as an event occurs in the specified CPU, the according messages are shown sorted by priority.

Please regard that you first have to define the initializing event in the project object group, register "Area Pointer", if you want a message because of a CPU event.

For this, create a new object with the type "Event Messages" via the

register "Area Pointer" with ⬛ and assign a DB or bit memory area. For the output follows the bit pattern of the defined area, several messages can be displayed simultaneously. The output is sorted after priority starting with priority 1.

Every message must be acknowledged with ENTER.

Screens

"Screens" allows you to monitor an image of the process. You may display processes and preset process values.

The screen object contains several screen entries. One screen entry has display size (2x20 characters) and is marked with an entry number. With the object name and the entry number you may directly access a screen entry.

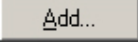You may place the following elements into a screen object:

- Alpha numeric texts

- Variables for in- res. output via {F} as:
  - Tag: Variable that is linked to a value in the PLC with settable in- res. output format. You may also output plain text from a list that concerns to a PLC value. The list for the text assignment is stored in the object group "Text/Graphics Lists".
  - Date: internal date
  - Time: internal time-of-day

  The format of date respectively time of day and the flashing of the input fields may be set by ⚙.

- Soft key ⊠1 □2 that allows to execute programmed functions like e.g. a jump in a special entry.

Click on the object group Screens and create a new screen with 📋. Click on the 1. screen entry and insert the wanted elements. This screen is automatically the start screen. You can assign the "start screen" property to another screen via the object properties.

You may also alter the language during the project engineering. This only influences the monitored text.
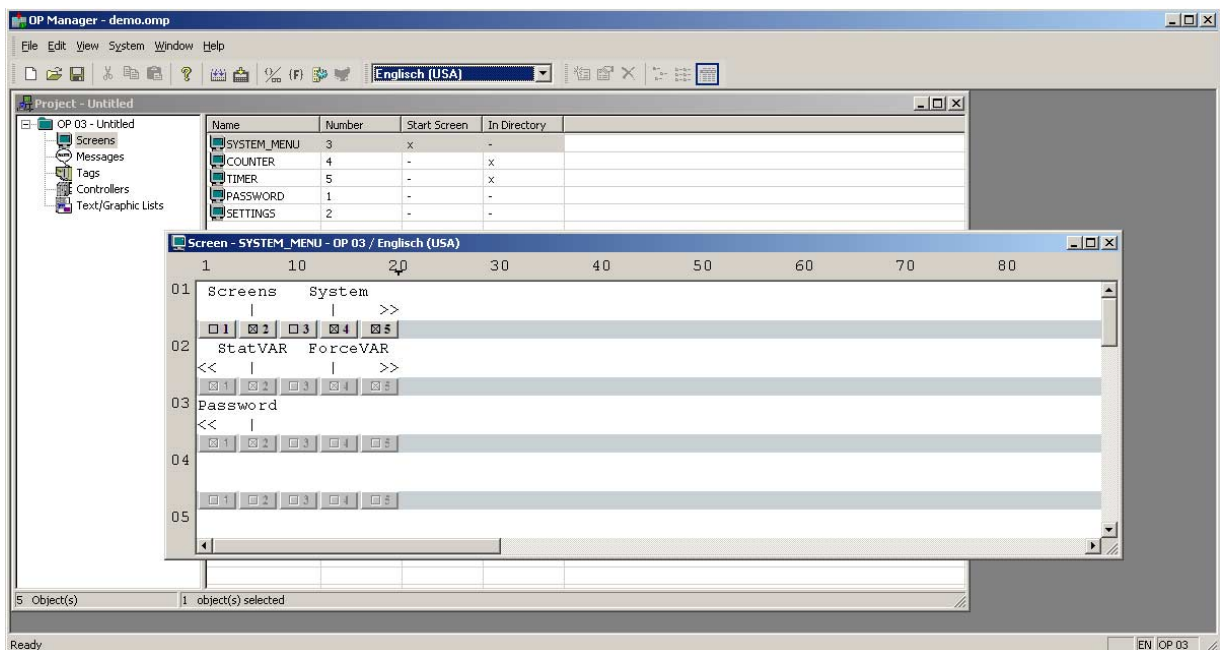
Function keys
(Soft keys)

Every screen entry has a soft key bar in the lower part of the window. Here you can assign a function to one of the function keys (1...5). Click on the according function key and assign a function via ⟦Add...⟧ like e.g. jump into screen entry.

The access to the soft keys may be configured with or without additional ⟦SHIFT⟧ key. This may be set with ⟦🔧⟧.

Password
protection for
soft keys

To prevent unauthorized operating, the OP 03 has an integrated password protection that enables passwords for up to 8 levels. Access to all password levels (Level 9) is only allowed with the "Supervisor-Password" that is defined in your project.

The assignment of the according password level happens in the OP-Manager. Here you can assign password levels from 1 to 9 according to the raising importance of the functions assigned to the soft keys. Setting Level 0 deactivates the password request.

You may set the passwords for the levels 1 to 8 only at the OP 03. You need access to the screen "Password" in your project (see standard project).

For access to this screen, the "Supervisor-Password" is required.

Set Supervisor-Password

The Supervisor-Password allows full access to all functions of the OP 03. The Supervisor-Password is transferred to the OP 03 together with the project. To enter the Supervisor-Password, choose ⟦🔧⟧ in your project. The following dialog window appears:
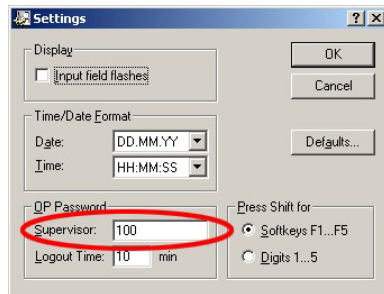
Under "Supervisor" you type a password and set via "Logout Time" the time for which the password is valid after login.

Set password level

You may set a password level for every soft key definition like shown in the picture.
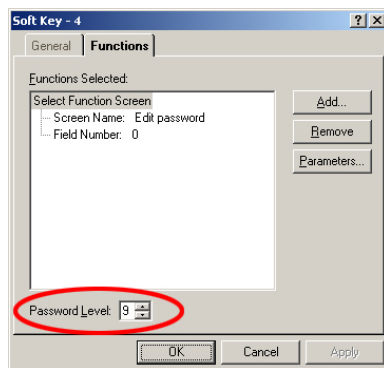
Please regard that the password levels for integrated standard screens of the OP 03 are preset e.g.:

Level 9: Password Edit, OP-Mode

Level 8: ForceVAR
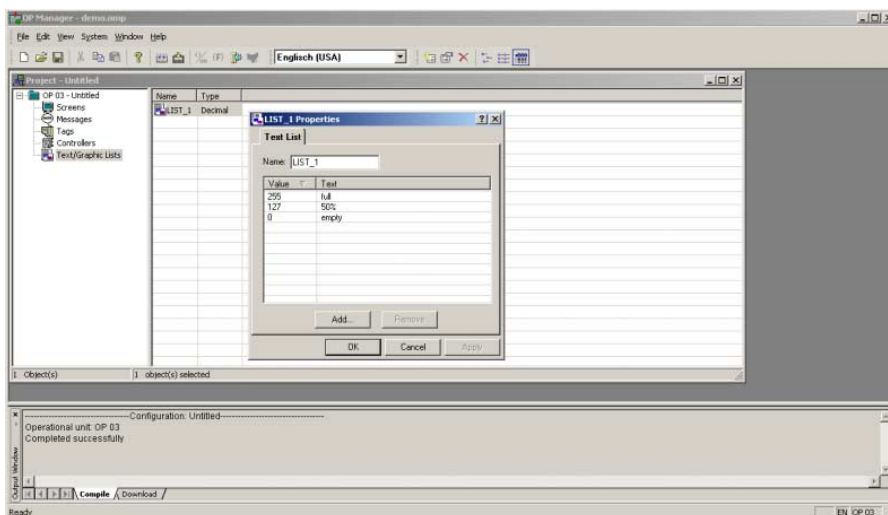
Level 6: System>MPI-Adr

Level 4: System>Dat/Time

Level 2: System>Language

Level 0: StatVAR, Password>Logout

Text/Graphics Lists   This object allows you to assign a text to a numeric value, which you can refer to via a tag (variable).

Mark the object group "Text/Graphics Lists" and add a new object with [icon]

Add...   assigns a text to a numeric value.

The reference to a tag is set in the screen object. Insert a field within a screen entry with {F}, select the property "Text" at "Display As", choose the according tag and your list object at "Text List".

Note!
Please regard that the output is restricted to texts that are assigned to a numeric value. Values without text assignment are displayed as "∗∗∗∗∗".

Integrated screens   In delivery state, the OP has integrated standard screens that are described in the following:

Screen name	Usage
Change modes	Switch between Online-, Offline- and Transfer operation
Language	Language selection
Edit password	Here you may set the passwords for the different levels (Default: 100) and login via a password.
Time/Date	Date and time input
MPI address	Input of MPI address and baud rate

Emulate project
The OP-Manager provides you with an OP emulator that emulates an OP 03 on your Windows system. This allows you to test your project engineering without further hardware needs.

To start the emulator, you first have to compile your project with [icon] and save it. After the compilation you may start the emulator with [icon]. After every change of the program, you have to recompile it again. The emulator has the following structure:
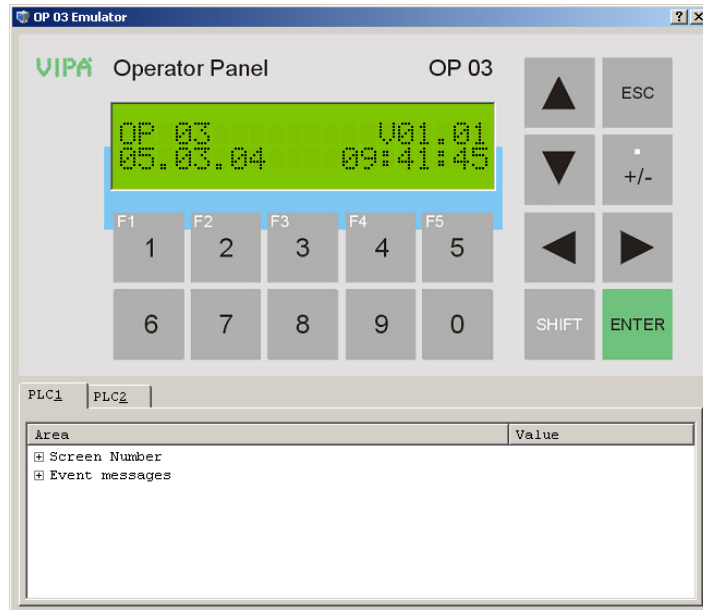
The upper half shows an original OP 03 with line display and keyboard. The lower half allows you to simulate an event on a specified CPU. Here you may jump to special screen entries by presetting the according values res. cause messages.

You may also use the menu option "Switch to Green Cable Mode" to directly connect your PC with the CPU via Green Cable and test your programming on the emulator.

When your programming runs error-free on the emulator, you may transfer your project via MPI into your OP 03.

Note!
Please regard that the CPU emulation only works when you've created objects of the type "Screen Number" and "Event Messages" in your project group in the register "Area Pointer".

Commissioning

Preconditions
- CPU system is built.
- A project has been configured by the OP-Manager and is ready for download.

Project transfer

The online project engineering requires a licensed version of the OP-Manager! More information may be found at the online help of the OP-Manager.

For project transfer the OP 03 is to be connected with the PC. Since here the OP 03 is to be served by DC 24V there are the following possibilities:
- Transfer by Green Cable
- Transfer by MPI converter

In the following the commissioning is described concerning these variants.

Transfer by Green Cable

Here the transfer is executed via an exclusively directly connected Green Cable from VIPA and external power supply.

The external power supply must be disconnected before operating with the CPU by means of the delivered MPI cable (VIPA 670-0KB00).

Green Cable connection

Connect the RS232 interface of your PC and the MPI interface of the OP 03 by VIPA Green Cable. Please regard the following hints:

Attention!
- Simultaneous voltage supply by MPI and external connection is not allowed and damages the hardware!
- The Green Cable may exclusively deployed <u>directly</u> at the concerning MP^{2}I jacks of the VIPA components (in between plugs are not permitted).
- The lengthening of the Green Cable with another Green Cable res. The combination with further MPI cables is not permitted and causes damages of the connected components! The Green Cable may only be lengthened with a 1:1 cable (all 9 Pins are connected 1:1).
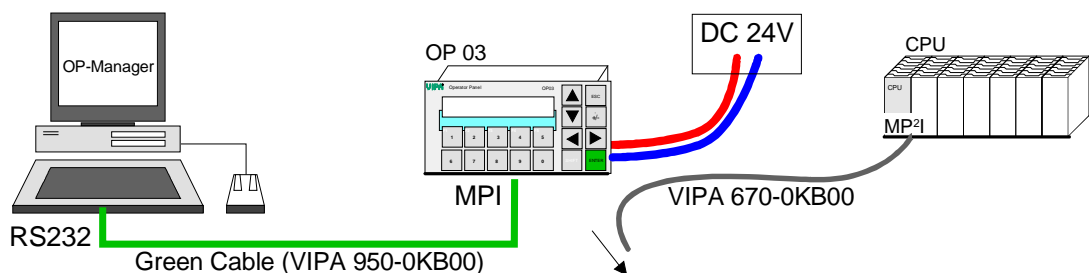
Connecting external
power supply

For external DC 24V power supply there is a connector at the back side of the OP 03 covered by a sticker with safety hints. Before connecting an external power supply first the sticker is to be removed.

The wiring takes place with spring clamp technology. The cabling with spring clamp technique enables a fast and easy connection of your supply wires. In opposite to a screw connection, this connection is vibration secure. You may connect cables with a cross-section of 0.08 mm^2 to 2.5 mm^2. You may use flexible cores without end case as well as stiff wires.

The wires are fixed at the spring clamp contacts as follows:
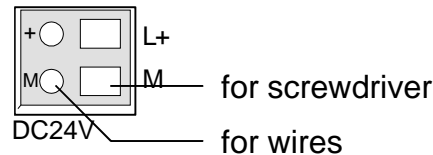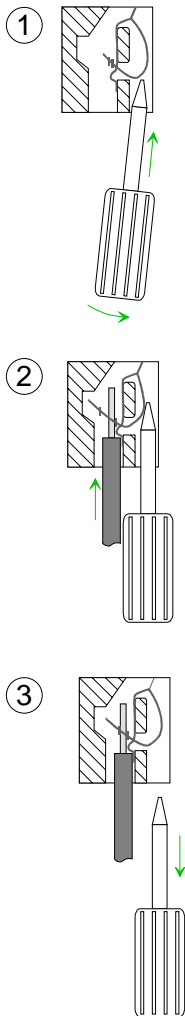
The illustration on the left side shows the steps of the cabling seen from top.

- To conduct a wire you plug a fitting screwdriver obliquely into the rectangular opening like shown in the picture.
- To open the contact spring you have to push the screwdriver in the opposite direction and hold it.
- Insert the de-isolated wire into the round opening. You may use wires with a cross-section from 0.08mm^2 to 2.5mm^2.
- By removing the screwdriver the wire is connected safely with the plug connector via a spring.

Please note as soon as the OP 03 is connected to the CPU by means of a MPI cable, which carries power supply, the external power supply must be disconnected again.

Prepare OP 03 for
data transfer

If the standard project is active in the OP 03, the OP mode "Operat. mode Transfer" may be set by **System** > *OP-Mode* > [SHIFT] + [▼] after entering the password "100" and confirmed by [ENTER].

With "Ready for transfer" the OP 03 is now waiting for data.

If the standard project is not just available there is the following possibility to reach the "Setup menu":

Push the key combination [▶] + [▼] + [ESC] and turn on the OP 03 until the "Setup menu" is active. With [▼] select "Perform Download from PC" and press [ENTER]. With "Ready for transfer" the OP 03 is now waiting for data.

This process may be aborted with [ESC] at any time.

Start transfer in
OP-Manager

Start at the PC the OP-Manager with your project.

There is an online access to the OP 03 only if the OP-Manager works with a licensed version.

Start the transfer function by clicking on ▣ in the OP-Manager, choose "MPI", if needed set the according COM port via Settings... and the baud rate to 38400, click on   OK   and confirm the project engineering. After the transfer, the OP 03 starts with the new project.

Disconnect external
power supply when
using VIPA 670-0KB00

The delivered cable (VIPA 670-0KB00) carries power supply, so the external power supply must be disconnected from the OP 03, before connecting to this cable.
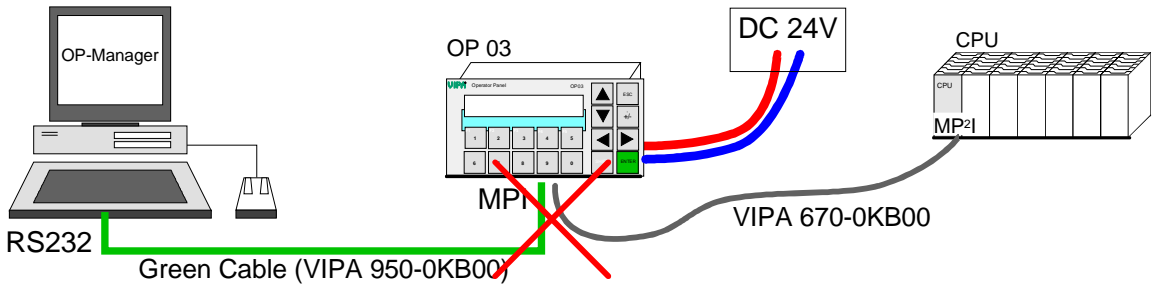
Operation

Connect after transmission the MPI jack of CPU and OP 03 by means of the delivered MPI cable. As soon as the power supply of the CPU is switched on, the OP 03 is power supplied via MPI and starts automatically with the project.
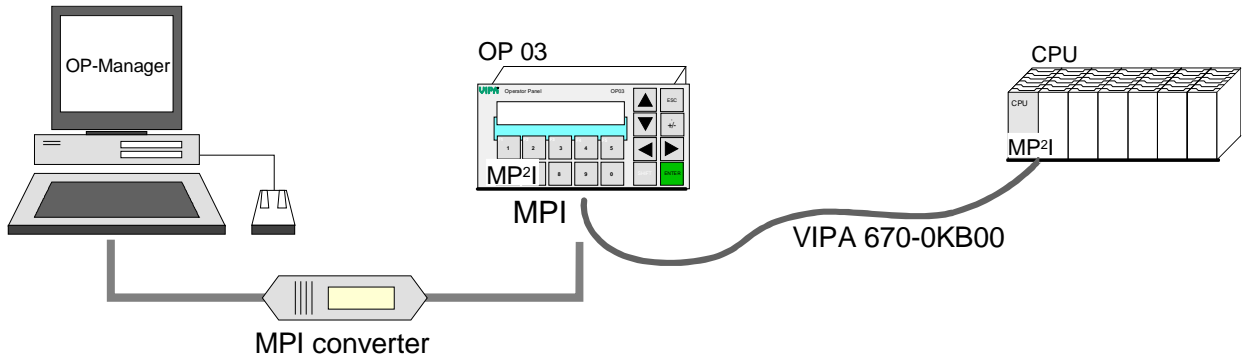
Operation
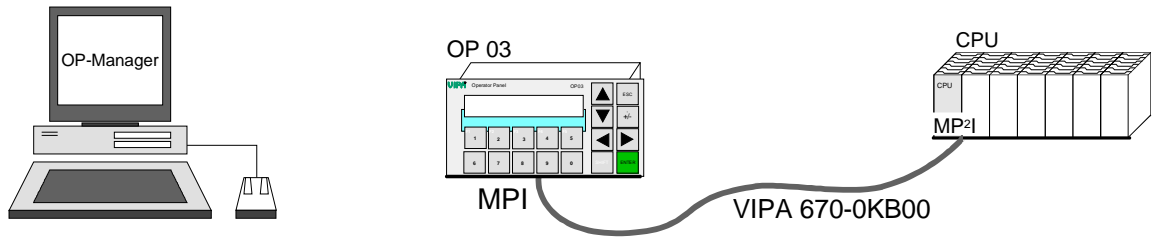
not permitted

Transfer by MPI converter cable

With this transfer method the OP 03 is powered by the power supply of the CPU when connecting this by the delivered MPI cable (VIPA 670-0KB00) to the CPU.

There is an additional MPI jack at the cable. Here a MPI converter cable may be attached.

The MPI converter cables are available from VIPA in different versions. At the PC side the MPI converter cable may be connected to the RS232 interface or the USB slot depending on the version.

Prepare OP 03 for data transfer

If the standard project is in the OP 03, you may set the OP mode "Operat. mode Transfer" via **System** > *OP-Mode* > [SHIFT] + [▼], entering the password 100 and confirm with [ENTER].

Now the OP 03 awaits data with "Ready for Transfer".

If the standard project is not yet present the setup menu may be connected with the following proceeding:

Push the key combination [▶] + [▼] + [ESC] on the OP 03 and turn it on again. Hold the keys until the OP 03 branches to the "Setup menu". Choose with [▼] "Perform Download from PC" and push [ENTER].

The OP 03 now awaits data with "Ready for Transfer".

This operation may always be aborted by [ESC].

Start transfer at OP-Manager

Load the OP-Manager with your project on your PC. You may only access the OP 03 online, if you work with a licensed version.

Call the transfer function with a click on [icon].

Select MPI and set the transfer parameters like COM port, baud rate 38400 via [Settings...] and confirm your entry.

With [OK] configuration is confirmed and the transfer is started. After the transfer, the OP 03 starts with the new project.

Operating the OP 03

Turn on

The OP 03 is to be connected to the CPU by the delivered cable (order no. VIPA 670-0KB00). As soon as the power supply of the CPU is turned on, the OP 03 is power supplied via MPI and starts automatically.

Operation via keyboard

In delivery state, the OP 03 is loaded with a standard project where all functions that are required for the operation are integrated.

You reach the menu res. the screens of a loaded project by pushing `ENTER` after start-up.

The following keys serve the navigation:

▲ res. ▼ Navigation to the previous res. next screen

◄ res. ► Navigation to the previous res. next screen

Push also `SHIFT` to navigate horizontal within a screen with ◄ res. ► and choose with ▲ res. ▼ characters from a character set that you can not insert via keyboard e.g. at hex entry for example.

With `ENTER` you leave and accept the date entry.

With `ESC` you abort an entry res. you come back to the next superordinated menu level.

The keys `F1 1` ... `F5 5` may be programmed as soft keys with screen depending functions via your engineering tool.

The access to the soft keys can be configured with or without additional `SHIFT` key. This is set via the icon in the OP-Manager from VIPA res. ProTool from Siemens.

`+/-` allows you to change the numeric sign res. with `SHIFT` + `+/-` to set a comma.

**SETUP for
data transfer,
error diagnosis and
contrast setting**

By pushing the key combination ESC + ► + ▼ before turning on, you reach the SETUP where you can set basic properties.

Set display contrast

The display contrast is set in the SETUP using SHIFT + ▲ res. ▼.

Navigation

The navigation happens with ▲ res. ▼, the selection with ENTER. ESC leaves the SETUP.

Data transfer and
error diagnosis

The SETUP includes the following functions:

- **Setup default prog**

  This function overwrites the recent project with the standard project.

- **Download from PC**

  This function prepares the OP to receive project engineering data via MPI from the OP-Manager.

  In delivery state, your OP has the MPI address 1.

  To control the MPI address you may also leave the SETUP with 2x ESC and request MPI address and baud rate via ENTER SYSTEM 4 >> ►

  MPI-ADR 4. The alteration of these values is only permissible via the project engineering in the OP-Manager.

  Afterwards you have to shut down the OP and restart it with the key combination above to enter the SETUP again.

  Choose **Download from PC** and push ENTER.

  After the data transfer has been finished, the data is proofed and stored in the memory. If everything is OK, the OP starts with the new project.

- **Display error log**

  All error codes that are stored in the OP are monitored.

Firmware update

Overview

The OP 03 allows you to update the firmware via an update software and the Green Cable from VIPA.

The last recent firmware versions can be downloaded in the service area of www.vipa.de.

Attention!

Please be very careful with loading a new firmware. Under certain circumstances you may destroy the OP 03, for example if the voltage supply is interrupted during transfer or if the firmware file is defective.

In this case, please call the VIPA hotline!

Please also regard that the update version has to be different from the existing version, otherwise no update will happen.

Read firmware version

If you didn't execute a firmware update before, you may find the recent firmware version on the label on the backside of the OP 03. Otherwise using the standard project the version is displayed at the LCD.

To download the firmware file, order no. and version no. (HW) are required. These ID numbers mark the storage directory of the concerning firmware. For example: The firmware file of an OP 03 with the order no. 603-1OP00 and HW no. 1 is stored under the file name 603-1op00_a1.xxx (xxx is the according firmware version).

Proceeding

- Go to www.vipa.de.
- Click at Service / Support > Downloads > Firmware and navigate via "HMI" to the firmware for your OP.
- Extract the zip-file into the wanted directory on your PC.
- If you want to execute the update with the Green Cable, the VIPA "Updater" is required that you may download under "Firmware" in the download area. Start the "Updater" with cpu_up.exe.

Firmwareupdate by Green Cable and cpu_up.exe

to 0.   Connect the COM interface of the PC and the MP^{2}I jack of your OP 03 via the Green Cable.

to 1.   Type the COM interface (you should not alter the setup).

to 2.   Turn off the power supply of your OP 03, push the [1] key and turn on the power supply again.

Now the OP 03 is ready for the firmware update. Nothing is shown on the display.

to 3.   Click on [connect] in the updater.

to 4.   A connection to the OP 03 is established and shown via the message "connected".

If an error message appears instead, repeat the steps above with another COM interface.

to 5.   At error free connection click on [verify hardware]. Your OP 03 is now prepared for data transfer.

to 6.   A click on [download] opens a file selection window. Choose the according firmware and start the download with [Open].

If the error message "The selected file doesn't fit to your hardware" appears you may have been tried to download a firmware that is not compatible to your OP 03. With a valid firmware version, the update process starts. This process may last several minutes and is shown in a process bar.

After the download, the following window should appear:
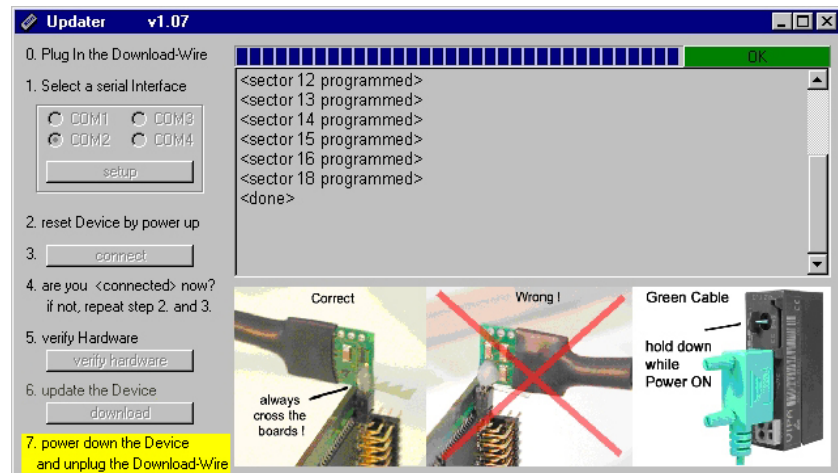
to 7.   Turn off the power supply of your OP 03, disconnect the Green Cable and turn on the power supply again. Now the OP 03 is ready with the new firmware.

If your OP 03 does not start anymore, an error occurred during the firmware update. Please call the VIPA hotline.

Chapter 3   Functions operator panel

Overview   This chapter informs you about the functionalities of the operator panel. Especially referred to is to the functions that are part of the standard project.

The text describes how you access screens, use operating keys, react to messages, alter values and use the password protection.

Screens

Overview

To monitor the process execution, the operator panel uses "Screens". A screen consists of a matrix of 2x20 characters that corresponds to the size of the display.

You may program this screens in the OP-Manager.

Screens collect logical matching process values and give you an overview over a process or an installation.

The screens allow you to enter process values and thus control the process.

To structure your process, you may develop up to 40 screens with up to 20 entries where you can branch if needed.

Screen components

Screens consist of entries. Every screen can contain several entries. Always one entry is shown per display page.

If existing, a not ready programmed row is monitored in the display as empty. A screen may include the following elements:

- Message and description texts like e.g. explanations for the user. The texts may also contain information about the soft key functions.
- Fields for in- and output of date, time, effective value and set point.
- Definitions of the soft keys that are programmed to different function calls depending on the screen.

Alter screen

You may enter values in a screen. Use the following approach:

- Choose the screen you want to alter.

  $\rightarrow$ The cursor jumps to the first input field.

- Move the cursor with ◀ res. ▶ to the according field and enter the wanted value.

- Confirm your entry with ENTER.
- Repeat this for all values that you want to alter.
- Finish the change e.g. with ESCAPE.

Screen contents list

During the operation, you may access screens via programmed soft keys or via integrated special functions.

At the project engineering in the OP-Manager, the main screens are collected in a screen contents list under "Screens" and listed with name and screen number.

Automatical update of values

During the project engineering in the OP-Manager you may set a poll rate for every variable that defines the interval for the variable update.

Please regard that the lowest poll rate is decisive for the complete screen entry.

To optimize your project engineering, you should:

- program the poll rate as high as possible (min. 1 second).
- program low poll rates only for critical variables.
- refer to only one CPU per entry. The OP 03 allows a max. of 2.

In- and output fields

Output fields display effective values of the control in numeric or symbolic format. Input fields enter set points in numeric or symbolic format. In input fields you can see the blinking cursor.

For symbolic in- and output fields, you may configure up to 256 texts where you can choose from via a selection field. The selected text is taken over.

For numeric value entries, configured number formats res. limit values are valid, regarding the number of digits in front and behind the comma.

Screen level and message level

The operator panels have two different operating levels that you may use.

Screen level:

The screen level serves the selection, operation and execution of functions.

You reach the screen level via `ENTER`. The first screen is the so-called start screen. From here, you can branch, depending on the project engineering, into other screens. The screens display recent process values, you may enter values and initialize functions via the soft keys.

Jump back to the message level with `ESC`.

At messages, the operator panel branches into a temporary message level.

As soon as you acknowledge every message with `ENTER`, the panel jumps back to the previous screen.

If several messages are waiting for acknowledgement, you may switch between them with `▲` res. `▼`.

Message level:

The message level displays recent messages like incoming operating and system messages.

After start-up, the operator panel switches to the message level.

Standard project with standard functions

Standard project after RESET

The project engineering tool OP-Manager allows you to load a "standard project". This project contains all functions available via standard screens. This project remains active also after a RESET of the operator panel.

As long as no project engineering is loaded res. after a RESET, the following standard project is activated with English dialogs.
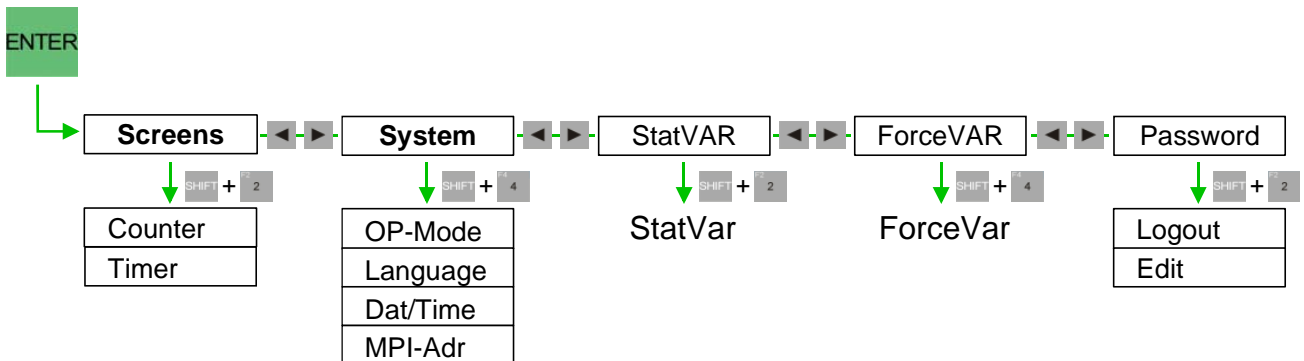
Functions in standard screens

The call of screens of the standard project happens via soft key.

Depending on the project engineering, you have to use the SHIFT key additional to the soft key.

The following standard screens are part of the standard project:

- **Screens**
  Via "Screens" you can enter a screen contents list that shows all screens that have been marked at the project engineering with the attribute "Screen to Directory" (Contents list). Without further programming, the contents list displays the two standard screens "Counter" and "Timer".

- **System**
  "System" allows you the access to the system settings. You may choose, for example, the operating mode, the language or set date and time.

- **StatVAR**
  This function starts the PG function STATUS VAR that allows you to display operands of the destination CPU.

- **ForceVAR**
  This function starts the PG function STEUERN VAR that allows you to display and alter operands of the destination CPU.

- **Password**
  Here you may set up to 20 passwords for up to 9 different password level.

Process depending operation

Screen hierarchy The project engineering allows you to adjust the screen hierarchy to the installation specific needs by adding, coupling or removing screens.

During the project engineering you define the start screen, structure, sequence of the coupling, entry in the contents list and the return destinations.

The branch into several screens happens via soft keys and programmed return destinations.

Evaluation of the screen number The screen number area is in the CPU. Here the operator panel stores the number of the recent called screen.

As soon as the CPU writes a number into this are, the according screen is displayed at the operator panel.

If you want to use the screen number area, you have to configure this in the OP-Manager. Create the screen number area in the project object group via the register "Area Pointer".

Choose the register "Area Pointer" and create a new object with the type "Screen number" via and assign a DB or a bit memory area.

The screen area consists of a double word and has the following structure:

Double word	Byte 0		Byte 1
	Bit 7	Bit 6 ... 0	Bit 7 ... 0
1. DW (Display content)	Bit 7 = 1 (ID for special screen)	Screen number	Entry number
2. DW (CPU entry)	Bit 7 = 1 (ID for special screen)	Screen number	Entry number

The first data word is filled by the operator panel with information about the monitored display content.

As soon as the CPU writes a screen and entry number into the second data word, the according screen is displayed at the operator panel with the concerning entry.

The entry FFFFh in the 1. or 2.DW marks the message level.

As soon as a 0 is in the 2.DW, your operator panel is ready for employment.

Special screens   When the highest valued bit is set in the DW of the screen number area
                         ("1"), a special screen is displayed.

                         When the highest valued bit in the DW of the screen number area is
                         deleted ("0"), a user specific screen is displayed.

Screen number	Special screen
0	Screen contents list
25 (19h)	Status Variable
26 (1Ah)	Control Variable
30 (1Eh)	Language selection
31 (1Fh)	Change operating modes
35 (23h)	Set Date/Time
36 (24h)	MPI address/Baud rate
55 (37h)	Password Login
56 (38h)	Password Edit

Example for   An example shows you the screen selection of screen number 2.
screen selection
via CPU

	Screen No.	Entry No.
1. DW	x	x
2. DW	x	x

The operator panel shows a not specified screen.

	Screen No.	Entry No.
1. DW	x	x
2. DW	0	x

To recognize and overtake an alteration, your user application
must write a "0" to the 2. DW of the screen number area.

	Screen No.	Entry No.
1. DW	x	x
2. DW	2	x

At the earliest after one poll cycle (1 second) your user
application may transfer the value 2.

	Screen No.	Entry No.
1. DW	2	x
2. DW	2	x

The operator panel recognizes the change from 0 to 2 and
displays the according screen. For control purposes, the screen
number is written to the 1. DW.

Keyboard input

At the front side there is a foil keyboard with 18 short click keys. 8 keys serve the navigation and 10 are numerical keys where 5 can be programmed as function keys.

When you push a function key, a bit is set into a bit memory byte of your CPU. By requesting the bit memory byte in your PLC application, you may react to an entry.

The numeric and cursor keys are provided with a repeat function. If you hold the key down, the key is after a short delay time repeated as long as you push the according key.

Note!

If you push several keys fast consecutively, some entries may get lost. Not received keys are signalized via an acoustic signal.

Numerical keys

The numeric keys enter numeric digits (0...9).
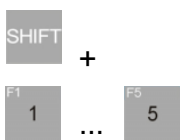
Soft keys (F1 to F5)

The numeric keys 1 ... 5 may be configured as soft keys, i.e. this keys can be programmed with screen depending functions. You enable the soft key functions by pushing the SHIFT key and simultaneously one of the keys 1 to 5.

SHIFT key

Switches to the second function of double programmed keys. [SHIFT] is pushed simultaneously with another key.

Math sign key

[+/-] allows you to change the math sign res. [SHIFT] + [+/-] to set a comma.

ENTER key (Return)

This key confirms and finishes an entry. ENTER also switches from the message to the screen level.

ESC

ESCAPE key

This key allows you to:

- clear field entries as long as they have not been confirmed with ENTER.
- branch back from the start screen to the message level or within a screen to a defined jump back destination.
- interrupt the leafing of messages and display of the recent message.
- leave a system message.

Navigation

For the navigation, the following keys are available:

▲ res. ▼ navigation to previous res. next screen

◄ res. ► navigation to previous res. next screen

Push additional SHIFT to navigate horizontal within a screen with ◄ res. ► and to choose a character from the character set that can not be entered via keyboard with ▲ res. ▼ e.g. at Hex input.

Enter the SETUP

Push simultaneously the key combination ESC + ► + ▼ before turning on and during the boot time to reach the SETUP where you can alter basic functions.

The navigation happens with ▲ res. ▼, The selection with ENTER. ESC leaves the SETUP again.

Set display contrast

The display contrast is set in the SETUP using SHIFT + ▲ res. ▼.

Functions of the
SETUP

The SETUP provides the following functions:

- **Setup default prog**

  This function overwrites the recent project engineering with the standard project.

- **Download from PC**

  This function enables the operator panel to receive engineering data from the OP-Manager via MPI.

  In delivery state your operator panel has the MPI address 1.

  To control the MPI address you may also leave the SETUP with 2x `ESC` and display via `ENTER` SYSTEM `4` >> ▶ MPI-ADR `4` the MPI address and baud rate. Alteration of this values happens in the OP-Manager via the project engineering.

  To return to the SETUP, you have to turn off the operator panel and turn it on again pushing the shown keys.

  Choose **Download from PC** and push `ENTER`.

  After the data transfer has finished, the data is proofed and stored in the memory. When executed with OK, your operator panel starts again with the new project engineering.

- **Display error log**

  All error codes stored in the operator panel are displayed.

Note!

Please regard that some functions like e.g. "Download from PC" are already included in the standard project. By including it into your project, you may use them as soft key functions without setup call.

Soft keys

The keys `1` ... `5` can be programmed as soft keys in your project engineering tool and be configured with screen depending functions.

The access to the soft keys can be programmed for usage with or without additional `SHIFT` key. This can be set via the icon in the OP-Manager.

System keyboard image

You can reserve a data area in your CPU for the system keyboard. Every key uses one Bit. By according evaluation your user application may react to key pushes.

If you want to create a data area for the system keyboard, you have to configure it in the OP-Manager. Choose for this the register "Area Pointer" in the project object group.

Create a new object of the type "System Key Assignment" with and assign a DB or bit memory area. The keyboard data area consists of a double word and has the following structure:

Bit	Byte 0								Byte 1							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
1. DW			·/+/-		SHIFT					ENTER			ESC			
2. DW	Sum bit						9	8	7	6	5	4	3	2	1	0

The sum bit 7 in the 2. DW serves as control bit. At every transfer of the keyboard image from the operator panel to the CPU it is set to the value "1" and should set back from your user application after evaluation.

Value entries

Input fields allow you to enter values that are transferred to the control.

Approach

1. Branch into the wanted screen and there to the according screen entry.

2. Use the cursor keys to select the wanted input field.

3. Enter the wanted value. Depending on the project engineering of the field you may enter values as:
   - numeric values
   - alphanumeric values
   - symbolic values

4. Confirm your entry with ENTER.

   Clear a wrong value with ESC.
   The original value it then set back into this field. Repeat the entry with the correct value.

5. Leave the screen entry with ESC.

Numeric values   Input fields that allow the entry of numeric values are filled via the number field of the keyboard digit per digit. An already started input can only be confirmed with ENTER or aborted with ESC.

To enter a decimal value, use SHIFT + +/-.

An already entered value is automatically deleted.

The input is linked to the right side. Entered digits are added right. Input fields in bit pattern format are linked to the left. Existing values are overwritten from the left.

Move here the cursor with SHIFT and ◀ res. ▶.

Number formats   The OP-Manager allows you to set limit values and number formats for
and Limit value   numeric input fields. These fields execute a limit value evaluation. The
evaluation   values you enter are only accepted if valid and within the defined range. If you enter a value exceeding the range, a system message appears. After abort, the previous value is displayed.

If the format of a numeric field has been set to a certain number of digits after the comma, empty places are filled with a 0, too many digits are ignored after acknowledgement.

Alphanumeric   Alphanumeric values contain digits as well as characters. Enter the digits
values   like shown above.

If you want to enter a character at the cursor position, you have to activate the alphanumeric character set. Push SHIFT and choose the according character via ▲ res. ▼.

Symbolic values   Symbolic values are texts res. value that can be chosen from a selection list.

Push SHIFT and choose the according entry via ▲ res. ▼. Confirm with ENTER.

Messages

Overview

Events and states of the control process are shown on the operator panel as messages.

Normally, a message consists of a static text and if wanted additionally variables. Messages can be:

- configurable operating messages that are initialized by the CPU,
- (error-) system messages that are initialized by the operator panel.

Operating messages

Operating messages contain process related information in form of static text and variable fields like e.g. messages about states or processes of an installation. Here you may display e.g. recent control effective values in numeric or symbolic format. You may configure operating messages as status messages as well as operating hints.

Configure operating message

The output of a message happens event triggered. As soon as an event takes place in the specified CPU, the according message is shown, sorted after priority. Acknowledge every message with ENTER . Please regard that you first have to configure the event in your project object group in the register "Area Pointer", if you want an event to cause a message.

Select the register "Area Pointer" and create a new object of the type "Event Messages" via . Assign a DB or bit memory area. For every bit in the operating message area you may configure one operating message. The operating message area can be divided in up to 4 address ranges. The address ranges need not to be in sequence. The assignment of message number and bit number happens automatically like shown in the picture:

16	15	14	13	12	11	10	9		8	7	6	5	4	3	2	1	Message no
15	14	13	12	11	10	9	8		7	6	5	4	3	2	1	0	Bit number

32	31	30	29	28	27	26	25		24	23	22	21	20	19	18	17	Message no
15	14	13	12	11	10	9	8		7	6	5	4	3	2	1	0	Bit number

48	47	46	45	44	43	42	41		40	39	38	37	36	35	34	33	Message no
15	14	13	12	11	10	9	8		7	6	5	4	3	2	1	0	Bit number

Address range

.
.
.
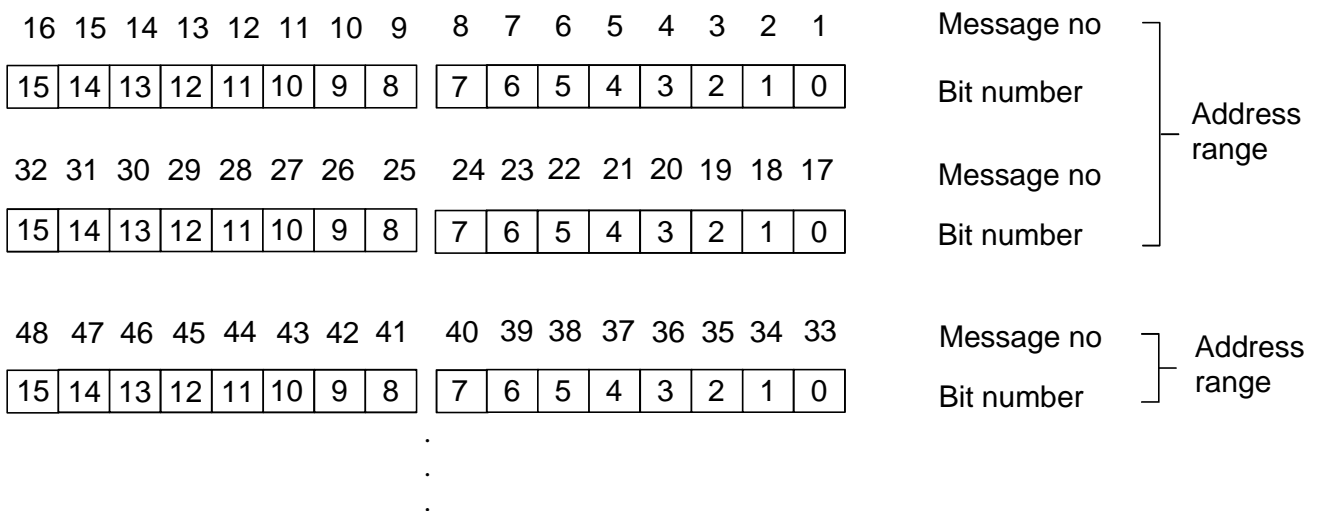
Standby message

When your operator panel is on message level and there is no message waiting, "Standby" is displayed as operating message. The standby message is stored in the firmware and contains per default release version and device type. You may change the content of the standby message via the message number 0 in the OP-Manager. You may display altered text, date and time but no variables.

System messages

System messages display internal operating states of the operator panel. They may monitor e.g. wrong handling or communication problems. This message type has the highest display priority. If a failure occurs, the recently displayed operating message fades and the system message is shown.

"Heavy" system message

A "heavy" system message requires a reboot of the operator panel.

Normal system message

All other errors cause normal system messages. The display of a normal system message can be aborted at any time with ESC . You return to the screen before.

The OP-Manager allows you to deactivate the output of system messages and preset the display duration.

After timeout the operator panel jumps automatically back to the previous screen.

Display priority

System messages always have the highest display priority.

Operating messages are displayed after message priority.

You may configure the priority for the operating messages during the project engineering, depending on the importance from 1 (low) to 4 (high).

If several messages with the same display and message priority occur, the latest message is always shown first.

Example

Reception sequence	Display sequence
1. Operating message A (Priority 2)	1. System message A
2. Operating message B (Priority 3)	2. Operating message D (Priority 4)
3. Operating message C (Priority 2)	3. Operating message B (Priority 3)
4. System message A	4. Operating message C (new with Priority 2)
5. Operating message D (Priority 4)	5. Operating message A (older with Priority 2)

Message buffer   The message buffer contains the last 50 messages in sequence of their reception.

The message buffer is filled, the oldest message is deleted. If there are more than 50 messages (message rush), only the recent 50 are shown in the message buffer. It is not possible to monitor more than 50 messages.

Scrolling   If no system message is waiting, you may scroll up down with ▲ res. ▼ . between waiting operating messages, which are displayed in the sequence of their reception and sorted after priority.

▲   Shows the next older (lower priority) message. After the oldest message of one priority group, the newest message of the next lower priority is displayed. "↓↓↓" marks the end of the messages.

▼   Shows the previous (higher priority) message. After the newest message of a priority group the oldest of the next higher priority group is displayed. "↑↑↑" marks the end of the messages.

ESC   Jumps back to the recently waiting message. This automatically happens also after 1 minute delay time.

Languages   Via the option "Language Assignment", the OP-Manager allows you, depending on the operator panel, to select up to 3 of max. 8 languages for screens and operating messages. Choose the according language in the OP-Manager and configure the according screens and messages. Now you may adjust screens and message text in the available up to 3 languages.

The texts for the system messages are fix integrated in the operator panel in the corresponding languages. The text output depends on the language that is set at the operator panel.

You may choose one of the 3 configured languages at any time during operation. To switch the language, you may choose **System** > *Language* enter your password (Standard: 100) and change the language. The selected language must be programmed before.

After the language selection, the operator panel restarts and all language related texts are displayed in the selected language.

Timer and Counter

Overview   Your operator panel allows you access to timer and counter of the CPU. You may only set time res. counter values. Start res. stop of timer and counter are not possible.

Examples for that you may see in the standard screens. The access to timer and counter happens via the standard screens *"Timer"* and *"Counter".*

Effective value   You may display the recent effective value for every programmed and in
and set point   the CPU activated timer function. Examples are to find in the standard project under screens. Choose the standard screen *"Screens"* → *"Timer"* in the standard project.

The display shows:

```
Set point       0.00             Timer 1
Effective value  0.00
```

The 1. row shows the recent timer value. The 2. row allows you to enter a set point.

ESC leaves the screen.

Time base   The common time base for every timer is configurable (10ms, 100ms, 1s or 10s). Your operating device recognizes the chosen time base and nominates the display value to seconds.

Date and time   The operator panel process date and time internally.

Please regard that the OP 03 has no integrated clock. You have to enter date and time after every reboot.

Alter date and time   The standard project allows you via **System** > *Dat/Time* to alter date and time. Switch between date and time with ▲ res. ▼. Within an input field you may navigate with SHIFT + ◄ res. ►.

Confirm the entered value with ENTER.

Interface area to external CPU

Overview

The definition of an interface area is only necessary at employment of an OP 03 if you want to use the following functions:

- Synchronization of date and time between CPU and OP 03,
- Boot recognition of the OP 03 in the CPU user application.

You may configure an interface area via the OP-Manager. This area is used by the OP 03 to synchronize date and time with the CPU res. for the login recognition of the OP 03 at the CPU.

The according area has to be provided with date and time by your user application. The access of the OP 03 happens automatically in fix intervals.

Configure interface area

Create a new object of the type "Interface Area" in the register "Area Pointer" via [icon] and assign a DB or bit memory area.

Structure

The interface area has a length of 32Byte and has the following structure:

Address	Bit 7 ... 0	Bit	
n+0	Date/Time	2	0=Data updated by CPU, 1=OP requests data
n+1	Control/Return bits	0	0=OP not present, 1=OP started
n+2 ... n+12	reserved		
n+13	Connection recognition	7 ... 0	00 as soon as CPU is connected
n+14	Reserved		
n+15	Time BCD coded	7 ... 0	Hour (0 ... 23)
n+16		7 ... 0	Minute (0 ... 59)
n+17		7 ... 0	Second (0 ... 59)
n+18 ... n+20	reserved		
n+21	Date BCD coded	7 ... 0	Day of Week (1=Su, 2=Mo, 3=Tu, ... 7=Sa)
n+22		7 ... 0	Day (1 ... 31)
n+23		7 ... 0	Month (1 ... 12)
n+24		7 ... 0	Year (0 ... 99)
n+25 ... n+31	reserved		

Synchronize Date and Time
Bit 2 of Byte 0,
Byte 15 ... 17,
Byte 21 ... 24

To synchronize date and time you have to execute the following steps:

• Create an area pointer of the type interface area for the OP 03 via the OP-Manager. Choose "Area Pointer" and create a new object of the type "Interface Area" via [icon]. Assign a DB or bit memory area. Transfer your project into the OP 03.

• Write via your user application date and time into the following bytes of your interface area:

Address	Bit 7 ... 0	Entry
n+0 ... n+14		
n+15	Time BCD coded	Hour (0 ... 23)
n+16		Minute (0 ... 59)
n+17		Second (0 ... 59)
n+18 ... n+20		
n+21	Date BCD coded	Day of week (1=Su, 2=Mo, ... 7=Sa)
n+22		Day (1 ... 31)
n+23		Month (1 ... 12)
n+24		Year (0 ... 99)
n+25 ... n+31		

• Release the data for the synchronization by setting Bit 2 of Byte 0 to 0. After start-up and then in defined intervals, the OP 03 synchronizes date and time. As acknowledgement for the CPU, the OP 03 sets Bit 2 of Byte 0 to 1 after synchronization.

Boot recognition in the user application
Bit 0 of Byte 1

As soon as an OP 03 is connected to a CPU and an interface area is configured, the OP 03 sets Bit 0 of Byte 1 of the interface area. The reset of Bit 0 marks the restart of the OP 03 for your user application.

Operating mode

Overview   Your operator panel is provided with integrated system functions that allow you to set the operating mode of the panel.

The following operating modes are available:

- Online
- Offline
- Transfer

Online   Your operator panel always starts in the operating mode "Online". The operating mode "Online" means a logical connection between operator panel and CPU res. it is tried to establish a connection.

Offline   "Offline", your operator panel works separately from the CPU. No connection establishment is tried. Thus allows you to suppress CPU error messages for test purposes.

Transfer   The operating mode "Transfer" initializes the operator panel to receive a project engineering via MPI. As communication parameter, the parameters defined at "MPI-Adr" in your operator panel are used.

When your operator panel is in the operating mode "Transfer", you may connect your PC via MPI and transfer your project online from the OP-Manager. You may interrupt the transfer at any time via ESC.

For the connection, you may use either an MPI adapter or the "Green Cable" from VIPA for a serial point-to-point connection. When using the Green Cable you have to set the transfer rate in the OP-Manager to 38400 Baud.

Note!

Please regard that the online project engineering is only available with a licensed version of the OP-Manager!

Navigation   In the standard project, the operating mode setting is under **System** > *OPMode*.

Change the operating mode with SHIFT + ▲ res. ▼. This function requires a password. The password of the standard project is 100.

StatVAR and ForceVAR

Overview   The functions StatVAR and ForceVAR allow you to monitor res. alter operand values of a connected CPU. So you may alter control operands directly during online operation.

- StatVAR monitors the operands of the CPU

- ForceVAR monitors the operands of the CPU and allows you to alter them. You may not use ForceVAR to fix values but only alter them during runtime.

Note!

The functions StatVAR and ForceVAR are to find in the standard project.

Start   In the standard project these functions are password protected. The password is 100. Starting from the message level, you see both functions like shown in the menu structure:

ENTER				
Screens ◄ ►	**System** ◄ ►	StatVAR ◄ ►	ForceVAR ◄ ►	Password
SHIFT + 2	SHIFT + 4	SHIFT + 2	SHIFT + 4	SHIFT + 2
Counter	OP-Mode	StatVar	ForceVar	Logout
Timer	Language			Edit
	Dat/Time			
	MPI-Adr			
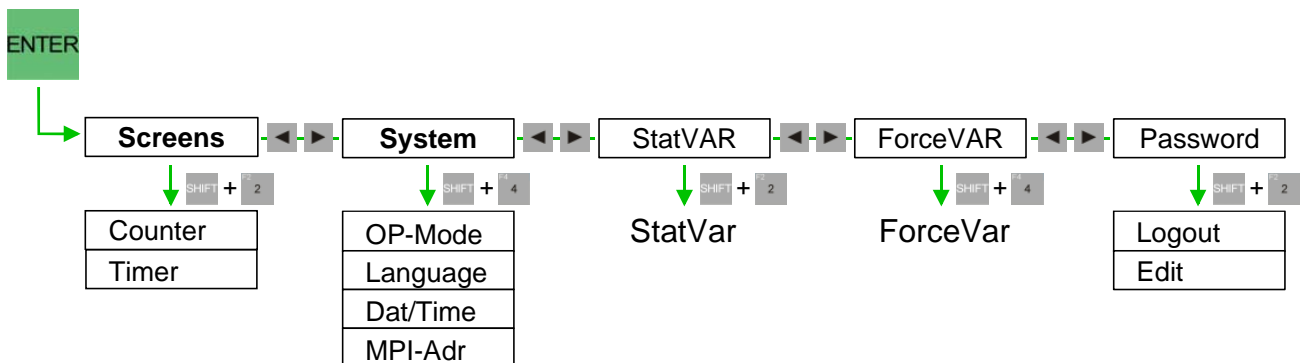
MPI address   After the call of StatVAR res. ForceVAR you need the MPI address of the destination CPU. Default address is address 2.

At the OP 03, this 2 functions give you the opportunity to connect an additional CPU to complete the already configure ones.

Key functions

SHIFT + ▲
▼
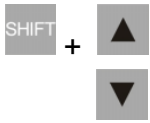
After entering the MPI address, you reach the operand field with the cursor key ▶.

Push SHIFT and choose with ▲ or ▼ the data type that you want to display. ENTER sets automatically the according data format in the format field.

The key ▶ brings you to the numeric input field. Use the numeric key block to type the number of the operand to monitor res. at ForceVAR the operand to monitor and alter and confirm with ENTER.

Every operand value that shall be monitored or altered has to be defined in a "Screen". You may create up to 10 screens.

Within a screen res. a value field you navigate the blinking cursor with the arrow keys.

Confirm your entries for every field with ENTER. The values of the displayed operands are shown in the preset format in the value field.

SHIFT + ESC

The key combination SHIFT + ESC deletes single rows.

ENTER

After you've altered the operand list, the values in the control must be updated. This happens immediately after the verification of a single value.

When you press the enter key again after the last confirm of your entries, the new values are transferred to the control.

Note!

During the status update, a blinking * is shown in the right upper corner of the display. If the star is not blinking, no logical connection to the control is established.

During the update process, no entries are permissible.

You may interrupt the update at any time via ESC.

Password protection

Overview

To avoid unauthorized access, the operator panel provides an integrated password protection. This includes the definition of passwords for up to 8 password level. The assignment of the password levels happens in the OP-Manager. With raising importance of the functions you may set a password level from 0 to 9 at the project engineering of soft keys.

Enter Level 0 to deactivate the password request.

A password of the level 9 gives you access to all other password levels. This "Supervisor-Password" is set in the project engineering.

The passwords for the levels 1 to 8 are exclusively set in the operator panel. The screen "Password" is required in your project (see standard project).

Set Supervisor-Password

The Supervisor-Password gives you access to all functions of your operator panel. The Supervisor-Password is transferred to the operator panel together with the project. To enter a Supervisor-Password click on

 in your project. The following dialog window appears:
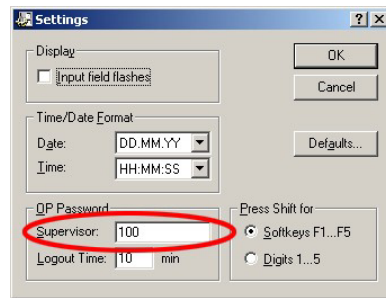
Set a password under "Supervisor" and define via "Logout Time" how long after the login the password will be valid.

Set password level

You may set a password level for every soft key definition like shown in the picture.
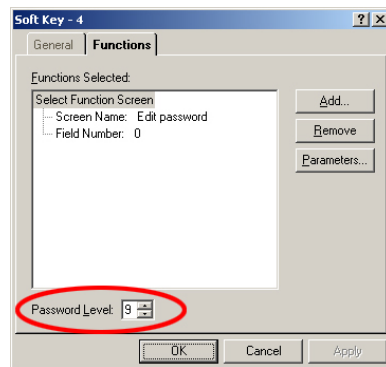
Please regard that the password levels for integrated standard screens of the operator panel are fix like e.g.:

Level 9: Password Edit, OP-Mode

Level 8: ForceVAR

Level 0: StatVAR, Password>Logout

More detailed information see following page.

Set password at the operator panel for level 1 to 8

Precondition

You've included the screen "Password" into your project and you know the Supervisor-Password.

Approach

- Load your project into the operator panel.

- Press ENTER and navigate to the screen "Password". Via "Edit" you reach the password dialog. The password alteration is protected with the Supervisor-Password. In delivery state, the password is 100. Please regard that you may have to push SHIFT additional to the digit 1 depending on the project basic settings.

- Enter the password and confirm with ENTER.

  Now you reach a table where you may enter a password for every level. For you may store up to 20 password assignments in the table, you may also assign more than one password to a level. **The password must have at least 3 digits and max. up to 8 digits. Characters and leading zeros are not permissible.**
  The table has the following structure:

  ```
  No.   Password        Level
  0     _____100        9
        (Supervisor-Password)
  1     _____        0
                 .
                 .
                 .
  20    _____        0
  ```

Navigation and delete password

The navigation happens with the arrow keys. You have to confirm every entry with ENTER. To delete a password, write a 0 (zero) over the password. The Supervisor-Password cannot be deleted.

ESC finishes the password entry and brings you back to the password screen. Via "Logout" you activate the passwords.

Fixed password levels

Please regard that the password levels for the following integrated standard screens are fixed in the operator panel:

Level 9: Password Edit, OP-Mode
Level 8: ForceVAR
Level 6: System>MPI-Adr
Level 4: System>Dat/Time
Level 2: System>Language
Level 0: Screens, StatVAR, Password>Logout

Chapter 4   General installation guidelines

Overview   The chapter gives you information about the interference-free installation of Programmable Logic Controls (PLC) together with a OP 03.

Here we describe possible paths how interference can enter the controller, how you ensure the electromagnetic compatibility (EMC) and how to approach shielding and screening issues.

Content   **Topic   Page**

Basic rules for the EMC-equitable assembly of installations

What is EMC? The term electromagnetic compatibility (EMC) refers to the ability of an electrical device to operate properly in an electromagnetic environment without interference from the environment or without the device causing illegal interference to the environment.

The Operation Panels are developed for applications in harsh industrial environments and complies with EMC requirements to a large degree. In spite of this you should implement an EMC strategy before installing any components, which should include any possible source of interference.

Possible sources for disturbances Electromagnetic interference can enter your system in many different ways:
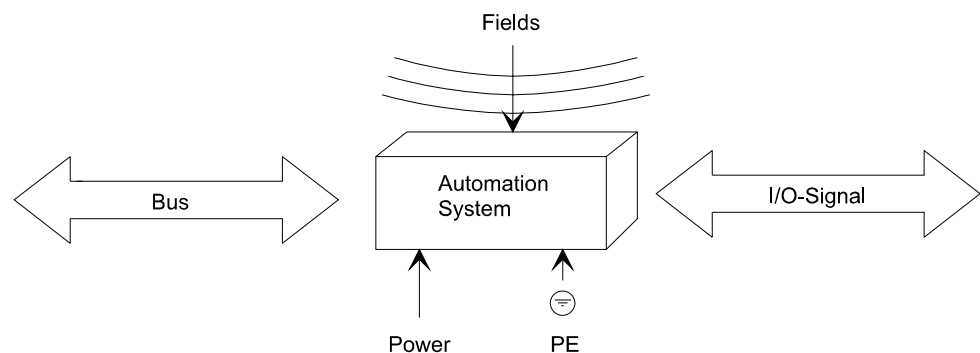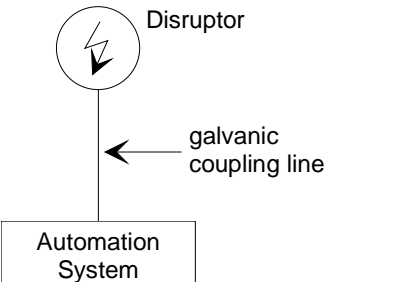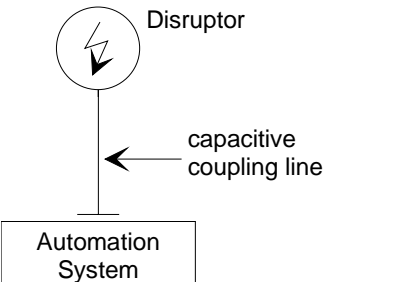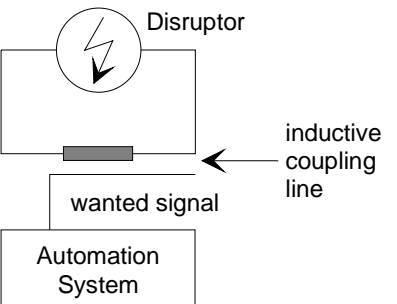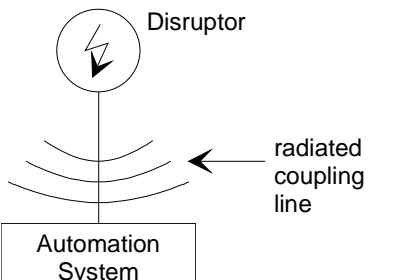
Interference is coupled into your system in different ways, depending in the propagation medium (conducted or not conducted) and the distance to the interference source.

We differentiate between:

- galvanic coupling
- capacitive coupling
- inductive coupling
- radiated power coupling

Coupling mechanisms and interference sources

The following table shows the four different coupling mechanisms, their causes and possible interference sources.

Coupling mechanism	Cause	Typical source
Galvanic coupling Disruptor galvanic coupling line Automation System	Galvanic or metallic coupling always occurs when two current circuits have a common line	• Pulsed devices (Net influence from transducers and foreign net devices) • Starting motors • Different potential of component cubicles with common current supply • Static discharges
Capacitive coupling Disruptor capacitive coupling line Automation System	Capacitive or electric coupling occurs between conductors with different potential. The coupling is proportionate to the time characteristics of the voltage.	• Interference through parallel signal lines • Static discharge of the personnel • Contactors
Inductive coupling Disruptor inductive coupling line wanted signal Automation System	Inductive or magnetic coupling occurs between two current active line loops. The magnetic flows associated with the currents induct interference voltages. The coupling is proportional to the time characteristics of the current.	• Transducers, motors, electric welding devices • Parallel net cables • Cables with toggled currents • Signal cable with high frequency • Unused coils
Radiate power coupling Disruptor radiated coupling line Automation System	One talks of radiate power coupling, when an electromagnetic wave meets a line circuit. The hit of the wave inducts currents and voltages.	• Sender in the neighborhood (e.g. walkie-talkie) • Sparking lines (sparking plugs, collector of electric motors, welding devices)

Basic rules for ensuring EMC

In many cases, adherence to a set of very elementary rules is sufficient to ensure EMC. For this reason we wish to advise you to heed the following rules:

During the installation of your automation units you should ensure that any inactive metal components are grounded via a proper large-surface earth

- Interconnect any inactive metal components via low-impedance conductors with a large cross-sectional area.
- Execute screw connections at coated and anodized metal parts either with special contact washer or remove the isolating protective film.
- Install a central connection between the chassis ground and the grounding/protection system.

Ensure that cabling is routed properly during installation

- Divide the cabling into different cable groups (High voltage lines, power supply lines, signal lines, data lines).
- Always install high voltage lines and signal or data lines in separate channels or bundles.
- Install signal and data lines as close as possible to any metallic ground surfaces (e.g. frames, metal rails, sheet metal).

Ensure that the screening of lines is grounded properly

- Data lines must be screened. The screen has to be laid both-sided.
- Analog lines must be screened. Where low-amplitude signals are transferred it may be advisable to connect the screen on one side of the cable only.
- Attach the screening of cables to the ground rail by means of large-surface connectors located as close as possible to the point of entry. Clamp cables mechanically by means of cable clamps. Route the connected screen to the modules without interruptions, but don't connect the screen again.
- Ensure that the ground rail has a low-impedance connection to the cabinet/cubicle.
- Use only metallic or metalized covers for the plugs of screened data lines.

In critical cases you should implement special EMC measures

- Connect suppressors to all inductive loads that are not controlled by special EMC-modules.
- Use incandescent lamps for illumination purposes inside cabinets or cubicles, do not use of fluorescent lamps.

Create a single reference potential and ensure that all electrical equipment is grounded wherever possible

- Ensure that grounding measures are implemented effectively. The controllers are grounded to provide protection and for functional reasons.
- Provide a star-shaped connection between the plant, cabinets/cubicles and the grounding/ protection system. In this way you can avoid ground loops.
- Where potential differences exist you must install sufficiently large equipotential bonding conductors between the different parts of the plant.

EMC-equitable assembly

Mostly, measures for suppressing interference voltages are only taken, when the control is already in commission and the perfect receive of a wanted signal is disturbed.

Causes for such interference's are in the most cases inadequate reference potentials, coming from mistakes at the device assembly and installation.

Guidelines for assembling and grounding of inactive metal parts

When assembling the devices, you have to ensure the large-surface grounding of the inactive metal parts. A correctly done grounding supports an unambiguous reference potential for the control and reduces the impact of coupled interference's.

Grounding means the conducting connection of all inactive metal parts. The sum of all interconnected inactive parts is called Ground.

Inactive parts are all conductive parts electrically separated from all active parts by means of a basic isolation and that may only get voltage in case of an error.

The ground must not adopt dangerous contact voltage even in case of an error. Thus you have to connect the ground with the protected earth conductor. To avoid ground loops, local distant ground constructions (cubicles, construction and machine parts) have to be connected with the protected earth conductor system in star-topology.

Please regard at grounding:

- Connect the inactive metal parts as carefully as the active ones.
- Take care of impedance-low metal-metal-connections, for e.g. with large-surface and well conductive contacts.
- If you include coated or anodized metal parts in the grounding, you have to come through the isolating protection layers. For this you may use special contact washers or remove the isolation layer.
- Protect the connection points from corrosion, e.g. with grease.
- Moveable grounding parts (e.g. cubicle doors) have to be connected via flexible ground strips. The ground strips should be short and have a large surface, because the surface is decisive for the diversion of high frequency interference's.

EMC-equitable cabling

Line routing   Content of this section is the line routing of bus, signal and supply lines. Object of the line routing is to suppress the "slurring" at parallel lines.

Line routing inside   For an EMC-equitable routing of the lines it is convenient to divide the
and outside of   cables in different groups and install each group itself:
cubicles

Group A
- screened bus and data lines
- screened analog lines
- unshielded lines for direct voltage ≤ 60V
- unshielded lines for alternating voltage ≤ 25V
- Coaxial cables for monitors

Group B
- unshielded lines for direct voltage >60V and ≤400V
- unshielded lines for alternating voltage >25V and ≤400V

Group C
- unshielded lines for direct and alternating voltage >400V

Group D
- Lines for H1 respectively TCP/IP

Combination of groups

Following the table you may see the conditions for the cabling of the line groups by combining the single groups:

	Group A	Group B	Group C	Group D
Group A	[1]	[2]	[3]	[4]
Group B	[2]	[1]	[3]	[4]
Group C	[3]	[3]	[1]	[4]
Group D	[4]	[4]	[4]	[1]

[1]	The lines may be installed in common bundles or cable trusses.
[2]	The lines have to be installed in different bundles or cable trusses (without min. distance).
[3]	The lines have to be installed in different bundles or cable trusses inside of cubicles and outside of the cubicle but inside the building in separated cable trusses with a min. distance of 10cm.
[4]	The lines have to be installed in different bundles or cable trusses with a min. distance of 50cm.

Line routing outside of buildings

Wherever possible, exterior cabling should be installed on metallic cable trays. A galvanic connection must be provided for joints between cable trays.

You must abide by the applicable lightning protection and grounding regulations when installing exterior cables.

Lightning protection

Attention!

Where cables and signal lines for PLC equipment are installed outside of buildings, the conditions for internal and external lightning protection must be satisfied.

- Exterior lines should either be installed in metallic conduit pipes that is grounded on both ends or in steel-reinforced concrete cable trunks with continuously connected reinforcing.
- Signal lines should be protected against overvoltage by varistors or by lightning arrester filled with rare gas.
- Install these protective elements at the location where the cables enter the building.

Note!

Any lightning protection system must be based on an individual assessment of the entire plant. For questions please contact VIPA GmbH.

Equipotential bonding

Potential differences may occur between different sections when controllers and peripheral equipment are connected by means of non-isolated connections or the screens of screened cables are connected at both ends and grounded on different sections of the plant.

One reason for a potential difference may be that different sections of the plant are powered from different power sources. These potential differences must be reduced by means of equipotential bonding conductors to ensure that the electronic equipment employed on the plant operates properly.

Rules for equipotential bonding

- The lower the impedance of the equipotential bonding conductor, the higher the effectiveness of potential equalization.
- The impedance of the equipotential bonding conductor must not exceed 10% of the impedance of the screen where screened signal lines are connected between the different sections of the plant and the screening is connected to ground/neutral on both sides.
- The cross-sectional area of the equipotential bonding conductor must be calculated to carry the maximum equalization current. The following cross-sections have been successfully employed:

  - 16mm^2 Cu for equipotential bonding conductors up to 200m

  - 25mm^2 Cu for equipotential bonding conductors exceeding 200m

- Use copper or galvanized steel for equipotential bonding conductors. These must be connected to ground/neutral by means of large-surface connections that are protected from corrosion.
- The equipotential bonding conductor should be installed in such a manner that it includes the smallest surface between the bonding conductor and the signal lines.

Screening of lines and cables

Screening is one method commonly used to reduce (attenuate) the interference pick-up from magnetic, electrical or electromagnetic fields.

- Interference on screens is conducted to ground by the conductive connection between the screen and the screening rain/enclosure. To avoid interference from these currents it is very important that the neutral connection is a low-impedance connection.
- You should only use of cables that are provided with a braided screen. The degree of screening should be more than 80%.
- Avoid cables with foil-type screens as the foil is easily damaged by tension and pressure at the point of attachment; this can result in reduced effectiveness of the screening action.
- As a rule you should always ground the screens of cables on both ends. This is the only way in which you can ensure that high frequency interference is attenuated properly.

One-sided grounding of screens

In exceptional cases it may be necessary to ground the screen on one side only. However, this will only attenuate the lowest frequencies. The one-sided grounding of screens may provide advantages when:

- It is not possible to install an equipotential bonding conductor

- Analogue signals (a few mV or μA) must be transmitted
- Foil-type screening (static screening) is employed.

You should always use metallic or metalized covers for serial data lines. Connect the screen of the data line to the cover. Do **not** connect the screen to PIN 1 of the connector!

In case of stationary operations it is recommended that the remove the insulation from the screened cable without cutting the screen and to attach this point to the screening/neutral rail.

Note!

Potential differences may give rise to an equalization current via the screen connected between the two ground connections.

In this case you must install an additional equipotential bonding conductor.

Connecting the screen

Please observe the following points when you handle the screens:

- Use only metallic cable clamps when connecting the screening of cables. These clamps must provide a good electrical contact and a large-surface connection to the screen.
- Attach the screens to the screening rail directly at the point where the cables enter the enclosure. The screening conductor must be continued to the module without interruption, however, it must not be connected to the module!
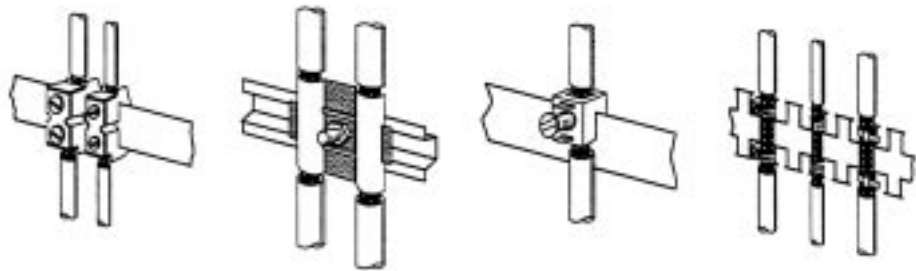
Special precautions providing high noise immunity

Inductors require suppressors

Inductors controlled by your programmable controller (e.g. contactors and relays) do not normally require suppressors as the respective modules have been provided with the required components.

Suppressors must only be connected to inductors when output circuits can be disabled by means of additional contacts (e.g. relay contacts). In this case the integrated suppressors on the module are also disabled.
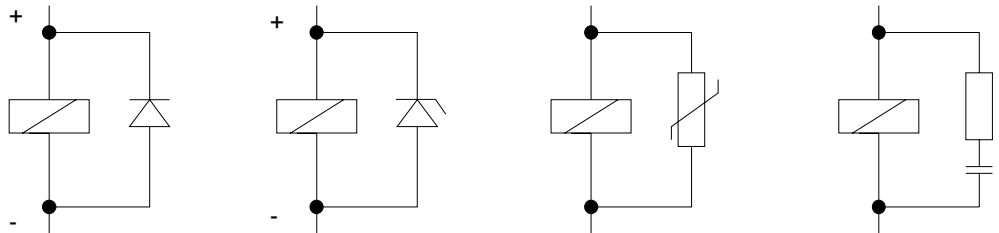
You can connect diodes to suppress back-emc, varistors or RC-networks to the inductors.

| Connections of DC-activated inductors		Connections of AC-activated inductors	
using a diode	using a Z-diode	using a varistor	using RC-network

Power outlet for PGs

Every cubicle must be provided with a power outlet for the PGs. These outlets must be wired to the distribution system, which is also used to connect the neutral conductor for the cubicle.

Cubicle illumination

The cubicle illumination should consist of incandescent lights, e.g. LINESTRA-lamps. Avoid using fluorescent lamps as these lamps can cause interference.

If you can not avoid using fluorescent lamps you should implement the steps outlined in the following figure.

Suppression of fluorescent lamps in cubicles
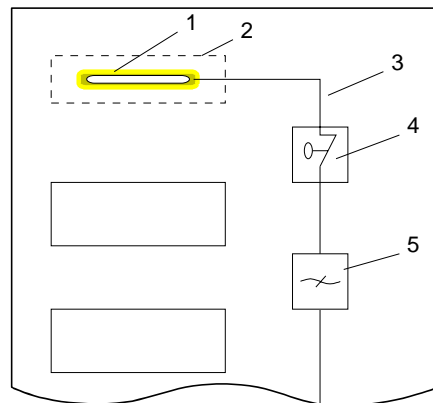
[1]   Fluorescent lamp

[2]   Screen above the lamp

[3]   Screened cable

[4]   Switch with metallic cover

[5]   Powerline filter or screened power cable

Checklist for the EMC-compliant installation of controllers

EMV-measures	Space for Notes
Connection of the inactive parts	
You should take special care to check the connections of: • Module racks • Frames • Screen and protected earth conductor	
Are all the inactive metal parts interconnected by means of large-surface and low-impedance connections?	
Has a proper connection been installed with respect to the ground/protected earth conductor system?	
Has the isolation been removed from varnished and anodized surfaces or have these connections been fitted with special contact washer?	
Have the connection been protected from corrosion, e.g. by means of grease?	
Have doors been grounded by means of grounding straps connected to the body of the cubicle?	
Cable routing	
Cabling divided into groups?	
Power cables (230...400V) and signal lines installed in separate channels or bunches?	
Potential compensating	
When installing the equipment at separate locations, check the installation of the potential compensating line.	
Cable screen	
All covers of plugs are metallic?	
All analog and data lines installed screened?	
Line screens attached to the screening or the protected earth conductor?	
Have the screens been connected by means of large-surface and low-impedance cable clamps?	
Cable screens grounded both-sided where possible?	
Inductors	
Have the coils of contactors controlled by means of contacts been connected to suppressors?	