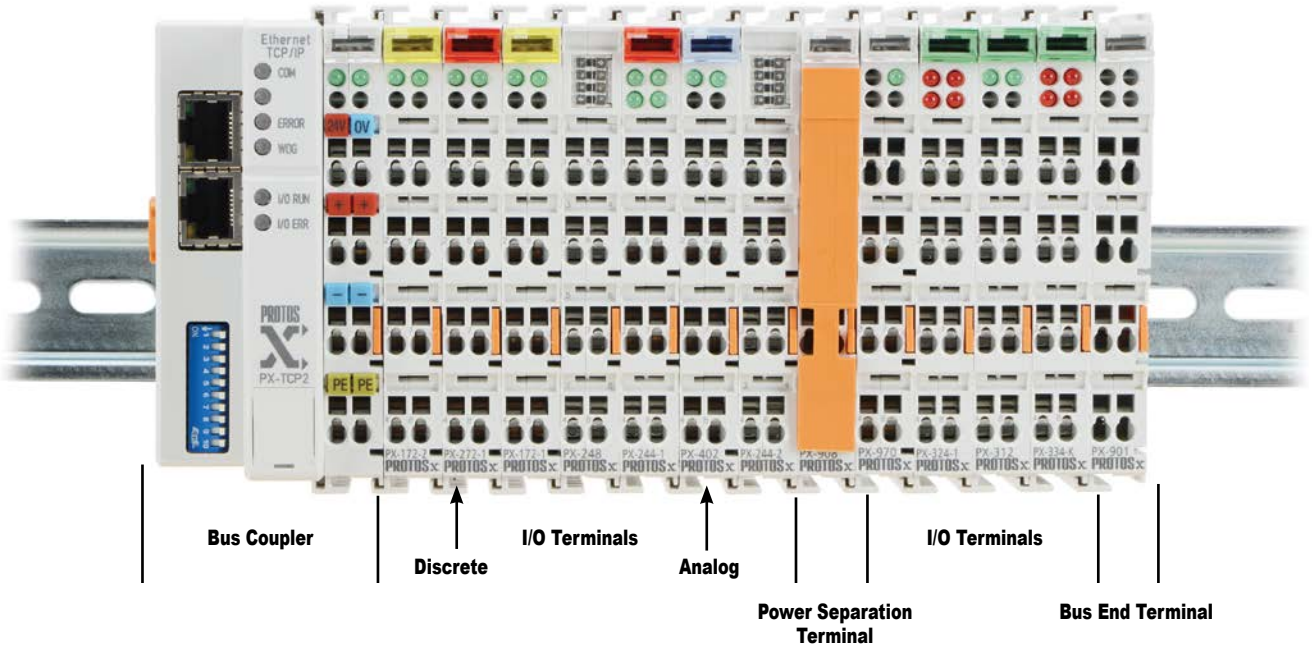
Protos X I/O

The Protos XTM I/O system (seen below) is a modular, field I/O system consisting of a Bus Coupler and its associated input/output terminals. The Protos X field I/O series offers

- 2, 4, 8, and 16-point discrete I/O terminals,
- 2, 4 and 8-channel analog I/O terminals,
- Three Bus Couplers that utilize the Modbus protocol with Modbus RTU/ASCII and Modbus TCP option,
- One Bus Coupler that utilizes EtherNet/IP and network addressing,
- Bus expansion terminals for expansion up to 255 I/O terminals per specific Bus Couplers,
- A variety of power supply options.



Bus Couplers

Bus Couplers are available in four configurations. The PX-MOD provides Modbus RTU/ASCII over RS-485. The PX-EIP1 provides EtherNet/IP; PX-TCP1 and PX-TCP2 offer Modbus TCP over Ethernet. The PX-TCP2 provides an additional port which can act as a switch to other couplers of the same type.

Protos X Bus Couplers

Part Number	Description	Price
PX-MOD	Modbus RTU/ASCII Bus Coupler	$;00?f9:
PX-TCP1	Modbus TCP Bus Coupler (1 port)	$;00?fa:
PX-TCP2	Modbus TCP Bus Coupler (2 ports)	$;00?fb:
PX-EIP1	EtherNet/IP Bus Co(1 port)	$01nne:

Protos X I/O

Bus End Terminal/ Bus Expansion Coupler Terminals

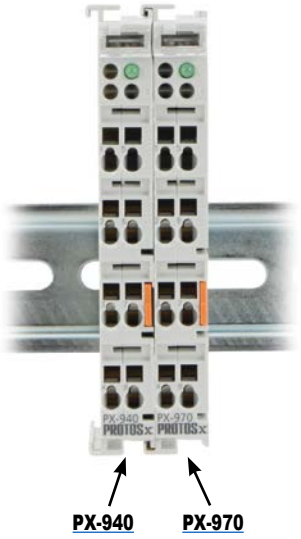
A Bus End Terminal, located at the end of a terminal assembly, is required for proper I/O bus communication. Bus expansion is available for the PX-MOD and PX-TCP1 Bus Couplers. Bus expansion requires that a Bus Expansion End Terminal be used in place of the Bus End Terminal and a Bus Expansion Coupler Terminal be used in place of the PX-MOD or PX-TCP1 at each expansion assembly.

Bus Expansion Terminals

Part Number	Description	Price
PX-901	Bus End Terminal	$;0?f1:
PX-902	Bus Expansion End Terminal	$;0?f2:
PX-903	Bus Expansion Coupler Terminal	$;00?f3:

Power Feed Terminals

Two Power Feed Terminals, 24VDC or 120–230 VAC, are available to add or change supply power to the Terminal Power Bus.



Power Feed Terminals

Part Number	Description	Price
PX-940	24VDC Power Feed Terminal	$;0?f5:
PX-970	120–230 VAC Power Feed Terminal	$;0?f7:

Power Distribution Terminal

A Power Distribution Terminal provides access to the integrated 24VDC Terminal Power Bus. The terminal provides 8 connection points each of 24V and 0V.

PX-949

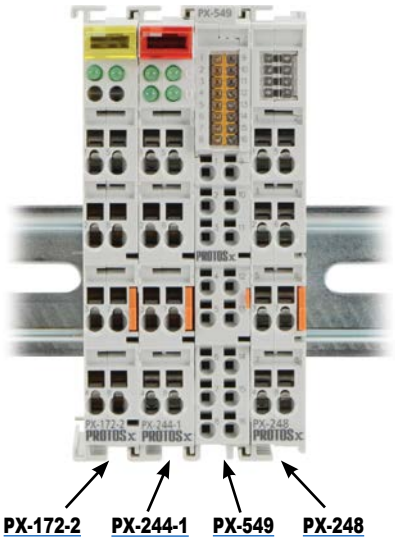
Power Distribution Terminal

Part Number	Description	Price
PX-949	24VDC Power Distribution Terminal	$;0?f6:

Protos X I/O

Discrete I/O Terminals

There are twelve discrete input and output terminals available offering 2 points, 4 points, 8 points or 16 points per terminal and include AC, DC and relay form factors.

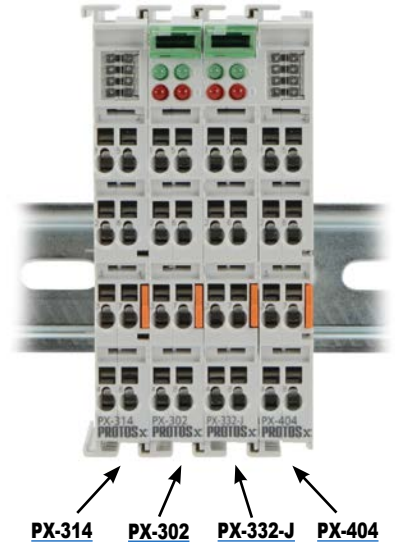


Discrete Input/Output Terminals

Part Number	Description	Price
PX-144	24VDC 4-point Input Terminal	$0?ea:
PX-148	24VDC 8-point Input Terminal	$0?eb:
PX-149	24VDC 16-point Input Terminal	$00?ec:
PX-172-1	120–230 VAC 2-point Input Terminal	$0?ed:
PX-172-2	120 VAC/VDC 2-point Input Terminal	$;0?ef:
PX-244-1	24VDC 4-point Output Terminal (0.5 A per point)	$0?eg:
PX-244-2	24VDC 4-point Output Terminal (2A per point)	$0?eh:
PX-248	24VDC 8-point Output Terminal	$-0?ei:
PX-249	24VDC 16-point Output Terminal	$-00?ej:
PX-272-1	230 VAC/VDC 2-point Output Terminal (0.3 A per point)	$0?ek:
PX-272-2	230VAC/30VDC 2-point Output Terminal (2A per point)	$-0?el:
PX-549	24VDC 8-point Input/ 24VDC 8-point Output Combination Terminal	$;00?f0:

Analog I/O Terminals

There are eighteen analog input and output terminals available offering 2 channels, 4 channels or 8 channels per terminal and include 4–20 mA, PT100 RTD, Type J and K thermocouple and 0–10 or ±10 VDC form factors.



Analog Input/Output Terminals

Part Number	Description	Price
PX-302	4–20 mA 2-channel Current Input Terminal	$00?en:
PX-304	4–20 mA 4-channel Current Input Terminal	$00?eo:
PX-308	4–20 mA 8-channel Current Input Terminal	$00?ep:
PX-312	±10VDC 2-channel Voltage Input Terminal	$00?eq:
PX-314	±10VDC 4-channel Voltage Input Terminal	$00?es:
PX-318	±10VDC 8-channel Voltage Input Terminal	$;00?et:
PX-322-1	2 Channel RTD Terminal	$00?eu:
PX-324-1	4 Channel RTD Terminal	$00?ev:
PX-332-J	2 Channel Thermocouple Terminal (J type)	$00?ex:
PX-332-K	2 Channel Thermocouple Terminal (K type)	$00?ey:
PX-334-J	4 Channel Thermocouple Terminal (J type)	$00?ez:
PX-334-K	4 Channel Thermocouple Terminal (K type)	$;00?e]:
PX-402	4-20 mA 2-channel Current Output Terminal	$;00?e[:
PX-404	4–20 mA 4-channel Current Output Terminal	$00?e_:
PX-408	4–20 mA 8-channel Current Output Terminal	$00?e#:
PX-412	0–10 VDC 2-channel Voltage Output Terminal	$;00?e!:
PX-414	0–10 VDC 4-channel Voltage Output Terminal	$00?e?:
PX-418	±10VDC 8-channel Voltage Output Terminal	$;00?e,:

Protos X I/O

Power Separation Terminal

A Power Separation Terminal is available to provide interruption of power along the Terminal Power Bus.

Power Separation Terminal		
Part Number	***Description***	***Price***
PX-908	Power Separation Terminal	$;0?f4:

Configuration Cable (USB v2.0)

A communications cable is available for configuration of the Bus Couplers. The cable has a USB type A connector for the PC and a 4-pin custom micro connector for the bus coupler.

Configuration Cable (USB)		
Part Number	***Description***	***Price***
PX-USB-232	Configuration Cable 3m (9.8 ft.)	$;0?fc:

Power Budget Planning

Managing Power Resources

When determining the types and quantity of terminals you will be using, it is important to remember there is a defined amount of I/O Bus Current supplied from the Bus Coupler. There are also defined limits for each external source.

The chart on the next page indicates the power supplied and used by each Protos X component. The chart below shows an example of how to calculate the power used by your particular system. These charts should make it easy for you to determine if the devices you have chosen will operate within the power budget of your system configuration.

If the I/O terminals you have chosen exceed the maximum power available from the Bus Coupler, you may be able to resolve the problem by using expansion terminals.

Power Budget Example

The example below shows how to calculate the power budget for a typical ProtosX system. This example is constructed using a PX-MOD Bus Coupler and six I/O Terminals. It is recommended you construct a similar table for your system. Follow the steps below to determine your power budget.

A	Column 1	Column 2	Column 3
	Terminal	***Terminal Type***	***I/O Bus (from Coupler)***
B	***CURRENT SUPPLIED***		
	PX-MOD	Bus Coupler	1000mA
C	***CURRENT REQUIRED***		
	PX-144 PX-172-1 PX-322-1 PX-312 PX-244-1 PX-412	4 pt DC Discrete Input 2 pt AC Discrete Input 2 ch RTD Input 2 ch DC Analog Input 4 pt DC Discrete Output 2 ch DC Analog Output	5mA 3mA 60mA 65mA 9mA 75mA
D	***Maximum Current Required***		217mA
E	***Remaining Current Available***		783mA

1. Using a chart similar to this one, fill in columns 1 and 2.
2. Using the tables on the next page enter the current supplied and current used by each device (column 3).
3. Add together the current used by the system (row C) for column 3 and put the total in the row labeled "Maximum Current Required" (row D).
4. Subtract the calculated "Maximum Current Required" (row D), from the "Current Supplied" and place the difference in the row labeled "Remaining Current Available" (row E).
5. If "Maximum Current Required" is greater than "Current Supplied" in column 3, the power budget will be exceeded. It will be unsafe to use this configuration, and you will need to restructure your I/O configuration.

Power Requirements

Power Supplied and Consumed

These tables show the amount of power supplied by each of the Bus Couplers and the amount of power consumed by each I/O device. The Power Consumed chart lists how much power is drawn from the I/O Bus, Terminal Power Bus (externally supplied) and from the Load (when using output terminals). Use this information when calculating the power budget for your system.

Power Supplied	
Device	***5V(mA) I/O Bus Supply***
Coupler	
PX-MOD	1000 Max
PX-TCP1	1000 Max
PX-TCP2	1750 Max
PX-EIP1	1000 Max
Bus Expansion Coupler	
PX-903	400 Max

Power Consumed			
Device	***5V(mA) from I/O Bus***	***(mA) from Terminal Power Bus***	***(mA) from Load***
Discrete Input Terminals			
PX-144	5	5	N/A
PX-148	5	2 (plus load)	
PX-149	20	N/A	
PX-172-1	3	6	
PX-172-2	3	6	
Discrete Output Terminals			
PX-244-1	9	N/A	30
PX-244-2	9		30
PX-248	18		60 (plus load)
PX-249	45		35 (plus load)
Analog Input Terminals			
PX-302	60	N/A	N/A
PX-304	85	Load	
PX-308	105	Load	
PX-312	65	N/A	
PX-314	100	N/A	
PX-318	140	N/A	
RTD/Thermocouple Input Terminals			
PX-322-1	60	N/A	N/A
PX-324-1	60		
PX-332-J	65		
PX-334-J	75		
PX-332-K	65		
PX-334-K	75		
Analog Output Terminals			
PX-402	60	N/A	50 (plus load)
PX-404	20		60 (plus load)
PX-408	25		50 (plus load)
PX-412	75		50 (plus load)
PX-414	75		50 (plus load)
PX-418	20		20
Relay Output Terminals			
PX-272-1	10	ON resistance max 100mV (plus load)	N/A
PX-272-2	80		
Combination In/Out Terminals			
PX-549	25 (additional 3mA for inputs)	15 (plus load)	N/A

System Installation and Removal

Bus Coupler and Bus Terminal Installation

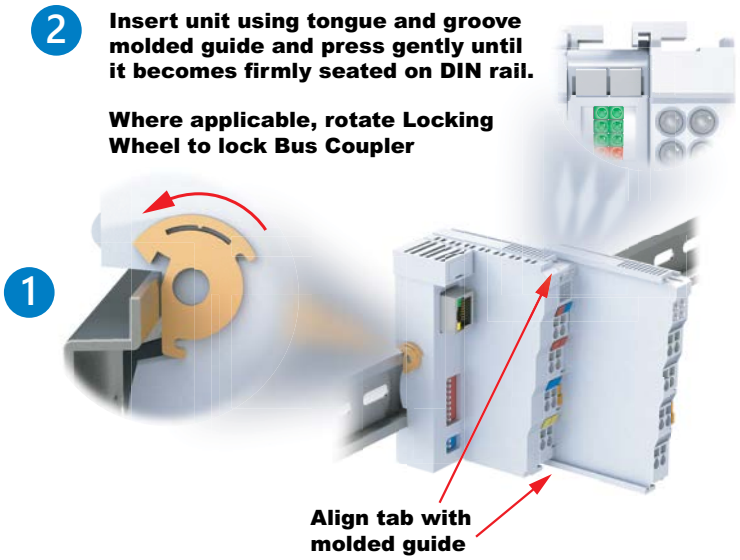
Bus Coupler Installation:

1. Attach a Bus Coupler by snapping it onto 35mm DIN rail and securing it into position using the DIN rail locking wheel (where applicable) located on the left side of the coupler.

Bus Terminal Installation:

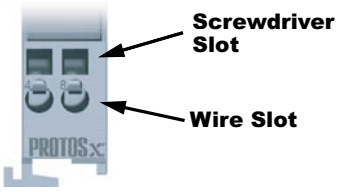
2. To add a bus terminal, insert unit onto right side of Bus Coupler using the tongue and groove at the top and bottom of the unit, pressing gently until it snaps onto the DIN rail.

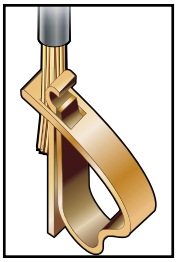
- A proper connection cannot be made by sliding the units together on the DIN rail. When correctly installed, no significant gap can be seen between the attached units. Bus connection is made through the six slide contacts located on the upper right side of the units. Add up to 64 bus terminals per Bus Coupler, including a bus end terminal.



Wiring Connections

- Wire connection is made through a spring clamp style terminal. This terminal is designed for a single-conductor solid or stranded wire. Wire connection is made by firmly pushing the screwdriver into the screwdriver slot, inserting the wire into the wire slot and removing the screwdriver, locking the wire into position.



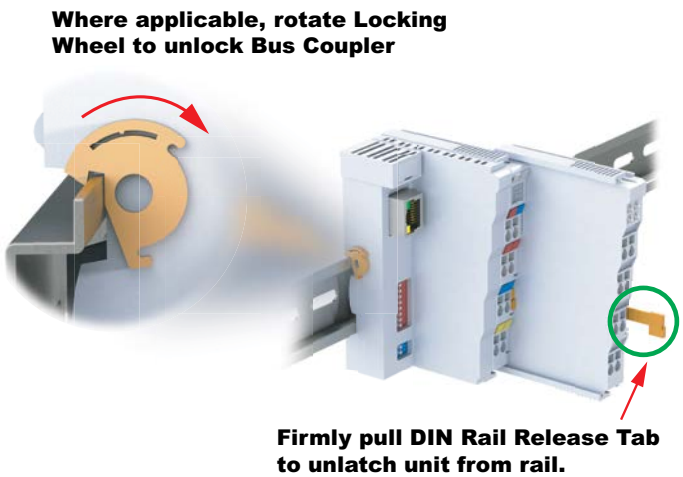


Wiring Specifications	
Connection Type	Spring Clamp Terminals
Wire Gauge	28–14 AWG (0.08–2.5 mm2)
Screwdriver Width	2.5 mm (0.10 in) such as P/N TW-SD-MSL-2
Wire Stripping Length	8mm

** For Thermocouple terminals, thermocouple extension wire is recommended*

Removing Bus Coupler and Bus Terminals

- A locking mechanism prevents individual units from being pulled off. For bus terminal removal, pull the orange DIN rail release tab firmly to unlatch the unit from the rail. If attached to other terminal units, slide unit forward until released. For Bus Couplers with locking wheels, release the DIN rail locking wheel, then pull firmly on DIN rail release tab.

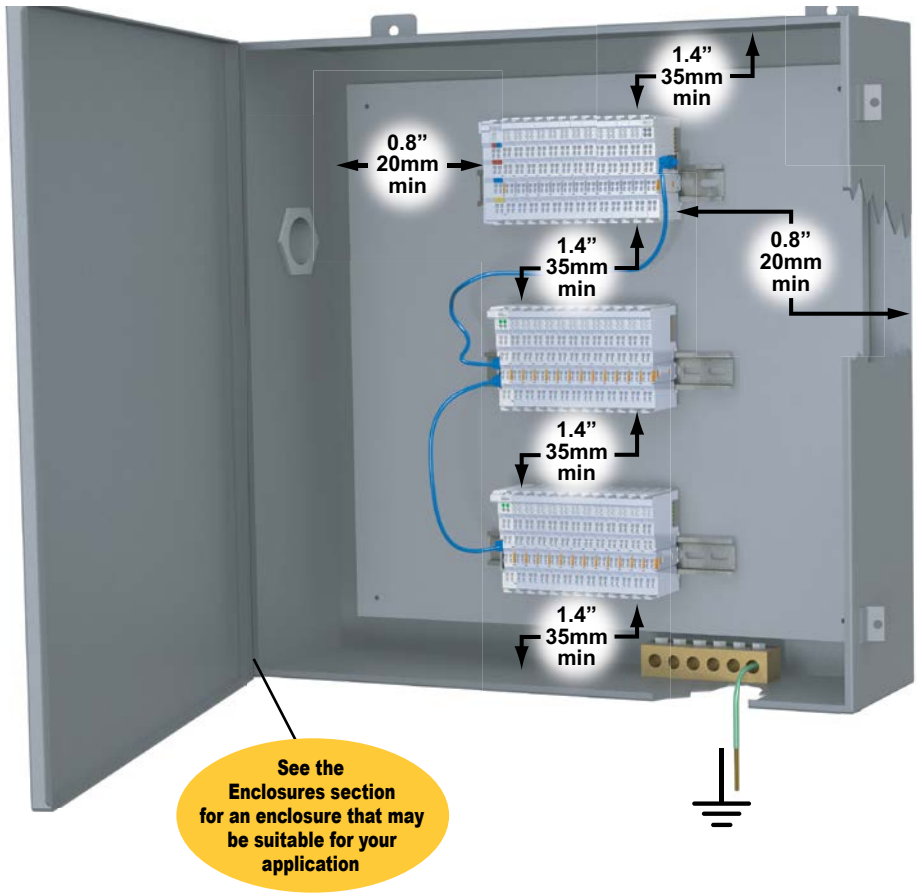


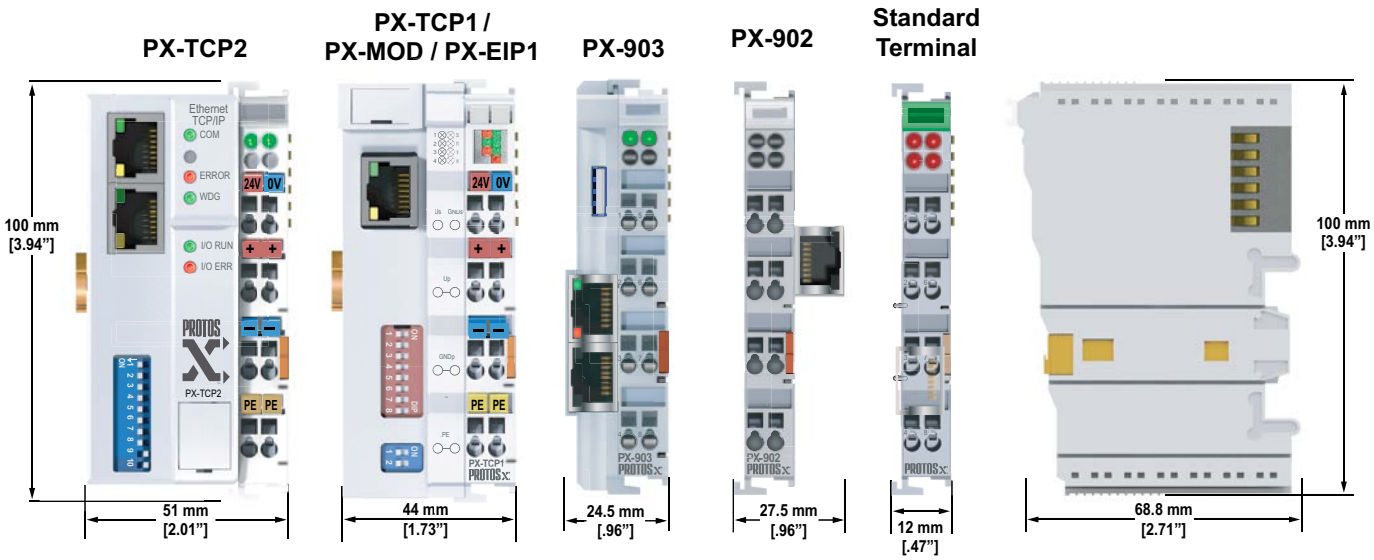
Installation Considerations

Terminal Dimensions and Spacing Requirements

Use the following diagrams to make sure the Protos X system can be installed in your application. Protos X terminals require 35mm DIN rail for mounting; there are no orientation restrictions.

To ensure proper airflow for cooling purposes, units should be spaced, at a minimum, as shown. It is also important to check the Protos X dimensions against the conditions required for your application.

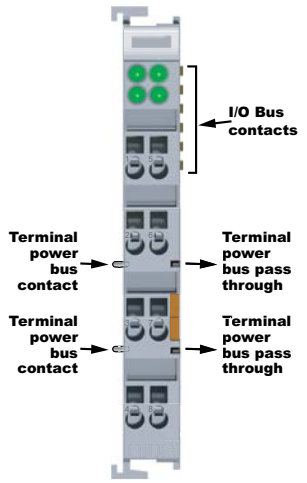




Installation Considerations

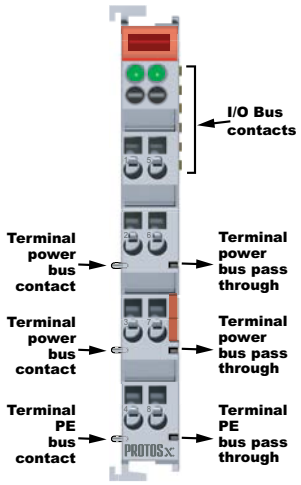
Terminal Types

TYPE 1



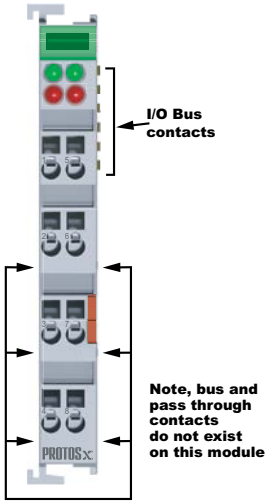
Type 1: This terminal passes the terminal power bus from the preceding terminal to the next terminal and therefore it must be mounted to a preceding terminal that passes bus power.

TYPE 2



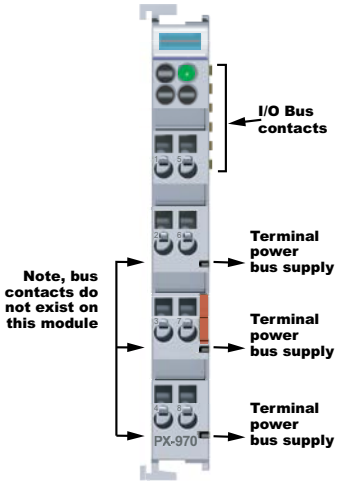
Type 2: This terminal passes the terminal power bus and PE from the preceding terminal to the next terminal and therefore it must be preceded by a terminal that passes both terminal power bus and PE.

TYPE 3



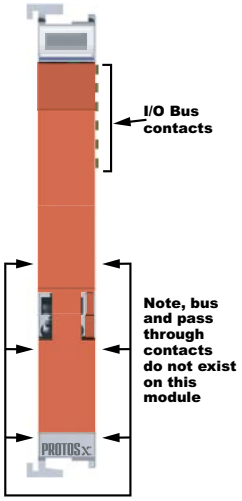
Type 3: This terminal does not pass the terminal power bus or PE and can be preceded by any terminal, however it will interrupt the terminal power bus and PE.

TYPE 4



Type 4: This terminal requires external voltage connection and supplies the terminal power bus to terminals located to its right. The terminals to its right must support the same power bus of 120/230 VAC or 24VDC. This terminal will not pass terminal power or PE from any preceding terminals.

TYPE 5



Type 5: This terminal is used to separate the terminal power bus and PE from other terminals and can mounted next to any terminal.