Electric Drives
and Controls

Hydraulics

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Assembly Technologies

Pneumatics

Service

Rexroth
Bosch Group

Rexroth IndraControl
VDP 16.1/40.1/60.1
Operator Display

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Project Planning Manual

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1   System Presentation

1.1   Brief Description of the VDP 16.1, VDP 40.1 and VDP 60.1 Operator Displays

The VDP 16.1/40.1/60.1 operator displays are passive operator and visualization terminals. They form a PC-based operator terminal when used with a control cabinet PC (IPC) equipped with a G4 display interface. At present, the IPC 40.2, VSB 40.1 or VPB 40.1 devices are available as control cabinet PCs. While the VDP 16.1, VDP 40.1 and VDP 60.1 displays are mounted in the door of the control cabinet or on a bracket with little mounting depth, the control cabinet PC (IPC) can for example be mounted in the control cabinet. Data is transmitted between control cabinet PC and VDP 16.1/40.1/60.1 operator display via G4 display interface.

Y-repeater   A Y-repeater is an accessory to connect VDP devices to a control cabinet PC (see chapter 11.5 "Accessories" on page 64). The Y-repeater can be used to connect two VDP devices to a control cabinet PC (IPC).

1.2   Variants

1.2.1   Characteristic Features

The displays are available as differnet variants, see type designation code in chapter 11.1 "Type Designation Code" on page 61. They differ in display size and touch screen capability.

VDP 16.1	BB	-	BK
Customized design for Bosch	-	AC	-
Display	304.8 mm TFT (12")		
Touch screen	Yes	Yes	No
Keys (foil keyboard)	No	No	16 machine function keys

Fig.1-1:   Characteristic features of the VDP 16.1 devices

VDP 40.1	BE	-	BI
Customized design for Bosch	AG		
Display	381 mm TFT (15")		
Touch screen	Yes	Yes	No
Keys (foil keyboard)	No	No	16 machine function keys

Fig.1-2:   Characteristic features of the VDP 40.1 devices

VDP 60.1	BL
Display	304.8 mm (12")
Touch screen	No
Keys (foil keyboard)	Machine function keys and alphanumeric keys

Fig.1-3:   Characteristic features of the VDP 60.1 devices

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1.2.2   Displays with Foil Keyboard

The front panel with foil keyboard consists of a 4 mm thick aluminum panel with beveled edges covered by a chemical resistant polyester foil with embossed keys. Machine functions keys are integrated in the application-oriented function keypad.

1.2.3   Displays with Touch Screen

The front panel with touch screen allows to operate the application software via the touch-sensitive surface of the display without keyboard and mouse.

NOTICE	Danger of destruction of the touch screen if operated with inappropriate objects (e.g. screwdriver).

Operate the touch screen only with your finger or with a touch pen.

1.2.4   VDP 16.1 Variants

VDP 16.1 - Variants

VDP 16.1BB with touch screen
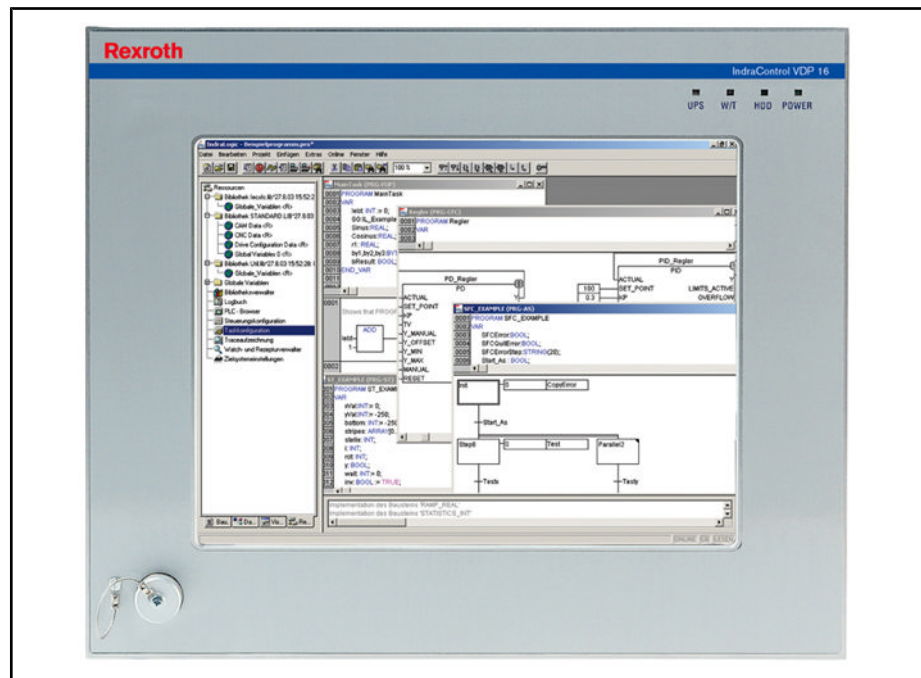
Fig.1-4:   VDP 16.1 with touch screen

VDP 16.1AC with touch screen, without front USB, customized Bosch design

Principally, they differ from the standard variant in its rounded edges, the missing USB connection and the different mounting dimensions.

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VDP 16.1BK with keypad and 16 M-keys, standard variant

Fig.1-5:   VDP 16.1 with foil keyboard

1.2.5   VDP 40.1 - Variants

VDP 40.1BE with touch screen
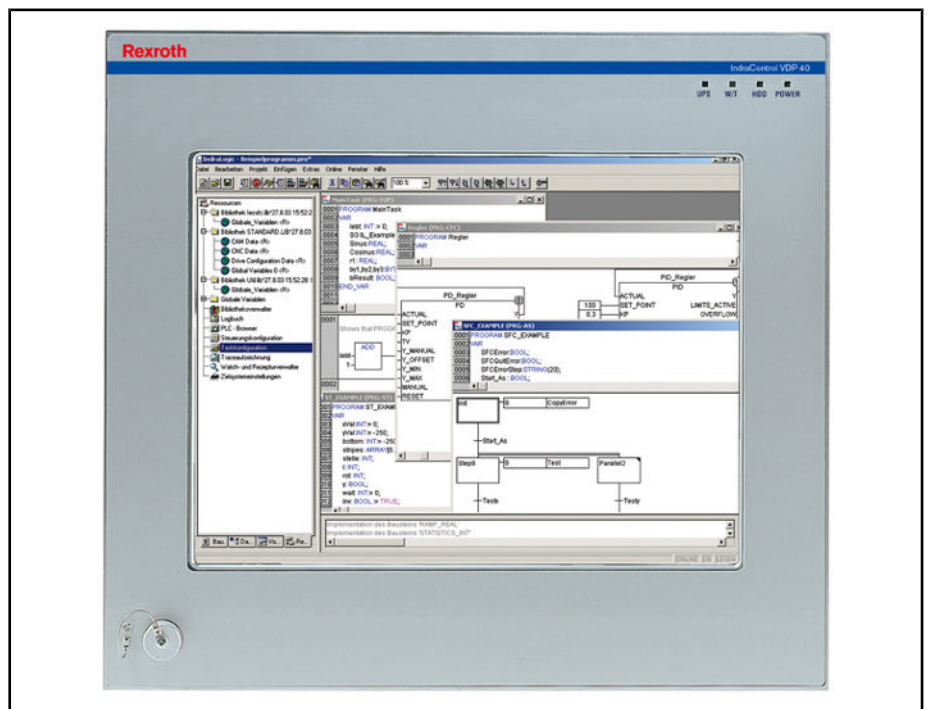
Fig.1-6:   VDP 40.1 with touch screen

VDP 40.1AG with touch screen, without front USB, customized Bosch design

Principally, they differ from the standard variant in its rounded edges, the missing USB connection and the different mounting dimensions.

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VDP 40.1BI with foil keyboard and 16 machine function keys, standard variant

Fig.1-7:   VDP 40.1 with foil keyboard

1.2.6   VDP 60.1

VDP 60.1BL with foil keyboard, 16 machine function keys, alphanumeric keys and 12" display
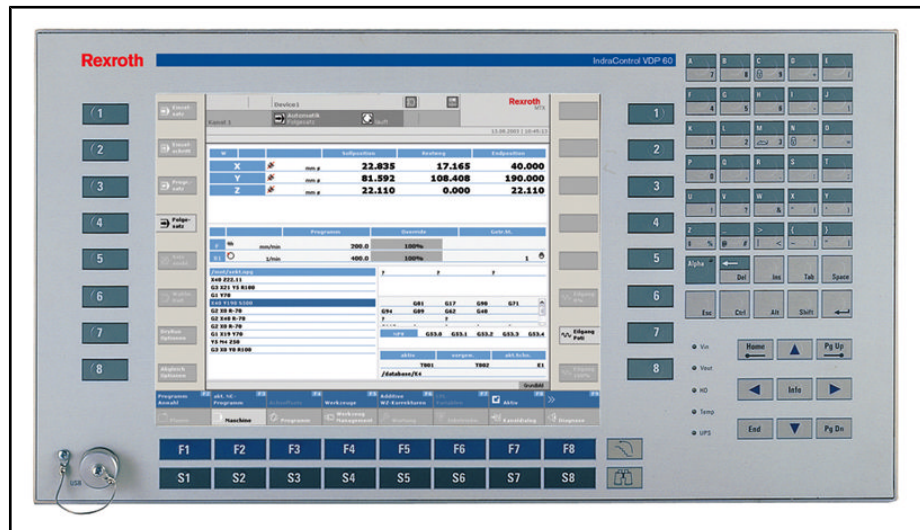
Fig.1-8:   VDP 60.1 with foil keyboard

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1.3   Accessories

Using the Y-repeater (VAC01.1S-YG4-EXTN) provided as accessory part, two VDP displays can be connected to a control cabinet PC (IPC). The Y-repeater can be cascaded. Therefore, three or more VDPs can be connected to a control cabinet PC.

1.4   Commissioning

Mount the device properly, see also chapter 5.3 "Installation " on page 32. Connect the device to the de-energized control cabinet PC (IPC); then connect the 24 V supply voltage.

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2   Important Instructions on Use

2.1   Appropriate Use

2.1.1   Introduction

Rexroth products represent state-of-the-art developments and manufacturing. They are tested prior to delivery to ensure operational safety and reliability.

⚠ WARNING	Physical injury and material damage might result from an inappropriate use of the products!

The products are designed for the use in an industrial environment and may therefore only be used for the intended purpose. If they are not used as intended, situations causing personal injury as well as material damage can occur.

☞   Rexroth disclaims as manufacturer any warranty, liability or damages occurring due to inappropriate use of the products. Furthermore, Rexroth is not paying any compensation. The user is responsible for any risks resulting from inappropriate use of the products.

Before using Rexroth products, the following requirements must be met to ensure appropriate use of the products:

- Anyone handling one of the Rexroth products in any way has to read and understand the respective safety-related guidelines as well as the instructions on appropriate use.

- Hardware products have to remain in their original state, i. e. no modification regarding the design is allowed. Software products must not be decompiled and their source codes must not be modified.

- Damaged or faulty products must not be implemented or put into operation.

- It must be ensured that the products are installed as specified in the documentation.

2.1.2   Areas of Use and Application

The Rexroth VDP 16.1/40.1/60.1 displays are passive operating and visualization terminals forming a PC-based machine operating terminal when used with an industrial PC.

NOTICE	Danger of destruction of the device if not expressly stated accessories, add-on components and other components, cables, conduits, software and firmware is used.

The VDP 16.1/40.1/60.1 displays may exclusively be used with the accessories and add-on components specified in this documentation. Components not named expressly mentioned must neither be mounted nor connected. The same applies to cables and conduits.

The products may only be operated with the expressly stated configurations and component combinations as well as with the software and firmware which is given and specified in the respective functional description.

Typical areas of application of the VDP 16.1/40.1/60.1 are:

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- Handling systems and assembly systems
- Packaging and food processing machines
- Printing machines and paper converting machines
- Machine tools
- Wood processing machines

The VDP 16.1/40.1/60.1 operator displays may only be operated under the assembly conditions and installation conditions, in the specified position of application and under the specified ambient conditions (temperature, degree of protection, humidity, EMC etc.) given in this documentation.

2.2   Inappropriate Use

The application of VDP 16.1/40.1/60.1 that are not within the specified areas of application or under operating conditions deviating from the operating conditions and technical data specified in the documentation is considered as "inappropriate".

VDP 16.1/40.1/60.1 must not be used if ...

- it is exposed to operating conditions that do not fulfill the ambient conditions specified. For instance, operation under water, in case of extreme variations of temperature or in extreme maximum temperatures is not allowed.
- the intended applications have not expressly been allowed by Rexroth. It is imperative that you also note the information given in the general notes on safety!

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3   Safety Instructions for Electric Drives and Controls

3.1   Definitions of Terms

Application Documentation
Application documentation comprises the entire documentation used to inform the user of the product about the use and safety-relevant features for configuring, integrating, installing, mounting, commissioning, operating, maintaining, repairing and decommissioning the product. The following terms are also used for this kind of documentation: User Guide, Operation Manual, Commissioning Manual, Instruction Manual, Project Planning Manual, Application Manual, etc.

Component
A component is a combination of elements with a specified function, which are part of a piece of equipment, device or system. Components of the electric drive and control system are, for example, supply units, drive controllers, mains choke, mains filter, motors, cables, etc.

Control System
A control system comprises several interconnected control components placed on the market as a single functional unit.

Device
A device is a finished product with a defined function, intended for users and placed on the market as an individual piece of merchandise.

Electrical Equipment
Electrical equipment encompasses all devices used to generate, convert, transmit, distribute or apply electrical energy, such as electric motors, transformers, switching devices, cables, lines, power-consuming devices, circuit board assemblies, plug-in units, control cabinets, etc.

Electric Drive System
An electric drive system comprises all components from mains supply to motor shaft; this includes, for example, electric motor(s), motor encoder(s), supply units and drive controllers, as well as auxiliary and additional components, such as mains filter, mains choke and the corresponding lines and cables.

Installation
An installation consists of several devices or systems interconnected for a defined purpose and on a defined site which, however, are not intended to be placed on the market as a single functional unit.

Machine
A machine is the entirety of interconnected parts or units at least one of which is movable. Thus, a machine consists of the appropriate machine drive elements, as well as control and power circuits, which have been assembled for a specific application. A machine is, for example, intended for processing, treatment, movement or packaging of a material. The term "machine" also covers a combination of machines which are arranged and controlled in such a way that they function as a unified whole.

Manufacturer
The manufacturer is an individual or legal entity bearing responsibility for the design and manufacture of a product which is placed on the market in the individual's or legal entity's name. The manufacturer can use finished products, finished parts or finished elements, or contract out work to subcontractors. However, the manufacturer must always have overall control and possess the required authority to take responsibility for the product.

Product
Examples of a product: Device, component, part, system, software, firmware, among other things.

Project Planning Manual
A project planning manual is part of the application documentation used to support the sizing and planning of systems, machines or installations.

Qualified Persons
In terms of this application documentation, qualified persons are those persons who are familiar with the installation, mounting, commissioning and operation of the components of the electric drive and control system, as well as with the hazards this implies, and who possess the qualifications their work requires. To comply with these qualifications, it is necessary, among other things,

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1) to be trained, instructed or authorized to switch electric circuits and devices safely on and off, to ground them and to mark them

2) to be trained or instructed to maintain and use adequate safety equipment

3) to attend a course of instruction in first aid

User A user is a person installing, commissioning or using a product which has been placed on the market.

3.2   General Information

3.2.1   Using the Safety Instructions and Passing Them on to Others

Do not attempt to install and operate the components of the electric drive and control system without first reading all documentation provided with the product. Read and understand these safety instructions and all user documentation prior to working with these components. If you do not have the user documentation for the components, contact your responsible Bosch Rexroth sales partner. Ask for these documents to be sent immediately to the person or persons responsible for the safe operation of the components.

If the component is resold, rented and/or passed on to others in any other form, these safety instructions must be delivered with the component in the official language of the user's country.

Improper use of these components, failure to follow the safety instructions in this document or tampering with the product, including disabling of safety devices, could result in property damage, injury, electric shock or even death.

3.2.2   Requirements for Safe Use

Read the following instructions before initial commissioning of the components of the electric drive and control system in order to eliminate the risk of injury and/or property damage. You must follow these safety instructions.

● Bosch Rexroth is not liable for damages resulting from failure to observe the safety instructions.

● Read the operating, maintenance and safety instructions in your language before commissioning. If you find that you cannot completely understand the application documentation in the available language, please ask your supplier to clarify.

● Proper and correct transport, storage, mounting and installation, as well as care in operation and maintenance, are prerequisites for optimal and safe operation of the component.

● Only qualified persons may work with components of the electric drive and control system or within its proximity.

● Only use accessories and spare parts approved by Bosch Rexroth.

● Follow the safety regulations and requirements of the country in which the components of the electric drive and control system are operated.

● Only use the components of the electric drive and control system in the manner that is defined as appropriate. See chapter "Appropriate Use".

● The ambient and operating conditions given in the available application documentation must be observed.

● Applications for functional safety are only allowed if clearly and explicitly specified in the application documentation "Integrated Safety Technology". If this is not the case, they are excluded. Functional safety is a safety

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concept in which measures of risk reduction for personal safety depend on electrical, electronic or programmable control systems.

- The information given in the application documentation with regard to the use of the delivered components contains only examples of applications and suggestions.

  The machine and installation manufacturers must

  – make sure that the delivered components are suited for their individual application and check the information given in this application documentation with regard to the use of the components,

  – make sure that their individual application complies with the applicable safety regulations and standards and carry out the required measures, modifications and complements.

- Commissioning of the delivered components is only allowed once it is sure that the machine or installation in which the components are installed complies with the national regulations, safety specifications and standards of the application.

- Operation is only allowed if the national EMC regulations for the application are met.

- The instructions for installation in accordance with EMC requirements can be found in the section on EMC in the respective application documentation.

  The machine or installation manufacturer is responsible for compliance with the limit values as prescribed in the national regulations.

- The technical data, connection and installation conditions of the components are specified in the respective application documentations and must be followed at all times.

National regulations which the user must take into account

- European countries: In accordance with European EN standards

- United States of America (USA):

  – National Electrical Code (NEC)

  – National Electrical Manufacturers Association (NEMA), as well as local engineering regulations

  – Regulations of the National Fire Protection Association (NFPA)

- Canada: Canadian Standards Association (CSA)

- Other countries:

  – International Organization for Standardization (ISO)

  – International Electrotechnical Commission (IEC)

3.2.3   Hazards by Improper Use

- High electrical voltage and high working current! Danger to life or serious injury by electric shock!

- High electrical voltage by incorrect connection! Danger to life or injury by electric shock!

- Dangerous movements! Danger to life, serious injury or property damage by unintended motor movements!

- Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electric drive systems!

- Risk of burns by hot housing surfaces!

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- Risk of injury by improper handling! Injury by crushing, shearing, cutting, hitting!
- Risk of injury by improper handling of batteries!
- Risk of injury by improper handling of pressurized lines!

3.3   Instructions with Regard to Specific Dangers

3.3.1   Protection Against Contact with Electrical Parts and Housings

☞   This section concerns components of the electric drive and control system with voltages of **more than 50 volts**.

Contact with parts conducting voltages above 50 volts can cause personal danger and electric shock. When operating components of the electric drive and control system, it is unavoidable that some parts of these components conduct dangerous voltage.

High electrical voltage! Danger to life, risk of injury by electric shock or serious injury!

- Only qualified persons are allowed to operate, maintain and/or repair the components of the electric drive and control system.
- Follow the general installation and safety regulations when working on power installations.
- Before switching on, the equipment grounding conductor must have been permanently connected to all electric components in accordance with the connection diagram.
- Even for brief measurements or tests, operation is only allowed if the equipment grounding conductor has been permanently connected to the points of the components provided for this purpose.
- Before accessing electrical parts with voltage potentials higher than 50 V, you must disconnect electric components from the mains or from the power supply unit. Secure the electric component from reconnection.
- With electric components, observe the following aspects:

  Always wait **30 minutes** after switching off power to allow live capacitors to discharge before accessing an electric component. Measure the electrical voltage of live parts before beginning to work to make sure that the equipment is safe to touch.
- Install the covers and guards provided for this purpose before switching on.
- Never touch electrical connection points of the components while power is turned on.
- Do not remove or plug in connectors when the component has been powered.
- Under specific conditions, electric drive systems can be operated at mains protected by residual-current-operated circuit-breakers sensitive to universal current (RCDs/RCMs).
- Secure built-in devices from penetrating foreign objects and water, as well as from direct contact, by providing an external housing, for example a control cabinet.

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High housing voltage and high leakage current! Danger to life, risk of injury by electric shock!

- Before switching on and before commissioning, ground or connect the components of the electric drive and control system to the equipment grounding conductor at the grounding points.

- Connect the equipment grounding conductor of the components of the electric drive and control system permanently to the main power supply at all times. The leakage current is greater than 3.5 mA.

- Establish an equipment grounding connection with a copper wire of a cross section of at least 10 mm^2 (8 AWG) or additionally run a second equipment grounding conductor of the same cross section as the original equipment grounding conductor.

3.3.2   Protective Extra-Low Voltage as Protection Against Electric Shock

Protective extra-low voltage is used to allow connecting devices with basic insulation to extra-low voltage circuits.

On components of an electric drive and control system provided by Bosch Rexroth, all connections and terminals with voltages between 5 and 50 volts are PELV ("Protective Extra-Low Voltage") systems. It is allowed to connect devices equipped with basic insulation (such as programming devices, PCs, notebooks, display units) to these connections.

Danger to life, risk of injury by electric shock! High electrical voltage by incorrect connection!

If extra-low voltage circuits of devices containing voltages and circuits of more than 50 volts (e.g., the mains connection) are connected to Bosch Rexroth products, the connected extra-low voltage circuits must comply with the requirements for PELV ("Protective Extra-Low Voltage").

3.3.3   Protection Against Dangerous Movements

Dangerous movements can be caused by faulty control of connected motors. Some common examples are:

- Improper or wrong wiring or cable connection

- Operator errors

- Wrong input of parameters before commissioning

- Malfunction of sensors and encoders

- Defective components

- Software or firmware errors

These errors can occur immediately after equipment is switched on or even after an unspecified time of trouble-free operation.

The monitoring functions in the components of the electric drive and control system will normally be sufficient to avoid malfunction in the connected drives. Regarding personal safety, especially the danger of injury and/or property damage, this alone cannot be relied upon to ensure complete safety. Until the integrated monitoring functions become effective, it must be assumed in any case that faulty drive movements will occur. The extent of faulty drive movements depends upon the type of control and the state of operation.

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Dangerous movements! Danger to life, risk of injury, serious injury or property damage!

A **risk assessment** must be prepared for the installation or machine, with its specific conditions, in which the components of the electric drive and control system are installed.

As a result of the risk assessment, the user must provide for monitoring functions and higher-level measures on the installation side for personal safety. The safety regulations applicable to the installation or machine must be taken into consideration. Unintended machine movements or other malfunctions are possible if safety devices are disabled, bypassed or not activated.

To avoid accidents, injury and/or property damage:

- Keep free and clear of the machine's range of motion and moving machine parts. Prevent personnel from accidentally entering the machine's range of motion by using, for example:
    - Safety fences
    - Safety guards
    - Protective coverings
    - Light barriers

- Make sure the safety fences and protective coverings are strong enough to resist maximum possible kinetic energy.

- Mount emergency stopping switches in the immediate reach of the operator. Before commissioning, verify that the emergency stopping equipment works. Do not operate the machine if the emergency stopping switch is not working.

- Prevent unintended start-up. Isolate the drive power connection by means of OFF switches/OFF buttons or use a safe starting lockout.

- Make sure that the drives are brought to safe standstill before accessing or entering the danger zone.

- Additionally secure vertical axes against falling or dropping after switching off the motor power by, for example,
    - mechanically securing the vertical axes,
    - adding an external braking/arrester/clamping mechanism or
    - ensuring sufficient counterbalancing of the vertical axes.

- The standard equipment **motor holding brake** or an external holding brake controlled by the drive controller is **not sufficient to guarantee personal safety**!

- Disconnect electrical power to the components of the electric drive and control system using the master switch and secure them from reconnection ("lock out") for:
    - Maintenance and repair work
    - Cleaning of equipment
    - Long periods of discontinued equipment use

- Prevent the operation of high-frequency, remote control and radio equipment near components of the electric drive and control system and their supply leads. If the use of these devices cannot be avoided, check the machine or installation, at initial commissioning of the electric drive and control system, for possible malfunctions when operating such high-frequency, remote control and radio equipment in its possible positions of normal use. It might possibly be necessary to perform a special electromagnetic compatibility (EMC) test.

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3.3.4   Protection Against Magnetic and Electromagnetic Fields During Operation and Mounting

Magnetic and electromagnetic fields generated by current-carrying conductors or permanent magnets of electric motors represent a serious danger to persons with heart pacemakers, metal implants and hearing aids.

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electric components!

- Persons with heart pacemakers and metal implants are not allowed to enter the following areas:
  - Areas in which components of the electric drive and control systems are mounted, commissioned and operated.
  - Areas in which parts of motors with permanent magnets are stored, repaired or mounted.

- If it is necessary for somebody with a heart pacemaker to enter such an area, a doctor must be consulted prior to doing so. The noise immunity of implanted heart pacemakers differs so greatly that no general rules can be given.

- Those with metal implants or metal pieces, as well as with hearing aids, must consult a doctor before they enter the areas described above.

3.3.5   Protection Against Contact With Hot Parts

Hot surfaces of components of the electric drive and control system. Risk of burns!

- Do not touch hot surfaces of, for example, braking resistors, heat sinks, supply units and drive controllers, motors, windings and laminated cores!

- According to the operating conditions, temperatures of the surfaces can be **higher than 60 °C** (140 °F) during or after operation.

- Before touching motors after having switched them off, let them cool down for a sufficient period of time. Cooling down can require **up to 140 minutes**! The time required for cooling down is approximately five times the thermal time constant specified in the technical data.

- After switching chokes, supply units and drive controllers off, wait **15 minutes** to allow them to cool down before touching them.

- Wear safety gloves or do not work at hot surfaces.

- For certain applications, and in accordance with the respective safety regulations, the manufacturer of the machine or installation must take measures to avoid injuries caused by burns in the final application. These measures can be, for example: Warnings at the machine or installation, guards (shieldings or barriers) or safety instructions in the application documentation.

3.3.6   Protection During Handling and Mounting

Risk of injury by improper handling! Injury by crushing, shearing, cutting, hitting!

- Observe the relevant statutory regulations of accident prevention.

- Use suitable equipment for mounting and transport.

- Avoid jamming and crushing by appropriate measures.

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- Always use suitable tools. Use special tools if specified.
- Use lifting equipment and tools in the correct manner.
- Use suitable protective equipment (hard hat, safety goggles, safety shoes, safety gloves, for example).
- Do not stand under hanging loads.
- Immediately clean up any spilled liquids from the floor due to the risk of slipping.

3.3.7   Battery Safety

Batteries consist of active chemicals in a solid housing. Therefore, improper handling can cause injury or property damage.

Risk of injury by improper handling!

- Do not attempt to reactivate low batteries by heating or other methods (risk of explosion and cauterization).
- Do not attempt to recharge the batteries as this may cause leakage or explosion.
- Do not throw batteries into open flames.
- Do not dismantle batteries.
- When replacing the battery/batteries, do not damage the electrical parts installed in the devices.
- Only use the battery types specified for the product.

☞   Environmental protection and disposal! The batteries contained in the product are considered dangerous goods during land, air, and sea transport (risk of explosion) in the sense of the legal regulations. Dispose of used batteries separately from other waste. Observe the national regulations of your country.

3.3.8   Protection Against Pressurized Systems

According to the information given in the Project Planning Manuals, motors and components cooled with liquids and compressed air can be partially supplied with externally fed, pressurized media, such as compressed air, hydraulics oil, cooling liquids and cooling lubricants. Improper handling of the connected supply systems, supply lines or connections can cause injuries or property damage.

Risk of injury by improper handling of pressurized lines!

- Do not attempt to disconnect, open or cut pressurized lines (risk of explosion).
- Observe the respective manufacturer's operating instructions.
- Before dismounting lines, relieve pressure and empty medium.
- Use suitable protective equipment (safety goggles, safety shoes, safety gloves, for example).
- Immediately clean up any spilled liquids from the floor due to the risk of slipping.

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☞   Environmental protection and disposal! The agents (e.g., fluids)
       used to operate the product might not be environmentally friendly.
       Dispose of agents harmful to the environment separately from other
       waste. Observe the national regulations of your country.

3.4   Explanation of Signal Words and the Safety Alert Symbol

The Safety Instructions in the available application documentation contain specific signal words (DANGER, WARNING, CAUTION or NOTICE) and, where required, a safety alert symbol (in accordance with ANSI Z535.6-2006).

The signal word is meant to draw the reader's attention to the safety instruction and identifies the hazard severity.

The safety alert symbol (a triangle with an exclamation point), which precedes the signal words DANGER, WARNING and CAUTION, is used to alert the reader to personal injury hazards.

⚠ DANGER

In case of non-compliance with this safety instruction, death or serious injury **will** occur.

⚠ WARNING

In case of non-compliance with this safety instruction, death or serious injury **could** occur.

⚠ CAUTION

In case of non-compliance with this safety instruction, minor or moderate injury could occur.

NOTICE

In case of non-compliance with this safety instruction, property damage could occur.

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Technical Data

4   Technical Data

4.1   Front Panel

	VDP 16.1BB	VDP 16.1AC	VDP 16.1BK
Display	304.8 mm TFT (12"), 800 x 600 pixels, 256,000 colors		
Operation	Touch screen operation		Key operation
Surface − front panel	Color RAL 7035 Light gray	Graphite gray (Bosch design)	Color RAL 7035 Light gray
Degree of protection	Front panel IP 65 acc. to DIN 40 050, IEC 529		
Interface	USB connection, Cover, degree pf protection IP 65	No USB connection	USB connection, Cover, degree pf protection IP 65

Fig.4-1:   Technical data, front VDP 16.1

	VDP 40.1BE	VDP 40.1AG	VDP 40.1BI
Display	381 mm TFT (15"), 1024 x 768 pixels, 256,000 colors		
Operation	Touch screen operation		Key operation
Degree of protection	Front panel IP 65 acc. to DIN 40 050, IEC 529		
Front panel - surface	Color RAL 7035 Light gray	Graphite gray (Bosch design)	Color RAL 7035 Light gray
Interface	Front panel IP 65 acc. to DIN 40 050, IEC 529		

Fig.4-2:   Technical data, front VDP 40.1

	VDP 60.1BL
Display	304.8 mm TFT (12"), 800 x 600 pixels, 256,000 colors
Operation	Key operation
Surface − front panel	Color RAL 7035 Light gray
Degree of protection	Front panel IP 65 acc. to DIN 40 050, IEC 529
Interface	USB connection, Cover, degree pf protection IP 65

Fig.4-3:   Technical data, front VDP 60.1

4.2   Voltage Supply

The VDP is supplied with a voltage of DC 24 V from the control cabinet PC (IPC) via the G4 display interface. The maximum current consumption is 2 A. Only if an Y-repeater is used, the VDP has to be separately provided with a voltage of DC 24 V, see chapter 7.1.5 "DC 24 V Voltage Supply" on page 46.

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Technical Data

4.3   Ambient Conditions

	In operation	Transport	Storage
Max. ambient temperature	+5 ℃ to +45 ℃	-20 ℃ to +60 ℃	-20 ℃ to +60 ℃
Max. temperature gradient	Temporal temperature changes up to 3 K per minute	Not defined	Not defined
Relative humidity	Climatic class 3K3 according to EN 60721, Non-condensing	Climatic class 3K3 according to EN 60721, Non-condensing	Climatic class 3K3 according to EN 60721, Non-condensing
Air pressure	Up to 2,000 m above MSL according to DIN 60204	Not defined	Not defined
Mechanical strength	Max. vibration: Frequency range: 10 to 150 Hz Excursion: 0.075 mm for 10 to 57 Hz Acceleration: 1 g for 57 to 150 Hz acc. to EN 60068-2-6	Max. shock: 15 g acc. to DIN IEC 68-2-27, No breakdown of the function	Max. shock: 15 g acc. to DIN IEC 68-2-27, No breakdown of the function

Fig.4-4:   Ambient conditions

4.4   Standards

4.4.1   Used Standards

The system components of the Operator display correspond to the following standards:

EN Standards

Standard	Meaning
EN 60 204-1	Electrical equipment of machines
EN 61 000-6-4	Generic standard, emitted interference (industrial environment)
EN 61,000-6-2	Generic standard, noise immunity (industrial environment)
EN 61 558-2-6	Transformer for 24 V power supply unit, protective separation
EN 60 664-1	Overvoltage category II
EN 61 131-2	24 V outputs requirements
EN 61 131-2	24 V current supply requirements
ISO 13 850	Machine safety, emergency stop devices
EN 60 529	Degrees of protection (including housings and installation compartments)

Technical Data

Standard	Meaning
EN 60 068-2-6	Vibration test
EN 60 068-2-27	Shock test

Fig.4-5:   Used standards

4.4.2   CE Marking

Declaration of Conformity

CE

The electronic products described in the project planning manual comply with the requirements and goals of the following EC guideline and with the agreed European standards:

EMC guideline 2004/108/EC

The electronic products described in the project planning manual comply with the requirements on the operation within the industrial environment:

Standard	Title	Edition
DIN EN 61000-6-4 (VDE 0839-6-4)	Electromagnetic compatibility (EMC) Volume: 6-4: Generic standards - emitted interference for industrial environments (IEC 61000-6-4:2006)	September 2007
DIN EN 61000-6-2 (VDE 0839-6-2)	Electromagnetic compatibility (EMC) Volume: 6-2: Generic standards – noise immunity for industrial environments (IEC 61000-6-2:2005)	March 2006

Fig.4-6:   Electromagnetic compatibility (EMC) standards

Note for the Machine Manufacturer

The electronic products described in this project planning manual do not fall under the machines listed in the EC guidelines. Therefore, explanations are not required for the 89/392/EMC guideline and do not exist.

89/392/EMC, the EC guideline for machines, specifies the requirements on a machine. In this guideline, a machine is defined as a combination of the components or mechanisms combined with each other. The described products belong to the electrical equipment of a machine. Therefore, they are to be included in the declaration of conformity of the machine manufacturer.

The standard EN 60204-1 (safety of machinery, general requirements on the electrical equipment of the machines) can be used for the electrical equipment of the machines.

NOTICE	Loss of CE conformity due to modifications of the device.

The CE marking is only valid for the device in its delivery status. After modifying the device, the CE conformity is to be verified.

4.4.3   UL/CSA Certified

c (UL) US LISTED

Technical Data

The devices of the IndraControl VDP 16.1/40.1/60.1 family are certificated according to

- **UL508** (Industrial Control Equipment) and
- **C22.2 no. 142-M1987** (CSA)

UL file no. E210730

However, there can be combinations or extension stages with limited or missing certification. Thus, the registration is to be verified according to the UL marking on the device.

NOTICE	Loss of UL/CSA conformity due to modifications of the device.

The UL/CSA marking is only valid for the device in its delivery status. After modifying the device, the UL/CSA conformity is to be verified.

4.5   Wear Parts

This section describes the wear parts as well as their service life. Wear parts are not subject to any warranty.

Backlight   The service life of the backlight is limited. After this time has been exceeded, the backlight will produce only 50 % of its original brightness. This time differs for the used displays:

Display size	Service life
304.8 mm (12")	40,000 hours
381 mm (15")	35,000 hours

Fig.4-7:   Service life of the backlight

Fan   Fans are mechanic wear components, whose service life is extremely temperature-dependent. For the fan, the following service life is specified by the manufacturer:

Surrounding air temperature	Service life
20 °C	45,000 hours
60 °C	15,000 hours

Fig.4-8:   Service life of the fan

4.6   Compatibility Test

All Rexroth controls and drives are developed and tested according to the latest state-of-the-art of technology.

As it is impossible to follow the continuing development of all materials (e. g. lubricants in machine tools) which may interact with our controls and drives, it cannot be completely ruled out that any reactions with the materials used by Bosch Rexroth might occur.

For this reason, before using the respective material a compatibility test has to be carried out for new lubricants, cleaning agents etc. and our housings / our housing materials.

Dimensions and Installation

5 Dimensions and Installation

5.1 Housing Dimensions

5.1.1 Housing Dimensions VDP 16.1

VDP 16.1 standard version
Independent of the design of the VDP 16.1 standard variants with M-keys or touch screen the front panel width is 350 mm and the height is 290 mm. All values in the illustrations are given in mm.
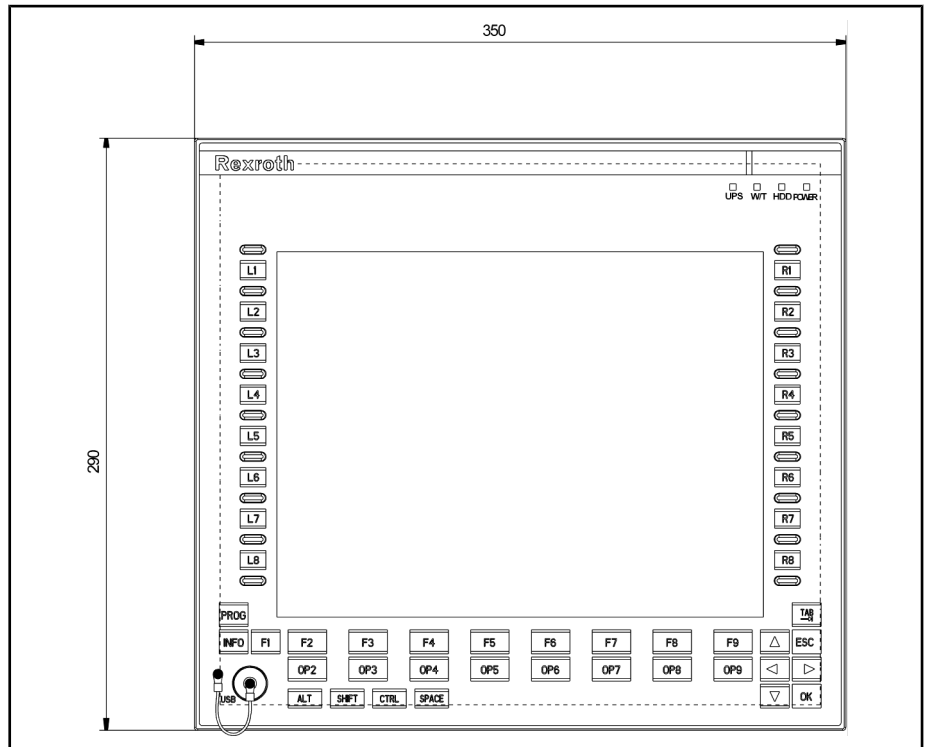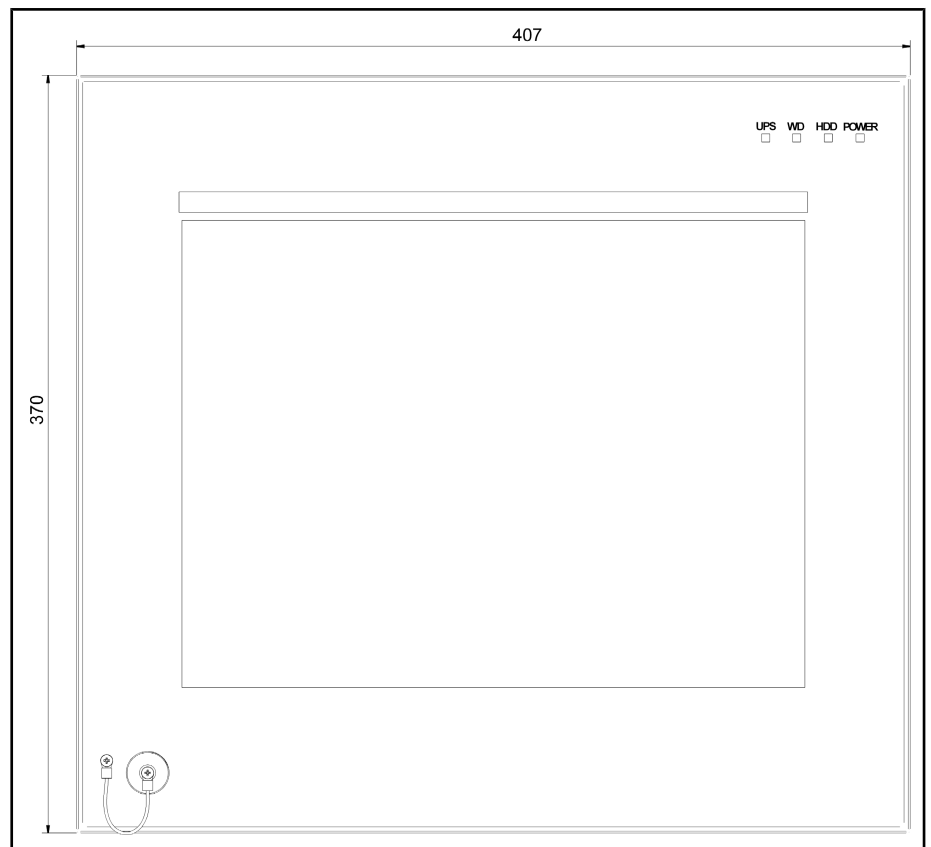

Fig.5-1:   Dimensions: Front panel of the VDP 16.1BK

The front panel of the VDP 16.1BB with touch screen has the same dimensions.

The front panel width of the VDP 16.1AC operator display is 360 mm and the height is 300 mm

Dimensions and Installation
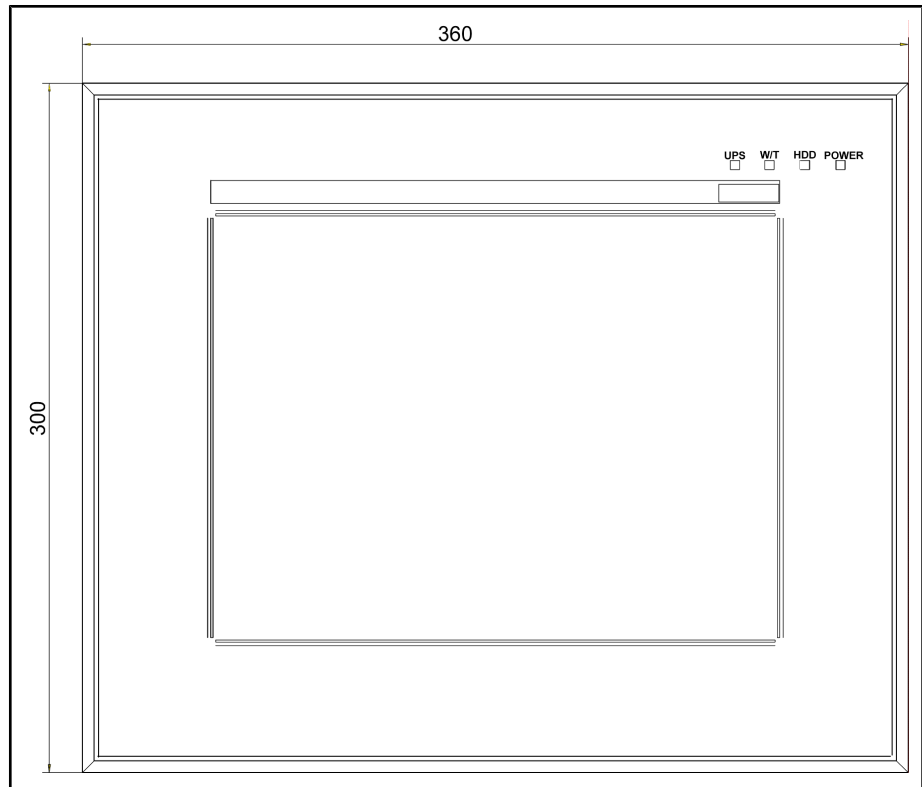
Fig.5-2:   Dimensions: Front panel of the VDP 16.1AC
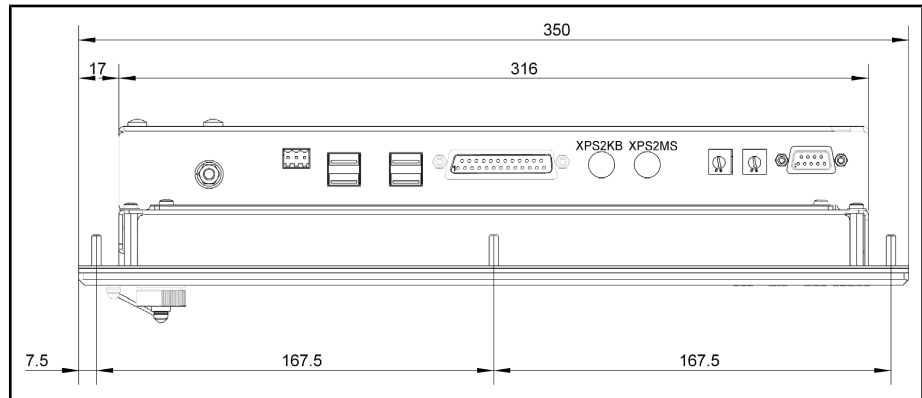
Fig.5-3:   VDP 16.1BB and VDP 16.1BK: Top View
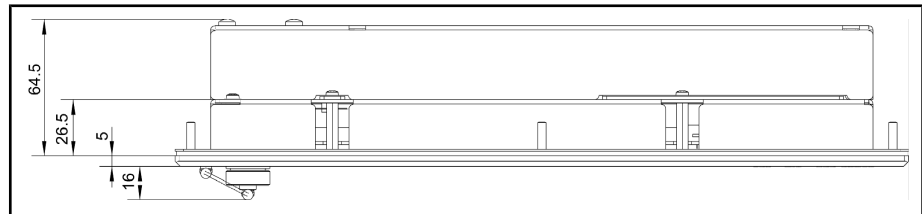
Fig.5-4:   VDP 16.1BB and VDP 16.1BK: Bottom view

	VDP 16.1BB + BK	VDP 16.1AC
Width	350 mm	360 mm
Height	290 mm	300 mm
Mounting depth	64.5 mm	

Fig.5-5:   Dimensions VDP 16.1

5.1.2　　　Housing Dimensions VDP 40.1

Independent of the design of the VDP 40.1 standard variants with M-keys or touch screen the front panel width is 407 mm and the height is 370 mm.

Fig.5-6:　　　　　Dimensions: Front panel of the VDP 40.1BE and VDP 40.1BI

The front panel width of the VDP 40.1AG display is 417 mm and the heigth is 380 mm.
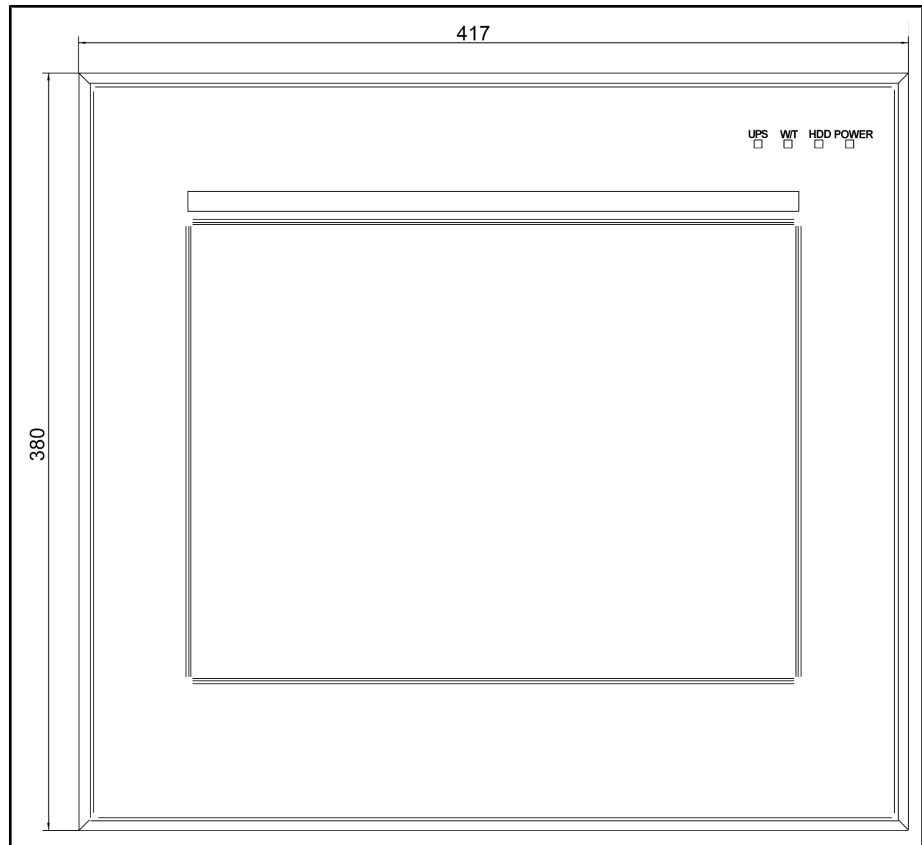
Dimensions and Installation
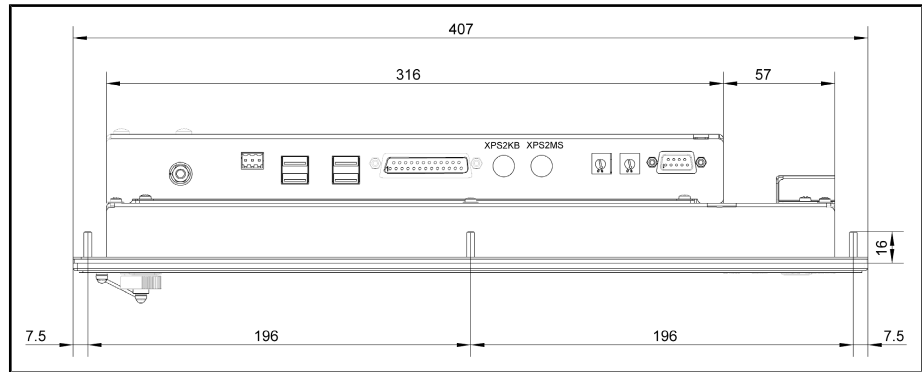

Fig.5-7:   Dimensions: VDP 40.1AG
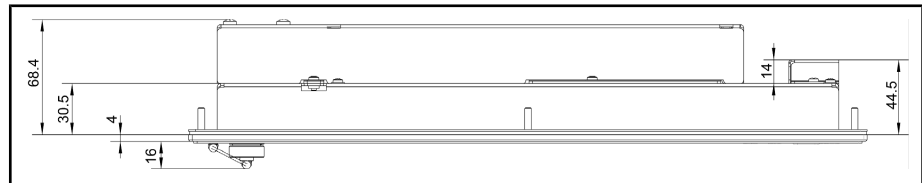

Fig.5-8:   VDP 40.1BE and VDP 40.1BI: Top View

Fig.5-9:   VDP 40.1BE and VDP 40.1BI: Bottom view

	VDP 40.1BE + BI	VDP 40.1AG
Width	407 mm	417 mm
Height	370 mm	380 mm
Mounting depth	68.4 mm	

Fig.5-10:   Dimensions VDP 40.1

Dimensions and Installation

5.1.3   Housing Dimensions VDP 60.1

The front panel width of the display VDP 60.1BL is 483 mm (19") and the height is 266 mm.

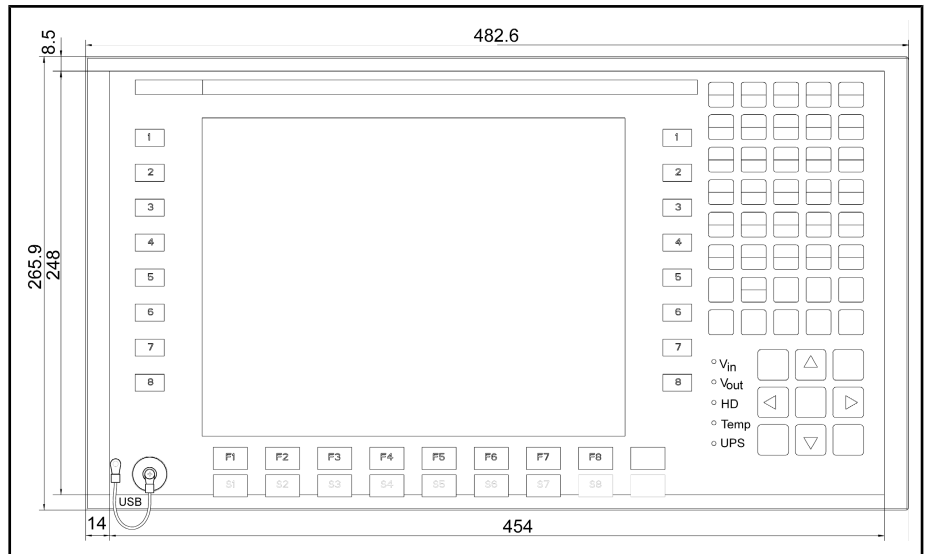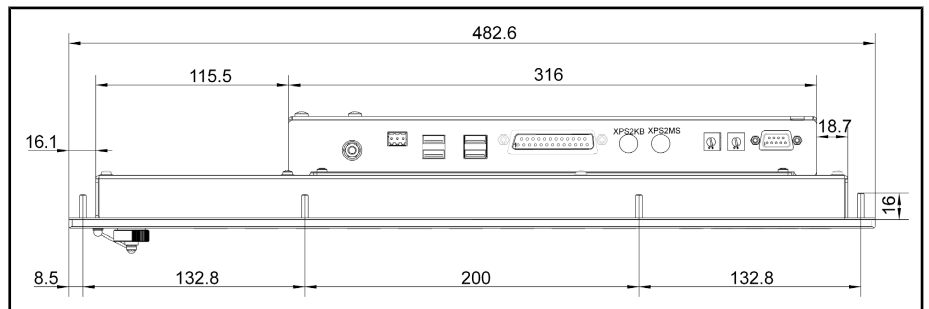*Fig.5-11:   Dimensions: Front panel of the VDP 60.1BL*

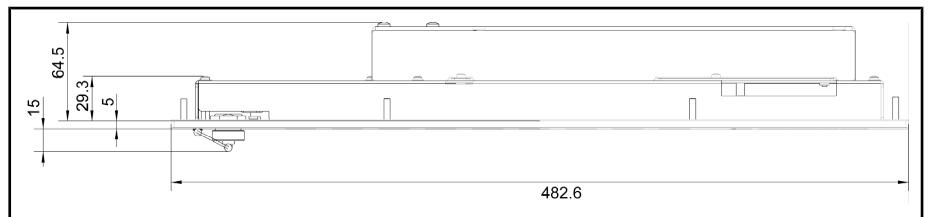*Fig.5-12:   VDP 60.1BL: Top View*

Fig.5-13:   VDP 60.1BL: Bottom view

	VDP 60.1BK
Width	483 mm
Height	266 mm
Mounting depth	64.5 mm

Fig.5-14:   Dimensions: VDP 60.1

5.2   Housing Dimensions of the Y-Repeater

The Y-repeater is provided for rear panel mounting as well as for mounting on a mounting rail.

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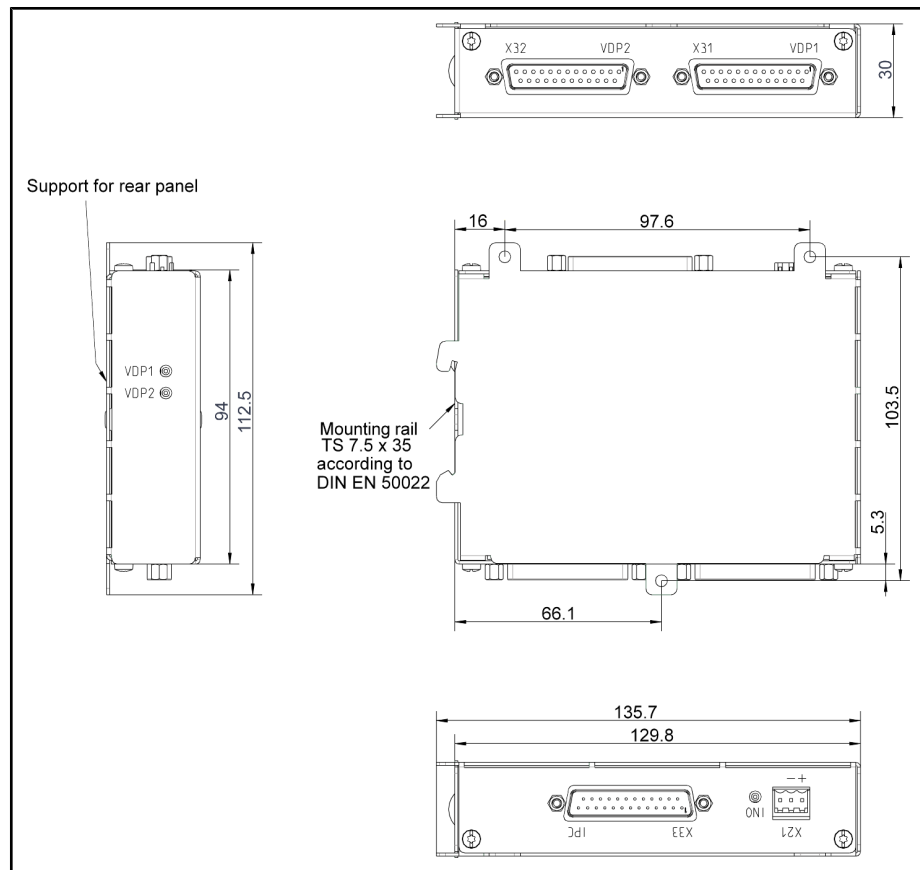
Dimensions and Installation

Fig.5-15:   Dimensions: Y-repeater

5.3   Installation

5.3.1   Installation Notes

- The display is to be installed in such a way that an ergonomic operation is ensured. Additionally, ensure that all machine components can be seen by the operator!

- Avoid installation locations exposed to direct UV light/sunlight, as the screen readability is reduced and additional heat development can occur.

- Provide a sufficient space of 50 mm on all sides of the device for cooling and cable routing.

- The LED displays on the front panel have to be visible.

- Lay all connecting cables in loops and use strain reliefs for all cables.

- Keep as much distance as possible to noise sources.

5.3.2   Mounting Cut-out

Mount the display as follows:

Dimensions and Installation

⚠ DANGER	Loss of degree of protection IP 65!

The mounting surface of the operator display must be:

- free of impurities and

- has to be provided with sufficient mechanical strength and flatness

These criteria influence the required degree of protection IP to a great extent.

Further required measures are to be taken depending on the mounting location, e. g. the stabilization of the mounting frame.

1. Create a mounting cut-out with 8 holes and a diameter of 5 mm according to the illustrations "Mounting dimensions" on the following pages.

2. Remove the paper strip from the seal on the rear side of the front panel.

3. Insert the display from the front into the cut-out. The mounting bolts M4 are inserted into the drilled holes.

4. Fasten the display by screwing the nuts at the rear side of the mounting bolts.

NOTICE	Damage of the mechanics caused by wrong mounting torque.

Screwas are to be fastened with the respective mounting torques specified in the following table.

Threads	Mounting torques
M2.5	0.4 Nm
M3	0.7 Nm
M4	1.4 Nm
M5	2.8 Nm

Fig.5-16:   Mounting torques

Dimensions and Installation

5.3.3   Mounting Dimensions VDP 16.1

Fig.5-17:   Mounting dimensions of the VDP 16.1 devices

Dimensions and Installation

5.3.4   Mounting Dimensions VDP 40.1
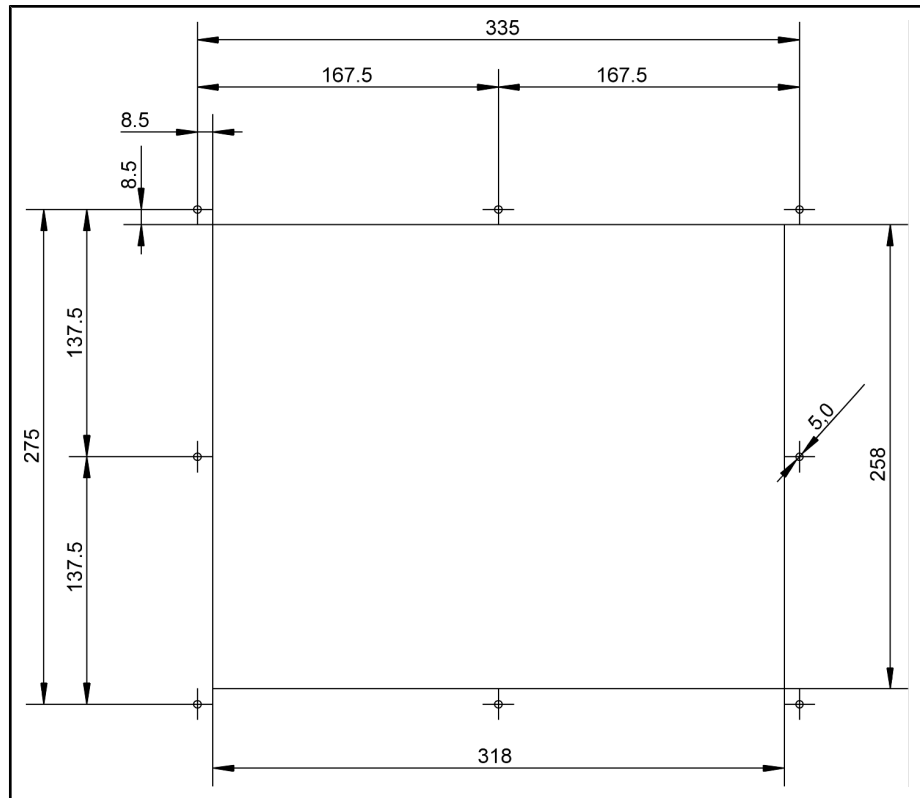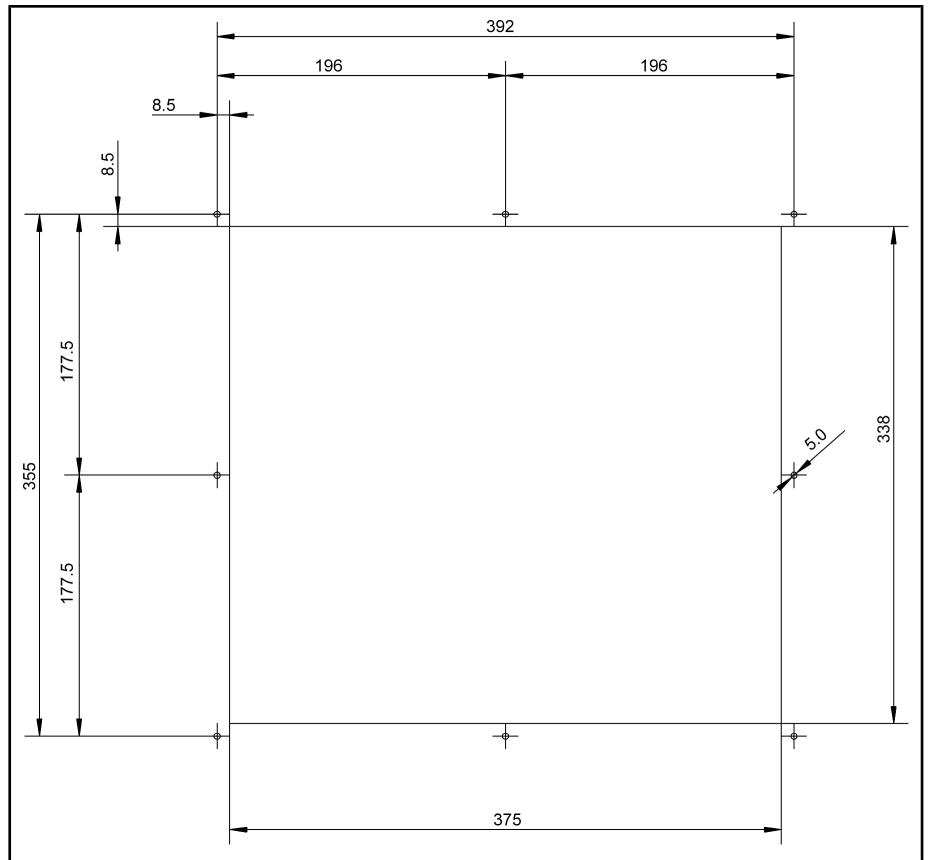

Fig.5-18:   Mounting dimensions of the VDP 40.1 devices

5.3.5   Mounting Dimensions VDP 60.1

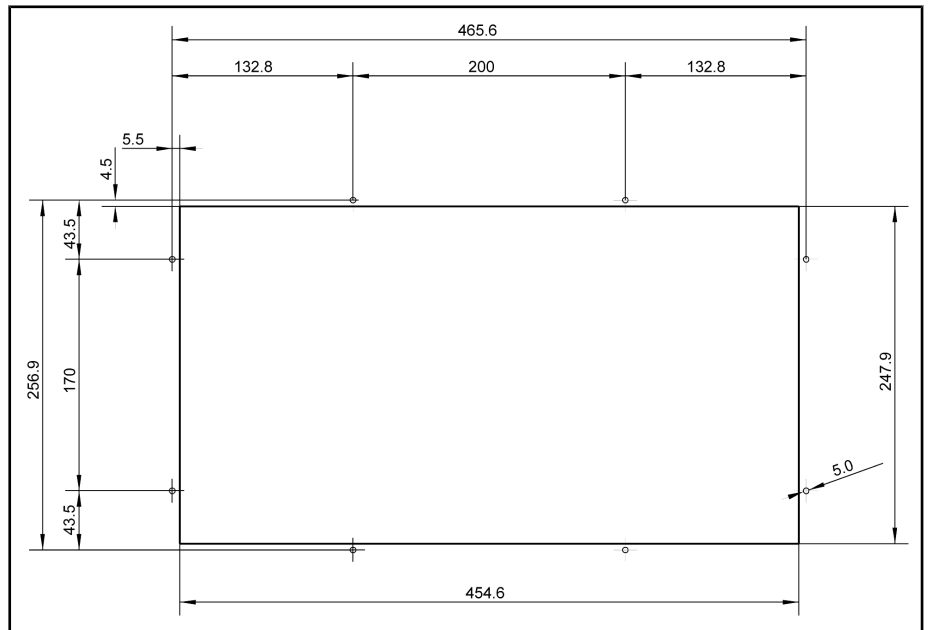*Fig.5-19:   Mounting dimensions of the VDP 60.1 devices*

6　　Display and Operating Components

6.1　　Backlight Switch-off

6.1.1　　General Information

The service life of the backlight of the display is limited, see chapter 4.5 "Wear Parts" on page 26.

To extend the service life of the LCD backlight, the flat screen display is provided with a backlight switch-off. This function "darkens" the display if the display has not been operated for a certain period of time. The length of the time interval can be specified in the Windows Control Panel under "Power Options", see fig. 6-1 "Setting the darkening mode of the display in the Windows Control Panel" on page 37. You can reach the "Power Options" under Windows XP via: **Control panel Display Screen saver Power schemes Turn off monitor**. Select the required time from the list.
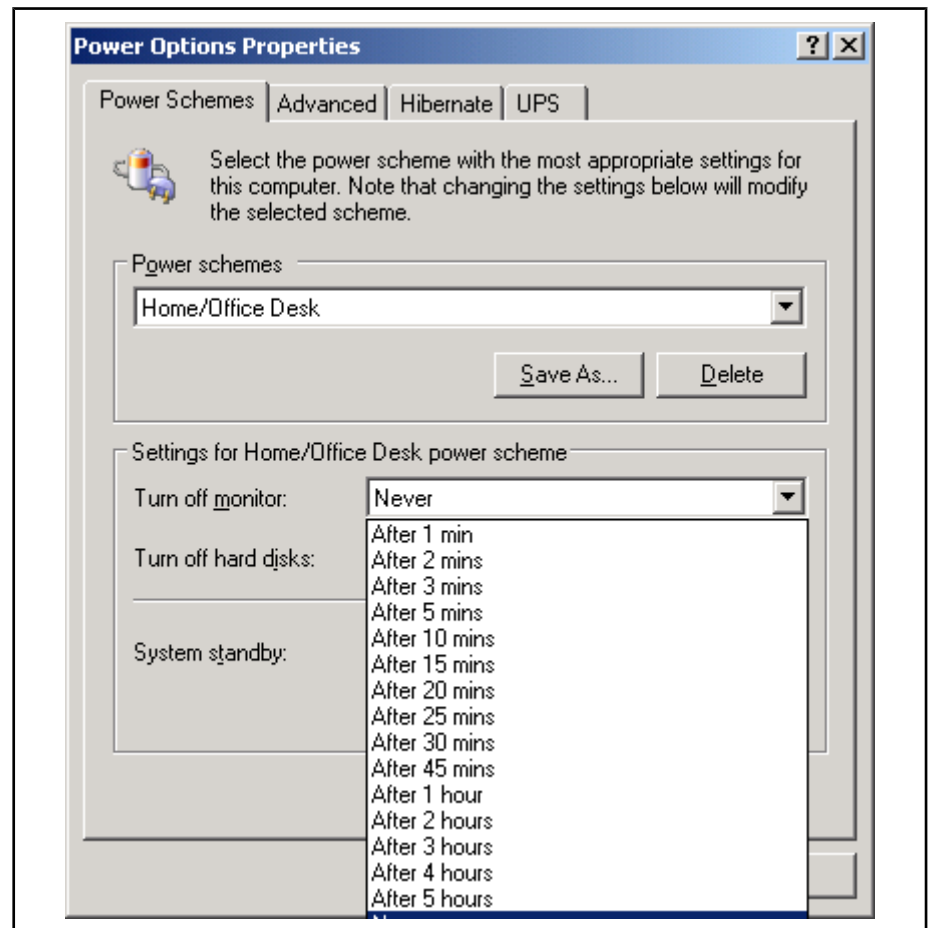

Fig.6-1:　　　　　*Setting the darkening mode of the display in the Windows Control Panel*

6.2　　Operating and Error Displays

Four LEDs are provided in the upper part of the front panel to display the device statuses and errors of the connected control cabinet PC (IPC). Start the measures specified in the following table if one of the succeeding LEDs displays an error or a note.

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Display and Operating Components

Symbol / LED	Indicator	Meaning	Measure
⏻ Power	LED green	Normal mode	-
	LED OFF	No supply voltage 230/115 VAC or 24 VDC	Check supply voltage at the power supply unit!
⬭ HDD	LED yellow	Hard disk access	-
🌡 Temp	LED green	Temperature in the safe range	
	LED red flashing	Temperature > 50 °C	Reduce ambient temperature (surrounding air temperature)! Check fan at the PC!
🔋 UPS	LED OFF	Normal mode	-
	LED red	IPC is currently operating in battery mode, i. e. no power supply available!	Restore power supply and initiate controlled IPC restart!
	LED red flashing	Battery pack discharged, defective or not connected	Check battery pack! Maintain the charging time of 5 hours!

Fig.6-2:   LEDs for operating and error display on the front panel

NOTICE	Depending on the connected control cabinet PC (IPC), not all LEDs are activated, therefore not all warnings/messages are displayed.

For further information please refer to the respective documentation of the control cabinet PC (IPC).

6.3   Foil Keyboard

6.3.1   System Requirements

To operate the foil keyboard, an English or US keyboard driver is required. Therefore, do not change the delivery settings.

Display and Operating Components

6.3.2   Position of the Buttons

①	Machine function keys (M-keys) L1 to L8
②	Function keys F2 to F9
③	Operating keys OP2 to OP9
④	Status displays
⑤	Machine function keys (M-keys) R1 to R8

Fig.6-3:   *Position of the keys VDP 16.1BK and VDP 40.1BI*

①	Machine function keys (M-keys) 1-8, left
②	Function keys F1 to F8
③	Special keys S1 to S8
④	Machine function keys (M-keys) 1-8, right
⑤	Alphanumeric keys
⑥	Status displays

Fig.6-4:   *Position of the keys VDP 60.1BL*

6.3.3   VDP 16.1 Keys and VDP 40.1 Keys

Function and Operating Keys (F... + OP...)

The assignment of the function and operating keys (F... + OP...) is determined by the respective application software.

Use of an External Keypad

Concerning the VDP 16.1BK and VDP 40.1BI with foil keyboard the key functions can also be activated with an external PC keyboard by the following shortcuts:

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Keys of the VDP 16.1BK and VDP 40.1BI	Corresponding shortcut of a standard keyboard
OP2	\<CTRL> + \<SHIFT> + \<ALT> + \<F2>
to	
OP9	\<CTRL> + \<SHIFT> + \<ALT> + \<F9>
Prog	\<CTRL> + \<SHIFT> + \<ALT> + \<Q>
INFO	\<CTRL> + \<SHIFT> + \<ALT> + \<I>

Fig.6-5:   Shortcuts for the VDP 16.1BK and VDP 40.1BI keys

M-Keys

Eight M-keys (machine function keys, see) are allocated on the right and the left side of the display. The keys on the right side of the display are labeled with R1 to R8, the keys on the left side of the display with L1 to L8.

Addressing of the M-keys   The state of the M-keys can be read out in different ways:

- Pressed M-keys are transmitted as PS/2 signals to the PC.
- They can be transferred to a soft control installed on the PC via the serial interface COM3.
- At last, the signals are output at the optional plug XDP as outputs of a PROFIBUS DP slave.

Requesting M-keys via PS/2   The following key codes are output:

Key at the VDP 16.1, VDP 40.1	Corresponding shortcut of a standard keyboard
M-keys, left L1 to L8	CTRL + ALT + SHIFT LEFT + X ASCII block X: 1 to 8 (not on Num block)
M-keys, right R1 to R8	CTRL + ALT + SHIFT RIGHT + X ASCII block X: 1 to 8 (not on Num block)

Fig.6-6:   Shortcuts for the VDP 16.1BK and VDP 40.1BI keys

M-Keys may not be subject to a repeating operation (Key Controller -> Conti. Jogging of axes].

Requesting M-keys via COM3

The states of the M-keys can be transferred to a soft control via the serial interface COM3. The soft control has to send a request telegram and receives a keyboard telegram containing all key states as response. The request telegram has to consist of one byte with the value 0xB2. The keyboard telegram is sent not later than 10 ms after receiving the request telegram. Pressed M-keys have the value "0", keys not pressed have the value "1". The keyboard telegram is structured as follows:

Display and Operating Components

Byte 3	Byte 2	Byte 1	Byte 0
CRC	Status	M-keys, right (Bit 0 = R1 to Bit 7 = R8)	M-keys, left (Bit 0 = L1 to Bit 7 = L8)

Fig.6-7:   *Keyboard telegram*

In byte 2, a status transmits the following meaning:

Value	Meaning
0x00	No error
0x01	A M-key is pressed directly after Reset, during the self test
0x02	Incoming request telegram before the current keypad telegram is closed

Fig.6-8:   *Status byte*

Value 0x01 means that during the self test executed directly after the reset, a M-key was recognized as pressed. As, however, after a reset no key is activated, thus, a defective key can be recognized. In byte 3 a CRC[1] is transmitted. To calculate byte 3, byte 0 is linked bit-by-bit with byte 1 by XOR. Then, the result is linked bit-by-bit with byte 2 by XOR. After that, this result is transferred as CRC in byte 3.

M-key output via Profibus DP   The M-keys are output at the optionally provided connection XDP (see chapter 7.1.10 "PROFIBUS DP Interface" on page 49) as output bits of a PROFIBUS DP slave, so that they can be read as inputs by a connected PROFIBUS DP master. The corresponding GSD file is stored in folder "C:\SUPPORT \PROFIBUS". Pressed M-keys have the value "1", key not pressed have the value "0".

Byte 1								Byte 0							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
R8	R7	R6	R5	R4	R3	R2	R1	L8	L7	L6	L5	L4	L3	L2	L1

Fig.6-9:   *M-key assignment at the Profibus DP*

6.3.4   Keys VDP 60.1

Function and Special Keys (F... + S...)

Key of the VDP 60.1BL	Corresponding shortcut of a standard keyboard
Overview (binoculars)	SHIFT + SPACE
Calling-up the basic screen (stairs)	CTRL + HOME
Info	SHIFT + RETURN

[1]   *CRC = cyclic redundancy checksum*

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Key of the VDP 60.1BL	Corresponding shortcut of a standard key-board
Function keys F1 to F8	F1 to F8
Special key S1 to S8	SHIFT + F1- SHIFT+F8

Fig.6-10:   Shortcuts for the keys of the VDP 60.1BL

M-Keys

Key of the VDP 60.1BL	Corresponding shortcut of a standard key-board
M-keys, left L1 to L4	F9 to F12
M-keys, left L5 to L8	SHIFT + F9 - SHIFT + F12
M-keys, right R1 to R4	CTRL + F9 - CTRL + F12
M-keys, right R5 to R8	CTRL + SHIFT + F9 - CTRL + SHIFT + F12

Fig.6-11:   Shortcuts for the keys of the VDP 60.1BL

Output of the M-keys and function keys via the PROFIBUS DP

Assignment and coding

The keys are located in the first input byte. If no key is pressed, 0x00 is output. The output of the M-Keys is code 0x10 to 0x1F.

M-keys, left 1-8	0x10 - 0x17
M-keys, right 1-8	0x18 - 0x1F

Fig.6-12:   Code 0x10 to 0x1F

The output of the function keys is code 0x20 to 0x2F.

Function keys F1 to F8	0x20 - 0x27
Function keys S1 to S8	0x28 - 0x2F

Fig.6-13:   Code 0x20 to 0x2F

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Display and Operating Components

Alphanumeric Block

The keys of the alphanumeric block send the default PS/2 codes to the PC. The alpha key is locking "toggling" and its output is no code, but only controls the keyboard controller. If the alpha key is active, the key LED lights. Additional characters like @ and " are entered while pressing the alpha keys. The alphanumeric block works exactly like a standard PC keyboard, especially the behavior of the "CTRL", "ALT" and "SHIFT" keys.

6.4   Touch Screen

In the versions VDP 16.1BB, VDP 16.1AC as well as VDP 40.1BE and VDP 40.1AG a touch screen is used, that allows the operation of the application software via the touch-sensitive surface of the display. Settings can be changed via the setup programs of the control cabinet PC (IPC). The icons available on the touch screen depend on the used application software.

NOTICE	Danger of destruction of the touch screen if operated with inappropriate objects (e.g. screwdriver).

Operate the touch screen only with your finger or with a touch pen.

6.5   LEDs at the Y-Repeater

Three LEDs are located at the Y-repeater:

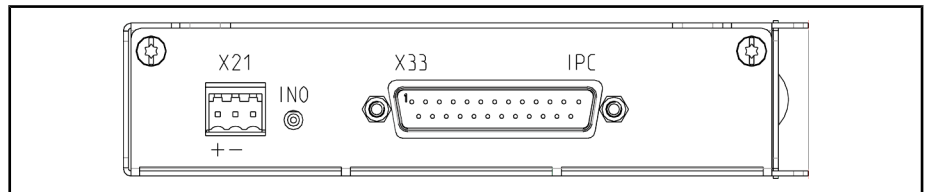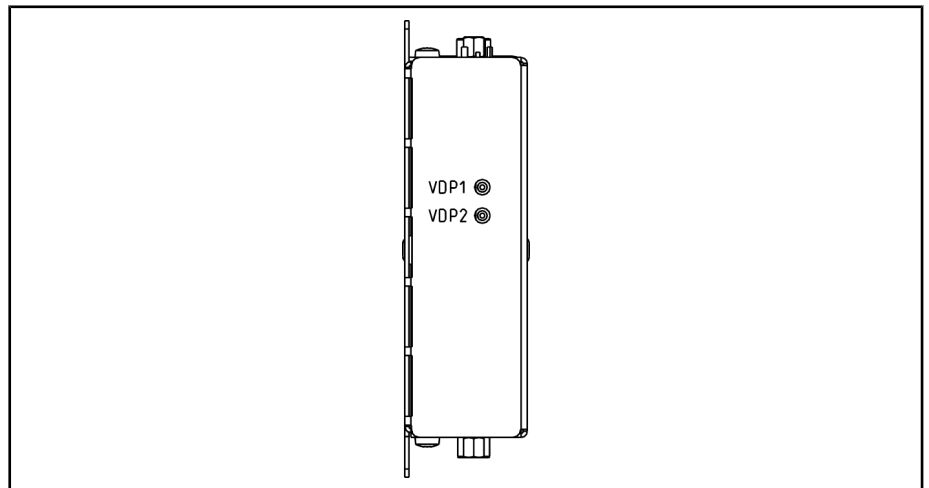*Fig.6-14:*　　　*LED IN0*

Fig.6-15:　　　*LEDs for VDP1 and VDP2*

IN0, VDP1 and VDP2 LEDs　　These 3 LEDs have the following meaning:

Display and Operating Components

LED	Meaning
IN0	Y-Repeater is supplied by the control cabinet PC (IPC) with power
VDP1	The control cabinet PC (IPC) is connected to VDP1
VDP2	The control cabinet PC (IPC) is connected to VDP2

Fig.6-16:   Meaning of the LEDs at the Y-repeater

7　　　Interfaces

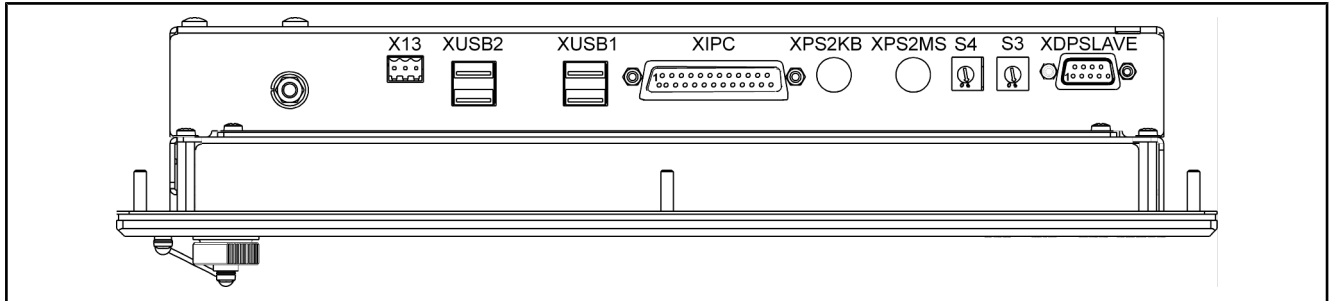## 7.1　　　Interfaces at the VDP

7.1.1　　　View on the Connector Panel

Fig.7-1:　　　*Interface to the control cabinet PC*

7.1.2　　　General Information

NOTICE	Malfunctions due to insufficient shielding!

Use only shielded cables and metallic, conductive connectors or coupling housings with large-area shield support.

NOTICE	Material damages to electronics due to missing functional earth ground connection!

Ensure that the functional earth ground is connected, because otherwise the electronics can be destroyed by a potential difference between the VDP 16.1/40.1/60.1 and the PC if the voltage supply is interrupted to only one device and established again. A direct connection between functional earth ground and VDP xx.1 and VPB 40.1, VSB 40.1 is optimal. If the functional earth ground is wired at a neutral point, also the control cabinet PC (VPB 40.1, VSB 40.1) must be connected to this neutral point.

7.1.3　　　Overview

Interfaces

Designation at the housing	Connection type	Connector type / integrated	Mating connector or cable (from outside)
X13	DC-24-V voltage supply > required if an Y-repeater is used	Weidmüller connector terminal, MSTB 1.5, 3-pin	Weidmüller female connector terminal, MSTB 1.5, 3-pin
XUSB1	2 USB interfaces	USB female connector, 4-pin, type A	USB male connector, 4-pin,
XUSB2	2 USB interfaces	USB female connector, 4-pin, type A	USB connector, 4-pin,

Interfaces

Designation at the housing	Connection type	Connector type / integrated	Mating connector or cable (from outside)
XIPC	G4 display interface > connection to control cabinet PC (IPC)	D-Sub connector, 25-pin	D-Sub female connector, 25-pin
XPS2KB	PS/2 keyboard connection	Mini DIN PS/2 female connector, 6-pin	Mini DIN PS/2 connector, 6-pin
XPS2MS	PS/2 mouse connection	Mini DIN PS/2 female connector, 6-pin	Mini DIN PS/2 connector, 6-pin
XDPSLAVE	PROFIBUS DP connection	D-Sub female connector, 9-pin	D-Sub connector, 9-pin

Fig.7-2:   Interfaces at the VDP 16.1, VDP 40.1 and VDP 60.1

7.1.4   S3/S4 Rotary Switch

Overview

Designation at the housing	Switch type	Function
Switch S3	BCD rotary switch for PROFIBUS DP slave station address (1-99)	To set the tens digit of the station address
Switch S4	BCD rotary switch for PROFIBUS DP slave station address (1-99)	To set the ones digit of the station address

Fig.7-3:   DIP switch on the VDP

7.1.5   DC 24 V Voltage Supply

X13 – 24 V voltage supply   The VDP is provided with the required voltages via the G4 display interface of the control cabinet PC.

☞   If Y-repeaters are used, the VDP must be separately provided with a voltage of DC 24 V via connection X13. For this an isolated power supply unit is required.
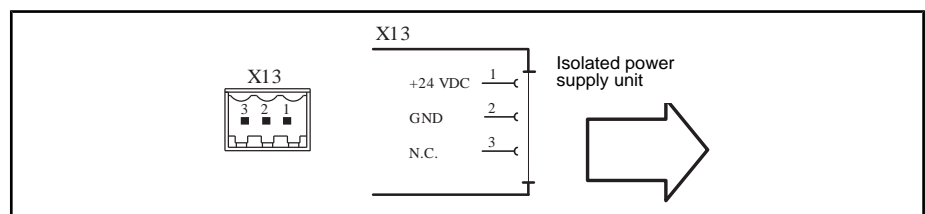

Fig.7-4:   Interface to the control cabinet PC

Pin	Function
1	Supply voltage +24 V

Interfaces

2	GND
3	n. c.

A standard 24 V industrial power supply unit can be used for the voltage supply.

NOTICE	**Possible damages if an inadequate power supply unit is used.**

An isolated power supply unit must be used, as pin 2 is internally connected with the housing.

7.1.6 XUSB Interfaces

XUSB – serial interfaces for printer, scanner, CD-ROM drive

The devices feature four USB interfaces on the connector panel (XUSB1 and XUSB2) and one on the front panel (not for devices for the food industry).

NOTICE	**The VDP power supply unit switches off if the total current of all USB connectors is exceeded.**

The maximum power consumption of the connected device must not exceed 500 mA per USB connector. If the load exceeds 500 mA, the internal current monitoring is activated.
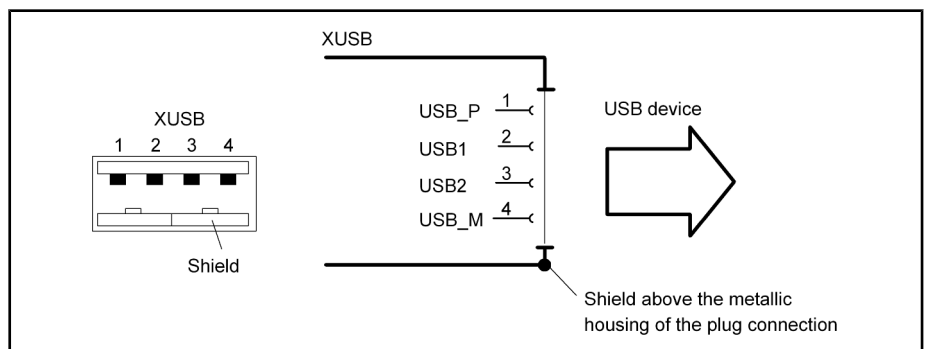

Fig.7-5: USB interfaces XUSB1 and XUSB2

Operating the USB connections on the VDP 16.3/40.3 in USB2.0 mode

NOTICE	**If the Windows NT4.0 operating system is used, no operation via USB interfaces is possible.**

USB interfaces must not be used under Windows NT4.0.

Pin	Function
1	USB power supply (max. 500 mA)
2	Data -
3	Data +
4	USB ground

Interfaces

NOTICE	The general function of non-specification-compliant USB devices can not be guaranteed, even if they are functioning e.g. at the USB interface directly at the control cabinet PC.

Connect only USB devices that fulfill the USB specification. However, also USB devices are commercially available that e.g., do not have the response times specified in the USB specification.

7.1.7   G4 Display Interface

XIPC - G4 display interface

The VDP is connected to the control cabinet PC (IPC) via the 25-pin G4 display interface (XIPC). Connecting cables of different lengths are listed in the ordering information, see chapter 11.5 "Accessories" on page 64.

NOTICE	Material damage due to cable extension!

The cables must not be plugged together for extension purposes, as this damages the VDPs.

7.1.8   Combined Keyboard/Mouse Interface

The combined keyboard/mouse interface (XPS2KB) allows to connect an external keyboard/mouse. The data is transmitted via the G4 display interface to the control cabinet PC.

XPS2KB – PS/2 Mini DIN keyboard/ mouse interface

PS/2 Mini DIN female connector, 6-pin	
Cable length:	1.5 m max.
Cable type:	Shielded, cross-section min. 0.14 mm^2

Fig.7-6:   Combined keyboard/mouse interface XPS2KB
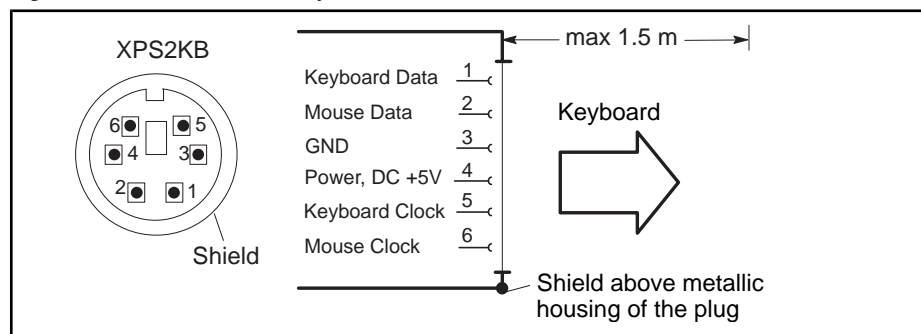

Fig.7-7:   Combined keyboard/mouse interface XPS2KB

7.1.9   Mouse Interface

The mouse interface (XPS2MS) can be connected to an external mouse. The data is transmitted via the G4 display interface to the control cabinet PC.

XPS2MS – PS/2 mouse interface

PS/2 Mini DIN female connector, 6-pin	
Cable length:	1.5 m max.
Cable type:	Shielded, cross-section min. 0.14 mm^2

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Interfaces

PS/2 Mini DIN female connector, 6-pin	
Interrupt (IRQ):	12
BIOS presetting:	PS/2 mouse support: Enabled PS/2 Mouse: Auto detect

Fig.7-8:   *Mouse interface XPS2MS*
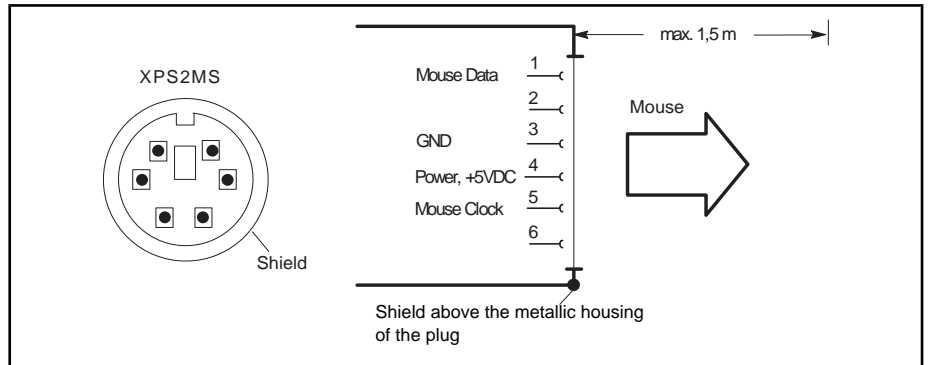

Fig.7-9:   *Mouse interface XPS2MS*

If a PS/2 mouse is not recognized by the system, the mouse must be activated in the BIOS by switching from "Disabled" to "Autodetect". The operating system will not detect the plugging-in of an external mouse at a later stage, since the mouse initialization is executed only during the booting process.

☞   The connected mouse is to comply with the PS/2 standard. Generally, the BIOS reserves IRQ 12 for the PS/2 mouse. If there are address conflicts, e. g., if IRQ 12 is already used by different PC extension cards, the IRQ of this extension card is to be changed to another, still unassigned IRQ.

☞   If a keyboard with mouse is connected to the VDP, no further mouse may be connected to the mouse interface.

7.1.10   PROFIBUS DP Interface

XDPSLAVE – PROFIBUS DP inter-
face

Optionally, the connection XDPSLAVE provides a Profibus DP SLAVE interface according to DIN EN 50170, Part 2. This interface allows to request the states of the M-Keys available for devices with keypad, see .

D-Sub female connector, 9-pin	
Type:	RS485
Cable type:	Shielded, twisted pair
Transmission rate:	10 or 100 Mbits/s

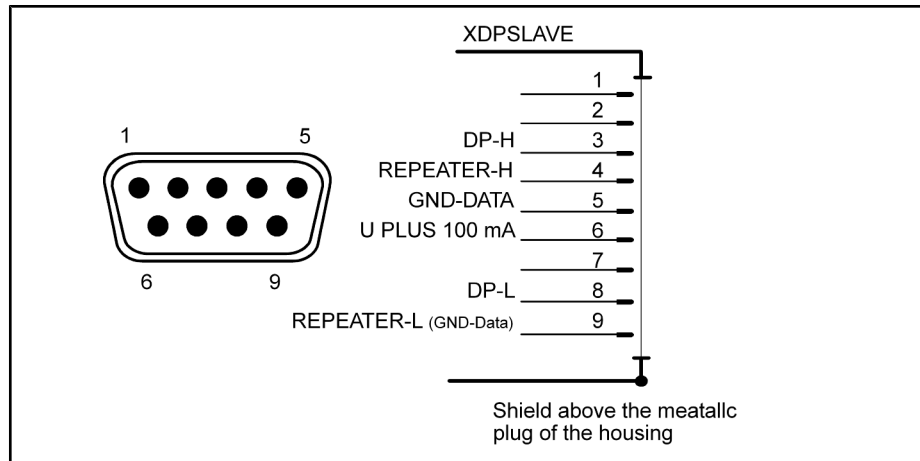*Fig.7-10:*   *PROFIBUS DP interface XDPSLAVE*

Interfaces

Fig.7-11:   *PROFIBUS DP interface XDPSLAVE*

The bus cable is specified as cable type A according to EN 50170, part 8-2. It must comply with the following cable parameters:

Surge impedance at a frequency within a range from 3 to 20 MHz	135 to 156 ohms
Operating capacity	≤ 30 pF/m
Loop resistance	≤ 110 Ohm/km
Outer diameter	> 0.64 mm
Core cross-section	> 0.34 mm^2

Fig.7-12:   *Parameters for PROFIBUS DP cable*

The above mentioned cable parameters of a standard cable of cable type A result in the following length extensions of a bus segment for the particular transmission rates:

Transmission rate in kbits/s	9,6	19,2	45,45	93,75	187,5	500	1500	3000	6000	12000
Max. segment length in m	1200	1200	1200	1200	1000	400	200	100	100	100

Fig.7-13:   *Maximum segment length with regard to the transmission rate*

☞   The corresponding PROFIBUS Slave address is set via the rotary switch, see chapter 7.1.4 "S3/S4 Rotary Switch" on page 46. The corresponding GSD file is "Rx010135.gsd".

7.2   Intefaces at the Y-Repeater

7.2.1   View on the Connector Panels

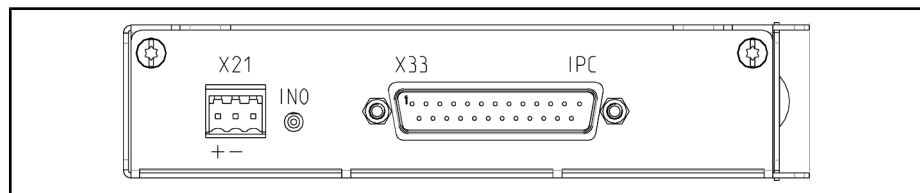The connections are located at the two shorter sides of the Y-Repeater:

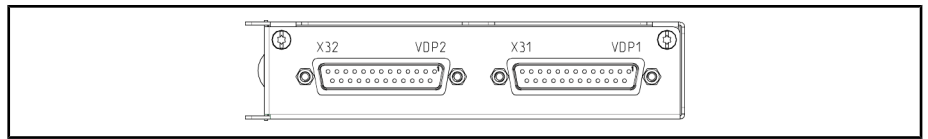
Fig.7-14:   *Interface to control cabinet PC (IPC)*

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Interfaces

Fig.7-15:　　　Interface to the VDP displays

7.2.2　　　Description of the Interfaces - Overview

Designation at the housing	Connection type	Connector type (integrated)	Mating connector or cable (from outside)
X21	Digital 24 V input: > Input bit to select the active VDP	Weidmüller connector terminal, MSTB 1.5 3-pin	Weidmüller female connector terminal, MSTB 1.5, 3-pin
X33	G4 display interface > Connection to control cabinet PC (IPC)	D-Sub connector, 25-pin	D-Sub female connector, 25-pin
X31	G4 display interface > Connection to VDP 1	D-Sub female connector, 25-pin	D-Sub connector, 25-pin
X32	G4 display interface > Connection to VDP 2	D-Sub female connector, 25-pin	D-Sub connector, 25-pin

Fig.7-16:　　　Connections Y-repeater

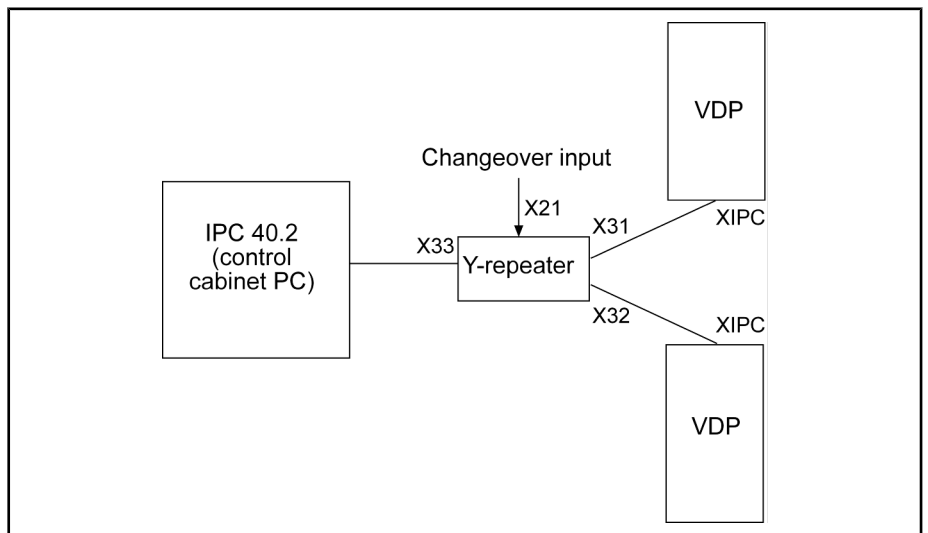## 7.2.3　　　Connection of the Y-Repeater (Block Diagram)

Fig.7-17:　　　Connection of the Y-repeater

7.2.4　　　G4 Display Interfaces

X31, X32, X33 – G4 display interfaces　Via the 25-pin G4 display interfaces (X31, X32, X33) the Y-repeater is connected, on the one hand, to the control cabinet PC (IPC) and, on the other hand, to the two VDP displays. Connecting cables of different lengths are listed in

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Interfaces

Connection	Function
X31	G4 display interface to control cabinet PC (IPC)
X32	G4 display interface to VDP 1
X33	G4 display interface to VDP 2

Fig.7-18:   Assignment of the three G4 display interfaces

Via the G4 display interfaces image data as well as the keyboard and mouse signals are transmitted from VDP displays to the control cabinet PC (IPC).

NOTICE   **Material damage due to cable extension!**

The cables must not be plugged together for extension purposes, as this damages the VDPs.

The following cable length must not be exceeded:

Cable between control cabinet PC (IPC) and Y-repeater	< 15 meters
Cable between Y-repeater and VDP	< 25 meters
Total length between control cabinet PC (IPC) and VDP	< 30 meters

Fig.7-19:   Permitted cable lengths of G4 display interfaces

All three values must be observed!

7.2.5   Digital 24 V Input (Changeover Input)

X21 –
digital 24 V input

The selection, which of the VDP displays connected to the Y-Repeater is activated, occurs via a digital 24 V input. As the image signals are transmitted to both VDP displays, data can only be entered with the active VDP.
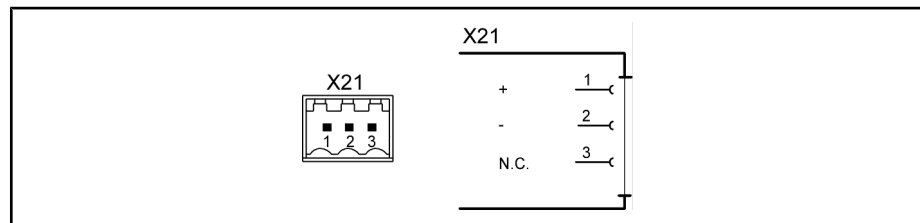

Fig.7-20:   Assignment of the digital 24 V input

Pin	Labeling	Function
1	+	Signal input
2	-	Signal ground
3	n.c.	not assigned

Fig.7-21:   Pin assignment X21

Input bit X21	Active VDP
0 (or open)	VDP 1
1	VDP 2

Fig.7-22:   Selection of the active VDP

Connection method	2-wire connection
Reverse voltage protection	Yes

Interfaces

Input voltage:	
Nominal value for "0"	-3 V ... + 5 V
Nominal value for "1"	11 V ... 30 V
Input current:	
Nominal value for "0"	< 2.5 mA
Nominal value for "1"	2.8 mA ... 6 mA
Cable length (unshielded)	< 100 m
Short-circuit protection/overload protection	Typ. 0.6 A

Fig.7-23:   Characteristic values of the digital 24 V input

☞   During the booting process of the control cabinet PC (IPC) you must
not switch from one VDP to another.

8   Maintenance

8.1   General Information

The operator terminals VDP 16.1/40.1/60.1 are maintenance-free. However, some components are subject to wear and must be replaced.

| *NOTICE* | Loss of IP degree of protection due to incorrect maintenance. |

The IP degree of protection must be guaranteed during maintenance!

| *NOTICE* | Damage of the mechanics caused by wrong mounting torque. |

If screws were removed because of maintenance works, they must be fastened again with the corresponding mounting torque (see the following table).

Threads	Mounting torques
M2.5	0.4 Nm
M3	0.7 Nm
M4	1.4 Nm
M5	2.8 Nm

Fig.8-1:   Mounting torques

Maintenance   Include the following measures in the maintenance schedule:

- Clean the screen at least once a week using an antistatic fabric or a cleansing agent containing alcohol.

| ⚠ CAUTION | The surface of the foil as well as the display cover are dissolved by solvents! |

- Do not use any solvents (e. g. diluents)!
- Do not use high pressure cleaning devices!

- At least once a year, check all plug and terminal connections of the components regarding proper tightness and possible damage. Check that cables are not broken or crushed. Replace damaged parts immediately.
- Check the fan at least once a year, if existent.

| ⚠ DANGER | Risk of injury by rotating fan impeller! |

The fan impeller must not to be touched with the hands and must not come into contact with other objects.

8.2   LCD Display

A fading backlight causes a progressive deterioration of the readability of the LCD display, so that a backlight exchange is necessary. For further information please contact the Bosch Rexroth Service, see also chapter 12 "Service and Support" on page 65.

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Maintenance

8.3   Connecting two VDPs via the Y-Repeater

To connect two VDP displays to one control cabinet PC (IPC), the Y-repeater is available as accessories. The Y-Repeater is located between the control cabinet PC (IPC) and the two VDP displays. The image signals of the control cabinet PC (IPC) are sent simultaneously via the Y-Repeater to the two VDP displays. However, you select via a 24 V signal which of the two VDP displays can be used as active VDP to operate the control cabinet PC. For safety reasons only one of the VDP displays can be active. The Y-repeater indicates which VDP is active.

Please find the connections of the Y-repeater in chapter 7.2 "Intefaces at the Y-Repeater" on page 50.

NOTICE	**Missing screen output or incorrect screen resolution if VDPs with different resolution are connected.**

If you use a Y-Repeater, you may only operate with VDP displays of the same type.

NOTICE	**No switching between two VDPs possible if the connected end devices (mouse, keyboard) are not of the same type.**

The end devices (mouse, keyboard) connected to the two VDP displays must be of the same type (e.g. a two-key mouse).

NOTICE	**Missing screen output or incorrect screen resolution if you switch during the booting process.**

During the booting process of the control cabinet PC (IPC) you must not switch from one VDP to another.

NOTICE	**Missing screen output or incorrect screen resolution if the voltage supply of the VDP is switched on after switching on the control cabinet PC (IPC).**

The operator displays must be supplied with voltage either before or at least at the same time as the control cabinet PC (IPC).

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9   Software

9.1   Touch Screen Software

In the VDP 16.1BB and VDP 16.2AC as well as VDP 40.2BE and VDP 40.2AG displays a touch screen is integrated, that allows the operation via the touch-sensitive surface of the displays.

The touch screen controller communicates with the PC via the G4 display interface using the serial interface COM2 of the control cabinet PC (IPC).

The required driver software for the touch screen is installed on the control cabinet PC (IPC) ex works. For more detailed information, please refer to the respective documentation of the Rexroth control cabinet PC (IPC).

> Please observe the Rexroth IPC 40.2, DOK-SUPPL*-IPC*40.2***-PR..-EN-P, Project Planning Manual, parts number: R911307652

10   Environmental Protection and Disposal

10.1   Environmental Protection

Production Processes   The products are made with energy- and resource-optimized production pro-
cesses which allow re-using and recycling the resulting waste. We regularly try
to replace pollutant-loaded raw materials and supplies by more environment-
friendly alternatives.

No Release of Hazardous Substan-   Our products do not contain any hazardous substances which may be released
ces   in the case of appropriate use. Normally, our products will not have any negativ
influences on the environment.

Significant Components   Basically, our products contain the following components:

Electronic devices
• steel
• aluminum
• copper
• synthetic materials
• electronic components and modules

Motors
• steel
• aluminum
• copper
• brass
• magnetic materials
• electronic components and modules

10.2   Disposal

Return of Products   Our products can be returned to our premises free of charge for disposal. It is
a precondition, however, that the products are free of oil, grease or other dirt.

Furthermore, the products returned for disposal must not contain any undue
foreign material or foreign components.

Send the products "free domicile" to the following address:

Bosch Rexroth AG
Electric Drives and Controls
Buergermeister-Dr.-Nebel-Strasse 2
97816 Lohr am Main, Germany

Packaging   The packaging materials consist of cardboard, wood and polystyrene. These
materials can be recycled anywhere without any problem.

For ecological reasons, please refrain from returning the empty packages to
us.

Batteries and Accumulators   Batteries and accumulators can be labeled with this symbol.

The symbol indicating "separate collection" for all batteries and accu-
mulators is the crossed-out wheeled bin.

The end user within the EU is legally obligated to return used batteries. Outside
the validity of the EU Directive 2006/66/EC keep the stipulated directives.

Used batteries can contain hazardous substances, which can harm the envi-
ronment or the people´s health when they are improper stored or disposed of.

After use, the batteries or accumulators contained in Rexroth products have to
be properly disposed of according to the country-specific collection.

Recycling   Most of the products can be recycled due to their high content of metal. In order
to recycle the metal in the best possible way, the products must be disassem-
bled into individual modules.

Environmental Protection and Disposal

Metals contained in electric and electronic modules can also be recycled by means of special separation processes.

Products made of plastics can contain flame retardants. These plastic parts are labeled according to EN ISO 1043. They have to be recycled separately or disposed of according to the valid legal requirements.

11   Ordering Information

11.1   Type Designation Code

11.1.1   General Information

According to the following type designation codes there are different variants of the VDP 16.1, VDP 40.1, and VDP 60.1 displays.

11.2   VDP 16.1


```
Abbrev.                          1
Column →        1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9
     Example:   V D P 1 6 . 1 B B N - G 4 - P S - N N
```

Product
VDP. . . . . = VDP

Line
16. . . . . = 16

Design
1 . . . . = 1

Front panel and display
Rexroth Design
12", touchcscreen . . . . = BB
12", with 16 machine
function keys (MTX) . . . . = BK

Additional option
without . . . . = N

Control panel interface
G4 display interface. . . . . = G4

Interface
without. . . . . = NN
PROFIBUS-DP slave . . . . = PS ①

Other design
without . . . . = NN

Note:
① Interface "PS" is not available with front panel "BB" (touch screen)

Fig.11-1:   Type designation code VDP 16.1

Ordering Information

11.3   VDP 40.1

Abbrev. Column →										1 0	1	2	3	4	5	6	7	8	9
Example:	V	D	P	4	0	.	1	B	E	N	-	G	4	-	P	S	-	N	N

Product
VDP . . . . = VDP

Line
40   . . . . = 40

Design
1   . . . . = 1

Front panel and display
Rexroth Design
15", touch screen. . . . . = BE
15", with 16 machine function
keys (MTX) . . . . = BI

Additional option
without . . . .= N

Control panel interface
G4 display interface. . . . .= G4

Interface
without . . . .= NN
PROFIBUS-DP Slave . . . . = PS ①

Other design
without. . . . .= NN

Note:
① Interface "PS" is not available with front panel "BE" and "AG" (touch screen)

Fig.11-2:   *Type designation code VDP 40.1*

Ordering Information

11.4   VDP 60.1
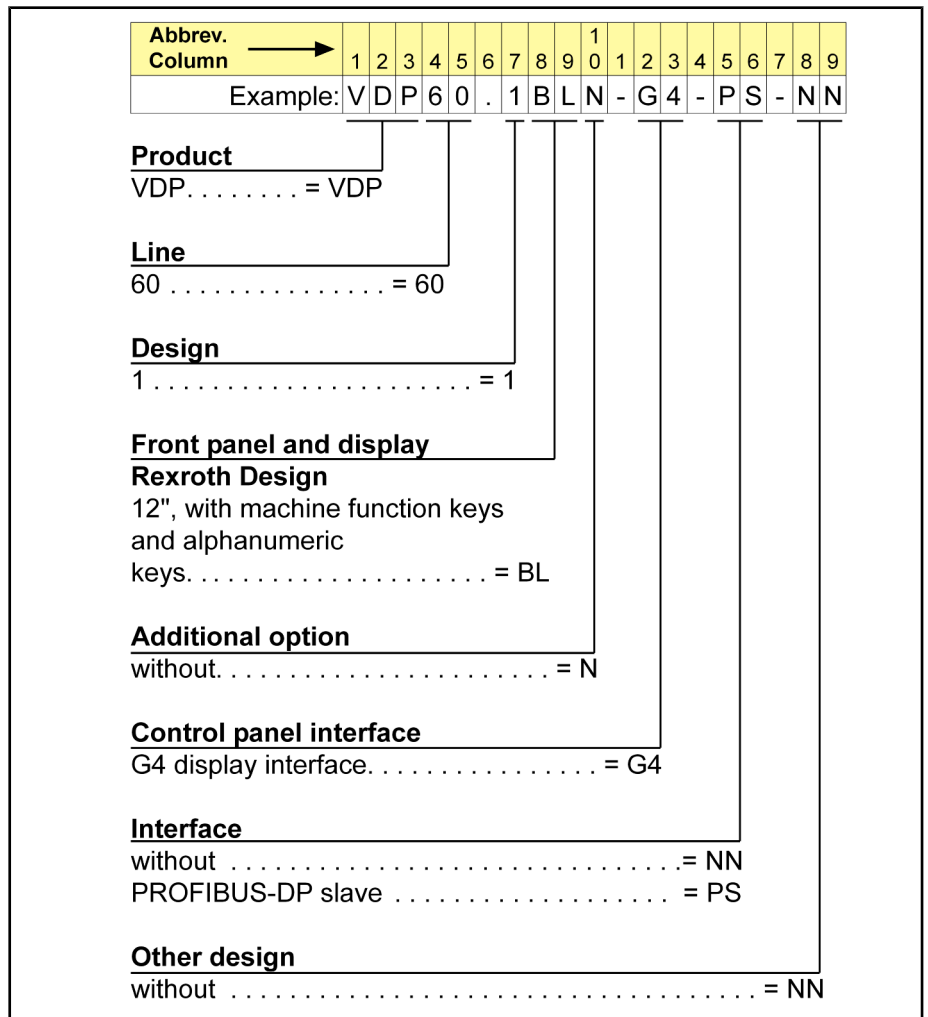
Fig.11-3:   *Type designation code VDP 60.1*

Ordering Information

11.5   Accessories

11.5.1   Y-Repeater

Connection unit for connecting two operating units (VDP 16.1/40.1/60.1) with the same resolution and of the same design with a control cabinet PC (IPC).

Order code	Parts number	Description
VAC01.1S-YG4-NNNN	R911307623	Y-repeater for G4 display interface

Fig.11-4:   Y-repeater

11.5.2   Connecting Cable to Control Cabinet PC IPC 40.2

If an Y-repeater is used, the following cables are utilized to connect conctrol cabinet PC (IPC) and Y-repeater as well as to connect Y-repeater and VDP. The specified maximum lengths must be observed, see "X31, X32, X33 – G4 display interfaces" on page 51.

Order code	Parts number	Description
BKS-U-H-G4****-IPCVDP-001,0-P	R911307684	Connecting cable control cabinet PC (IPC) - VDP, highly flexible, 1 m
BKS-U-H-G4****-IPCVDP-005,0-P	R911306043	Connecting cable control cabinet PC (IPC) - VDP, highly flexible, 5 m
BKS-U-H-G4****-IPCVDP-010,0-P	R911306046	Connecting cable control cabinet PC (IPC) - VDP, highly flexible, 10 m
BKS-U-H-G4****-IPCVDP-015,0-P	R911308482	Connecting cable control cabinet PC (IPC) - VDP, highly flexible, 15 m
BKS-U-H-G4****-IPCVDP-020,0-P	R911306047	Connecting cable control cabinet PC (IPC) - VDP, highly flexible, 20 m
BKS-U-H-G4****-IPCVDP-030,0-P	R911306048	Connecting cable control cabinet PC (IPC) - VDP, highly flexible, 30 m

Fig.11-5:   Connecting cable to control cabinet PC IPC 40.2

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DOK-SUPPL*-VDP16/40/60-PR03-EN-P   **Bosch Rexroth AG**   **65**/69
Rexroth IndraControl VDP 16.1/40.1/60.1 Operator Display

Service and Support

12 Service and Support

Our service helpdesk at our headquarters in Lohr, Germany and our worldwide service will assist you with all kinds of enquiries. You can reach us **around the clock - even on weekend and on holidays**.

	Helpdesk	**Service Hotline** **Worldwide**
Phone	+49 (0) 9352 40 50 60	Outwith Germany please contact our sales/service office in your area first.
Fax	+49 (0) 9352 40 49 41	
E-mail	service.svc@boschrexroth.de	For hotline numbers refer to the sales office addresses on the Internet.
Internet	http://www.boschrexroth.com You will also find additional notes regarding service, maintenance (e.g. delivery addresses) and training.	

Preparing Information

For quick and efficient help please have the following information ready:

- Detailed description of the fault and the circumstances
- Information on the type plate of the affected products, especially type codes and serial numbers
- Your phone, fax numbers and e-mail address so we can contact you in case of questions.

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