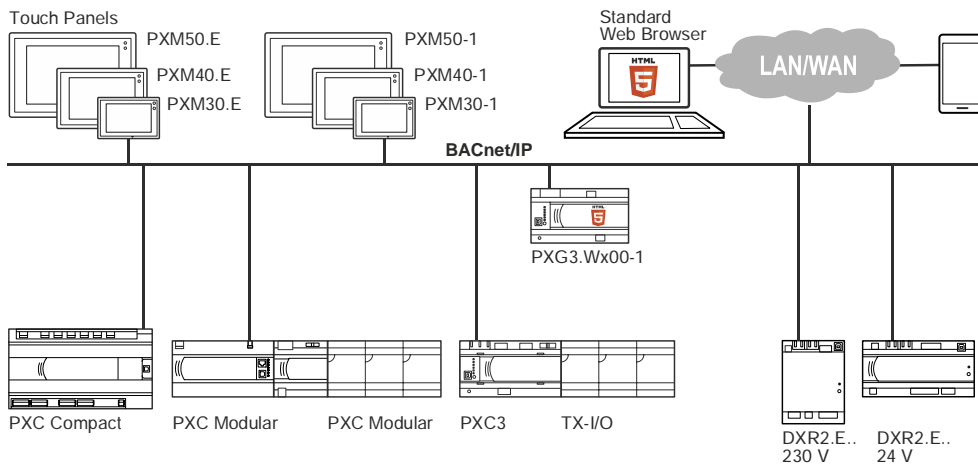


# SIEMENS



## Desigo™

## Desigo Control Point Planning and Installation

## Manual

## Edition notice

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# 1 Cyber security disclaimer





Products, solutions and services from Siemens include security functions to ensure the secure operation of building automation and control, fire safety, security management, and physical security systems. The security functions on these products, solutions and services are important components of a comprehensive security concept.






Drafting, implementing and managing a comprehensive and up-to-date security concept, customized to individual needs, is nevertheless necessary, and may result in additional plant- or site-specific preventive measures to ensure secure operation of your site regarding building automation and control, fire safety, security management, and physical security. These measures may include, for example, separating networks, physically protecting system components, user training, multi-level defensive measures, etc.







For additional information on security as part of building technology and our product, solution and service offerings, please contact your Siemens sales representative or project department. We strongly recommend to always comply with our security advisories on the latest security threats, patches and other related measures.

<http://www.siemens.com/cert/en/cert-security-advisories.htm>

## 2 Safety notes

	<p><b>⚠ CAUTION</b></p> <p><b>General safety regulations</b> Please comply with the following general regulations during engineering and execution:</p> <ul style="list-style-type: none"> <li>• Measures/prohibitions to prevent the hazard of electrical and mains power ordinances for the given country.</li> <li>• Other applicable, national regulations.</li> <li>• Building installation regulations for the given country.</li> <li>• Regulations of the utility company.</li> <li>• Diagrams, cable lists, dispositions, specifications, and orders by the customer or authorized engineering office.</li> <li>• Third-party regulations, e.g. by the general contractor or building owner.</li> </ul>
	<p><b>⚠ CAUTION</b></p> <p><b>National safety regulations</b> Failure to comply with national safety regulations may result in personal injury and property damage.</p> <ul style="list-style-type: none"> <li>• Observe national provisions and comply with the appropriate safety regulations.</li> </ul>
	<p><b>⚠ CAUTION</b></p> <p><b>Electrical safety</b> The electrical safety for building automation and control systems by Siemens Building Automation is essentially based on safely separating low voltage from mains voltage.</p>
	<p><b>⚠ CAUTION</b></p> <p><b>IEC (SELV/PELV) (worldwide)</b> Application as per SELV or PELV pursuant to IEC 60364-4-41 "Low voltage electrical installations" depending on the grounding (<math>\perp</math> AC 24 V) of the low voltage:      Ungrounded = Safety Extra-Low Voltage (SELV)      Grounded = Protection by PELV (Protected Extra Low Voltage)</p>

	<p><b>⚠ CAUTION</b></p>
	<p><b>NEC (North America)</b>  Use of class 2 transformers limited to 100 VA or class 2 circuits at max. 100 VA by a non-limited transformer of max. 400 VA, combined with overcurrent protection (T 4 A fused) for each AC 24 V device. Multiple fuses for multiple insulated secondary circuits per transformer are possible (see Power requirements [→ 25]).  The same applies to DC 24 V power supplies.</p>
	<p><b>⚠ CAUTION</b></p>
	<p><b>Device safety</b>  Device-related safety is guaranteed, among others, by low voltage power supply AC 24 V, DC 24 V and double insulation between the mains voltage AC 230 V, AC 24 V circuits and the housing or Power over Ethernet (PoE Class 4).  Comply with specific regulations for electrical wiring per the following sections.</p>
	<p><b>⚠ CAUTION</b></p>
	<p><b>Grounding ⊥ (system neutral AC/DC 24 V)</b>  Observe the following points when grounding ⊥ AC 24 V (system neutral):</p> <ul style="list-style-type: none"> <li>• Operating voltage of AC 24 V is permitted in principle for both grounded as well as non-grounded system neutrals. Local regulations and customs apply accordingly. Grounding may be required or not allowed for functional reasons.</li> <li>• Recommendation: AC 24 V systems are generally grounded unless otherwise not recommended by the manufacturer.</li> <li>• In order to avoid ground loops, connect systems with PELV to the ground at one location only (especially for transformers), unless otherwise indicated.</li> <li>• The same applies to DC 24 V power supplies.</li> </ul>
	<p><b>⚠ CAUTION</b></p>
	<p><b>Functional ground ↕</b>  The connections of the functional ground must be connected on the installation side with the building grounding system (PE).</p>
	<p><b>⚠ CAUTION</b></p>
	<p><b>Operating voltage AC/DC 24 V</b>  It must meet requirements for SELV or PELV. Permissible deviation to nominal voltage:  At the transformer/power unit: AC / DC 24 V -10 ... + 20%  At the end device (web server): AC 24 V ±20%, DC 24 V ± 20%  At the end device (touch panel): AC 24 V ±20%, DC 24 V ± 20%</p>

	<b>⚠ CAUTION</b>
	<p><b>Transformer specification AC 24 V</b>  IEC: Use safety insulating transformers as per IEC 61558 with double insulation designed for 100% duty to supply SELV or PELV circuits.  USA: Class 2 circuits per UL 5085-3  Power taken from the transformer should be at least 50% of nominal load for efficiency reasons (effectiveness).  Transformer nominal power should be at least 25 VA. For smaller transformers, the ratio of open circuit voltage to full load is unfavorable (&gt; + 20 %).</p>
	<b>⚠ CAUTION</b>
	<p><b>DC 24 V power supply specification</b>  Designed for 100% duty to supply SELV or PELV electrical circuits.  USA: Class 2 circuits per UL 5085-3.  Power taken from the transformer is at least 50% of nominal load for efficiency reasons (effectiveness).</p>
	<b>⚠ CAUTION</b>
	<p><b>Operational voltage fuse AC 24 V</b>  Transformers on the secondary side correspond to the actual load of all connected devices as per transformer sizing:  AC 24 V line (system potential) must always be fused.  Where required, also fuse line ⊥ (system neutral).</p>
	<b>⚠ CAUTION</b>
	<p><b>Operational voltage fuse DC 24 V</b>  DC 24 V power are short-circuit proof or have internal fuses.  Comply with all local regulations.</p>
	<b>⚠ CAUTION</b>
	<p><b>Mains fuse</b>  Transformers / DC 24 V power on the primary side: Panel fusing (control fuse)</p>
	<b>⚠ CAUTION</b>
	<p><b>Power over Ethernet (PoE) PoE</b>  Designo touch panels require power for PoE+ Class 4 (max. 600 mA / 25.5 W). It must comply with IEEE 802.3at-2009.  Comply with manufacturer guidelines on power to the PoE switches.</p>



**⚠ CAUTION****Caution with regard to foreign voltages**

Any insertion or drawing of dangerous voltages to the system's low-voltage circuit, e.g. caused by improper wiring, directly places people at risk and may result in the partial or complete destruction of the building automation and control system.

## 3 Overview

### 3.1 Devices

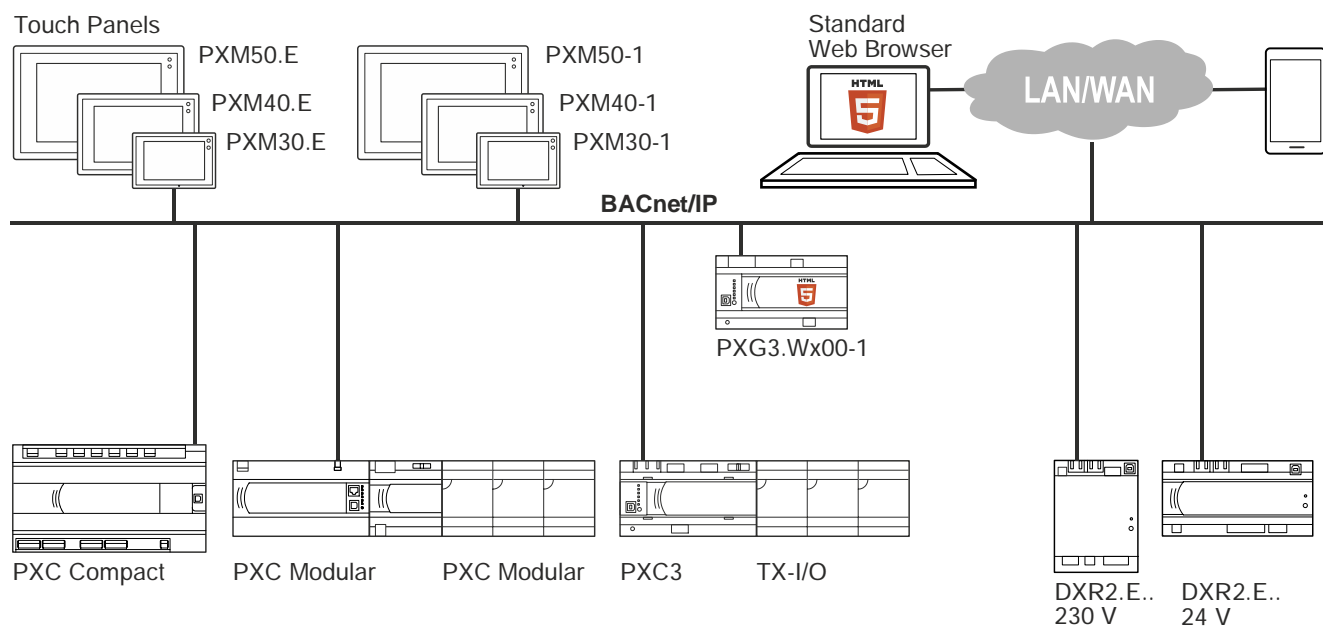
Desigo Control Point is an embedded building management station to operate and monitor building automation and control systems on BACnet/IP.

In addition, room users can operate room applications (using QMX7 widgets).

Functionality can be adapted to any user profiles – from room users to facility managers.

#### Operable systems

- Desigo primary plants
- Desigo room automation
- BACnet third-party devices



#### Operation and monitoring devices

ASN	Device	Data sheet
PXM30-1	Touch Panel 7.0", web client	A6V10933111
PXM30.E	Touch Panel 7.0", integrated web server	
PXM40-1	Touch Panel 10.1", web client	A6V10933114
PXM40.E	Touch panel 16.6", integrated web server	
PXM50-1	Touch panel 15.6", web client	
PXM50.E	Touch panel 15.6", integrated web server	
PXG3.W100-1	Web server, basic functionality	A6V10808336
PXG3.W200-1	Web server, advanced functionality	

#### Standard operator units

Operation and monitoring is also possible on standard operating units with HTML5.0 web browsers.

## 3.2 Functions

Desigo Control Point offers efficient and intuitive building operation.

Function	Touch panel		BACnet/IP web interface	
	TCP/IP	BACnet/IP	PXG3.W100-1	PXG3.W200-1
	PXM50-1 PXM40-1 PXM30-1	PXM50.E PXM40.E PXM30.E		
Generic operation of all objects/parameters	Available on PXG3.Wx00-1	✓	✓	✓
Operation of Desigo primary and room automation stations as well as third-party BACnet devices		✓	✓	✓
User administration (create, delete, and edit)		✓	✓	✓
User access rights		✓	✓	✓
Alarm view		✓	✓	✓
Alarm and event history		✓	✓	✓
Alarm forwarding to email recipient		✓	✓	✓
Trend Viewer (online and offline trends)		✓	✓	✓
Scheduler operation		✓	✓	✓
Heating curve		✓	✓	✓
Animated graphics (plants, rooms, floors, etc.)		✓	✓	✓
Integrated web server for remote access		✓	✓	✓
Graphics engineering online over the desktop web browser		✓	✓	✓
Manual trend data export		✓	✓	✓
Haystack interface		✓	✓	✓
Energy dashboards		✗	✗	✓
Kiosk presentation (available on PXMxx.E and PXG3.Wx00)		✓	✓	✓
Automatic trend data export	✗	✗	✓	
System status report	✗	✗	✓	

## 3.3 Engineering

No engineering is required to prepare standard operating views.

The offline engineering workflow is fully integrated in ABT Site:

- Building hierarchy
- Device topology
- Create graphics

Graphics engineering in a runtime system over an HTML 5.0 web browser.

Graphic library with a large amount of templates and symbols.

Operating interfaces for technical operators and end users are created using the same engineering solution.

For further information, see:

- *Desigo Control Point operation* (A6V11211557)
- *Desigo Control Point engineering* (A6V11211560)

## 3.4 Commissioning

No tool is required to commission the devices. Commissioning is performed directly on the touch panel or using an HTML5 browser. The devices are then operated using standard operating views. Graphics can be created or edited online using the integrated graphics editor.

The workflows for commissioning and service are the same as for other Desigo devices.

For further information, see *ABT SSA user guide* (A6V10429119).

## 4 Functions in detail

### 4.1 User profile

- Users can be managed offline with ABT Site or online using a web browser.
- Each administrator can create additional users on its own user level or lower.
- Customized users must be created using ABT Site.
- The password security must be administered with ABT Site.

Views / rights	User profile					
	Administrator	Advance engineer	Standard engineer	Advanced user	Standard user	Customized user
Plant view	✓	✓	✓	✓	✓	Can be configured
Alarm view	✓	✓	✓	✓	✓	Can be configured
Scheduler	✓	✓	✓	✓	✓	Can be configured
List view	✓	✓	✓	✓	✓	Can be configured
Trend view	✓	✓	✓	✓	✓	Can be configured
Report view	✓	✓	✓	✓	✓	Can be configured
Alarm acknowledgement	✓	✓	✓	✓	✓	Can be configured
Tools (available if application view is selected) Tools – Settings (SMTP, FTP, etc.)	✓	✓	✓	✗	✗	Can be configured
Device learning	✓	✓	✗	✗	✗	✗
Create / edit / delete users	✓	✗	✗	✗	✗	✗
Switch off automatic logout	✗	✗	✗	✗	✗	Can be configured
Setup & service (Navigation to generic view)	✓	✓	✓	✓	✗	Can be configured

## 4.2 Access levels

Desigo assigns each data point / BACnet object one of the following object access levels:

#	English	German	Description
0	No access	Kein zugriff	Special objects that are not displayed on the runtime system
1	Internal	Intern	Special objects/pins for very special tasks
2	Extended service	Erweiterter Service	Not used in the HQ solution
3	Basic service	Standardservice	Objects/pins that are important for commissioning
4	Administrator	Administrator	Not used in the HQ solution
5	Extended operation	Erweiterter Betrieb	Objects/pins for operating & monitoring by trained personnel Level <=5: TechOp is the standard tool
6	Standard operation	Standardbetrieb	Objects/pins for day-to-day operating & monitoring on the management station
7	Basic operation	Allgemeine Benutzung	The most important information for room users Primary plants: Rarely used

The access level is application specific. It is set to allow each user to display the appropriate data points. The access level of a data point can be viewed and edited in CFC.

### Primary plant

Each pin for a data point has its own access level. The data points receive the access level for pin PrVal during learning in Desigo Control Point.

### Room automation

Each data point has only one access level.

### Third-party devices and systems

Third-party devices and systems do not know the access levels for the data points. All data points are always integrated during device learning.

### User role

Each user role has a defined access level applicable to the user. The user can filter the displayed data points within the assigned access level to improve the overview.

### Graphics-based operation

The access levels are also used to limit the number of integrated data points.

We recommend the following access levels for integration if each integrated data point is fully graphically operated:

- Extended operation for Desigo primary automation stations
- Standard operation for Desigo room automation stations
- No access levels are available for BACnet third-party automation stations. As a consequence, all data points are always selected by default.

The data points can be integrated at the lowest access level if no graphical operation is required.

The selection of integrated data points can be optimized and individually customized in the device learning function using Advanced Tools. The tool can individually select or exclude data points.

The alarm view is based on the integrated data points. For assigned devices, all objects in an alarm state are always displayed regardless of whether or not the corresponding object was integrated.

## Generic operation

- For toolless commissioning (Setup & Service > Assigned devices), the data points are sorted by device.
- For tool-based commissioning (ABT Site), the data points are displayed in the building hierarchy.
- Generic operation does not depend on graphical operation: All data points and properties can always be operated.

## 5 System limits

### 5.1 Device-related limits (independent of license)

Function	Touch panel		BACnet/IP web interface	
	TCP/IP	BACnet/IP	PXG3.W100-1	PXG3.W200-1
	PXM50-1 PXM40-1 PXM30-1	PXM50.E PXM40.E PXM30.E		
Generic operation	n.a.	All data points of all assigned devices		
Graphical operation (BACnet objects)	n.a.	500	1,000	2,000
Haystack interface (BACnet objects)	n.a.	500	1,000	2,000
Online trends	n.a.	20	20	50
Graphics (average complexity)	n.a.	20	20	50

### 5.2 Memory management

	PXM50.E PXM40.E PXM30.E	PXG3.W100-1	PXG3.W200-1
<b>Available application memory</b>	3 GB	3 GB	3 GB
<b>Memory requirements</b>			
Max. number of DPs that can be integrated for graphical operation	1,500 kB (500 DPs)	2,500 kB (1,000 DPs)	5,000 kB (2,000 DPs)
Max. number of plant graphics at 300 kB each	20 (6,000 DPs)	20 (6,000 DPs)	50 (15,000 DPs)
Alarm history - 10,000 entries	5,000 kB	5,000 kB	5,000 kB
1 online trend (multistage object) 10 years, 24 entries per day = ca. 90 values	40 kB	40 kB	40 kB
1 report with 1,000 objects	150 kB	150 kB	150 kB



## 5.3 Graphics-based operation

The data point capacity is limited on graphical operation (data points are integrated via device learning).

The figures below apply to integration over the standard user level and where full graphical operation of all data points is required.

	Desigo primary plant	Desigo room automation	
Access level for integration	Extended operation	Standard operation	
Max. number*	Number HW-I/Os**	Number of simple rooms (HVAC only)	Number of complex rooms (HVAC, lighting, shading)
PXG3.W100-1	400	30	10
PXG3.W200-1	800	60	20
PXM30.E	200	15	5
PXM40.E	200	15	5
PXM50.E	200	15	5
PXM30-1, PXM40-1, PXM50-1	n.a. (see limits for PXG3wx00-1)		

\* The selection of integrated data points can be optimized and individually customized in the device learning function using Advanced Tools.

\*\* Primary plants: Per HW I/O some 2.5 BACnet objects are integrated on average.

## 5.4 Technical limits

The following limits have been tested and released.

Function	Touch panel		BACnet/IP web interface	
	TCP/IP	BACnet/IP	PXG3.W100-1	PXG3.W200-1
	PXM50-1 PXM40-1 PXM30-1	PXM50.E PXM40.E PXM30.E		
Max. BACnet objects of assigned devices	n.a.	10,000		
Number of simultaneously connected operator clients	n.a.	5*	5*	5*
Data points per plant graphic	n.a.	40	40	40
Data points (in a table)	n.a.	40	40	40
Number of defined users	n.a.	8	8	8

\* 5 is a recommended number. You can connect more clients, but if you carry out the same user operations simultaneously, the performance will suffer. Example: Simultaneous loading of the same plant graphic on 10 clients.

## 5.5 Limits for MS/TP

Recommendation: Assign (integrate) or learn a maximum of 10 MS/TP devices. More devices are permitted, but they may result in longer and inconsistent times.

- Assigned devices offline/online:
  - > 10 devices deteriorate performance in system TechOp.
- Learn devices offline/online:
  - > 10 devices takes longer, the devices remain longer in caching.
- Restart devices (e.g. after a return of power):
  - > 10 devices take longer.

## 5.6 Supported BACnet objects

The BACnet objects supported in Desigo Control Point are listed in the Appendix [→ 37].

## 6 Compatibility

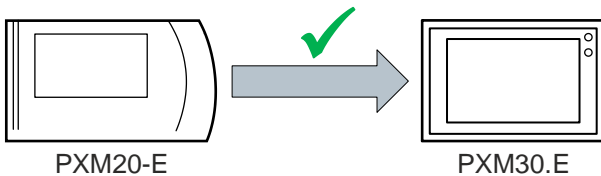
### 6.1 Compatibility with earlier systems

System compatibility	PXM50-1 PXM40-1 PXM30-1	PXM50.E PXM40.E PXM30.E	PXG3.W100-1	PXG3.W200-1
Desigo PX primary plants	n.a.	as of Desigo V4.0		
Desigo room automation PXC3	n.a.	as of Desigo V5.0		
Desigo room automation DXR2	n.a.	as of Desigo V6.0		
BACnet third-party devices	n.a.	as of BACnet revision 1.05 (≙ Desigo V4.0)		

### 6.2 Compatibility with earlier devices

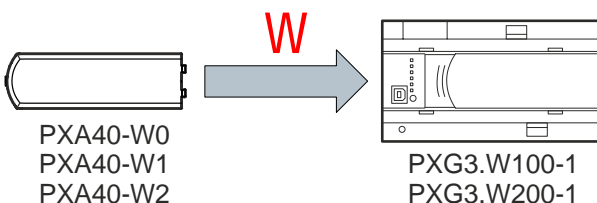
Desigo devices ≤ Desigo V6.0	Desigo Control Point			
	PXM50-1 PXM40-1 PXM30-1	PXM50.E PXM40.E PXM30.E	PXG3.W100-1	PXG3.W200-1
PXG3.W100			n.a.	n.a.
PXM20-E		PXM30.E		
PXM40	PXM40-1			
PXM50	PXM50-1			

#### PXM20-E



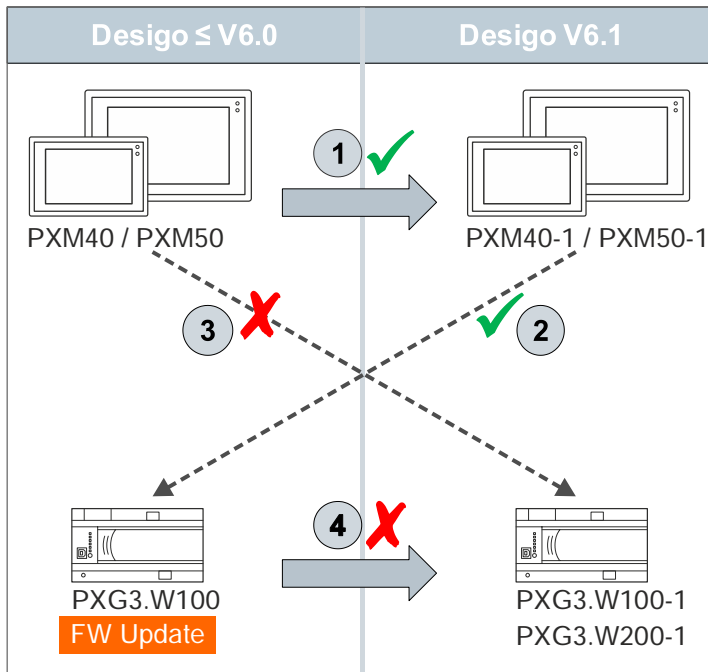
- The dimensions for the cut out are the same as for mounting in the panel.
- Supply voltage AC/DC 24 V.
- Ethernet connection for communication.
- No Power over Ethernet (PoE) connection on PXM30.E.

#### PX Web



- PX web graphics are not compatible with graphics for the new web interface PXG3.Wx00-1.
- No workflow is currently available to automate migration of PX Web graphics.
- New graphics can be efficiently created, based on templates or existing graphics.

## Designo Control Point



- ① Same dimensions for the cut out as for mounting in the panel  
Supply voltage AC/DC 24 V  
Ethernet connection  
Similar look and feel
- ② PXM40-1 and PXM50-1 are backwards compatible to PXG3.W100 (PXG3.W100 FW update required)
- ③ Existing PXM40 and PXM50 are not compatible with the new web interface PXG3.Wx00-1
- ④ Engineering data, including graphics are not compatible with the new web interface

## 7 Supported browsers

The following browsers support graphics and operation:

Graphics editor	Google Chrome* Graphics can be created and edited without a tool using this browser.
Grade A Recommended web browsers for standard operator units	Google Chrome on desktop* Google Chrome on Android tablet* Google Chrome on Surface tablet* Microsoft Edge on Surface tablet <ul style="list-style-type: none"> <li>Fully tested and approved browser.</li> <li>Supported officially by Siemens BT.</li> <li>All functions are available and can be executed as documented.</li> </ul>
Grade B Compatible web browsers	Google Chrome on Android cellphone* Microsoft Edge on desktop <ul style="list-style-type: none"> <li>Fully tested and approved browser.</li> <li>Supported officially by Siemens BT.</li> <li>Basic functions are available and can be executed as documented.</li> <li>Minor deviations in terms of display and operation to recommended browsers are possible (fonts, etc.).</li> </ul>
Grade C Partially compatible standard web browsers	Safari on iPad Safari on iPhone Firefox Internet Explorer 11 <ul style="list-style-type: none"> <li>Minimally tested browsers.</li> <li>Not supported by Siemens BT.</li> <li>Access to the web server is possible in principle.</li> </ul>

\* Chrome remains automatically on https when visiting an HTTPS page. It must be manually switched back to http to work with Desigo Control Point.

## 8 Planning (hardware)

### 8.1 IT security

Desigo Control Point works with devices with a web interface to allow remote access via the Internet. As a consequence, you must comply with all IT security rules.

All participants must have a solid understanding of possible risks and side effects associated with new and efficient functions (especially remote access).

Refer in this regard to the document *"IT security on installation with Desigo"* (CM110663).

### 8.2 Ports for remote access

The following ports must be open on the firewall for Desigo Control Point:

TCP / 80	http (general access)
TCP / 443	https (secured access)
UDP / 30000	S1 Discovery
UDP / 30001	S1 Discovery
UDP / 47808	BACnet (changes depending on configuration)
UDP / 47874	BACnet
UDP / 68	DHCP

## 8.3 Topologies

Various viewpoints can guide planning operating and monitoring concepts:

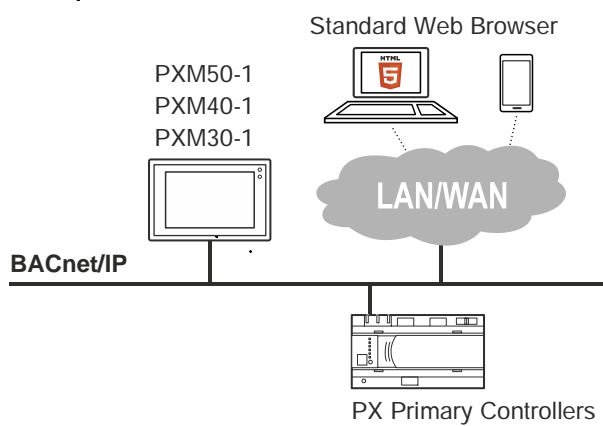
- Who operates which parts of the plant?
- What devices are used?
- How large is the system?
- How is the building subdivided (floors, tenants, etc.)?

### Use case: Small project

Project requirements:

- Small heating and ventilation plants
- Web access for remote operation
- Local operator unit

Example:

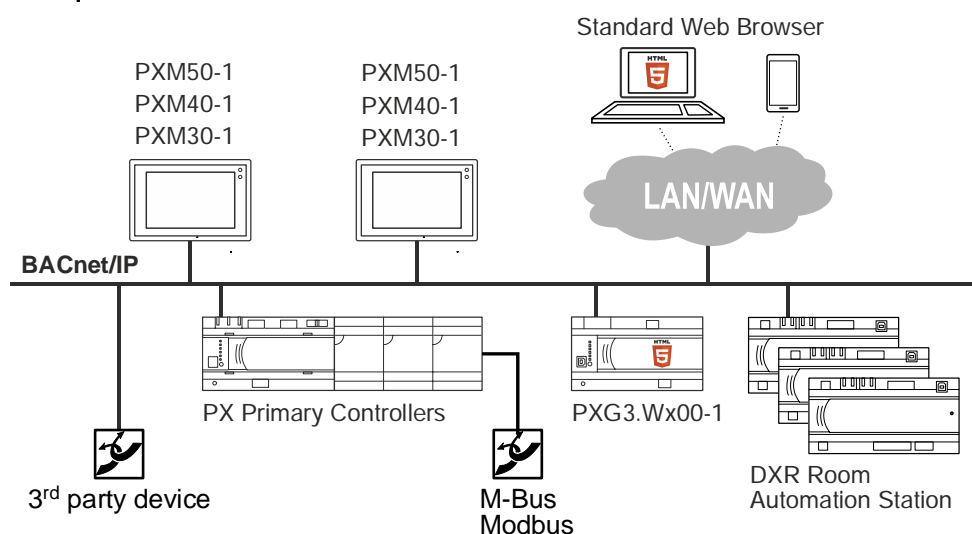


### Use case: Mid-sized project

Project requirements:

- Multiple heating plants and/or air handling units
- Some rooms have room automation
- BACnet third-party devices
- Multiple, local operator units
- Web access for remote operation

Example:

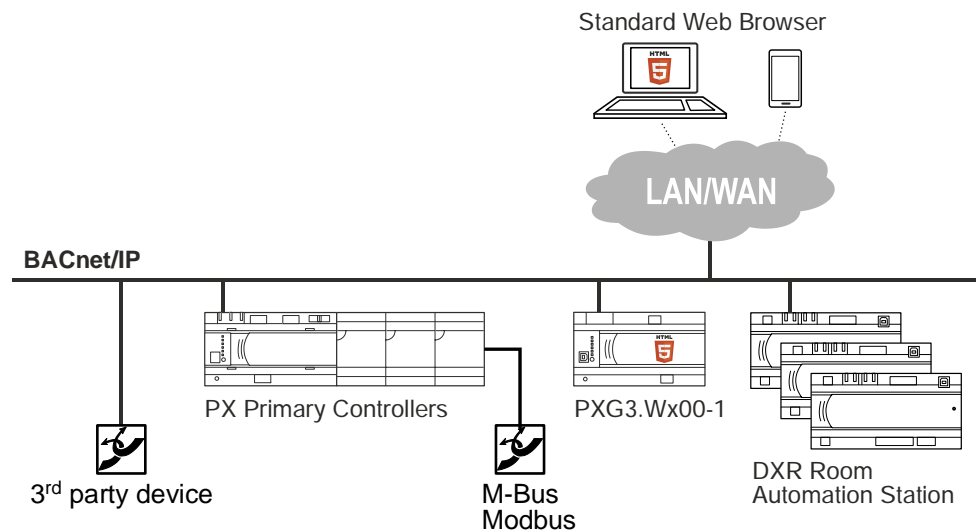


## Use case: Project without touch panels

Project requirements:

- Multiple heating plants and/or air handling units
- Some rooms have room automation
- Web access for remote operation

Example:



## Use case: Large and complex project

Project requirements:

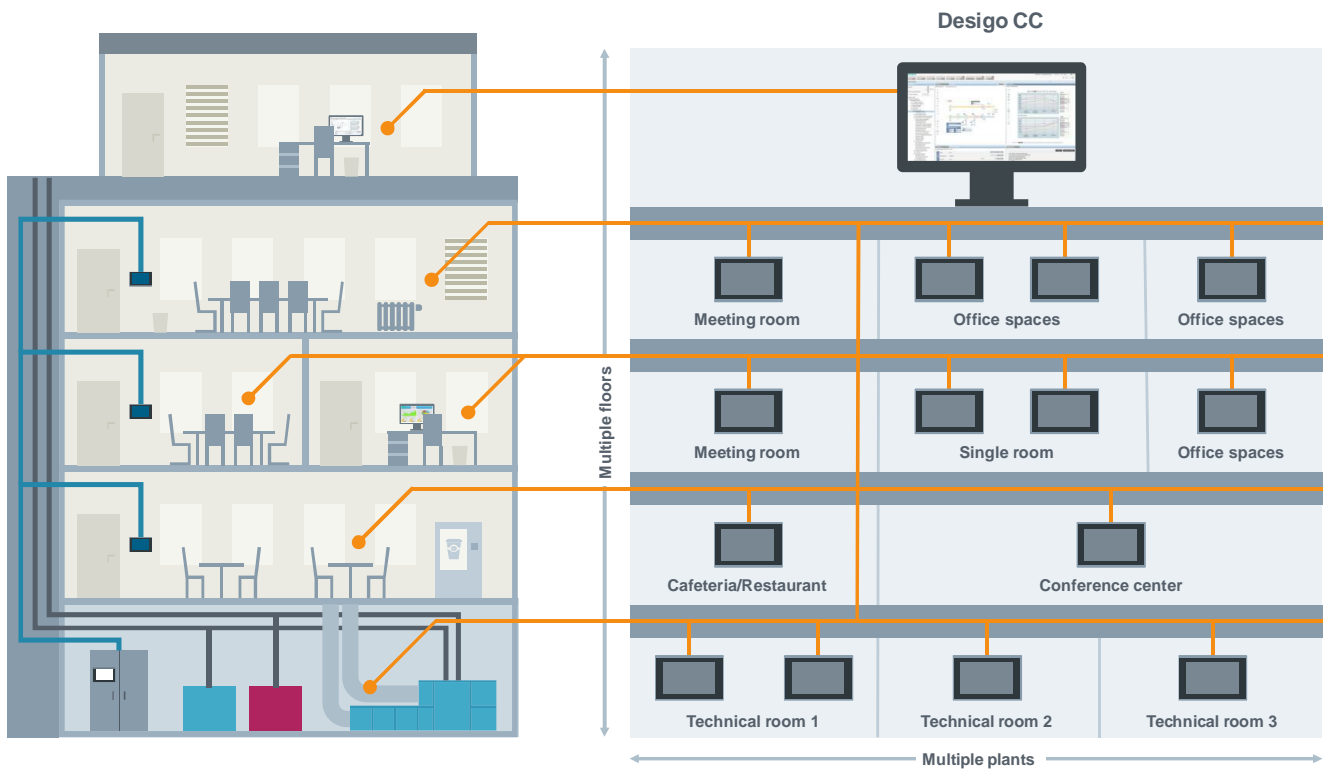
- Office building
- Lots of offices and technical rooms
- Central operation for the entire building
- Decentralized operation of rooms and plants

Design CC for central operation

Touch panels with or without web server for decentralized operation

Example:





## 8.4 Power requirements

### 8.4.1 Power consumption per device

Type	AC 24 V ± 20 %	DC 24 V ± 15%	PoE <sup>1)</sup> (DC 48 V Class 4)
PXM30-1 PXM30.E	Max. 29 VA	Max. 17 W	n.a.
PXM40-1 PXM40.E	Max. 32 VA	Max. 21 W	Max. 22 W
PXM50-1 PXM50.E	Max. 42 VA	Max. 26 W	Max. 25 W

<sup>1</sup> Power over Ethernet. See Section Power over Ethernet.

Type	AC 24 V ± 20 %	DC 24 V ± 20%
PXG3.W100-1 PXG3.W200-1	Max. 9 VA	Max. 4 W

## 8.4.2 Transformer sizing AC 24 V

The transformation power is the sum of the power consumption of the connected devices.

### Operating voltage

The operating voltage is AC 24 V. It must meet the requirements for SELV or PELV per IEC 60364-4-41.

NEC: Class 2 transformers or class 2 circuits.

Permissible deviation to nominal voltage AC 24 V on the Transformer: +20%/-10%.

This guarantees a tolerance of +/- 20% on the devices after considering line and contact resistance.

### Transformer specification AC 24 V

IEC: Use safety insulating transformers as per EN 61558 with double insulation designed for 100% duty to supply SELV or PELV circuits.

NEC: Class 2 transformers.

Transformer nominal power should be at least 25 VA. For smaller transformers, the ratio of open circuit voltage to full load is unfavorable (> + 20 %).

The nominal transformer power should not exceed 200% of maximum load for efficiency reasons (effectiveness).

### Wire lengths: Power supply AC 24 V

The basis for calculation is a permissible voltage drop off of 2.4 V (10%) on the power line from the transformer to the farthest power point.

The following table outlines the wire lengths and diameters based on load.

Cross-section/power	Cable length for AC 24 V				
	10 VA	20 VA	50 VA	100 VA	200 VA
2.50 mm <sup>2</sup> / AWG14	350 m	175 m	75 m	35 m	18 m
1.50 mm <sup>2</sup> / AWG16	210 m	105 m	42 m	20 m	10 m
1.00 mm <sup>2</sup> / AWG18	135 m	68 m	27 m	14 m	7 m

The supply wire (AC 24 V) and return wire (⊥) can each have the indicated lengths.

Each power point is either connected separately to the terminal bar on the transformer (star wiring) or looped.

Power is added together for multiple back-to-back looped devices which reduces the cable length accordingly.

Cables may be wired in parallel to increase the cross section.

In practice, the small level of permissible voltage drop off means that the transformer must always be installed in close proximity to the devices and that any cascading powering of devices is only possible over short distances or at small outputs.

### 8.4.3 Power requirements for DC 24 V

#### Operating voltage

The operating voltage is DC 24 V. It must meet the requirements for SELV or PELV per IEC 60364-4-41.

NEC: Class 2 circuits.

Permissible deviation to nominal voltage DC 24 V on the power supply: +15% / -10%.

This guarantees a tolerance of +15/-15% on the devices after considering line and contact resistance (web server: -20%).

#### Wire lengths: Power supply DC 24 V

The basis for calculation is the permissible voltage drop off of 2.4 V (10%, web server) or 1.2 V (5%, touch panels on the power line between the power supply and the farthest power point).

The following tables outline the wire lengths and diameters based on load.

Cross-section/power	Cable length DC 24 V – Web server				
	10 VA	20 VA	50 VA	100 VA	200 VA
2.50 mm <sup>2</sup> / AWG14	350 m	175 m	75 m	35 m	18 m
1.50 mm <sup>2</sup> / AWG16	210 m	105 m	42 m	20 m	10 m
1.00 mm <sup>2</sup> / AWG18	135 m	68 m	27 m	14 m	7 m

Cross-section/power	Cable length DC 24 V – Touch panels				
		20 VA	50 VA	100 VA	200 VA
2.50 mm <sup>2</sup> / AWG14		75 m	35 m	18 m	9 m
1.50 mm <sup>2</sup> / AWG16		42 m	20 m	10 m	5 m
1.00 mm <sup>2</sup> / AWG18		27 m	14 m	7 m	3.5 m

The supply wire (AC 24 V) and return wire ( $\perp$ ) can each have the indicated lengths.

Each power point is either connected separately to the terminal bar on the power supply (star wiring) or looped.

Power is added together for multiple back-to-back looped devices which reduces the cable length accordingly.

Cables may be wired in parallel to increase the cross section.

In practice, the small level of permissible voltage drop off means that the power supply must always be installed in close proximity to the devices and that any cascading powering of devices is only possible over short distances or at small outputs.

## 8.5 Ethernet

For detailed information on Ethernet, see:

- *Ethernet, TCP/IP, MS/TP and BACnet fundamentals* (CM110666)
- *Practical guide on IP networks in building automation and control* (CM110668)
- *Practical guide on BACnet networks in building automation and control* (A6V11159798)
- *Design building automation and control - Technical principles* (CM110664)
- *IT security on installations with Design* (CM110663)

The following provides only specific notes on topology.

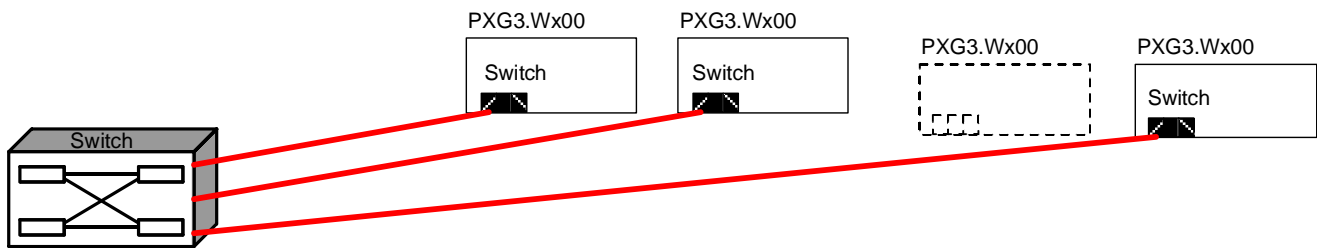
### Topologies

You can use the following bus topologies:

- Star topology
- Line topology (for web server)

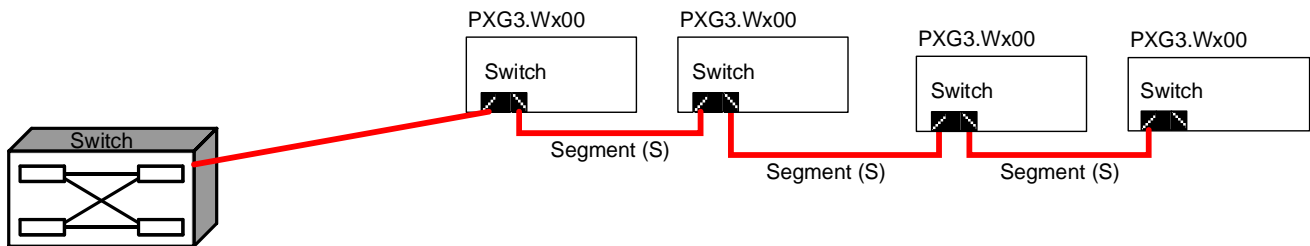
### Star topology

Touch panels can only be connected in a star topology.



### Line topology

The number of devices is limited to 20 for a line topology (daisy chain).



### Availability/reliability

The Ethernet switch does not work on a device without 24 V power. The following devices, connected in a line topology, are no longer on the network. As a result, each web server should be separately powered with 24 V for secure system operation.

## 8.5.1 Cable

Desigo Control Point devices are connected over switches and Ethernet cable with RJ45 plugs.

The following conditions must be met:

Bus cable and length:

- Standard Ethernet cable: Min. category 5
- Shielded or unshielded
- STP (Shielded Twisted Pair) or UTP (Unshielded Twisted Pair)
- Length between switch and room automation station: max. 100 m
- Length between room automation stations: Max. 100 m
- Number of devices on a line topology: Max. 20
- For PoE Class 4, the maximum cable resistance is 12  $\Omega$ .

Switch: Standard product from IT at 100 Mbps

## 8.5.2 Power over Ethernet (PoE) PoE

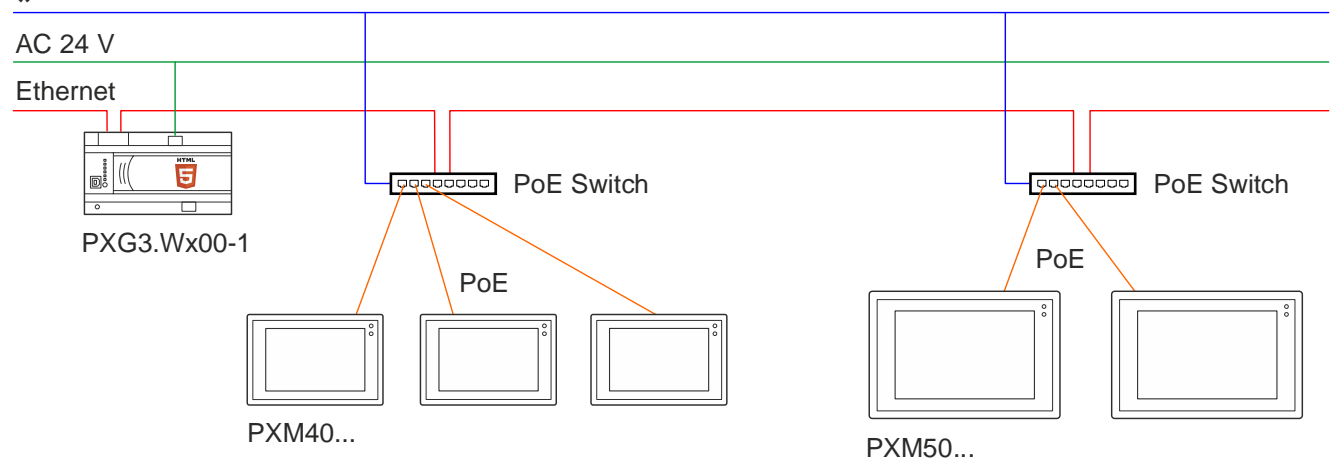
Principle: "Usable signal and power supply on the same cable".

### Advantages

Power over Ethernet (PoE) is a simpler solution to supply power to low consumption room operator units. It saves on power cables and associated installation costs. PoE can be used to connect Ethernet devices in difficult to access locations or area where multiple cables are disruptive.

For further information on Power over Ethernet (PoE), see *Ethernet, TCP/IP, MS/TP and BACnet fundamentals* (CM110666).

\*



\* Power voltage and current is based on the PoE switch used as well as the number of connected touch panels.

### Function

On PoE, Powered Devices (PDs, here: End units) are supplied by Power Sourcing Equipment (PSEs). The voltage is supplied over the RJ45 plug and twisted pair cable (TP), and by device over:

- Wires that also transmit data
- Unused wires on the RJ45 connection

## PoE topologies

PoE requires a star topology. Typical PoE switches have 4 to 16 outputs.

As a result, multiple switches are used in a line topology on larger systems (e.g. suites in a hotel).

Additional topologies:

- Certain switches (general industrial types) possess an uplink, i.e. multiple switches can be switched in series.
- An individual consumer can be powered using a PoE injector. This is an intermediate power source (mid span), in contrast to direct power by the PoE switch (end span).

## PoE switches / injectors

- Use only switched design for industrial use
- Transmission speed: 100 Mbps
- Compliant with IEEE 802.3at
- Power class 4 (12,95-25,50 W)
- Type 2
- The switches must support supply alternative A

## Selection criteria

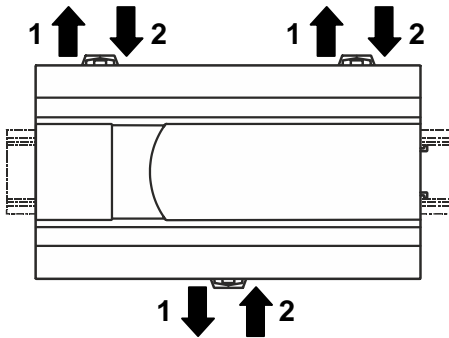
- Required number of outputs
- Required power
- Operating switch voltage
- (PoE itself operated at DC 48 V; various switches can, however, be powered for example at DC 18...24 V or AC 230 V)
- Installation location (due to protection class)

## 9 Mounting

### 9.1 Web server

#### Mounting on standard rails

The devices are snapped on directly to standard rails.



### 9.2 Touch panels PXM...

#### Panel mounting

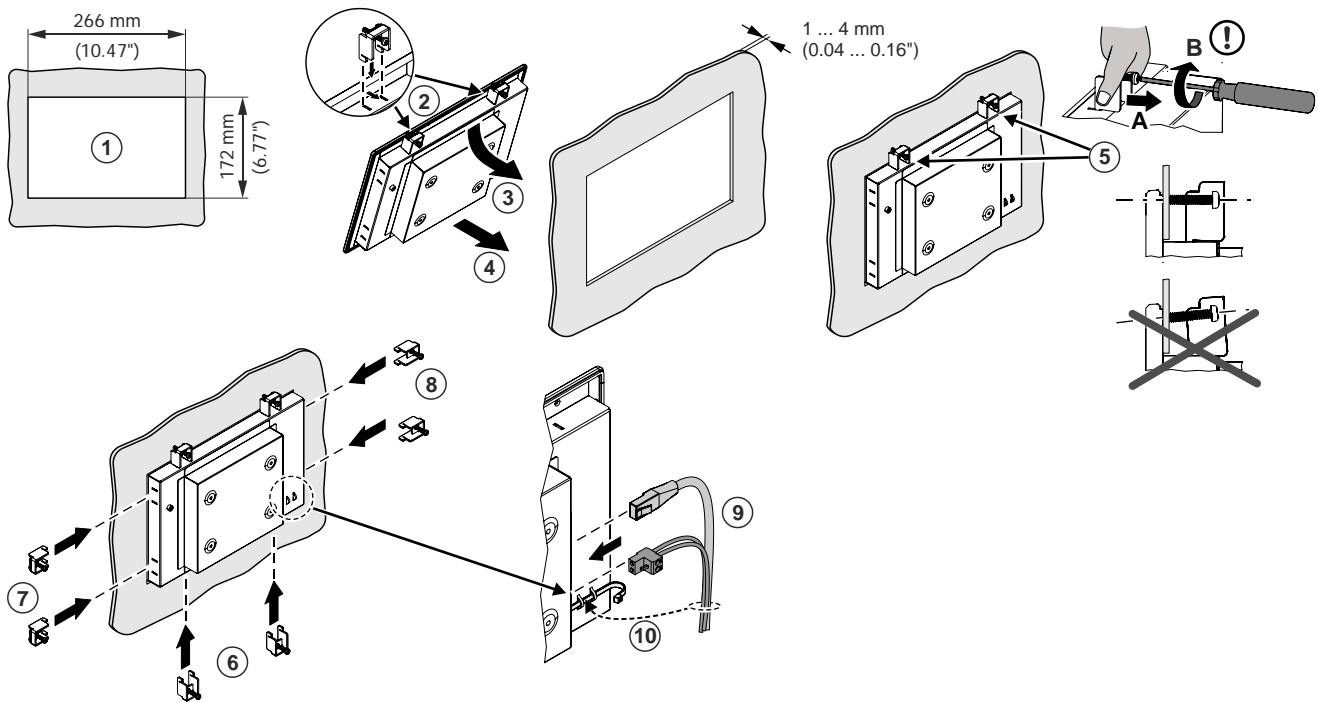
A cut out with the following dimensions is required to mount the touch panel on the panel door.

Wall thickness: 1 mm to 4 mm

The dimensions vary somewhat from the dimensions for PXM20-E and the touch panels and PX Touch and Web. The tolerance is, however, sufficiently large to ensure compatibility for new devices.

Cut out for PXM30...	Cut out for PXM40...	Cut out for PXM50...

## Example PXM40:



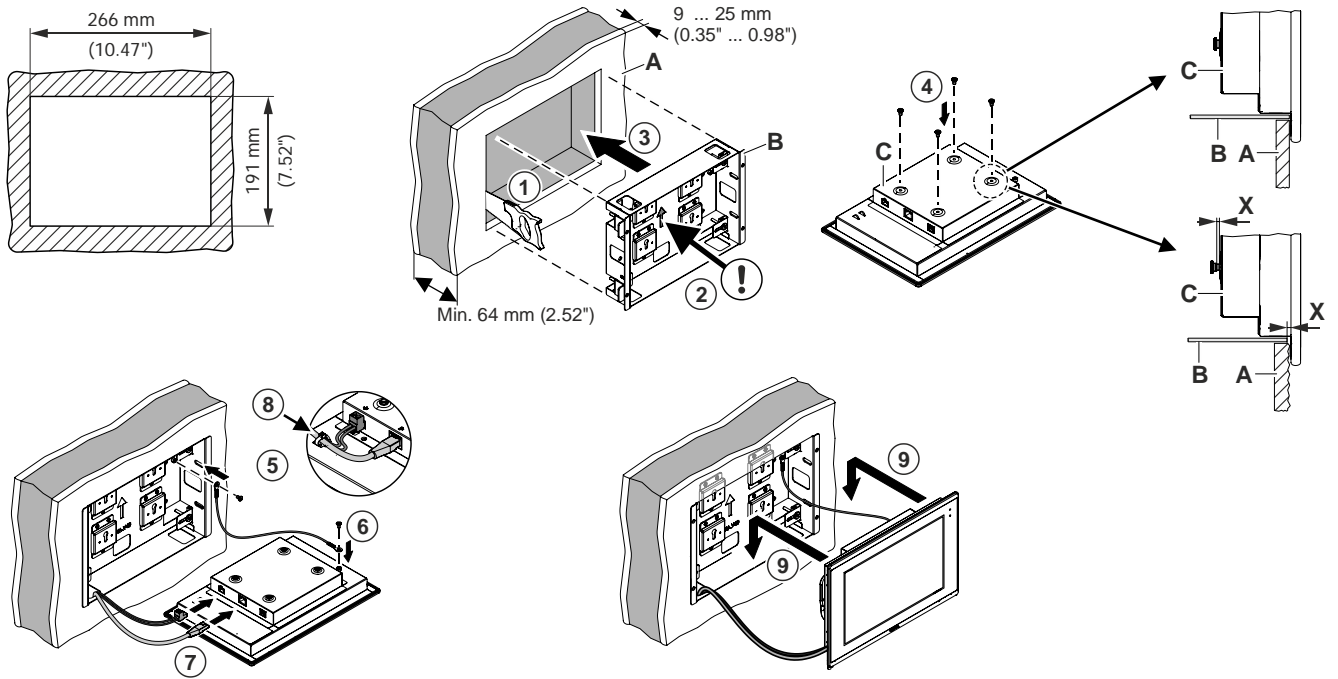
## Recessed mounting

Installation frames PXA.V40 and PXA.V50 are used to install a touch panel in a recessed wall.

Cut out for PXM40...	Cut out for PXM50...
<p>266 (10.47")</p> <p>191 (7.52")</p> <p>AGV109333114_M01_01</p>	<p>395 (15.55")</p> <p>261 (10.28")</p> <p>AGV109333114_M03_01</p>



Example PXM40:



④ You can loosen the fixing crews a bit if the plaster is uneven. This increases the panel's distance to the wall.

A Wall plate

B Mounting frame

C Touch panel with fixing screw

X Panel distance to the wall

## 10 Wiring

### Cabling and duct cross section

Wire the devices in the standard manner in the cable ducts.

Recommendation: Design the duct cross-section with at least 30% in reserve.

### Wiring and connection terminals

Use wiring types and diameters as per the specifications below:

Item	Specification
Cabling	Use standard stranded cable and wiring. The ends can be connected directly or strengthened with conductor sleeves or pin connectors.  Important: If low-voltage wiring runs alongside mains voltage, it must have the same level of insulation as wiring for mains voltage.
Device connection terminals	The device connection terminals are designed for wiring for: Min. 0.5 mm Ø Max. 2 x 1.5 mm <sup>2</sup> or 1 x 2.5 mm <sup>2</sup> Connection terminals are so-called lifting clams. The contact plate between the wire and the screw end is easy on the wiring. Important: Only the original plug-in connection terminals may be used as the connection facility

### Tightening torque

Set the torque to 0.5-0.6 Nm or 50-60 SCM (0.37...0.44 lb ft) when using electrical screwdriver on the connection terminals.

## 10.1 Wiring AC 230 V

The AC 230 V wiring is not described in detail here.

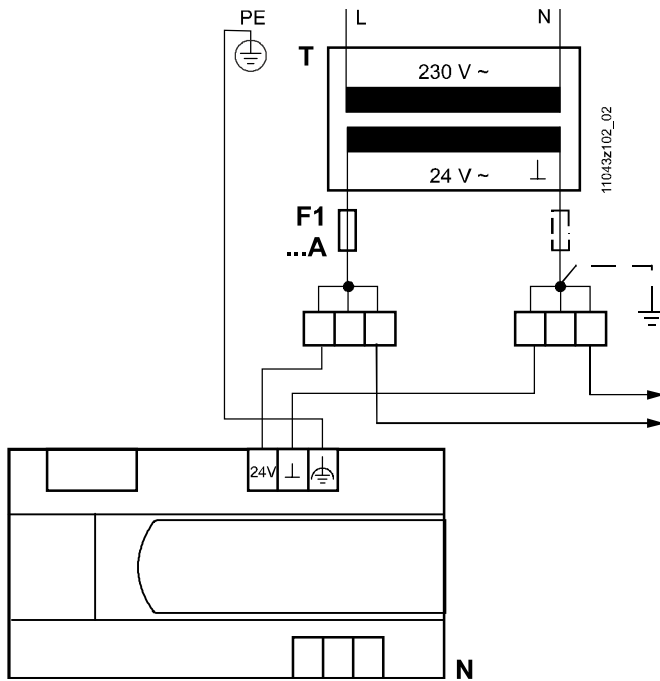
Comply with all national and regional laws and regulations.

## 10.2 Power lines AC 230 V

### Basic implementation for web server

The diagram below illustrates basic wiring for power lines for web server using AC 24 V operating voltage per PELV:

They are wired in a star as view from the connection terminals (24 V ~ , ⊥).



- N Web server
- T Safety transformer AC 230 V / AC 24 V as per EN 61 558.
- F1 Low-voltage fuse, for max. power with AC 24 V.
- 24 V System potential AC/DC 24 V
- ⊥ System zero
- ⚡ The connections of the functional earth must be connected on the installation side with the building grounding system (PE).

24 V distributor to PXG... keep wiring as short as possible. 24 V distributor is the start point.

## Lines

### Line materials

Use the following material for 24 V wiring and ⊥ for the supply voltage AC 24 V:

- Stranded wire with a cross-section of 1 mm<sup>2</sup>, 1.5 mm<sup>2</sup>, or 2.5 mm<sup>2</sup>
- Individual or a 2-wire cable.

For information on wire lengths and cross sections, see Section Power requirements [→ 25].

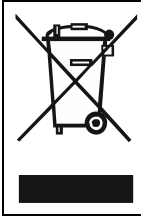
### Transformer phase position

The transformer phase position to one another is not relevant, in other words, the transformers can be powered using the different phases ( L1, L2, L3 ).

## 10.3 Power lines DC 24 V

The same rules apply as for AC 24 V.

## 11 Disposal



The device is considered an electronic device for disposal in accordance with the European Guidelines and may not be disposed of as domestic garbage.

- Dispose of the device through channels provided for this purpose.
- Comply with all local and currently applicable laws and regulations.

# 12 Appendix

Id	Name	BA Model	Proxy Model	Tech Op	Present_Value	Graphical operation				Tags							Subscription Type					
						learned	List View	Trend	Reports	sensor	cmd	sp	kind	baCalendar	baSchedule	writable	baWrite	unit	S1	Desigo	Apogee	Third-party
0	analog-input	x	x	x	REAL	p	p	x	x	X			Number					X	COV	COV	COV	Polling
1	analog-output	x	x	x	REAL	p	p	x	x		X		Number				X	COV	COV	COV	Polling	
2	analog-value	x	x	x	REAL	p	p	x	x		X		Number					COV	COV	COV	Polling	
3	binary-input	x	x	x	BACnetBinaryPV	p	p	x	x	X			Bool					COV	COV	COV	Polling	
4	binary-output	x	x	x	BACnetBinaryPV	p	p	x	x		X		Bool					COV	COV	COV	Polling	
5	binary-value	x	x	x	BACnetBinaryPV	p	p	x	x	[x]			Bool					COV	COV	COV	Polling	
6	calendar	x	x	x	BOOLEAN	p	p	x	y			X	Bool	X				Polling	Polling	Polling	Polling	
7	command	x	x	x	Unsigned	p	p	x	y			X	Str			X	<baId>	Polling	Polling	Polling	Polling	
8	device	x	x	x														Polling	Polling	Polling	Polling	
9	event-enrollment	x	x	x														Polling	Polling	Polling	Polling	
10	file	x	x	x														Polling	Polling	Polling	Polling	
11	group	x		x	BACnetList of ReadAccessResult					[x]			[""]					Polling	Polling	Polling	Polling	
12	loop		x	x	REAL	p	p	x	y	X			Number				X	Polling	Polling	Polling	Polling	
13	multi-state-input	x	x	x	Unsigned	p	p	x	x	X			Str					COV	COV	COV	Polling	
14	multi-state-output	x	x	x	Unsigned	p	p	x	x		X		Str					COV	COV	COV	Polling	
15	notification-class	x	x	x														Polling	Polling	Polling	Polling	
16	program	x	x	x														Polling	Polling	Polling	Polling	
17	schedule	x	x	x	Any	p	n <sup>1)</sup>		ny			X	""			X		Polling	Polling	Polling	Polling	
18	averaging	x	x	x						X			Number					Polling	Polling	Polling	Polling	
19	multi-state-value	x	x	x	Unsigned	p	p	x	x		X		Str					Polling	Polling	Polling	Polling	
20	trend-log	x	x	x		t												Polling	Polling	Polling	Polling	
21	life-safety-point				BACnetLifeSafetyState													Polling	Polling	Polling	Polling	
22	life-safety-zone				BACnetLifeSafetyState													Polling	Polling	Polling	Polling	
23	accumulator		x	x	Unsigned	p	p	x	y	X			Number				X	Polling	Polling	Polling	Polling	
24	pulse-converter		x	x	REAL	p	p	x	y	[x]			[""]					Polling	Polling	Polling	Polling	
25	event-log	x	x	x		t												Polling	Polling	Polling	Polling	
26	global-group				BACnetARRAY[N] of BACnetPropertyAccessResult													Polling	Polling	Polling	Polling	
27	trend-log-multiple	x	x	x														Polling	Polling	Polling	Polling	
28	load-control		x	x	BACnetShedState (Enum)	x	x						[""]					Polling	Polling	Polling	Polling	
29	structured-view	x	x	x		h <sup>2)</sup>	h						[""]					Polling	Polling	Polling	Polling	
30	access-door																	Polling	Polling	Polling	Polling	
31	<unassigned>																	Polling	Polling	Polling	Polling	
32	access-credential																	Polling	Polling	Polling	Polling	
33	access-point																	Polling	Polling	Polling	Polling	
34	access-rights																	Polling	Polling	Polling	Polling	
35	access-user																	Polling	Polling	Polling	Polling	
36	access-zone																	Polling	Polling	Polling	Polling	
37	credential-data-input				BACnetAuthenticationFactor													Polling	Polling	Polling	Polling	
38	network-security																	Polling	Polling	Polling	Polling	
39	bitstring-value				BITSTRING													Polling	Polling	Polling	Polling	
40	characterstring-value				CharacterString													Polling	Polling	Polling	Polling	
41	date-pattern-value				Date													Polling	Polling	Polling	Polling	
42	date-value				Date													Polling	Polling	Polling	Polling	
43	datetime-pattern-value				BACnetDateTime													Polling	Polling	Polling	Polling	
44	datetime-value				BACnetDateTime													Polling	Polling	Polling	Polling	
45	integer-value				INTEGER													Polling	Polling	Polling	Polling	
46	large-analog-value				Double													Polling	Polling	Polling	Polling	
47	octetstring-value	x		x	OCTET STRING <sup>3)</sup>	o	o											Polling	Polling	Polling	Polling	
48	positive-integer-value	x	x	x	Unsigned	p	p	x	y	[x]			Number				X	Polling	Polling	Polling	Polling	
49	time-pattern-value				Time													Polling	Polling	Polling	Polling	
50	time-value				Time													Polling	Polling	Polling	Polling	
51	notification-forwarder																	Polling	Polling	Polling	Polling	
52	alert-enrollment	x	x	x														Polling	Polling	Polling	Polling	
53	channel				BACnetChannelValue													Polling	Polling	Polling	Polling	
54	lighting-output				Real													Polling	Polling	Polling	Polling	
72	web-port																	Polling	Polling	Polling	Polling	
200	hierarchy		x	x		h	h						[""]					n/a	Polling	n/a	n/a	
201	bluck		x	x		h	h						[""]					n/a	Polling	n/a	n/a	
207	access-control-profile	x	x	x														n/a	n/a	n/a	n/a	
208	discipline-io	x	x	x														n/a	n/a	n/a	n/a	
211	group-object	x	x	x														n/a	n/a	n/a	n/a	
214	cmn-alarm	x	x	x	Unsigned (enum)	o												n/a	n/a	n/a	n/a	
216	command		x	x														n/a	n/a	n/a	n/a	
217	device-info		x	x														n/a	n/a	n/a	n/a	
256	group-member	x	x	x														n/a	n/a	n/a	n/a	
257	group-master	x	x	x														n/a	n/a	n/a	n/a	
258	blind-output	x		x	{REAL, REAL}	h/p	h/p	x	x	[x]			Number					COV	n/a	n/a	n/a	
259	blind-input	x		x	{Unsigned, REAL, REAL, Unsigned}	h/p	h/p		x	[x]			Number					COV	n/a	n/a	n/a	
260	analog-lighting-output	x		x	REAL	p	p	x	x		X		Number				X	COV	n/a	n/a	n/a	
261	binary-lighting-output	x		x	REAL	p	p	x	x		X		Number					COV	n/a	n/a	n/a	
262	lighting-input	x		x	{Unsigned, REAL, REAL}	h/p	h/p		x	[x]			Number					COV	n/a	n/a	n/a	
263	application-configuration	x		x														n/a	n/a	n/a	n/a	
264	network-port	x		x														n/a	n/a	n/a	n/a	

1) curVal displays as blank  
 2) Learning only supports SVOs with NodeTypes of DEVICE (3), AREA (5), COLLECTION (8), and FUNCTIONAL (10).  
 3) OCTET STRING = Property Datatype

o = omitted  
 t = associated trended object(s)  
 w/ supports tagged/learned  
 x = available for online trend  
 y = supported in report object type filter "all" is selected  
 [x] = implicitly tagged

Str-"" = explicitly tagged empty  
 "" = implicitly tagged empty

<baId> = tag applied; value is object id of

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