GE
Intelligent Platforms

Programmable Control Products

VersaMax* IP

Installation Manual, GFK-2307B

May 2013

Warnings, Cautions, and Notes as Used in this Publication

Warning

Warning notices are used in this publication to emphasize that hazardous voltages, currents, temperatures, or other conditions that could cause personal injury exist in this equipment or may be associated with its use.

In situations where inattention could cause either personal injury or damage to equipment, a Warning notice is used.

Caution

Caution notices are used where equipment might be damaged if care is not taken.

Note: Notes merely call attention to information that is especially significant to understanding and operating the equipment.

This document is based on information available at the time of its publication. While efforts have been made to be accurate, the information contained herein does not purport to cover all details or variations in hardware or software, nor to provide for every possible contingency in connection with installation, operation, or maintenance. Features may be described herein which are not present in all hardware and software systems. GE Intelligent Platforms assumes no obligation of notice to holders of this document with respect to changes subsequently made.

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	support.in.ip@ge.com (remaining Asia customers)
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	customercare.cn.ip@ge.com (China)

Chapter 1

Introduction

This manual describes the installation of VersaMax IP modules.

This chapter describes the types of VersaMax IP modules that are available, and shows their basic features.

Chapter 2: Module Installation, describes the basic installation steps for all types of VersaMax IP modules.

Chapter 3: Network Connections for Profibus Modules, includes specific installation information for VersaMax IP Profibus modules.

Chapter 4: Network Connections for PROFINET Modules, includes specific installation information for VersaMax IP PROFINET modules

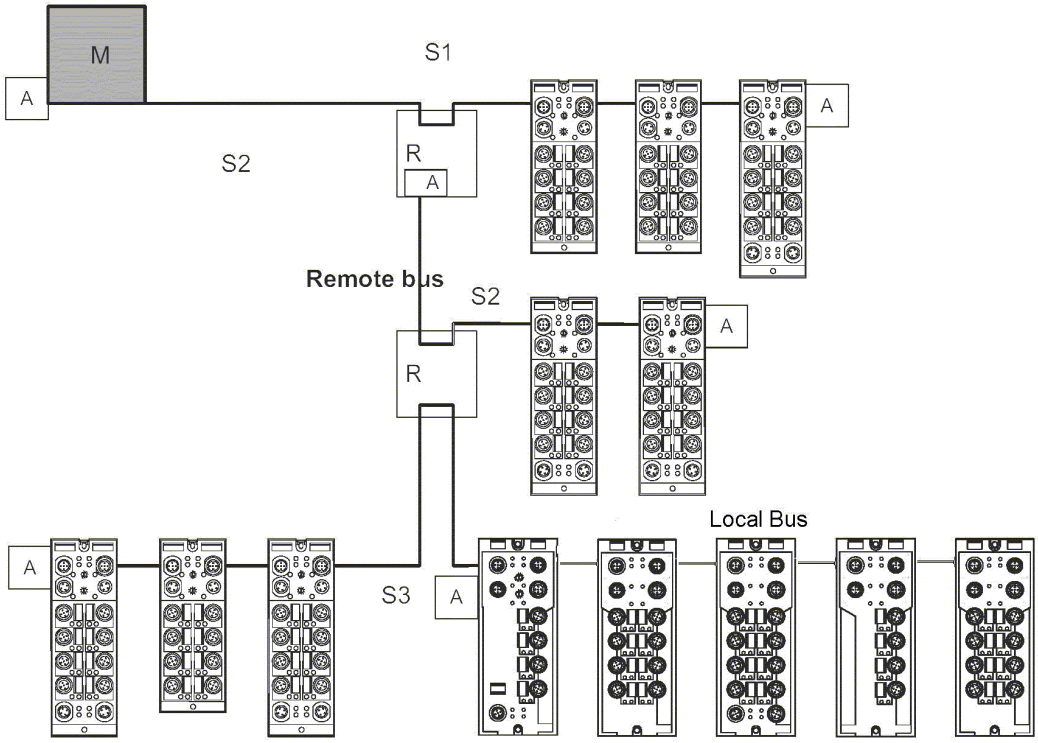
Chapter 5: Power Connections, explains how to complete the power connections for all VersaMax IP modules.

VersaMax IP

VersaMax IP modules are designed for distributed automation tasks in harsh environmental conditions. Modules meet the requirements for IP65/IP 67 protection. They enable the direct connection of sensors and actuators in an environment close to the station.

The VersaMax IP product group includes two types of devices:

- ***VersaMax IP Standalone*** modules connect directly to the Profibus system.
- ***VersaMax IP Modular*** devices consist of a Profibus / PROFINET Network Interface Unit (gateway), and I/O modules that can be connected to it on a local bus. These devices are designed for applications with high I/O node density and complex functions. An illustration of the Profibus network adapter is shown below:



In the illustration:

M	Master	A	Termination resistor
R	Repeater	R/T	Repeater with termination resistor
S1, S2, S3	Segments		

See Chapter 3 for information about using VersaMax IP modules in a Profibus network and Chapter 4 for VersaMax IP PROFINET network.

VersaMax IP Standalone Modules

VersaMax IP Standalone modules provide a direct interface between field devices and the Profibus network. VersaMax IP Standalone modules are identified by catalog numbers that start with IC676. Input, Output, and Mixed Digital I/O modules are available.

Input Modules

VersaMax IP Standalone discrete input modules detect digital control signals from the process and transfer the input signals to higher-level automation equipment. LEDs on the module indicate signal status. Input sensors are connected to the module using M12 connectors. The sensors are supplied from the module's sensor voltage supply.

Output Modules

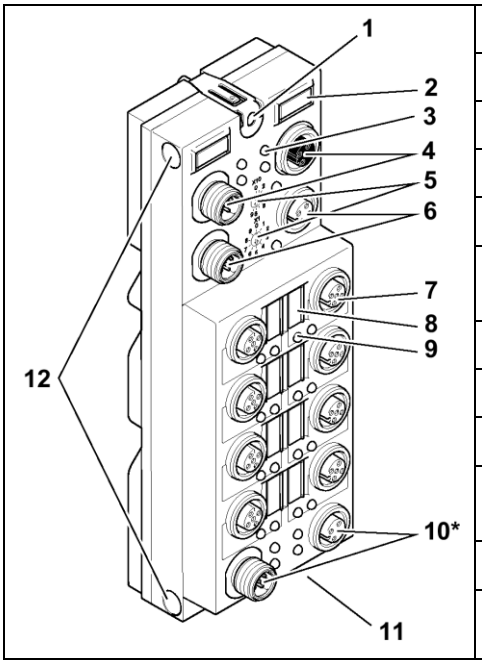
A VersaMax IP Standalone discrete output module transfers digital control signals from the automation equipment to actuators. Load currents for the module outputs are specifed in the module datasheet. LEDs on the module indicate signal status. Actuators are connected to the module M12 connectors. The outputs are protected against short circuits and overloads. The actuators are supplied from the module's actuator voltage supply.

Mixed I/O Module

A VersaMax IP Standalone mixed I/O module provides a combination of inputs and outputs. Devices are connected via M12 connectors. Mixed I/O modules have one connection for the incoming supply and another connector to forward the actuator supply.

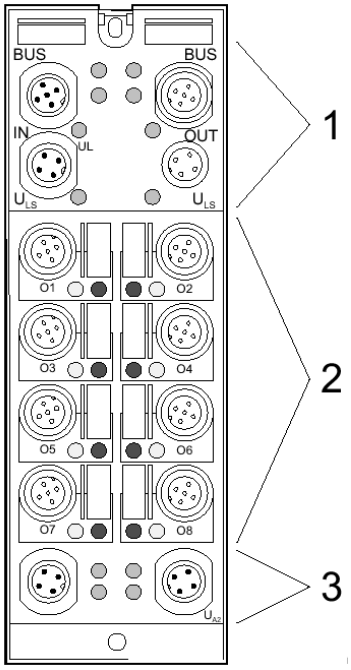
VersaMax IP Standalone Module Features

The diagram below points out some VersaMax IP Standalone (IC676) module features.



1	Upper mounting hole
2	Label slot
3	LEDs for bus and supply voltages
4	Bus connections (IN and OUT)
5	Rotary Switch
6	Connection for supply voltages for communications power and sensors (IN and OUT)
7	Connections for inputs and outputs
8	Label slot
9	LEDs for inputs and outputs
10	Connection for actuator supply voltage (*not on input modules)
11	Lower mounting hole
12	Side mounting holes

VersaMax IP Standalone Module LEDs



Diagnostic LEDs (green/red) indicate whether an error is present or not. In the event of an error, they indicate the error type and location. The VersaMax IP module is functioning correctly if all of the green LEDs are on.

Status LEDs (yellow) indicate the signal status of the corresponding input/output. If a yellow status indicator is on, it indicates the signal state "1" of the input/output signal.

The illustration to the left shows the three main LED areas.

1. Bus-specific indicators
2. Inputs and outputs (device-specific)
3. Actuator supply voltage (device-specific)

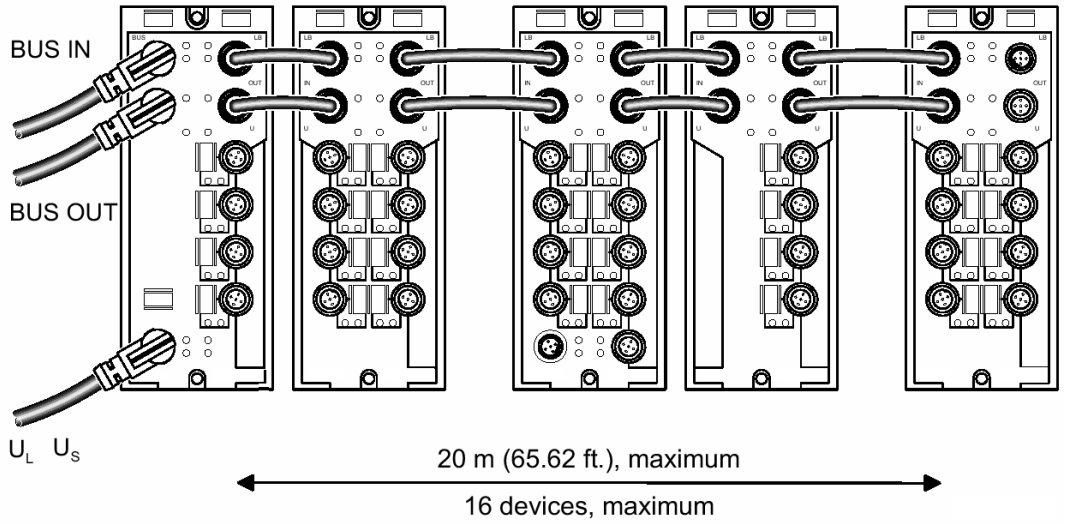
Specific details of LED operation for VersaMax IP modules are described in the module datasheets.

VersaMax IP Modular

A Profibus / PROFINET Interface Unit module provides the bus interface for up to 16 / 15 simultaneously individual VersaMax IP Modular devices located on a bus stub.VersaMax IP Modular products are identified by catalog numbers that start with IC677. Input, Output, and Mixed Digital I/O modules can be installed on the bus stub and connected to field devices.

The Profibus / PROFINET Interface Unit provides the power supply for the modules on the local bus. The maximum total length of the local bus is 20 m (65.62 ft.). The transmission speed can be switched from 500 kbaud to 2 Mbaud.

The Profibus / PROFINET Interface Unit itself can also be connected directly to up to eight digital sensors. It supplies the sensors with the required voltage and reads the available signals.



Input Modules

A VersaMax IP Modular discrete input module detects digital control signals from the process and transfer the input signals to the Network Interface Unit over the local bus. LEDs on the module indicate signal status. Input sensors are connected to the module using M12 connectors. The sensors are supplied from the module's sensor voltage supply.

Output Modules

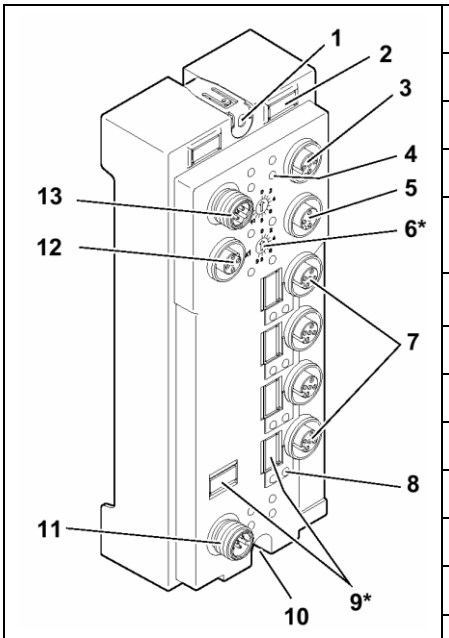
A VersaMax IP Modular discrete output module transfers digital control signals from the Network Interface Unit to actuators. Load currents for the module outputs are specifed in the module datasheet. LEDs on the module indicate signal status. Actuators are connected to the module's M12 connectors. The outputs are protected against short circuits and overloads. The actuators are supplied from the module's actuator voltage supply.

Mixed I/O Modules

A VersaMax IP Modular mixed I/O module provides a combination of inputs and outputs. Devices are connected via M12 connectors. Mixed I/O modules have one connection for the incoming supply and another connector to forward the actuator supply.

VersaMax IP Modular Network Interface Unit Features

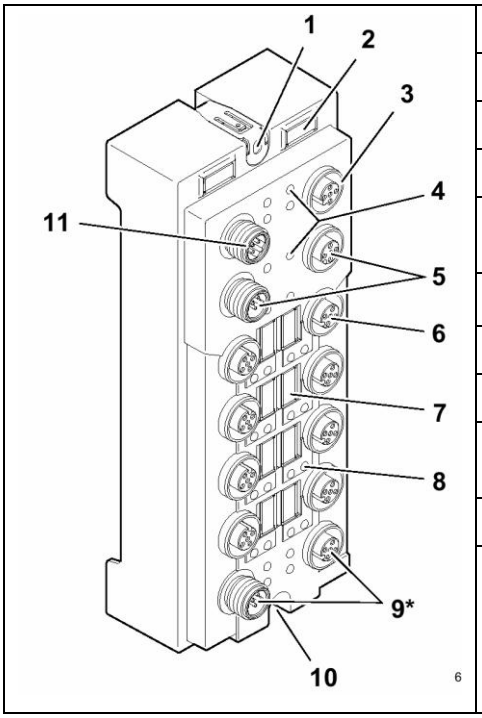
The diagram below points out some features of the VersaMax IP Modular (IC677) Network Interface Unit.



1	Upper mounting hole
2	Label slot
3	Local bus connection (OUT)
4	LEDs for bus and supply voltages
5	Connection for supply voltages for communications power and sensors
6	Rotary switch (applicable only for Profibus)
7	Connections for inputs
8	LEDs for inputs
9	Label slot
10	Lower mounting hole
11	Connection for supply voltage
12	Bus connection (OUT) / Port 2 for PROFINET
13	Bus connection (IN) / Port 1 for PROFINET

VersaMax IP Modular I/O Module Features

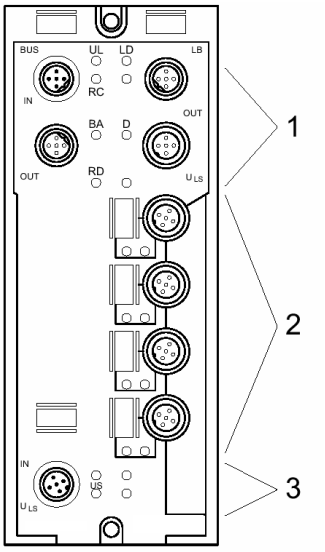
The diagram below points out some VersaMax IP Modular (IC677) I/O module features.



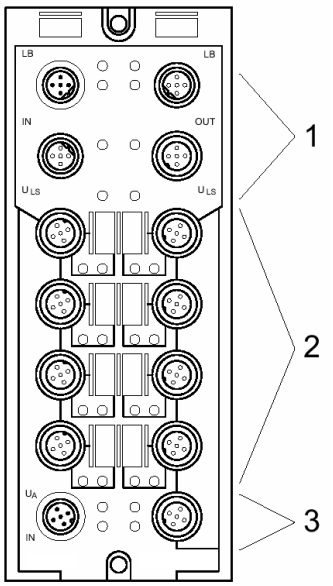
1	Upper mounting hole
2	Label slot
3	Connection for local bus (OUT)
4	LEDs for bus and supply voltages
5	Connection for supply voltages for communications power and sensors
6	Connections for inputs and outputs
7	Label slot
8	LEDs for inputs or outputs
9	Connection for actuator supply voltage (*not on input modules)
10	Lower mounting hole
11	Connection for local bus (IN)

VersaMax IP Modular Device LEDs

VersaMax IP Modular Network Interface Unit



VersaMax IP Modular Discrete Module



Diagnostic LEDs (green/red) indicate whether an error is present or not. In the event of an error, they indicate the error type and location. The VersaMax IP module is functioning correctly if all of the green LEDs are on.

Status LEDs (yellow) indicate the signal status of the corresponding input/output. If a yellow status indicator is on, it indicates the signal state "1" of the input/output signal.

The illustration at left shows the three main LED areas.

1. Bus-specific indicators
2. Inputs and outputs (device-specific)
3. Actuator supply voltage (device-specific)

Specific details of LED operation for VersaMax IP modules are described in the module datasheets.

Configuration of the Profibus Master

Each of the VersaMax IP Standalone (IC676) modules and the VersaMax IP Modular (IC677) Profibus Interface Unit function as slaves on the Profibus network.

Profibus-DP is normally a single master system. This master is typically a communications module installed in a Programmable Controller, industrial PC, or other controller (Drive, Computer Numerical Control, etc.). In each case these communication modules require configuration information for the attached Profibus Slaves. This configuration is typically accomplished using a configuration tool specifically designed for the Profibus Master. Given this variability, specific instructions for the configuration of the Profibus Master cannot be given here – please consult the information available with your Profibus Master.

The GSD Files

Every Profibus slave device that is certified by the Profibus Trade Organization must have a GSD file (electronic device data sheet). Depending on the master type, the GSD files for the slaves may be included in the configuration of the master's configuration.

The GSD file is a text file that defines the specific characteristics of the slave device. The GSD file also includes the text strings to properly decode the diagnostic information provided by the Profibus slave.

An electronic version of the GSD file is provided with each Profibus slave device.

Configuration of the PROFINET controller

Each of the VersaMax IP PROFINET Network Interface Unit function as a remote IO drop on the PROFINET network.

The VersaMax IP PROFINET scanner can be configured within the PROFINET controller with GSDML files. The latest GSDML files are available at support.ge-ip.com.

Chapter 2

Module Installation

This chapter describes the basic installation steps for all types of VersaMax IP modules:

- General Information
  - Protecting Bus Lines
  - Installing Bus Lines Between Buildings
- Mounting VersaMax IP Modules
  - VersaMax IP Standalone Panel Mounting or Side Mounting
  - VersaMax IP Modular, Direct and DIN Rail Mounting
- Setting the Rotary Switches
- Connecting Functional Earth Ground

For information about installing a VersaMax IP Profibus module on the communications network, please see chapter 3.

For more information about installing VersaMax IP PROFINET module on the network please see chapter 4. For information about power connections, see chapter 5.

For specific module installation details, please see the module datasheets.

Labeling

VersaMax IP modules are supplied with 10 labels. Labels can be filled in according to the application and snapped into place on the module. Labels can be removed from the module by prying up with a small screwdriver.

General Information

When preparing for cable installation, the local conditions and the corresponding mounting regulations are very important. Cables can be installed, for example, in cable ducts or on cable jumpers.

A minimum distance between the cabling and possible sources of interference (e.g., machines, welding equipment, power cables) is defined in the relevant regulations and standards. During system planning and installation, these regulations and standards must be taken into account and observed.

Protecting Bus Lines

Protect the bus lines from sources of electric/magnetic interference and mechanical strain.

Observe the following regulations for "Electromagnetic Compatibility" (EMC) to keep mechanical risks and interference to a minimum:

Mechanical Strain

- Select the correct cable type for each application.
- Observe the minimum bending radius.
- Cables must not enter the shear area of moving machine parts.
- Do not install bus lines at right angles to driving paths and machine movements.
- Use cable ducts or cable jumpers.
- Observe the specifications for the cable used.

Interference

- Signal and power supply lines should not be installed in parallel. If necessary, metal isolating segments should be placed between the power supply and signal lines.
- Only use connectors with metal housings and connect as much of the shielding as possible to the housing.
- During installation, all connector interlocks (screws, cap nuts) must be firmly tightened to ensure the best possible contact between shielding and ground. Before initial startup, the connection for the cable ground or shielding must be checked for low-resistance continuity.

Routing of Buses in Control Cabinets

- Install bus lines in separate cable ducts or separate cable bundles.
- Avoid the installation of bus lines parallel to power supply lines.
- Install bus lines with a minimum distance of 10 cm (3.94 in.) to power cables.

Routing of Buses in Buildings

- If possible, use metal cable hangers.
- Do not install bus lines together with or parallel to power supply lines.
- Separate bus lines on cable jumpers or in cable ducts from the power supply lines using isolating segments.
- Install bus lines as far away as possible from sources of interference, for example, motors and welding equipment.
- For long line connections, install an additional equipotential bonding line between the connection points.

Routing of Buses outside Buildings

- Install the bus lines in metal pipes that are grounded on both sides or in concrete cable ducts with continuous reinforcement.
- For long line connections, install an additional equipotential bonding line between the connection points.

Installing Bus Lines between Buildings

Surge Voltages

Surge voltages result from switching operations, electrostatic discharges, and lightning discharges. Surge voltages can be coupled inductively, capacitively or galvanically to the electrical lines for power supply, measured value transmission, and data transmission. In this way, surge voltages reach power supply units and the interfaces of systems and termination devices.

Grounding Cable Shielding

Ground the cable shielding directly after it has been installed in the building to avoid surge voltages. The cable shielding must have a diameter that meets all applicable standards.

Equipotential bonding line

Install an additional equipotential bonding line between the grounding points of buildings, that preferably is designed as

- a metal reinforced concrete channel
- an additional grounding cable
- a metal pipe

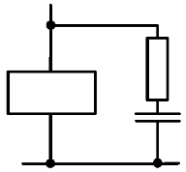
Surge Protection Devices

All cable wires should be connected with surge protection devices to protect the modules against surge voltages.

Observe all national and international regulations when installing surge protection devices.

Interference Suppression Measures

Connect relay coils or motor coils with an RC element to protect the devices against interference. Depending on the application, the delay time of the relay can be increased by approximately 1ms.



When sizing the RC element, the following values are recommended:

R=100 Ohms to 200 Ohms; C=220 nF to 470 nF.

Grounding

Grounding protects people and machines against hazardous voltages. To avoid these hazards, correct installation, taking the local conditions into account, is vital.

Ensure that the devices you are using are properly grounded before startup.

VersaMax IP devices operate in the low-level signal voltage range. In low-level signal devices, interference is discharged via functional earth ground (FE).

Functional Earth Ground Connection for VersaMax IP Devices

VersaMax IP devices are designed for screw-mounting on a flat mounting surface (direct mounting). The FE connection for the housing can be achieved using a mounting screw on a grounded mounting surface or an outside grounding connection (latch)

Electrostatic Discharge

The device contains components that can be damaged or destroyed by electrostatic discharge. When handling this device, observe the necessary safety precautions against electrostatic discharge (ESD) in accordance with EN 61340-5-1 and EN 61340-5-2, as well as IEC 61340-5-1 and IEC61340-5-2.

Only qualified personnel should mount and remove a device while observing the ESD regulations.

Meet Noise Immunity Requirements

Connect functional earth ground as described in this chapter.

Ensure IP65/67 Protection

To ensure IP65/67 protection, cover unused connections with protective caps.

Avoid Damage to the Electronics

Only supply the sensors with the voltage US provided at the connection points.

Avoid Polarity Reversal

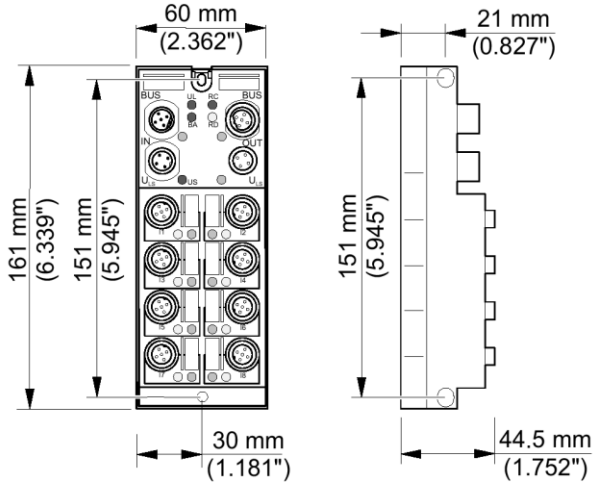
Avoid polarity reversal of the supply voltages U_L, U_S, and U_A.

Mounting VersaMax IP Modules

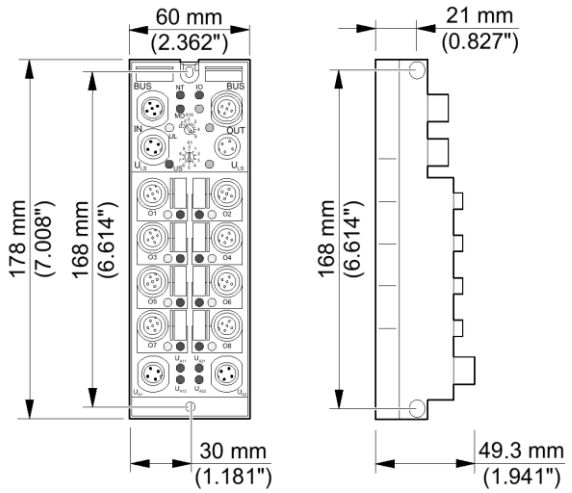
No specific distances are required between devices or from a device to a cabinet door or cover. Mounting distances are determined solely by the connectors used and the bending radii of the cables.

The maximum length of the local bus for VersaMax IP Modular devices is 20 m (65.62 ft.). A maximum of 16 devices can be connected.

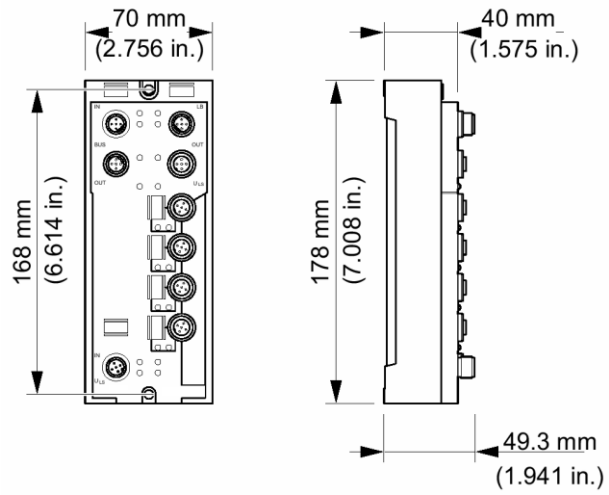
VersaMax IP Standalone IC676 Input Modules



VersaMax IP Standalone IC676 Output and Mixed I/O Modules



VersaMax IP Modular IC677 Devices

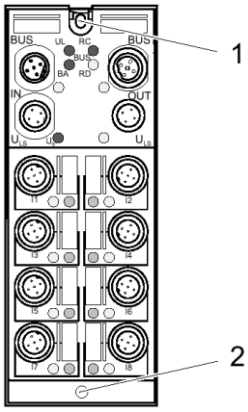


VersaMax IP Standalone Panel Mounting or Side Mounting

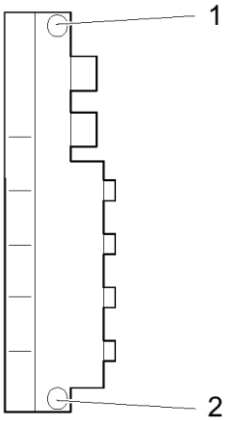
VersaMax IP Standalone devices are mounted directly on a flat mounting surface. The mounting surface must be flat to avoid strain in the housing when tightening the screws. (Disconnect the power supply before installing a module.)

You can directly mount the devices on the mounting surface or on mounting profiles, using two mounting holes.

Front Mounting Holes



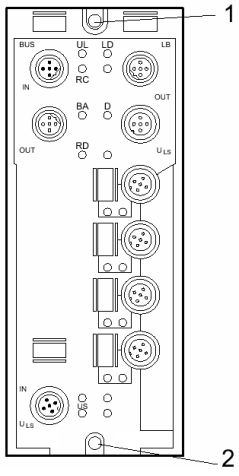
Side Mounting Holes



The mounting materials required are two screws with a diameter of 4 mm (M4, 0.157 in.) and a maximum head diameter of 7mm (0.276 in.) and two retaining washers. The length of the screws depends on the mounting method used (at least 30mm [1.181 in.] for front mounting, at least 40mm [1.575 in.] for side mounting). The tightening torque is 0.8Nm.

VersaMax IP Modular Mounting

VersaMax IP Modular devices can be front-mounted on a flat surface.



For direct mounting on the front on a grounded mounting surface, the devices are grounded using the upper mounting screw.

For front mounting on an ungrounded mounting surface, the devices are grounded using cable lugs (2.8 mm [0.110 in.]) via the external grounding connection (connection latch).

You can directly mount the devices on the mounting surface, using two mounting holes (Ø 4 mm [0.157 in.], cylindrical sinking 8mm [0.315 in.])..

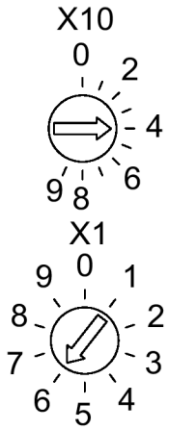
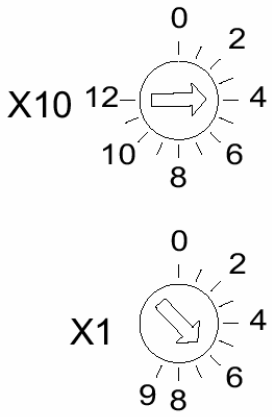
Screw the device directly onto the mounting surface using two mounting screws (1 and 2 at left).

The use of a DIN rail is recommended. You can directly mount devices on the DIN rail, using two mounting holes (Ø 4 mm [0.157 in.], cylindrical sinking 8 mm [0.315 in.]). The device is connected to functional earth ground via the upper mounting screw as described in this section.

Setting the Rotary Switches

VersaMax IP modules have rotary switches for setting the address and, if necessary, the transmission speed. Proper use of these switches is explained in the module datasheets and bus-specific sections of this manual.

As appropriate for each module, use rotary switch X10 to specify the tens and use switch X1 to specify the units. For example, the illustration below shows the switches set to select “46”.

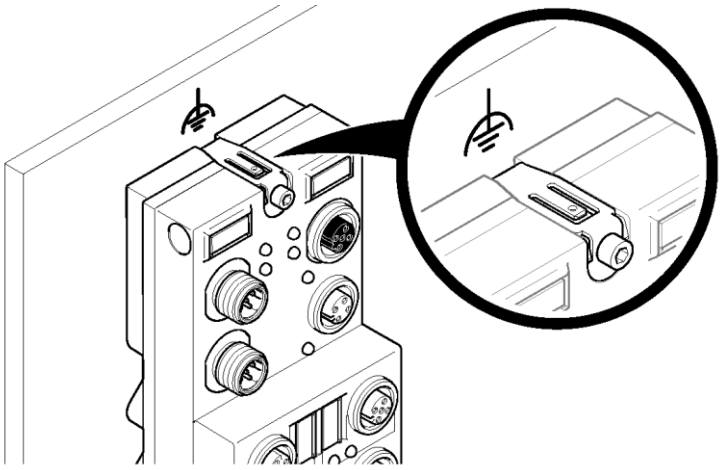
VersaMax IP Standalone	*VersaMax IP Modular*
	

Adjust the rotary switches using a suitable screwdriver (blade width 3.5mm [0.138 in.]). Use of an unsuitable tool may damage the switches.

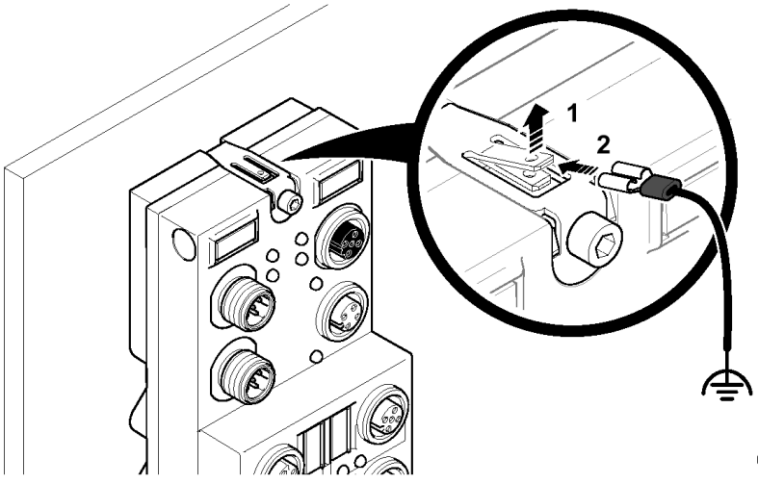
Connecting Functional Earth Ground to the Module

Functional earth grounding is absolutely essential for error-free bus operation.

If the module is directly mounted on a grounded mounting surface, the module is grounded using the upper mounting screw.



If the module is mounted on an ungrounded mounting surface (as shown below) or side-mounted, the module must be grounded using lugs (2.8 mm [0.110 in.]) via the external grounding connection (connection latch).



- Bend the connection latch back (1).
- Insert a lug (2.8mm [0.110 in.]), which is connected to FE, in this connection (2).

Chapter 3

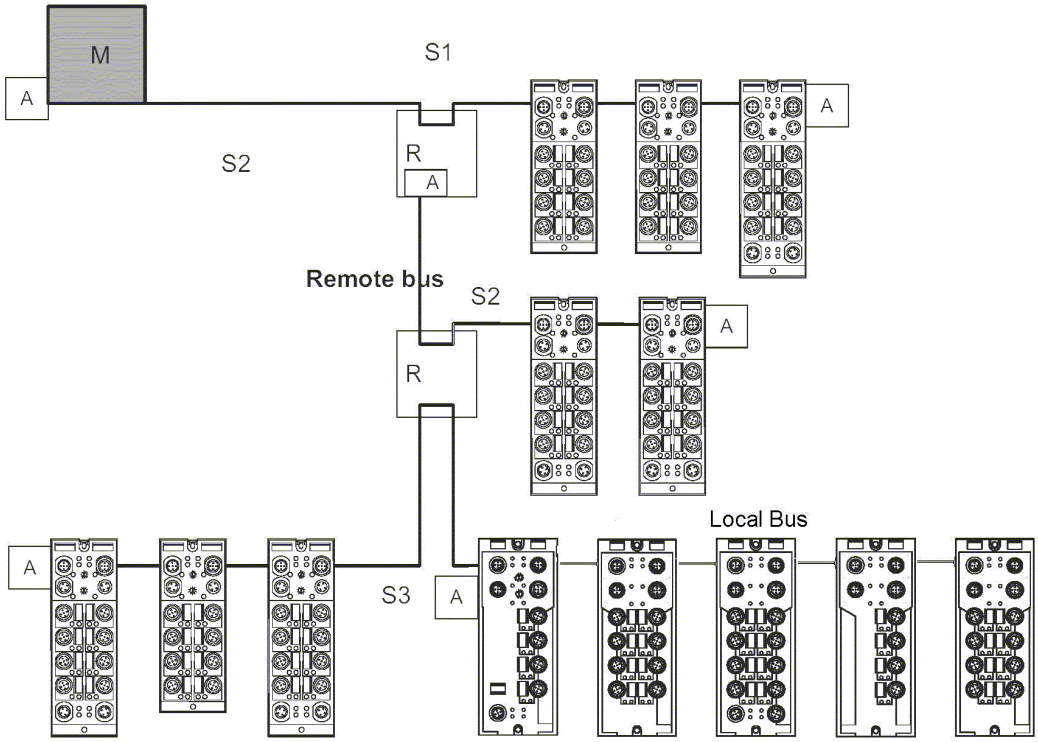
Network Connections for Profibus-DP Modules

This section includes specific installation information for VersaMax IP Profibus modules.

- VersaMax IP Modules in a Profibus-DP System
- The Profibus-DP Network
  - Basic Specifications
  - Baud Rate
  - Cable Type and Length
- Profibus Connectors
  - Pin Assignments of the Bus Connectors on a VersaMax IP Module
  - Pin Assignments of the Connectors on the Cable
- Connecting VersaMax IP Modules to the Network
  - Termination Resistors
- Setting a Module's Bus Address
- The Local Bus for VersaMax IP Modular Devices

VersaMax IP Modules in a Profibus-DP System

The illustration below shows VersaMax IP Modules in a Profibus-DP Network



In the illustration:

M	Master	A	Termination resistor
R	Repeater	R/T	Repeater with termination resistor
S1, S2, S3	Segments		

When laying a Profibus cable, please observe the following:

- Do not lay signal and bus cables parallel to power cables or in bundles with power cables.
- Lay Profibus cables and cables with direct voltages greater than 60V and alternating voltages greater than 25V in separate bundles or cable ducts.
- Always lay signal cables and equipotential bonding together in one channel, following the shortest route.
- Avoid extending the Profibus cables with connectors.
- Do not lay Profibus cables in bundles with telephone lines and cables leading to potentially explosive areas.
- As a rule, avoid branch lines.

The Profibus-DP Network

Basic Profibus-DP Network Specifications

Topology	Linear, active bus connection at both ends of a segment (termination resistor); branch lines are permitted
Number of Stations in a Segment	32 (without repeater) 127 (with repeater)
Number of Repeaters between Two Devices	9, maximum
Maximum Expansion of the bus	Depends on the transmission speed (see the table below); 1.2km (0.75mi), maximum at 93.75 kbps; expansion can be increased through the use of repeaters
Transmission Speed	9.6 kbps to 12 Mbps, can be adjusted in increments (see the table below)

Baud Rate

After power up, a VersaMax IP Profibus slave module automatically detects the network baud rate. The module stores stores the baud rate while the supply voltage is present. Only one baud rate can be used at a time in a Profibus system.

If you change the baud rate of the master, you must disconnect and reconnect the supply voltage for the VersaMax IP Profibus slave module so that it detects the new baud rate.

Cable Type

For interference-free transmission, use 2-wire, twisted pair and shielded cable, specified as cable type A in EN50170 Part 8-2. Cable type B should not be used, as it is out-of-date.

The following cables are available from GE Intelligent Platforms:

Catalog Number	Description
IC676CBLPBM020	IP67 Profibus Cordset, 2 Meters, Male Connector w/Leads
IC676CBLPBM050	IP67 Profibus Cordset, 5 Meters, Male Connector w/Leads
IC676CBLPBM100	IP67 Profibus Cordset, 10 Meters, Male Connector w/Leads
IC676CBLPBF020	IP67 Profibus Cordset, 2 Meters, Female Connector w/Leads
IC676CBLPBF050	IP67 Profibus Cordset, 5 Meters, Female Connector w/Leads
IC676CBLPBF100	IP67 Profibus Cordset, 10 Meters, Female Connector w/Leads
IC676CBLPBB003	IP67 Profibus Cordset, 0.3 Meters
IC676CBLPBB005	IP67 Profibus Cordset, 0.5 Meters
IC676CBLPBB010	IP67 Profibus Cordset, 1 Meter
IC676CBLPBB013	IP67 Profibus Cordset 13.5cm
IC676CBLPBB020	IP67 Profibus Cordset, 2 Meters
IC676CBLPBB050	IP67 Profibus Cordset, 5 Meters
IC676CBLPBB100	IP67 Profibus Cordset, 10 Meters

Cable Length and Baud Rate

The maximum length of a bus segment depends on the baud rate as shown below.

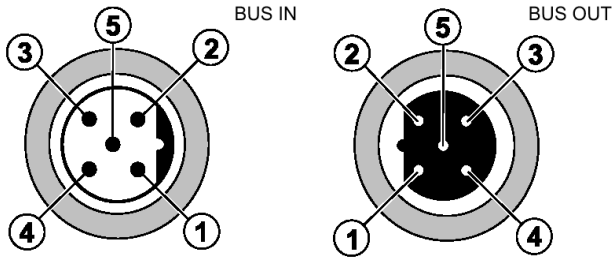
Baud Rate in Kbps	9.6	19.2	93.75	187.5	500	1500	12000
Line length	1200m 3937.01ft	1200m 3937.01ft	1200m 3937.01ft	1000m 3280.84ft	400m 1312.34ft	200m 656.17ft	100m 328.08ft
Length of branch lines	<6.6m (21.65ft)						none

Information about Profibus Networks

Important information on system planning, installation instructions when using Profibus, and starting up Profibus systems can be found in the assembly guidelines for Profibus. This information is published by the Profibus User Organization (see also www.profibus.com).

Profibus Connectors

Bus Connector Pin Assignments on a VersaMax IP Module



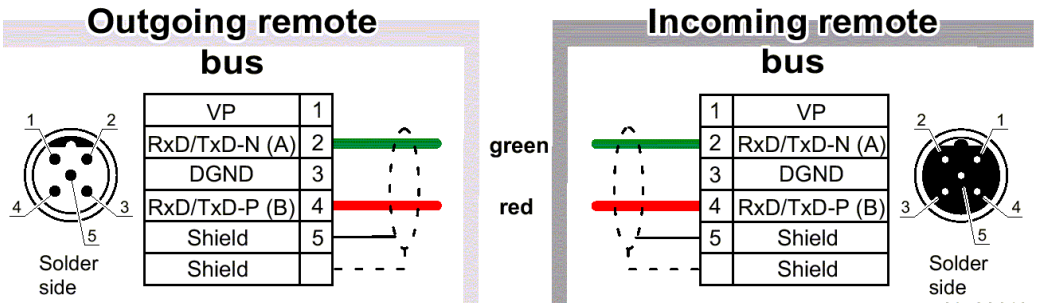
Pin	IN	OUT	Note
1	VP	VP	Supply voltage for active bus connection (termination resistor)
2	RxD/TxD-N (A)	RxD/TxD-N (A)	
3	DGND	DGND	Reference potential of the RS-485 transceiver of the station
4	RxD/TxD-P (B)	RxD/TxD-P (B)	
5	Shield	Shield	Placed directly on FE

Connector Pin Assignment of the M12 Connectors on the Cable

Profibus DP cables usually have one wire pair (red and green) protected by a braided shield and membrane. The data lines are labeled A and B. The thread and pin 5 are used for shielding.

For a cable with red and green wires, use the following assignment for both the incoming and outgoing bus:

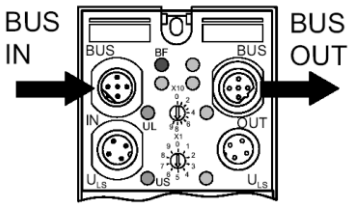
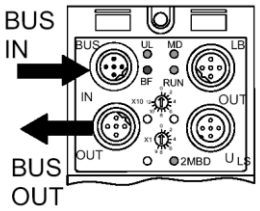
- Data line A Green
- Data line B Red



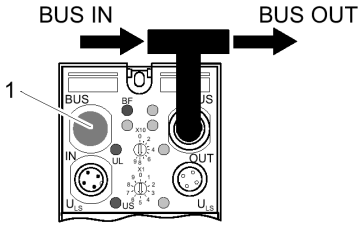
Connecting VersaMax IP Modules to the Profibus Network

There are two ways of connecting a VersaMax IP module to the bus:

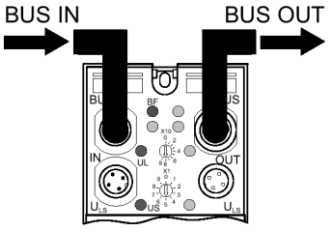
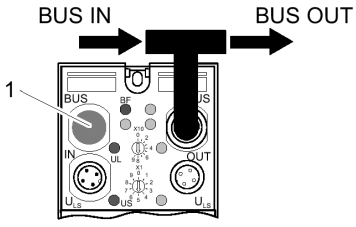
1. All VersaMax IP IC676 modules and IC677 Profibus Interface Units can be connected directly, by connecting the incoming Profibus to BUS IN and the outgoing Profibus to BUS OUT. Direct connection can be used for transmission rates up to 1.5 Mbaud. If direct connection is used, adding or removing devices will interrupt bus communications.

Profibus Connectors on IC676 Modules	*Profibus Connectors on IC677 Modules*
	

2. VersaMax IP Standalone (IC676) modules can also be connected indirectly, using a T-connector attached to the module's BUS OUT connector. This requires a T-connector (IC676ACC005), and one protective cap (IC676ACC002). Transmission speeds above 1.5 Mbaud require T-connectors with integrated series inductance.To ensure IP65/IP67 protection, cover the unused BUS IN connection on the module with the protective cap (1, below right).

Indirect Bus Connection of IC676 Modules


Indirect connection allows devices to be removed or added while the bus is running without physical interruption. To do this, the master and the control program must support the removal and addition of devices. All transmission rates are supported.

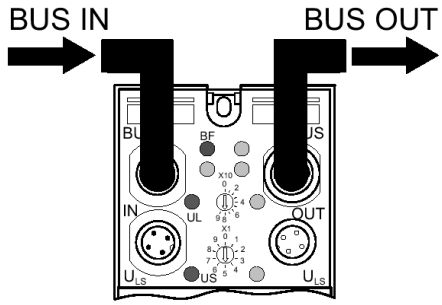
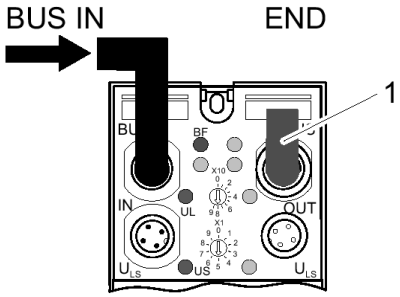
Direct Bus Connection	*Indirect Bus Connection of IC676 Modules*
	

Termination Resistors

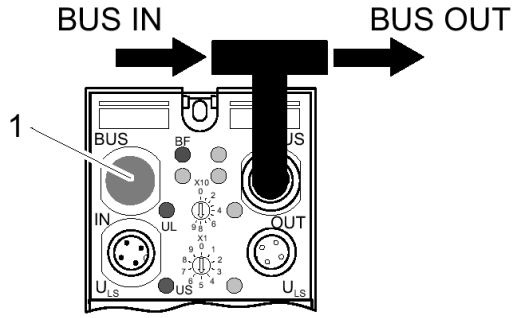
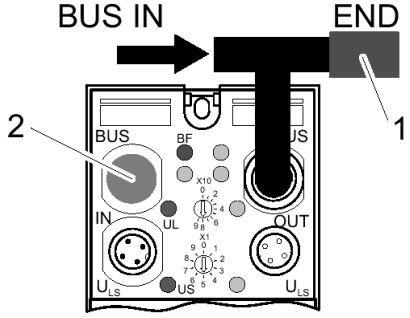
In Profibus-DP, the individual branches must each be terminated with a resistor.

Connecting Termination Resistors to VersaMax IP Standalone Modules

For a VersaMax IP Standalone (IC676) module at the end of a branch, a suitable resistor (IC676ACC004) must be installed.

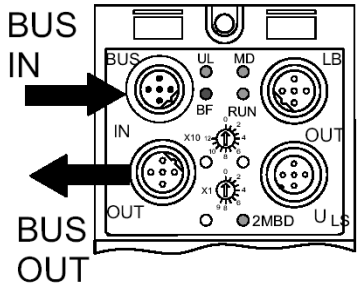
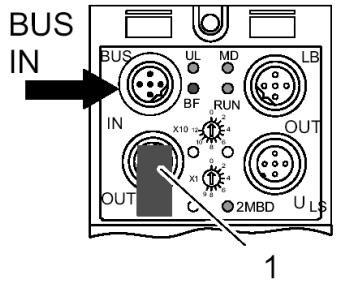
Direct Bus Connection of IC676 Modules	*Direct Connection of IC676 Modules with Termination Resistor Attached to BUS OUT*
	

The termination resistor can be attached to BUS OUT on the module (1, below left). A termination resistor can also be attached to the open connection of a T-connector (1, below right). When using a T-connector, cover the unused BUS IN connector on the module with a protective cap (2, below right) to ensure IP65/IP67 protection.

Indirect Bus Connection IC676 Modules	*Indirect Connection with Termination Resistor Attached to T-Connector*
	

Connecting Termination Resistors to VersaMax IP IC677 Profibus Interface Units

For a VersaMax IP Profibus Interface Unit IC677PBI01, the Profibus cable is connected to BUS IN and BUS OUT as described previously. If the module is the last device on the Profibus network, a termniation resistor must be placed in the BUS OUT connector.

Bus Connection of Profibus Interface Unit	***Bus Connection of Profibus Interface Unit with Termination Resistor Attached to BUS OUT***
	

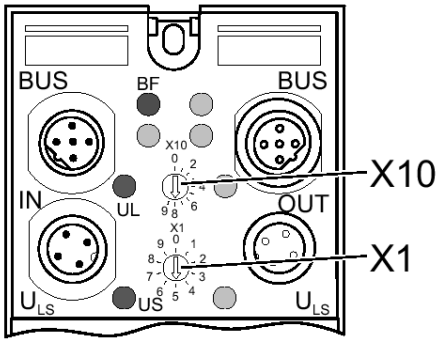
Setting a Module's Profibus Bus Address

Each device that attaches directly to the Profibus network must have a unique bus address.

- A VersaMax IP Standalone IC676 module may have a bus address from 1 to 99.
- A VersaMax IP Profibus Interface Unit IC677PBI001 may have a bus address from 1 to 126.

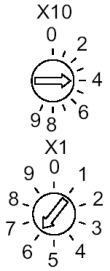
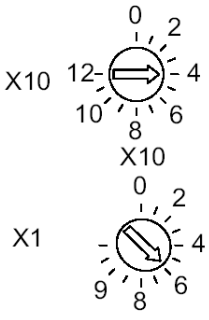
The address should be set immediately after installation, **before** connecting the supply voltages. Changing the switch positions during operation has no affect on the address settings. Dynamic address changing via the Profibus network is not supported.

The Profibus address is set using two rotary switches on the module. Rotary switch X10 specifies the tens and switch X1 specifies the units of the address. An IC676 module is shown below.



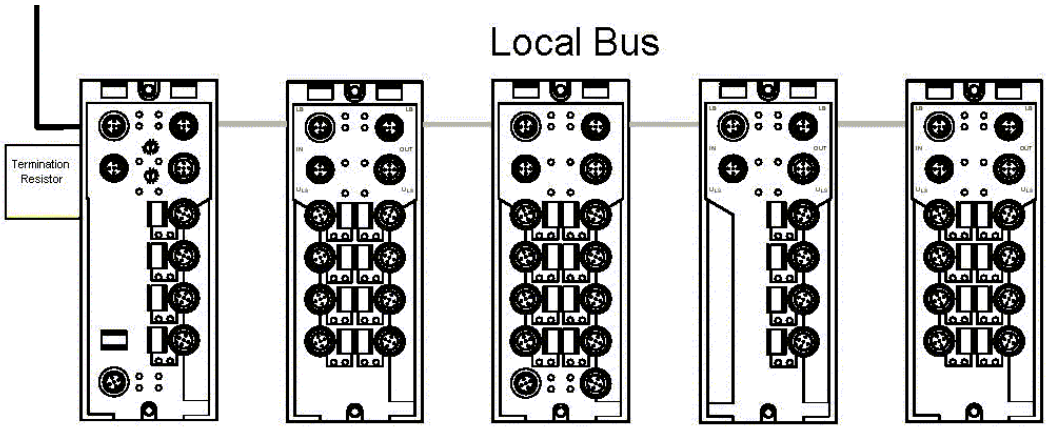
Adjust the rotary switches using a suitable screwdriver (blade width 3.5mm [0.138 in.]). Use of an unsuitable tool may damage the rotary encoding switches.

Example, Setting Address 46:

VersaMax IP Standalone Modules	VersaMax IP Profibus Interface Unit IC677PBI001
	

The Local Bus for VersaMax IP Modular Devices

VersaMax IP Modular devices are connected to a Profibus Interface Unit IC677PB001 and to each other by a local bus cable. Up to 16 modules can be connected to each Profibus Interface Unit. The Profibus Interface Unit provides the power supply for the modules.

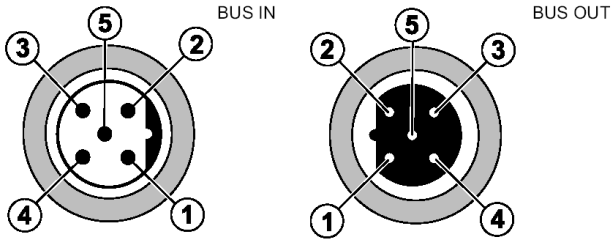


The maximum total length of a local bus is 20 m. The transmission speed can be switched from 500 Kbaud to 2 MBaud.

In addition to the inputs and outputs located on the modules it serves on the local bus, the Profibus Interface Unit can also be directly connected to up to eight digital input sensors via M12 connectors, which are double-assigned. It supplies the sensors with the required voltage and reads the available signals.

Pin Assignments on the IC677 Modules' Local Bus

M12 B-encoded



Pin	Bus In	Bus Out
1	DO	DO
2	$\overline{DO}$	$\overline{DO}$
3	DI	DI
4	$\overline{DI}$	$\overline{DI}$
5	GND	GND

The thread is used for shielding.

Chapter

4

Configuration of PROFNET Modules

This chapter explains how to configure Profinet NIU and installation procedure.

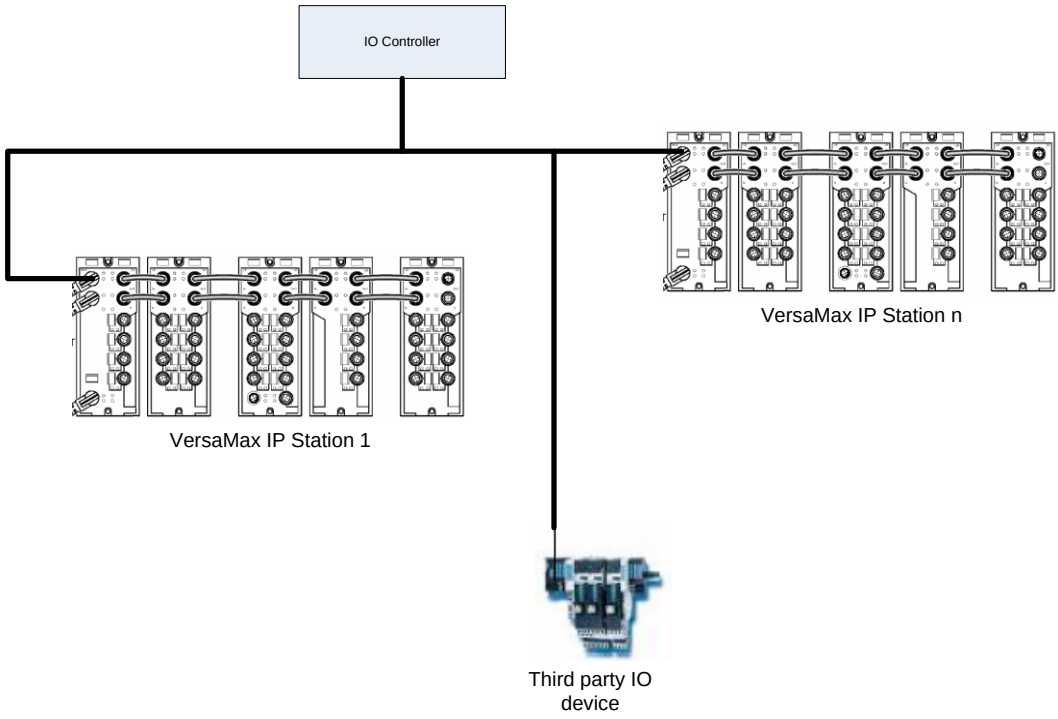
- VersaMax IP Modules in PROFINET system
- Communication Model and Properties
- Configuration

VersaMax IP Modules in PROFINET System

The VersaMax IP PROFINET Scanner module interfaces a remote node of VersaMax IP modules to PROFINET IO network. The PROFINET Scanner scans the module in its node (retrieving input date and providing output data), publishes input data on the PROFINET network at the configured update rate, and receives data for module outputs.

The PROFINET Scanner manages PROFINET communication and module configuration between an IO-controller and modules within the remote node.

The illustration below shows VersaMax IP Modules in a PROFINET Network:



Communication Model and Properties

PROFINET IO offers a detailed communication model with lots of flexibility by providing options for devices to use only those parts of the standard that are required for the specific application. Also this protocol meets all demands of modern automation solutions.

Device Type Identification

PROFINET IO field devices are identified by the unique Device ID. The IO controller transmits the device ID, during startup IO device checks the device ID transmitted by the controller against the stored ID.

The Device attributes of the VersaMax IP module are:

Vendor ID: 0x015A

Device ID: 0x0007

Vendor ID is a 16-bit unique identifier assigned to each manufacturer by PNO.

Device ID is used for detailed differentiation between IO devices, specified by manufacturer for each device class and family.

GSDML File for Configuration

Integrating a PROFINET IO device within the IO controller is done by a device description file. Each PROFINET device is provided with a device description file which contains all the data that is important for the engineering tool to configure the device.

For VersaMax IP the PROFINET scanner device GSDML file is provided and can be used with Proficy Machine Edition (PME) for configuring the device.

Note: For details on using the *Proficy Machine Edition PLC Logic Developer* programmer to create and download the configuration for VersaMax IP PNS in RX3i PROFINET network, refer to *PACSystems RX3i Profinet Controller Manual*, GFK-2751.

Configuration

The basic configuration steps are:

- Configure a PROFINET IO-Controller and its PROFINET LAN using the Controller manufacturer‟s recommended PROFINET IO configuration tool.
- Configure the parameters of the PROFINET Controller.
- Add IO-Devices to the LAN. These IO-Devices can be VersaMax IP PROFINET Scanner modules or third-party IO-Devices. VersaMax IP PROFINET Scanners and other types of IO-Devices use GSDML files to describe their capabilities. The PROFINET IO configuration tool imports these GSDML files and incorporates the devices into the configuration.
- Configure the parameters of the VersaMax IP PROFINET Scanners and other IO-Devices.
- Configure the communications properties of the PROFINET IO-Controller, VersaMax IP PROFINET Scanners, and other IO-Devices.
- Add VersaMax IP modules to the VersaMax IP PROFINET Scanner remote nodes.
- Configure the parameters of the VersaMax IP modules and other devices in the remote nodes.
- When the configuration is ready, use a DCP tool to assign a name to each IO-Device so the PROFINET IO-Controller can connect to the devices and deliver their configuration.
- Store the configuration data from the configuration tool to the PROFINET IO-Controller.

Note: When a VersaMax IP PROFINET Scanner receives a changed configuration, it temporarily sets all of its outputs to their defaults. If the configuration has not changed, a VersaMax IP PROFINET Scanner does not default outputs.

The network parameters of the PNS (IP Address, subnet mask, and gateway IP) should either be configured to match the fixed parameters assigned to the PNS using a DCP Tool or to what the IO-Controller should assign during the startup of communications between the PNS and IO-Controller. If the network parameters assigned by the DCP tool are different from the configuration in the IO-Controller and the IO-Controller is configured to assign them to devices, then when the IO Controller assigns them as a temporary setting, the settings previously stored from the DCP tool are lost. On a reset, the IO-Device is set to factory default values (0.0.0.0/0.0.0.0/0.0.0.0).

Chapter

5

Power Connections for VersaMax IP

This chapter explains how to complete the power connections for VersaMax IP products.

- General Information about Power Connections for VersaMax IP
- Power for Communications and Input Sensors
- Power for Actuators
- Power Connections for Sensors and Actuators
- Voltage Supply Examples
- Calculating Sensor and Actuator Currents
- Supply Line and Current Supply

General Information about Power Connections

Power Sources

For VersaMax IP devices, a distinction is made between three different voltages:

- U_L to supply the communications power for the device electronics (always required)
- U_S to supply the sensors (only required for devices with inputs).
- U_A to supply the actuators (only required for devices with outputs)

Power for communications (U_L)and for input points (U_S) is supplied by the same power source. For output modules and mixed input/output modules, power for the output points (U_A)must be supplied by a separate power source. Protect the power supplies independently. In this way the bus continues to run even if some I/O devices are switched off.

All supply voltages are connected via M12 connectors on the modules. The individual contact pins of M12 connectors on the modules can be loaded with a maximum of 4 A. This means that the maximum current carrying capacity for each of the voltages is 4 Amps.

Connect each of the supply voltages completely (to +24V and GND). Do not connect several supply voltages via one GND, as this would exceed the current carrying capacity of the contacts.

Cables

The following power cables are available from GE Intelligent Platforms:

Catalog Number	Description
IC676CBLPWM020	IP67 Power Cordset, 2 Meters, Male Connector w/Leads
IC676CBLPWM050	IP67 Power Cordset, 5 Meters, Male Connector w/Leads
IC676CBLPWM100	IP67 Power Cordset, 10 Meters, Male Connector w/Leads
IC676CBLPWF020	IP67 Power Cordset, 2 Meters, Female Connector w/Leads
IC676CBLPWF050	IP67 Power Cordset, 5 Meters, Female Connector w/Leads
IC676CBLPWF100	IP67 Power Cordset, 10 Meters, Female Connector w/Leads
IC676CBLPWB003	IP67 Power Cordset, 0.3 Meters
IC676CBLPWB005	IP67 Power Cordset, 0.5 Meters
IC676CBLPWB010	IP67 Power Cordset, 1 Meter
IC676CBLPWB020	IP67 Power Cordset, 2 Meters
IC676CBLPWB050	IP67 Power Cordset, 5 Meters
IC676CBLPWB100	IP67 Power Cordset, 10 Meters
IC677CBLPWB0013	IP67 Voltage Supply Cable for Local Bus; A coded, 5 position, unshielded 13.5 cm

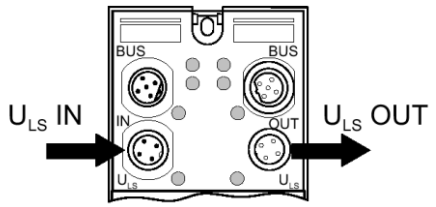
Power for Communications and for Input Sensors

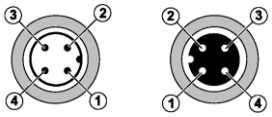
U_L supplies the communications power for the device electronics. U_S supplies power for input sensors. The power supplies U_L and U_S should only be supplied with SELV (Safety Extra-Low Voltage). Both voltages U_L and U_S are supplied via the U_{LS} IN connection. U_L must be connected to every device. If this supply voltage is disconnected, the device does not function. U_S is only connected to devices with inputs. If other devices are also supplied, both voltages are forwarded via U_{LS} OUT.

The current-carrying capacity of the M12 connectors is 4A per contact. Ensure that this value is not exceeded. The connection for the outgoing supply voltage is not monitored for overload. If the permissible current carrying capacity is exceeded, this may lead to connector damage.

Connecting the Power Supply U_{LS} to VersaMax IP Standalone Modules

For VersaMax IP Standalone (IC676) modules, connect the power supplies for the communications power and input sensors to the U_{LS} IN male connector. To supply other devices, connect the cable for the outgoing supply voltage to the U_{LS} OUT female connector.





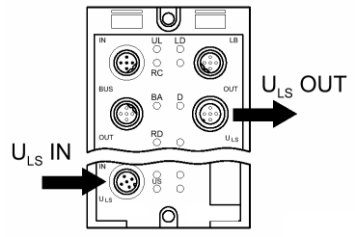
1	U_L +24V	U_L +24V
2	U_S GND	U_S GND
3	U_L GND	U_L GND
4	U_S +24V	U_S +24V

Connecting the Power Supply U_{LS} to VersaMax IP Modular Devices

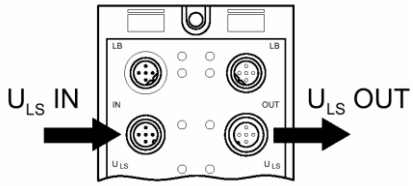
For VersaMax IP Modular (IC677) devices, connect the power supplies for the communications power and input sensors to female connector U_{LS} IN on the Profibus / PROFINET NIU. To supply other devices, connect the cable (IC677CBLPWB0013) for the outgoing supply voltage to female connector U_{LS} OUT.

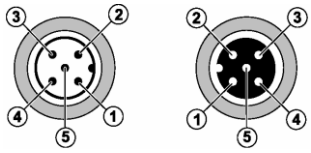
The Profibus NIU IC676PBI001 provides U_L and U_S to additional IC677 modules installed in the VersaMax IP Modular station via the voltage supply cable. The voltages U_L and U_S each have a maximum load of 2 amps at the Profibus Interface Unit. See Voltage Supply Examples for the VersaMax IP Modular IC677 for more information.

Network Interface Unit



Devices on Local Bus





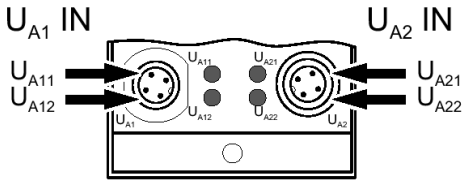
1	U_L +24V	U_L +24V
2	U_S GND	U_S GND
3	U_L GND	U_L GND
4	U_S +24V	U_S +24V
5	500 kbaud / 2 Mbaud	500 kbaud / 2 Mbaud

The transmission speed is switched to 2 Mbaud by jumpering +24 V (U_L, pin 1) to pin 5.

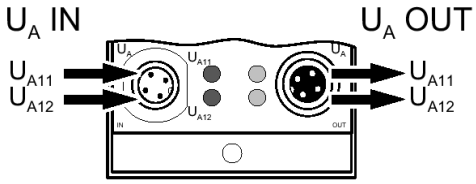
Power for Actuators

On VersaMax IP output modules and mixed I/O modules, power supply U_A supplies the actuators. The connectors for U_A have different functions for discrete output and discrete mixed modules, as shown below.

VersaMax IP Standalone, Discrete Outputs



VersaMax IP Standalone Discrete Mixed, VersaMax IP Modular Discrete Outputs and Discrete Mixed



The different functions of the connections are due to the different number of outputs and their nominal current.

Two voltages are connected to each connection for supplying U_A, e.g., the voltages U_{A11} and U_{A12} at U_{A1}. Each of these voltages supplies a group of outputs. This allows outputs to be switched off in groups. For information about which outputs are supplied from each voltage for specific modules, refer to the module datasheets in appendix A.

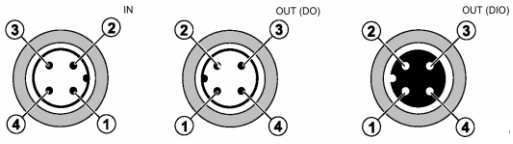
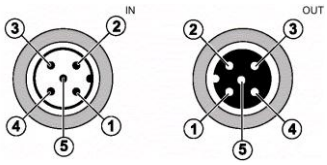
Connect each of the supply voltages completely (to +24V and GND). Do not connect several supply voltages via one GND, as this would exceed the current-carrying capacity of the contacts.

The connection for the outgoing supply voltage is not monitored for overload. If the 4A permissible current carrying capacity is exceeded, it may lead to connector damage.

When determining the load for a supply voltage, take into account the number of outputs, the nominal current, and the simultaneity.

Connecting the Power Supply U_A to VersaMax IP Devices

Pin Assignments of the Power Supply U_A for the Outputs on the Module are shown below.

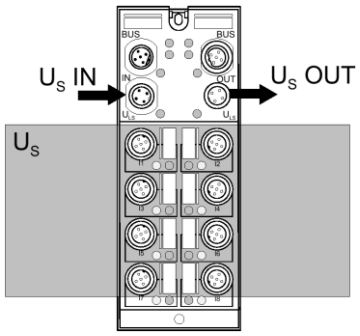
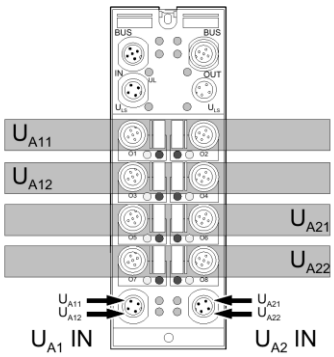
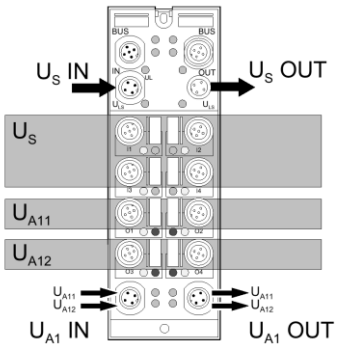
VersaMax I/O Standalone (IC676)			***VersaMax IP Modular (IC677)***	
				
Pin	***IN***	***OUT***	***IN***	***OUT***
1	U_{A11} +24V	U_{A11} +24V	U_{A11} +24V	U_{A11} +24V
2	U_{A12} GND	U_{A12} GND	U_{A12} GND	U_{A12} GND
3	U_{A11} GND	U_{A11} GND	U_{A11} GND	U_{A11} GND
4	U_{A12} +24V	U_{A12} +24V	U_{A12} +24V	U_{A12} +24V
5	-	-	Not used	Not used

Power Connections for Sensors and Actuators

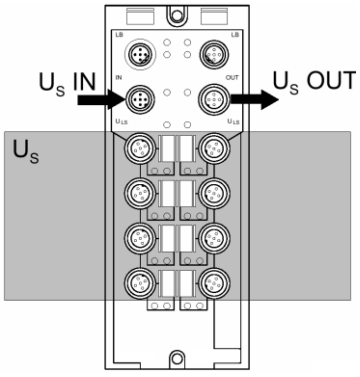
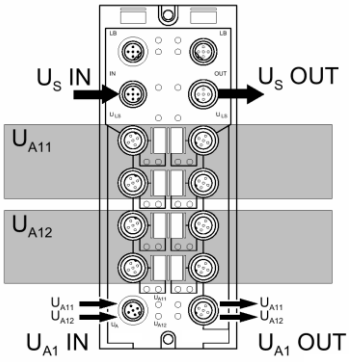
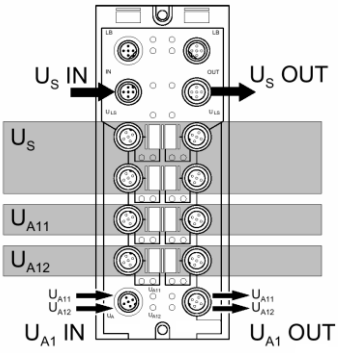
Connect the sensors and actuators using M12 connectors. Pre-assembled cables are recommended.

The maximum cable length for connecting sensors and actuators is 100 m (328.08 ft.).

The following diagrams show which VersaMax IP Standalone (IC676) module inputs and outputs are supplied by each supply voltage. See the module datasheets in appendix A for details of connecting sensors and actuators.

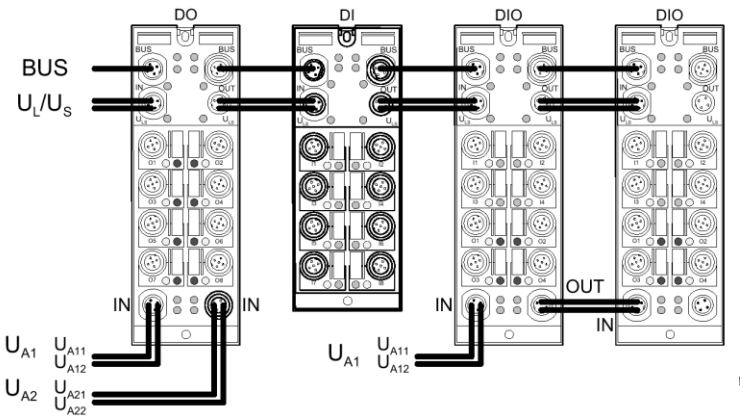
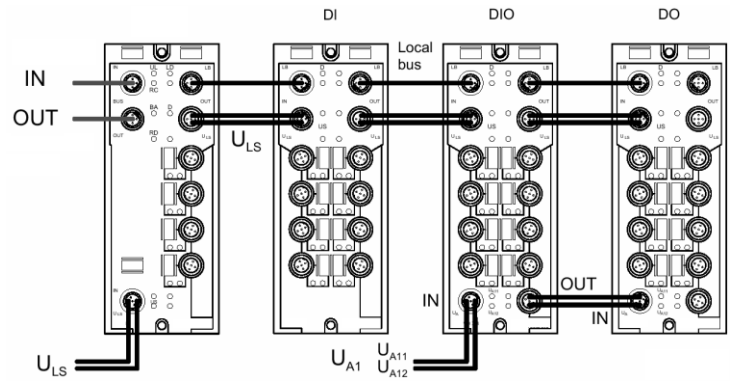
Input Supply (Discrete Input Module)	***Output Supply (Discrete Output Module)***	***Input and Output Supply (Mixed Discrete Module)***
		

The diagrams below show which VersaMax IP Modular (IC677) module inputs and outputs are supplied by each supply voltage. See the module datasheets in appendix A for details of connecting sensors and actuators.

Input Supply (Discrete Input Module)	***Output Supply (Discrete Output Module)***	***Input and Output Supply (Mixed Discrete Module)***
		

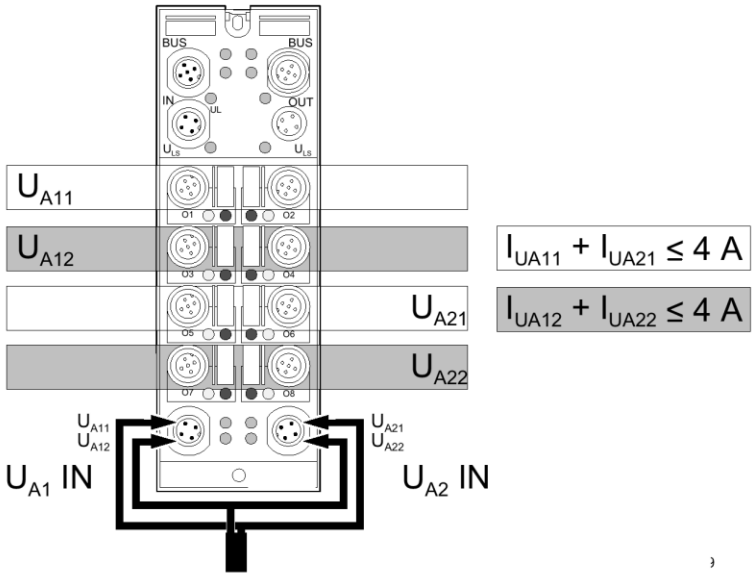
Voltage Supply Examples

Example 1: Supplying and Forwarding Supply Voltages

VersaMax IP Standalone IC676	
VersaMax IP Modular IC677	

The connection for the outgoing supply voltage is not monitored for overload. If the 4A permissible current-carrying capacity is exceeded, it may lead to connector damage.

Example 2: Optional Supply via a Y Cable with Reduced Current, VersaMax IP Standalone Only

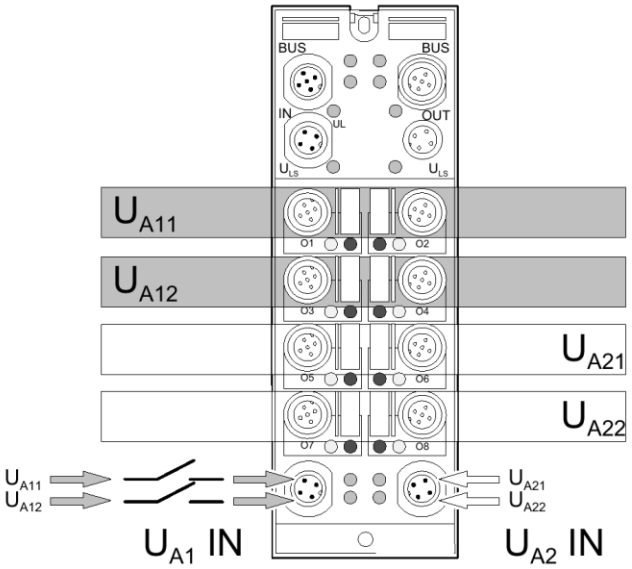


If you are working with reduced current, you can use a Y cable to supply the supply voltages UA. In this case, the following conditions must be met for the currents:

The total current at UA11 and UA21 must not exceed 4A.

The total current at UA12 and UA22 must not exceed 4A.

Example 3: Switching Off Specific Outputs, VersaMax IP Standalone Only

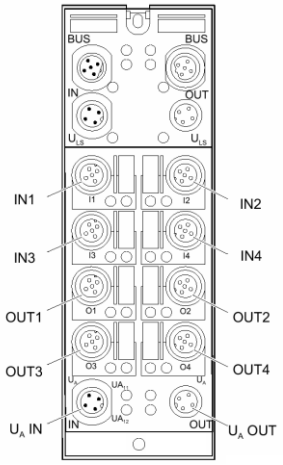


If you switch off the voltage U_{A11}/U_{A12} in the example, outputs O1 to O4 are switched off. Outputs O5 to O8 can still be operated independently.

Calculating Sensor and Actuator Currents

This section includes examples of calculating current requirements for input, output, and mixed I/O modules with various types of sensors and actuators.

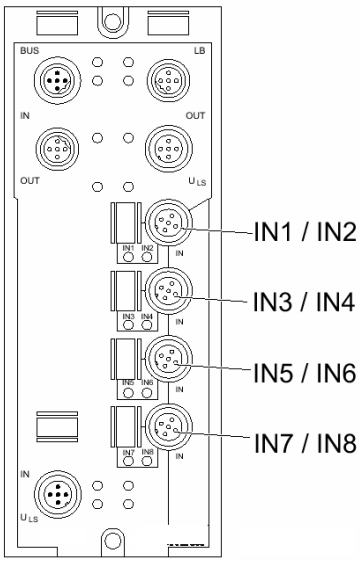
Calculation Example for a VersaMax IP Standalone (IC676) 4-Input 4-Output Module



Sensor Type		Current Consumption
1 x reflex optical data link with 2 output signals		30 mA each
2 x proximity switches		15 mA each
Actuator Type		
2 x solenoid valves (hydraulic)		1.3A
2 x solenoid valves (pneumatic)		67mA
Calculation Example for a VersaMax IP Discrete I/O Module		
IN1, IN2	Reflex optical data link	30 mA
IN3	Proximity switch	+15 mA
IN4	Proximity switch	+15 mA
Sensor supply		**= 60 mA**
Current consumption of inputs (5A for each input used)		**+20mA**
I_{US} total		**= 80 mA**
Current consumption of actuators I_{UA11}		
OUT1	Solenoid valve (hydraulic)	+1.3A
OUT2	Solenoid valve (pneumatic)	+67mA
I_{UA11} total		**+1.367A**
Current consumption of actuators I_{UA12}		
OUT3	Solenoid valve (hydraulic)	+1.3A
OUT4	Solenoid valve (pneumatic)	+67mA
I_{UA12} total		**+1.367A**

With this configuration, the module loads U_S with approximately 80mA. U_L is loaded with approximately40mA (see datasheet). U_{A11} is loaded with approximately 1.367A. U_{A12} is loaded with approximately 1.367A.

Calculation Example for a VersaMax IP Modular Profibus Interface Unit, IC677PBI001



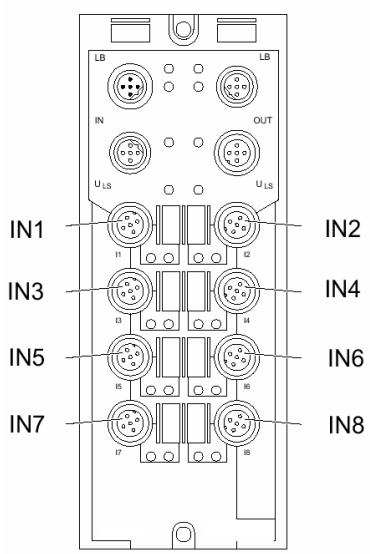
Sensor Type		**Current Consumption**
2 x reflex optical data links each with 2 output signals		30 mA
2 x inductive sensors		15 mA
Calculation Example for a Profibus Interface Unit		
IN1, IN2	Reflex optical data link	30 mA
IN3, IN4	Reflex optical data link	+ 30 mA
IN5	Inductive sensor	+ 15 mA
IN7	Inductive sensor	+ 15 mA
Sensor supply		**= 90 mA**
Current consumption of inputs (5mA for each input used)		**+ 30 mA**
I_{US} total		**= 120 mA**

With this configuration, the Profibus Interface Unit loads U_S with approximately 120mA. U_L is loaded with approximately 70mA (see datasheet).

The voltages U_L and U_S each have a maximum load of 2 Amp at the Profibus Interface Unit.

Calculation Example for a VersaMax IP Modular 8-Point Digital Input Module

This example shows a VersaMax IP Modular (IC677) device on a local bus.

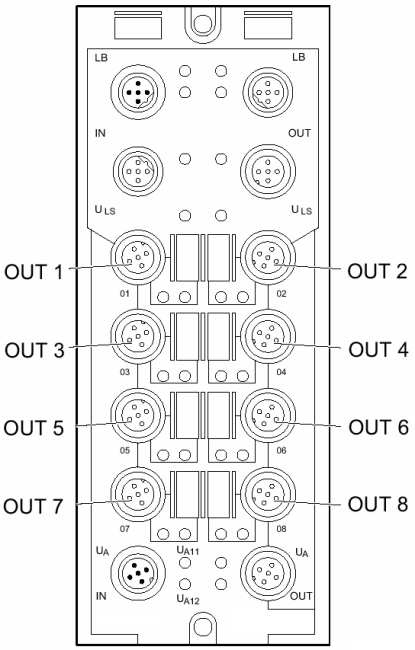


Sensor Type		**Current Consumption**
1 x reflex optical data link with 2 output signals		30 mA each
2 x inductive sensors		15 mA each
3 x proximity switches		10 mA each
Calculation Example for a VersaMax IP Discrete Input Module		
IN1, IN2	Reflex optical data link	30 mA
IN3	Inductive sensor	+15 mA
IN4	Inductive sensor	+15 mA
IN5	Proximity switch	+10 mA
IN6	Proximity switch	+10 mA
IN7	Proximity switch	+10 mA
Sensor supply		**= 90 mA**
Current consumption of inputs (5mA for each input used)		**+ 35 mA**
I_{US} total		**= 125 mA**

With this configuration, the module loads U_S with approximately 125mA. U_L is loaded with approximately 70mA (see datasheet).

Calculation Example for a VersaMax IP Modular 8-Output Device

This example shows a VersaMax IP Modular IC676) Output Module.

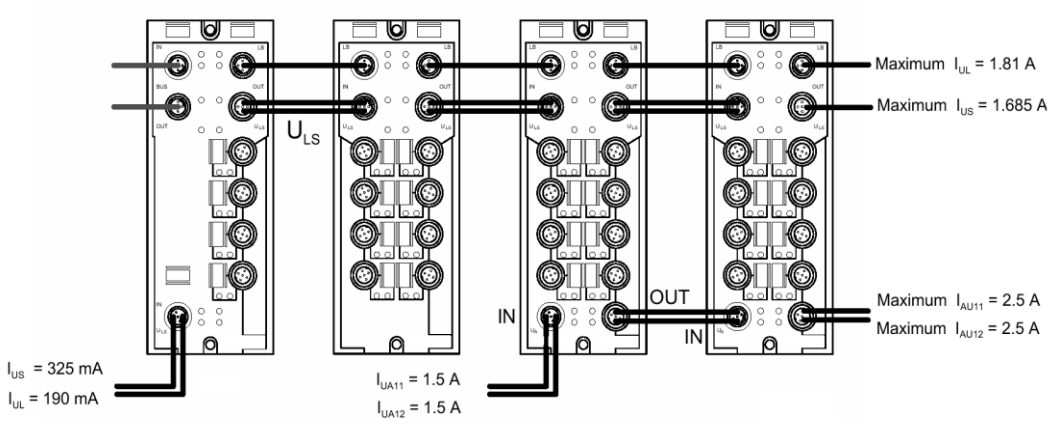


Actuator Type		
4 x solenoid valves (pneumatic)		67mA
Calculation Example for a VersaMax IP Discrete Output Module		
Current consumption of actuators I_{UA11}		
OUT1	Solenoid valve (pneumatic)	+67mA
OUT2	Solenoid valve (pneumatic)	+67mA
I_{UA11} total		**+134mA**
Current consumption of actuators I_{UA12}		
OUT5	Solenoid valve (pneumatic)	+67mA
OUT6	Solenoid valve (pneumatic)	+67mA
I_{UA12} total		**+134mA**

The module never loads U_S. U_L is loaded with approximately134mA. U_{A11} is loaded with approximately 1.367A. U_{A12} is loaded with approximately 134mA.

Calculation Example for a VersaMax IP Modular I/O Station

This example shows the total power requirements of a VersaMax IP Modular I/O Station.



	Network Interface Unit	***Discrete Input Device***	***Discrete I/O Device***	***Discrete Output Device***	***I/O Station***
I_{UL}	+70mA	+40mA	+40mA	+40mA	=190mA
I_{US}	+120mA	+125mA	+80mA	-	=325mA
I_{UA11}	-	-	1.367mA	+134mA	=1.5A
I_{UA12}	-	-	1.367mA	+134mA	=1.5A

Voltages U_{A11} and U_{A12} should be loaded equally.

Supply Line and Current Supply

For M12 connectors in VersaMax IP devices, **a maximum of 4A per contact** is permitted.

To ensure this condition is met, the following factors should be considered:

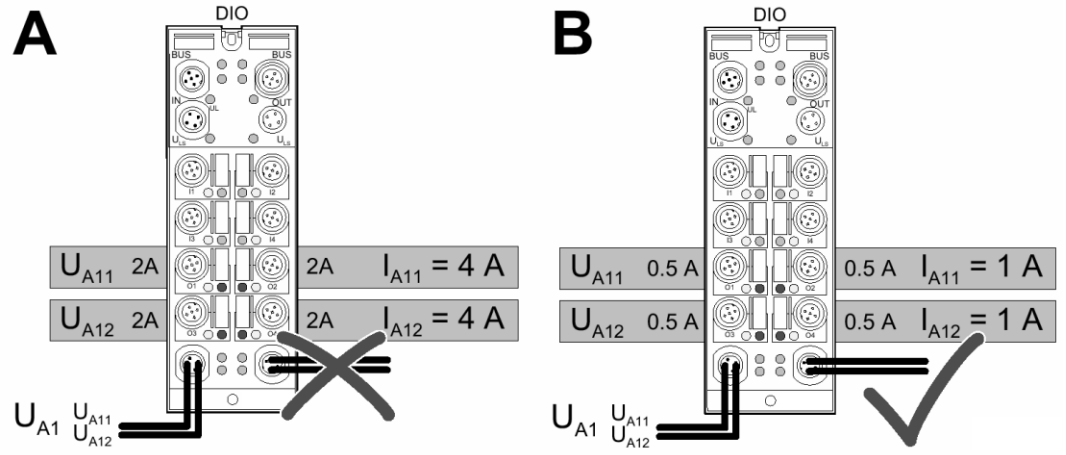
1. Current consumption of the devices (see data sheets)
2. Current consumption of the connected sensors
3. Current consumption of the connected actuators
4. Length of the cables and losses on these cables

It is particularly important to observe these factors when looping the supply voltage.

Examples

A below: On a VersaMax IP Standalone (IP676) Discrete Mixed 4 Iput / 4 Output module, if both outputs of a group are loaded with 2A simultaneously, the supply voltage for these outputs cannot be looped.

B below: On the same device, if both outputs of a group are loaded with 0.5 A simultaneously, the supply voltage for these outputs can be looped. Forwarding would also be permitted, for example, if the outputs were each loaded with 2A but simultaneity was not permitted.



Losses on the Cables

The voltage drop on the cables can be calculated using the formula

$U_A = I \times R \times 2$ Where:

UA	Voltage drop
I	Current strength
R	Conductor resistance
2	Calculation for forward and return path

For a power supply cable 4x0.75 mm² (18 AWG) cable type 186, the conductor resistance is 26 Ohms /km. With 4A:

$U_A = 4\ A \times 26\ Ohms/km \times 2 = 208\ V/km$

which corresponds to 2.08 V on 10 m (32.81 ft.)

With 2A:

$U_A = 2\ A \times 26\ Ohms/km \times 2 = 104\ V/km$

which corresponds to 1.04 V on 10 m (32.81 ft.)

Other cables have other specific resistance values, which can be used to calculate the voltage drop according to the above formula.