TP 6000 HMI for machine control

User manual

UM EN TP 6000

PHOENIX CONTACT
INSPIRING INNOVATIONS

User manual
TP 6000 HMI for machine control

UM EN TP 6000, Revision B 2021-10-11

This user manual is valid for:

Designation	Order No.
TP 6070-WVPS	1189629
TP 6101-WXPS	1190417
TP 6121-WXPS	1190420
TP 6156-WHPS	1190421
TP 6185-WHPS	1190423
TP 6215-WHPS	1190424

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1 For your safety

Read this user manual carefully and keep it for future reference.

1.1 Labeling of warning notes

This symbol indicates hazards that could lead to personal injury.

There are three signal words indicating the severity of a potential injury.

DANGER
Indicates a hazard with a high risk level. If this hazardous situation is not avoided, it will result in death or serious injury.

WARNING
Indicates a hazard with a medium risk level. If this hazardous situation is not avoided, it could result in death or serious injury.

CAUTION
Indicates a hazard with a low risk level. If this hazardous situation is not avoided, it could result in minor or moderate injury.

This symbol together with the **NOTE** signal word warns the reader of actions that might cause property damage or a malfunction.

Here you will find additional information or detailed sources of information.

1.2 Qualification of users

The use of products described in this user manual is oriented exclusively to:

– Qualified electricians or persons instructed by them. The users must be familiar with the relevant safety concepts of automation technology as well as applicable standards and other regulations.
– Qualified application programmers and software engineers. The users must be familiar with the relevant safety concepts of automation technology as well as applicable standards and other regulations.

1.3 Field of application of the product

1.3.1 Intended use

This device is intended for use in industrial environments.

This device is state-of-the-art and has been built to the latest standard safety requirements. However, dangerous situations or damage to the machine itself or other property can arise from the use of this device.

1.3.2 Product changes

Changes or modifications to hardware and software of the device are not permitted.

Incorrect operation or modifications to the device can endanger your safety or damage the device. Do not repair the device yourself. If the device is defective, please contact Phoenix Contact.

1.3.3 Disposal

The device contains valuable recyclable materials, which should be utilized. The electronic circuit board is fitted with a lithium battery. Dispose of the device separately from other waste, i.e., via an appropriate collection site.

1.4 Security in the network

NOTE: Risk of unauthorized network access

Connecting devices to a network via Ethernet entails the danger of unauthorized access to the network.

To prevent unauthorized network access, please read the following notes:

- If possible, deactivate unused communication channels.
- Assign passwords such that third parties cannot access the device and make unauthorized changes.
- Due to its communication interfaces, the device should not be used in security-critical applications unless additional security appliances are used. Therefore, please take additional protective measures in accordance with the IT security requirements and the standards applicable to your application, e.g., virtual networks (VPN) for remote maintenance access, firewalls, etc., for protection against unauthorized network access.
- On first request, you shall release Phoenix Contact and the companies associated with Phoenix Contact GmbH & Co. KG, Flachsmarkstrasse 8, 32825 Blomberg, Germany in accordance with §§ 15 ff AktG (German Stock Corporation Act), hereinafter collectively referred to as “Phoenix Contact”, from all third-party claims made due to improper use.
- For the protection of networks for remote maintenance via VPN, Phoenix Contact offers the mGuard product series of security appliances; these are described in the latest Phoenix Contact catalog (phoenixcontact.net/products).
- Additional measures for protection against unauthorized network access are listed in the AH EN INDUSTRIAL SECURITY application note. The application note can be downloaded at phoenixcontact.net/products).

2 Overview and ordering data

2.1 Description

The TP 6…PS human machine interface (HMI) provides a method to interface with a machine or system, either for control of that machine or to monitor it locally or through a central monitoring system. Various touch screen sizes are available.

Features

- PCAP touch interface
- Fanless design
- Dual USB 2.0 ports
- Single 1 Gbps LAN port
- Configurable multifunction serial port

2.2 Ordering data

Products

Description	Type	Order No.	Pcs./Pkt.
Touch panel, 7-inch display	TP 6070-WVPS	1189629	1
Touch panel, 10-inch display	TP 6101-WXPS	1190417	1
Touch panel, 12-inch display	TP 6121-WXPS	1190420	1
Touch panel, 15.6-inch display	TP 6156-WHPS	1190421	1
Touch panel, 18.5-inch display	TP 6185-WHPS	1190423	1
Touch panel, 21.5-inch display	TP 6215-WHPS	1190424	1

Accessories

Description	Type	Order No.	Pcs./Pkt.
Mounting clip for TP 6000	TP 6000 MOUNTING HW CLIP (2PCS)	1289537	2
Battery, real time clock	TP 6000 RTC BATTERY KIT	1289761	1
MicroSDHC card, 16 GB, Industrial grade	MICROSDHC-16GB	1154696	1
MicroSDHC card, 32 GB, Industrial grade	MICROSDHC-32GB	1154699	1

3 Installation

3.1 Mounting

The TP 6…PS can be mounted in a panel or attached to a VESA mount. Use the appropriate section below to install the TP 6…PS.

3.1.1 Panel mount

NOTE:

Observe the following notes during installation:

When installing the device, leave a gap of at least 30 mm around the device to ensure sufficient air circulation.

When the operating device is installed horizontally, please note that additional sources of heat beneath the operating device may result in heat accumulation.

Make sure to allow sufficient heat dissipation!

Please observe the permissible temperature range specified in the technical data when operating the device.

In order to ensure the degree of protection specified in the technical data, observe the following points:

- A tolerance of ±0.5 mm is maintained for the mounting cutout.
- The seal lies flat against the mounting surface.
- The number of mounting brackets, given in the technical data, is used.
- The material of the mounting surface is sufficiently stable to ensure permanently secure attachment of the operating device.
- The mounting surface and the operating device may not become deformed due to the effects of the mounting clamps or through the operation of the device.
- The threaded pins of the mounting brackets are tightened uniformly to a maximum torque of 1 Nm.

When installing the TP 6…PS in a cabinet, follow these general rules:

- Verify clearances within the cabinet. Typically, allow at least 5 cm (2 in.) on each side of the TP 6…PS.
- Drill all holes and make all cuts before beginning installation.Be sure to protect already installed components from metal shavings.
- Supporting panels must be at least 1.9 mm (14 gauge) to provide proper support.
- Make sure there is adequate space around the heat sink on the unit and air inlets/outlets to provide sufficient cooling.

Installation

1. Cut a hole in the enclosure according to the dimensions for the selected display.

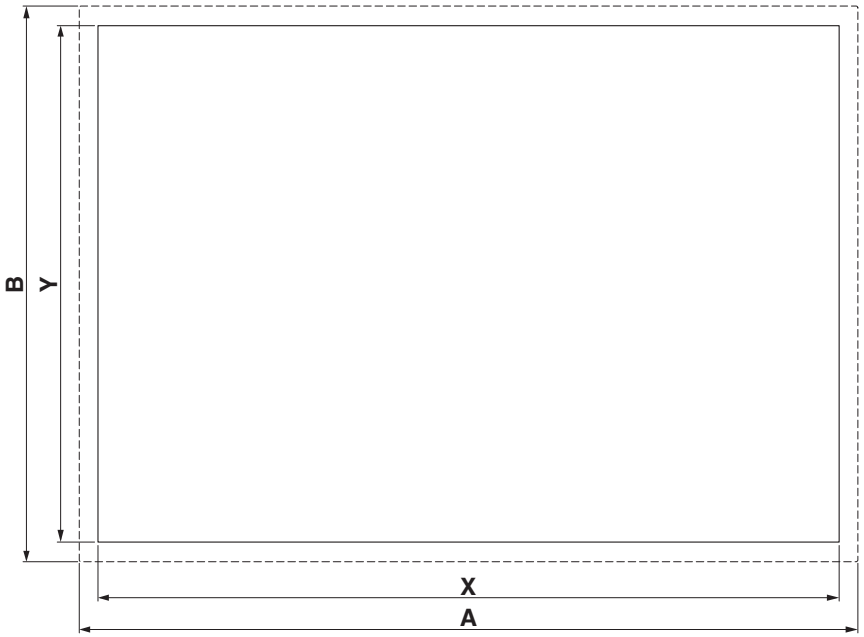


Figure 3-1 Panel cutout dimensions

Refer to Table 3-1for dimensions

Table 3-1 Overall and cutout dimensions with number of mounting clamps

Display size	Overall dimensions		Cutout dimensions[1]		Number of mounting clamps
	A (mm)	B (mm)	X (mm)	Y (mm)	
7 in.	202	146	195	139	8
10 in.	263	200	252	189	8
12.1 in.	302	229	292	219	10
15.6 in.	389	273	388	263	14
18.5 in.	465	310	455	300	14
21.5 in.	532	346	522	336	20

[1] Cutout dimensions are ±0.5 mm

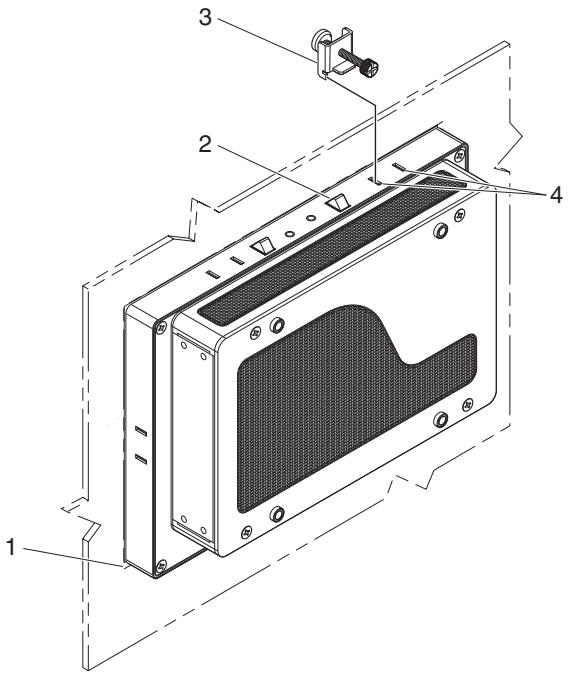


Figure 3-2 Panel mounting clamps

2. From the front, place the bottom edge of the TP 6…PS in the opening (1), making sure the spring-loaded retention clips (2) are inside the panel. Tilt the top of the TP 6…PS into the opening until the retention clips are inside the panel. Ensure that the gasket is properly positioned in the groove and against the panel.

CAUTION:
All clamps must be installed around the display to secure the TP 6…PS in the panel. The retention clips on top and bottom of the monitor only provide temporary assistance during installation.

3. From the rear, place the clamps (3) in the slots (4) on the display. Clamps must be installed in every slot.
4. Tighten the screws on all clamps, alternating from one side to the other until the front bezel is secure against the mounting panel. Torque the screws to 0.78 Nm.

Removal

1. Remove power and disconnect cables to the TP 6…PS.
2. Loosen and remove the clamps securing the TP 6…PS in the panel.
3. Using an assistant, press the retention clips along the top, and tilt the TP 6…PS forward.
4. Lift the TP 6…PS so the bottom retention clips clear the panel, and remove.

3.1.2 VESA mount

The TP 6…PS includes a VESA MIS-D, 100, C hole pattern for attachment to an appropriate mount. Note that this standard is for devices up to 14 kg (30 lb.).

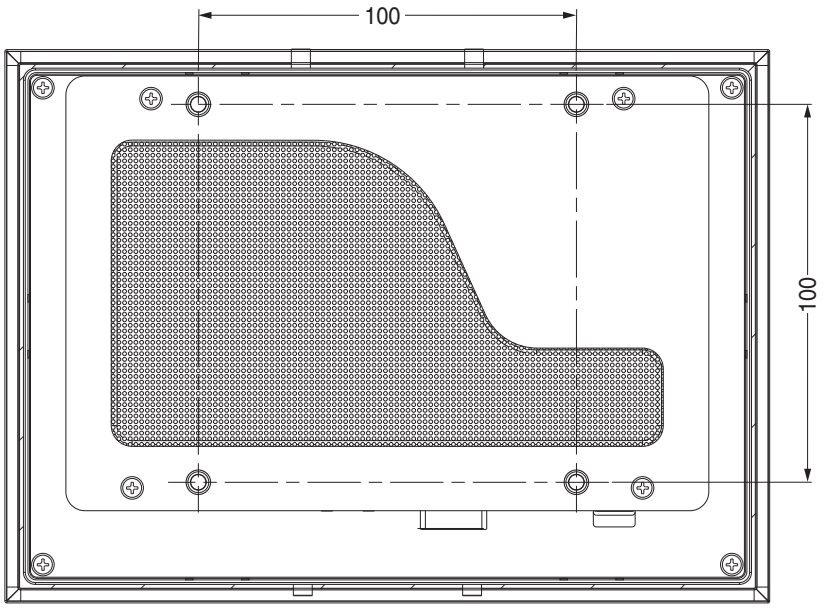
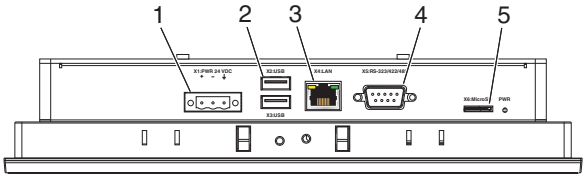


Figure 3-3 VESA mount drawing

3.2 Interfaces



1 Power connection
2 USB 2.0 ports
3 RJ45 Ethernet port
4 D-SUB 9 serial port
5 MicroSD card slot

Figure 3-4 Connectors and ports

After mounting the TP 6…PS, make any necessary cable connections. The available connectors are:

– USB (USB): USB devices connect using Type A connectors. Ports are USB 2.0 ports.
– Network (LAN): An RJ45 connector allows the device to communicate on a 10/100/100 Base-T Ethernet network. The use of CAT5e or better cable is recommended.
– Serial port (RS-232/422/485): The serial port may be configured as either RS-232, RS-422, or RS-485 port from within the configuration environment, such as Visu+ (Express) (refer to "Serial communication" on page 13)
– MicroSD: The microSD slot accepts use of a microSD card to transfer data to and from the TP 6…PS. Typical use is for transferring a common configuration between similar devices.

3.2.1 Power connection

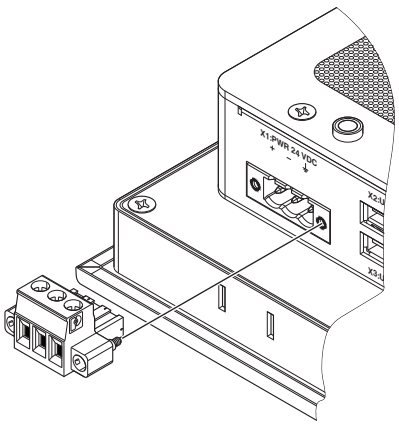


Figure 3-5 Power connection

Connect a power source to the three-position removable connector. The connector (Order No. 1777992) accepts wire sizes from 0.5 to 2.5 mm^2 (24 to 12 AWG). Torque the wire-retaining screws in the connector to 0.5 Nm (4.4 lb_f-in.).

Connect the TP 6…PS to a 24 V DC power supply.

NOTE:
To ensure safe operation, use safety extra-low voltage (SELV) according to DIN EN 61131 as a supply voltage.
This device is protection class I item of equipment.

3.2.2 Grounding

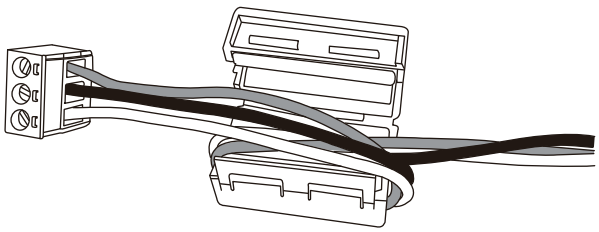
This is part of the power connector.

3.2.3 Ferrite core

NOTE:
A ferrite core is required for initial version of hardware, indicated on the product label as VC00. Starting with VC01, the ferrite core is built into the internal power supply.

A ferrite core is included with the TP 6…PS units. It is required to reduce EMI interference when the device is installed within the EEC.

Figure 3-6 Ferrite core



1. Connect the appropriate conductors to the supplied power connector.
2. Open the core.
3. Lay the three conductors in the core and wrap them around the outside so a second strand is routed through the core. There must be between 3 and 5 cm of conductor between the core and connector.
4. Snap the core closed, taking care to not pinch the conductors.

3.2.4 Serial communication

The configurable D-SUB 9 port is a future enhancement. It is included in the document for future reference when the capability is released.

The D-SUB 9 port can be configured to support RS-422, RS-485, or 5-wire RS-232 physical layer signal levels. The serial port is configured in the Visu+ configuration environment as either

Port 1	RS-232
Port 2	RS-422/485

When in Visu+ (Express), the user will select the communication driver (RealTimeDB), and then configure the port within the station properties.

The function of the pins in the D-SUB 9 connector varies with the different configuration settings.

Table 3-2 D-SUB 9 pinout

D-SUB 9 pin		Function
1	TX+	RS-485 transmitted data plus
2	TXD	RS-232 transmitted data
3	RXD	RS-232 received data
4	RX+	RS-485 received data plus
5	GND	Ground
6	–	Not used
7	–	Not used
8	TX-	RS-485 transmitted data minus
9	RX-	RS-485 received data minus

4 Operation

4.1 Touchscreen

NOTE:
Pointed and sharp objects, such as pens and fingernails, can lead to irreparable damages of the touchscreen. Use only fingertips or touchscreen display tools, such as a stylus or touch pen, for operation.

The device is equipped with a touchscreen. The device is operated using this touchscreen.

4.2 Power LED

A power LED indicates when power is available at the operating device.

Table 4-1 Power LED meaning

Indication	Description
Solid green	Normal operation
Solid red	Supply voltage is outside the operating range
Off	0 V DC

4.3 Display

DANGER:
If the display is damaged, avoid touching, swallowing, or breathing in the liquids or gases which may leak out.

NOTE:
Pixel failures, which can occur with TFT displays, are due to production and are not covered by the warranty.

The operating device is equipped with different displays (see technical data) depending on variant.

5 Maintenance

5.1 Fuse

NOTE:
The semiconductor fuse cannot be replaced.

A semiconductor fuse protects the device. Once the fuse has been tripped, the device must be disconnected from the supply voltage to allow the semiconductor fuse to regenerate. At an ambient temperature of 20°C (68°F), the regeneration takes approximately 20 seconds. The higher the ambient temperature, the longer the regeneration takes.

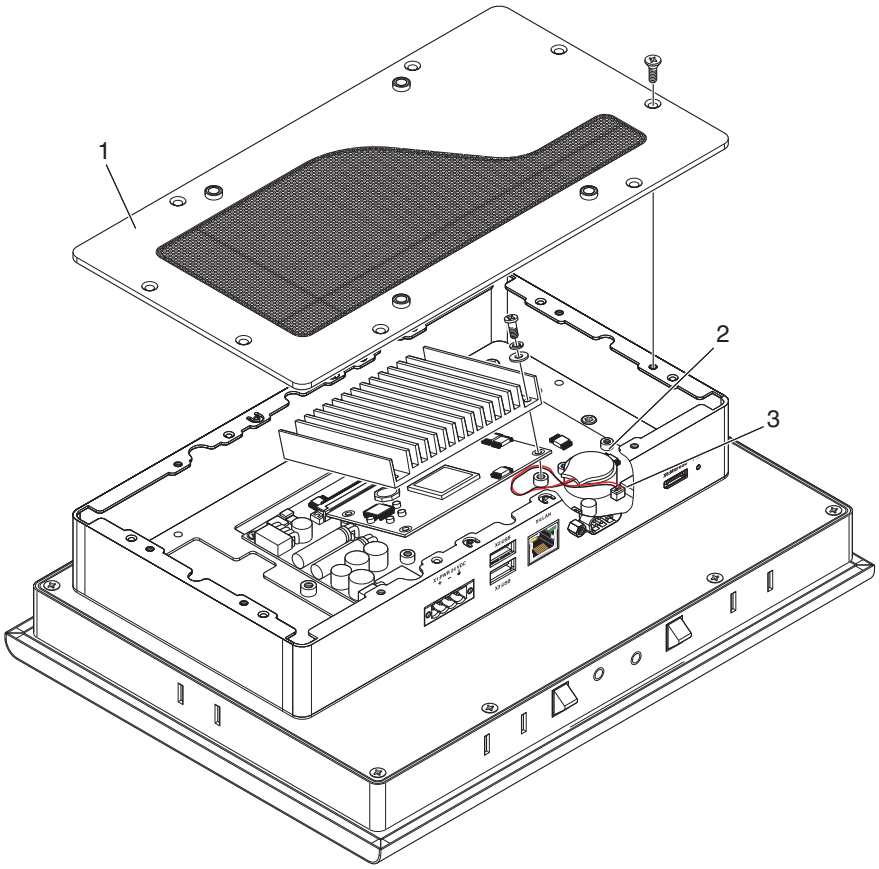
5.2 Battery replacement

The battery can be replaced if it fails.

1. Disconnect power from the TP 6…PS.
2. Remove the unit from it's mounting, either VESA or panel mount, and place it on a flat surface.

Place the TP 6…PS on a towel to protect the display from damage.

Figure 5-1 Battery replacement



3. Remove the screws securing the back cover (1) and remove the cover.
4. Locate the battery (2) and unplug the battery connector (3).
5. Remove the battery. It is held in place with double-stick tape and may require a small amount of effort to remove.
6. Secure the new battery in place using new double-stick tape (obtained locally).
7. Plug the battery into the circuit board.
8. Place the back cover on the unit and secure with the previously removed hardware. Torque screws to 0.5 Nm.
9. Remount the TP 6…PS and apply power.

A Technical appendix

General data	
Overall, dimensions (width x height x depth)*	
TP 6070-WVPS	202 x 146 x 51 mm
TP 6101-WXPS	263 x 200 x 51 mm
TP 6121-WXPS	302 x 229 x 51 mm
TP 6156-WHPS	398 x 273 x 51 mm
TP 6185-WHPS	465 x 310 x 51 mm
TP 6215-WHPS	532 x 346 x 51 mm
Ambient temperature (operation)	
TP 6070-WVPS, TP 6101-WXPS, TP 6121-WXPS	-20 … 50°C
TP 6156-WHPS, TP 6185-WHPS, TP 6215-WHPS	0 … 50°C
Ambient temperature (storage/transport)	
TP 6070-WVPS, TP 6101-WXPS, TP 6121-WXPS	-25 … 85°C
TP 6156-WHPS, TP 6185-WHPS, TP 6215-WHPS	-20 … 60°C
Permissible humidity (relative)	
TP 6070-WVPS, TP 6101-WXPS, TP 6121-WXPS	5% … 85%, non-condensing
TP 6156-WHPS, TP 6185-WHPS, TP 6215-WHPS	10% … 95%, non-condensing
Weight	
TP 6070-WVPS	1.3 kg
TP 6101-WXPS	2.1 kg
TP 6121-WXPS	2.5 kg
TP 6156-WHPS	4.3 kg
TP 6185-WHPS	5.2 kg
TP 6215-WHPS	6.3 kg
Degree of protection	IP66 front, IP20 rear
Mounting	Panel cutout
LED indicators	Power, bicolor

* Dimensions are overall, including bezel

Electrical data	
Power supply, nominal	24 V DC ±20%
Type of connection	Removable screw-type and screw lug
Conductor size	0.2 … 2.5 mm² (24 … 12 AWG)
Torque, wire clamping screw	0.5 … 0.6 Nm
RTC battery, typical life	5 years
Fuse	Integrated
Protection against polarity reversal	Diode

Current and power data	
Power consumption, maximum @ 24 V	
TP 6070-WVPS	14.71 W
TP 6101-WXPS	19.01 W
TP 6121-WXPS	21.53 W
TP 6156-WHPS	30.48 W
TP 6185-WHPS	32.16 W
TP 6215-WHPS	32.88 W

Operating systems	
Operating system (configuration option)	Windows® Embedded Compact 7

Data storage	
Type	eMMC 8 GB

Main memory	
RAM	1 GB

Processor data	
Processor	ARM Cortex-A9
Clock speed	800 MHz
Number of cores	4

Interfaces	
Data port	2x Type A USB 3.0 MicroSD
Serial connection	1x D-SUB 9 (male), configurable via Visu+ (Express) for RS-232/422/485*
Number of Ethernet connectors	1
Ethernet connection	10/100/1000 Mbps

* This is a limited implementation of the EIA-232 standard.

Display (TP 6070-WVPS)	
Display size, inch (cm)	7 (17.8)
Type	TFT
Resolution, W x H (pixels)	800 x 480
Number of colors	16.7 million
Touch technology	PCAP (10 point)
Brightness (cd/m²)	500
Backlight	LED
Backlight MTBF (hours)	50000
Viewing angle (horizontal/vertical)	89°
Panel cutout size, W x H (mm)	195 x 139

Display (TP 6101-WXPS)	
Display size, inch (cm)	10.1 (25.9)
Type	TFT
Resolution, W x H (pixels)	1280 x 800
Number of colors	16.7 million
Touch technology	PCAP (10 point)
Brightness (cd/m²)	500
Backlight	LED
Backlight MTBF (hours)	50000
Viewing angle (horizontal/vertical)	85°
Panel cutout size, W x H (mm)	252 x 189

Display (TP 6121-WXPS)	
Display size, inch (cm)	12.1 (30.7)
Type	TFT
Resolution, W x H (pixels)	1280 x 800
Number of colors	16.7 million
Touch technology	PCAP (10 point)
Brightness (cd/m²)	400
Backlight	LED
Backlight MTBF (hours)	50000
Viewing angle (horizontal/vertical)	88°
Panel cutout size, W x H (mm)	292 x 219

Display (TP 6156-WHPS)	
Display size, inch (cm)	15.6 (39.6)
Type	TFT
Resolution, W x H (pixels)	1920 x 1080
Number of colors	16.7 million
Touch technology	PCAP (10 point)
Brightness (cd/m²)	450
Backlight	LED
Backlight MTBF (hours)	50000
Viewing angle (horizontal/vertical)	85°
Panel cutout size, W x H (mm)	388 x 263

Display (TP 6185-WHPS)	
Display size, inch (cm)	18.5 (46.9)
Type	TFT
Resolution, W x H (pixels)	1920 x 1080
Number of colors	16.7 million
Touch technology	PCAP (10 point)
Brightness (cd/m²)	350
Backlight	LED
Backlight MTBF (hours)	50000
Viewing angle (horizontal/vertical)	85°
Panel cutout size, W x H (mm)	455 x 300

Display (TP 6215-WHPS)	
Display size, inch (cm)	21.5 (54.6)
Type	TFT
Resolution, W x H (pixels)	1920 x 1080
Number of colors	16.7 million
Touch technology	PCAP (10 point)
Brightness (cd/m²)	400
Backlight	LED
Backlight MTBF (hours)	50000
Viewing angle (horizontal/vertical)	85°
Panel cutout size, W x H (mm)	522 x 336

Mechanical tests	
Impact load, shock test	IEC 60068-2-27
Sinusoidal vibration	IEC 60068-2-6

Conformance with EMC directives	
EN 61000-6-4, Class A	
EN 61000-6-2	

Approvals	
CE compliant	
IEC 61131-2	

B Appendixes

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Section 4

Please observe the following notes

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