Premium and Atrium using Unity Pro

IP67 Sealed Input/Output Modules Setup Manual

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Table of Contents

Safety Information

Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

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⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

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NOTICE

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A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book

At a Glance

Document Scope

This manual describes the implementation of hardware and software for IP67 sealed input/output modules with Premium and Atrium PLCs.

Validity Note

This documentation is valid for Unity Pro V8.1 or later.

The technical characteristics of the devices described in this document also appear online. To access this information online:

Step	Action
1	Go to the Schneider Electric home page *www.schneider-electric.com*.
2	In the **Search** box type the reference of a product or the name of a product range. ● Do not include blank spaces in the model number/product range. ● To get information on grouping similar modules, use asterisks (*).
3	If you entered a reference, go to the **Product Datasheets** search results and click on the reference that interests you. If you entered the name of a product range, go to the **Product Ranges** search results and click on the product range that interests you.
4	If more than one reference appears in the **Products** search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the data sheet.
6	To save or print a data sheet as a .pdf file, click **Download XXX product datasheet**.

The characteristics that are presented in this manual should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the manual and online information, use the online information as your reference.

Related Documents

Title of Documentation	Reference Number
Premium and Atrium Using Unity Pro, Fipio Bus, Setup Manual	35008155 (English), 35008156 (French), 35008157 (German), 35013953 (Italian), 35008158 (Spanish), 35013954 (Chinese)

You can download these technical publications and other technical information from our website at www.schneider-electric.com.

Product Related Information

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

The application of this product requires expertise in the design and programming of control systems. Only persons with such expertise should be allowed to program, install, alter, and apply this product.

Follow all local and national safety codes and standards.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Part I
Hardware Installation for IP67 Sealed I/O Modules

Subject of this Part

This part presents the range of sealed I/O modules for Premium PLCs.

What Is in This Part?

This part contains the following chapters:

Chapter 1
General presentation of IP67 sealed I/O modules

Subject of this Chapter

This chapter provides a general introduction to IP67 sealed I/O modules.

What Is in This Chapter?

This chapter contains the following topics:

Presentation of sealed I/O modules

Introduction

The IP67 family is constituted of sealed I/O modules that may be connected to the Fipio field bus, making it possible to create automation systems with distributed I/Os.

Its great flexibility of use makes it possible to include all available technologies on a single bus (**TBX IP20** and **IP65**, **TSX IP67**, **Momentum**) and to use the different connection principles (branch and point to point).

Type of application

IP67 modules make it possible to have sealed I/O module interfaces in processes or machines, and in difficult environments (oil spray, pressurized water spray, dust, soldering).

The sealed structure of the modules allows them to be used when immersed up to depths of 1 m.

Software configuration

The software configuration *(see page 95)* and the addressing of the sealed I/O modules on the Fipio bus is performed using Unity Pro design and setup software.

Furthermore, addressing must be carried out physically on the module.

Physical presentation of the sealed I/O modules

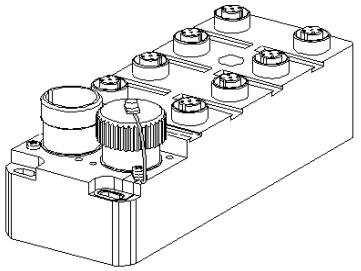
IP67 modules

There are four types of IP 67 sealed I/O modules on the Fipio bus:

- the 24 V IEC type 2 eight channel input module: **TSX EEF 08D2**,
- the 24 V IEC type 2 sixteen channel input module: **TSX EEF 16D2**,
- the 8 input IEC type 2 mixed module, 8 0.5 A, 24 V transistor outputs: **TSX EMF 16DT2**,
- the eight output 24 V, 2 A transistor module: **TSX ESF 08T22**.

Illustration

The figure below shows the standard configuration of the sealed I/O modules.



Standards and certifications

The sealed I/O modules on the Fipio bus comply with the following standards and certifications:

- IEC 1131,
- CNOMO,
- Fipio certification,
- DIN,
- UL certification,
- CSA certification.

Functions offered

Introduction

The overall range of functions offered by the IP67 is designed to meet the demands of the manufacturing and agri-food industry, and for all uses in severe environments. Thanks to its rapid connection technology and diagnostic resources, it makes it possible to reduce downtime to a minimum.

Functions

IP67 modules make it possible to satisfy the most frequently used values such as:

- the remote power supply (power supply for IP 67 modules and sensors) is provided via a single cable,
- each remote power supply can supply up to 31 modules over a maximum distance of 300 m,
- a faulty IP 67 module can be changed without interrupting the bus,
- an operator terminal may be connected to any point on the bus,
- short circuits may occur in the sensors' power supply without the bus malfunctioning,
- the power supply for the outputs is a separate power supply,
- a rapid Fipio bus connection system composed of M23 connectors and cables and a system of rapid connections to sensors/preactuators by M12 connector is available,
- rapid diagnostic of faults is possible on installation.

Chapter 2
General rules for the installation of sealed I/O modules

Subject of this Chapter

This chapter presents general rules for the installation of IP67 sealed I/O modules.

What Is in This Chapter?

This chapter contains the following sections:

Section 2.1
Electrical connections on sealed I/O modules

Subject of this Section

This section describes the various possible electrical connections that can be made to sealed I/O modules of the **TSX IP67** family (**TSX EEF 08D2**, **TSX EEF 16D2**, **TSX ESF 08T22**, **TSX EMF 16DT2**).

What Is in This Section?

This section contains the following topics:

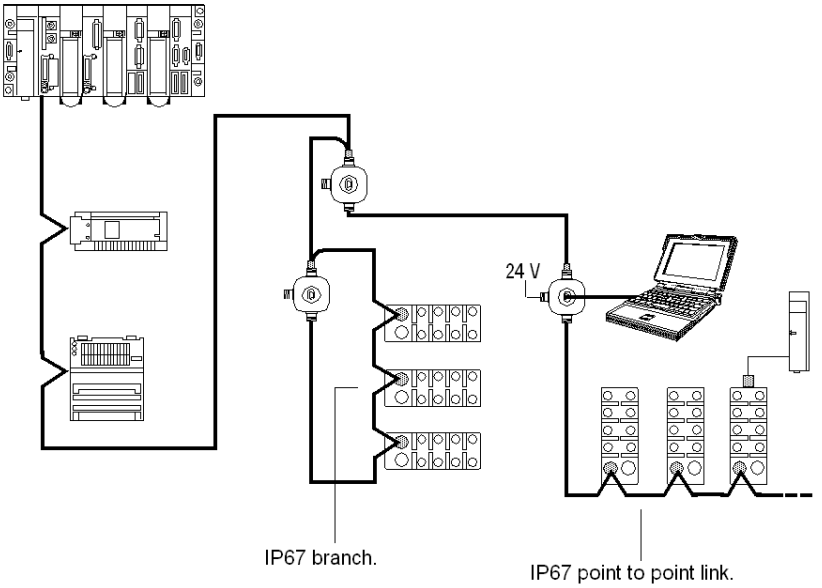
General connection principles

Introduction

Each of the four modules in the **TSX IP67** family can be connected to the Fipio bus by using a series of accessories including connectors, branch cables and boxes.

On account of the necessity of maintaining the level of protection of the whole unit, Schneider supplies the accessories necessary to conserve the IP67 protection rating.

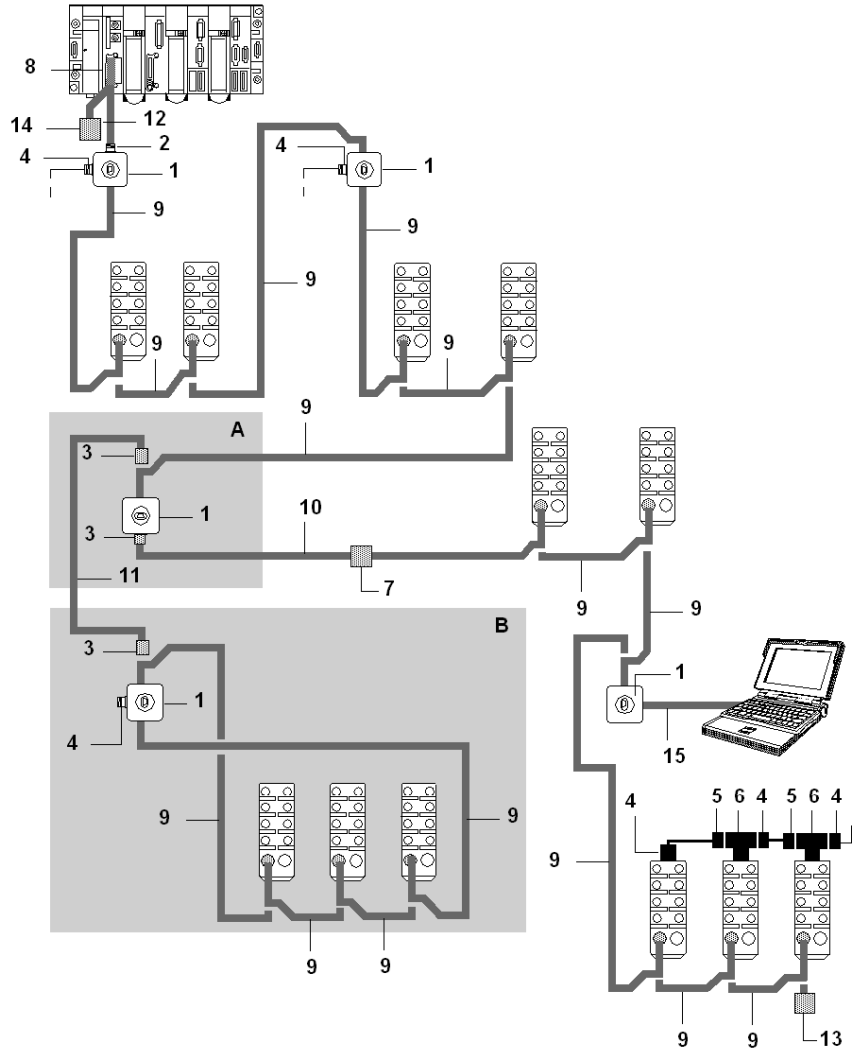
The modules are connected in accordance with the Fipio bus connection principles and enable point to point or branch connections to be used.



Accessories

Illustration

The diagram below shows the possible architectures which may be used to connect IP67 sealed I/O modules, as well as the accessories used, to the Fipio bus



A Branch head
B IP67 branch.

Description

The following table presents the various accessories that make it possible to assemble the desired configuration whilst observing all the operating constraints of the Fipio bus.

Number	Reference	Type of connection	Description
1	**TSX EF ACC 99**	Branch box.	This branch box can be used to perform 3 functions: ● connection of a 24 VDC power supply, ● creation of an IP67 branch, ● connection of a programming terminal.
2	**TSX EF CF 01**	IP67 female connector, type M23.	IP67 female solder connector with M23 type ring, 6 contacts for Fipio bus connection and 24 VDC power supply. This type of independent connector is designed to be fitted to one end of **TSX FP CA/CC/CP•00/CR** cables
3	**TSX EF CM 01**	IP67 male connector, type M23.	IP67 male solder connector with M23 type ring, 6 contacts for Fipio bus connection and 24 VDC power supply. This type of independent connector is designed to be fitted to one end of **TSX FP CA/CC/CP•00/CR** cables.
4	**TSX EF CF 03**	IP67 female connector, type 7/8" (24 VDC power supply).	7/8" type IP67 female screw connector, 5 contacts for connection of the 24 V power supply. This type of connector is designed to be used for connecting the 24 VDC power supply of **TSX ESF/EMF** output or mixed modules and/or of the **TSX EF ACC 99** branch box. The maximum authorized current for each contact on this connector is 8 A.
5	**TSX EF CM 03**	IP67 male connector, type 7/8" (24 VDC power supply).	7/8" type IP67 male screw connector, 5 contacts for linked connection using the **TSX EF CT 03** T connector, designed to supply the preactuators with 24 VDC.
6	**TSX EF CT 03**	T connector (for linking 24 VDC power supply).	7/8" type IP67 T connector, 5 contacts for linking the 24 V power supply of the preactuators. The maximum authorized current for each contact on this connector is 8 A.
7	**TSX EF CF 02**	IP67 female connector, type M23.	M23 type IP67 female threaded solder connector, 6 contacts for extending Fipio **TSX FP CA/CC/CP•00/CR** cables.
8	**TSX FP ACC 2** or **TSX FP ACC 12**	SUB-D 9 type female connector.	SUB-D type connectors with 9 contacts for Fipio/Fipway connection to PLCs. Can be used for linked or branched connection (90° high or low output, 45° high or low output).
9	**TSX EF ACC 2•••** and **TSX EF ACC 2••••**	IP67 compound-filled Fipio cable for linking of modules.	Main compound-filled cable of a predefined length, 150 Ω twisted shielded pair, and a 1.5 mm^2 power supply pair. Equipped with an M23 male connector and an M23 double female/female connector.
10	**TSX FP CP •00**	IP67 Fipio cable (1 cable pair, 2 1.5 mm^2 power supply conductors, in 100 m or 500 m).	Main IP67 Fipio cable, 150 Ω twisted shielded pair, and a 1.5 mm^2 power supply pair (Ø 9.5 mm). Free wire ends to be fitted with IP 67 M23 type **TSX EF CF 01/02** and **TSX EF CM 01** solder connectors.

Number	Reference	Type of connection	Description
11	**TSX FP CC •00**	Fipio branch cable (2 pairs, in 100 m or 500 m).	Branch cable, 150 Ω double shielded twisted pair (ÿ†8 mm) for standard environments and building interiors. Free wire ends to be fitted with IP67 M23 type **TSX CF 01/02** and **TSX CM 01** soldered connectors.
12	**TSX FP CA •00**	Fipio link cable (1 pair, in 100 m, 200 m or 500 m).	Main cable, one 150 Ω shielded twisted pair (ÿ†8 mm) for standard environments and building interiors. Free wire ends to be fitted with IP 67 M23 type **TSX EF CF 01/02** and **TSX EF CM 01** solder connectors.
13	**TSX EF ACC 7**	IP67 M23 type line terminator.	IP67 M23 type line terminator, to be positioned, depending on use, at one or both ends of the section (male type for direct connection).
14	**TSX FP ACC 7**	Line terminator	IP20 line terminator (batch of 2), to be positioned, depending on use, at one or both ends of the section.
15	**TSX FP CG 0•0**	PLC or programming terminal link cable	Branch connection cable for **TSX FPP 10/20 PCMCIA** interface card for Premium, FT 2000 terminal and PC-compatible PLCs. This cable allows a PLC or a programming terminal to be connected to a **TSX EF ACC 99** branch box.

Other accessories

The following table shows the other accessories available.

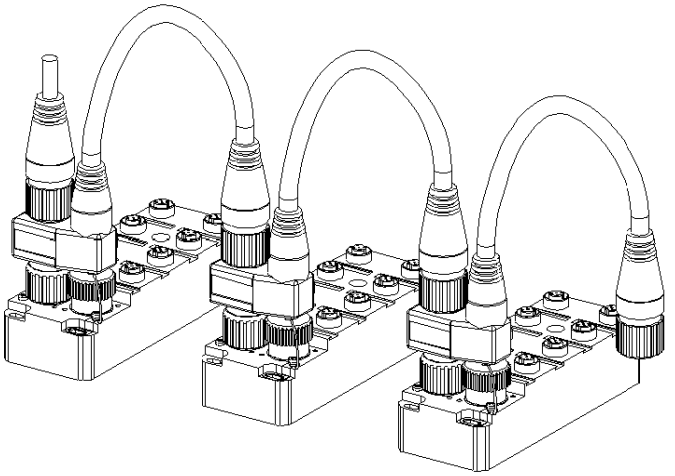
Reference	Type of connection	Description
XZ-LG 101	Identification labels.	Strip of 10 additional identification labels (a strip is already supplied with each module).
XZ-LG 102	IP67 sealing plugs	Batch of 10 M12 sealing plugs for unused I/O connectors. Each module is supplied with two plugs.
170 XTS 050 00	IP67 sealing plug.	Sealing plug for M23 connector.

Types of connection

Point to point connection of modules to power supply

A point to point connection allows IP67 modules to be connected together from a PLC.

The following figure shows the structure of this type of connection.

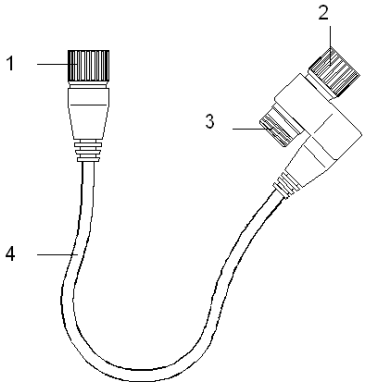


The cable which allows the IP67 modules to be linked up is a **TSX EF ACC 20** cable.

This cable has a compound-filled M23 connection system and ensures that the IP67 protection rating of the connection is maintained. It enables the modules to be supplied remotely and allows connection to the Fipio bus over distances of between 0.2 m and 25 m.

Illustration

The following figure shows a **TSX EF ACC 20** cable.



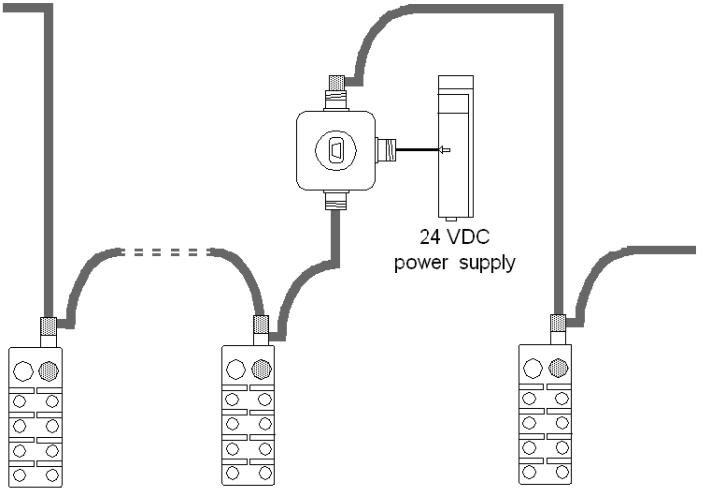
The various elements of the **TSX EF ACC 20** cable are described in the following table.

Number	Description	
1	Male IP 67 compound-filled connector with M23 type ring, 6 contacts for the Fipio connection to the previous module (or to the upstream branch box).	
2	Double compound-filled connector with:	a female IP67 connector, with M23 type ring, 6 contacts for connection to the module.
3		a female IP67 connector, with M23 type thread, 6 contacts for outgoing cable of the same type intended for connection to the next module (or to the downstream branch box).
4	A main cable, a 150 Ω shielded twisted pair and a 1.5 mm^2 24 VDC power supply pair, length 0.2, 1, 3, 7, 12 or 25 m (45 mm bending radius, ÿ†9.5 mm).	

Inserting a new power supply for IP67 modules and sensors

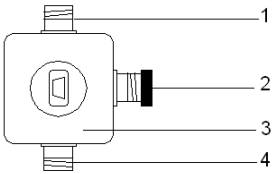
The power to the IP67 modules and sensors is supplied by the single cable linking the modules together (**TSX EF ACC 2•••**). For distance and consumption reasons, it may be necessary to power a group of IP67 modules with a second power supply.

In this case, a **TSX EF ACC 99** branch box can be used in the power supply insertion configuration, and the cabling diagram used shall be as follows:



Illustration

The following diagram shows the **TSX EF ACC 99** branch box.

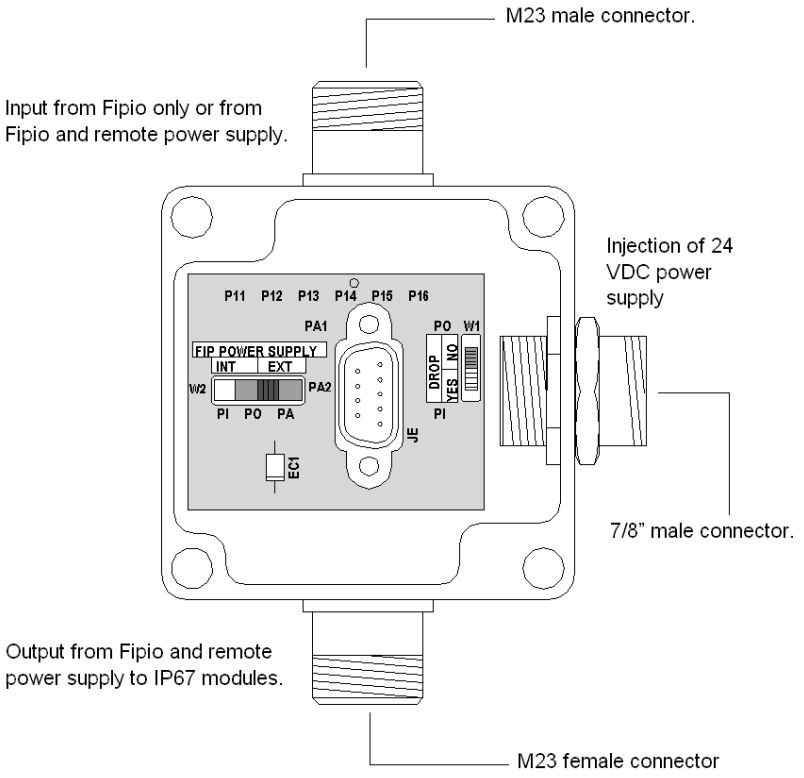


The various elements of the **TSX EF ACC 99** branch box are described in the following table.

Number	Description
1	An M23 type male screw connector for connection to the Fipio bus (input and output).
2	A 7/8" type male connector for the connection of a 24 V power supply to remote modules, equipped with a sealing plug.
3	An M23 type female connector for the connection of the Fipio bus (output) equipped with a sealing plug.
4	An access plug to the SUB-D 9 contact female connector for the connection to an operator terminal.

Configuration used

The configuration used for the **TSX EF ACC 99** branch box shall be as follows:



NOTE: When in use during power supply insertion, the **W1** switch must be set to **NO** (no branch) and the **W2** switch set to **"EXT"** (external power supply). The product is delivered in this configuration..

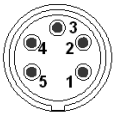
NOTE: Moreover, even if the input link of the bus carries a power supply, it is the external power supply that provides the power for the Fipio output as the two power supply systems are separate.

The following drawing shows the M23 male connector.

The following table describes the various contacts of the M23 male connector.

1	24 VDC.
2	D+ Fipio input.
3	0 VDC.
4	D- Fipio input.
5	D+ Fipio output
6	D- Fipio output

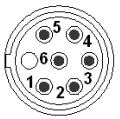
The following drawing shows the 7/8" male connector.



The following table describes the various contacts of the 7/8" male connector.

1	24 VDC.
2	nc.
3	Ground.
4	0 VDC.
5	nc.

The following drawing shows the M23 female connector.



The following table describes the various contacts of the M23 female connector.

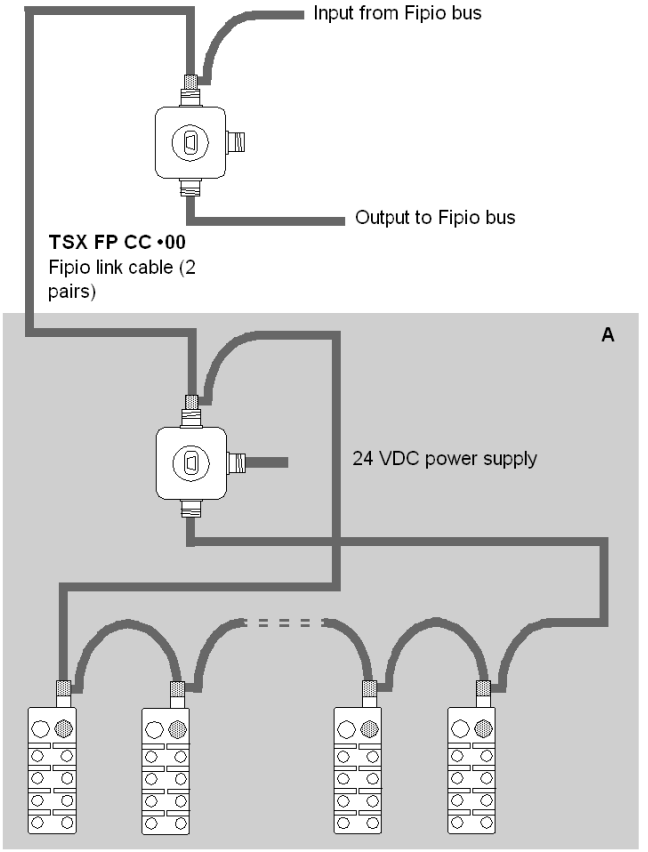
1	24 VDC.
2	D+ Fipio input.
3	0 VDC.
4	D- Fipio input.
5	nc.
6	nc.

Creating a branch

Structure of a branch:

Depending on the topology of the installation, a group of IP67 modules can be connected via a branch to the main installation.

The following drawing shows the structure of a branch.



A Branch.

The branch uses two **TSX EF ACC 99** branch boxes and must be powered locally.

The **TSX FP CC •00** branch cables ensure the go-between link of the Fipio bus, but not the remote-power supply.

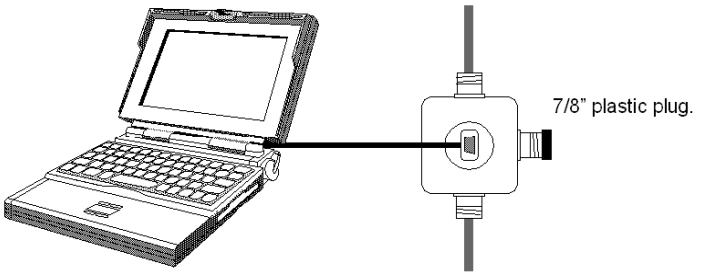
When in use, in the two branch boxes, the **W1** switches must be in the **YES** position (branch activated) and the **W2** switch of the box which is powered by a voltage of 24 VDC must be in the **EXT** position (external power supply).

Connecting a programming terminal

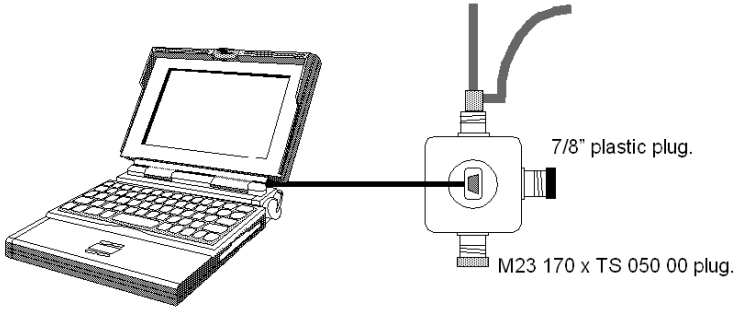
Connection

The **TSX EF ACC 99** branch box allows a link for a programming terminal to be added to any part of the installation.

The following drawing shows the insertion of a terminal link on the bus.



There is another possibility, but since the load in the Fipio bus is greater, this solution is only to be used in reduced topologies.



NOTE: For this type of use, in the branch box *(see page 26)* the **W1** switch must be set to **NO** (no branch) and the **W2** switch of the box which sets the branching to **INT** (uninterrupted power supply).

Section 2.2
Fipio addressing of sealed I/O modules

Fipio addressing of the modules

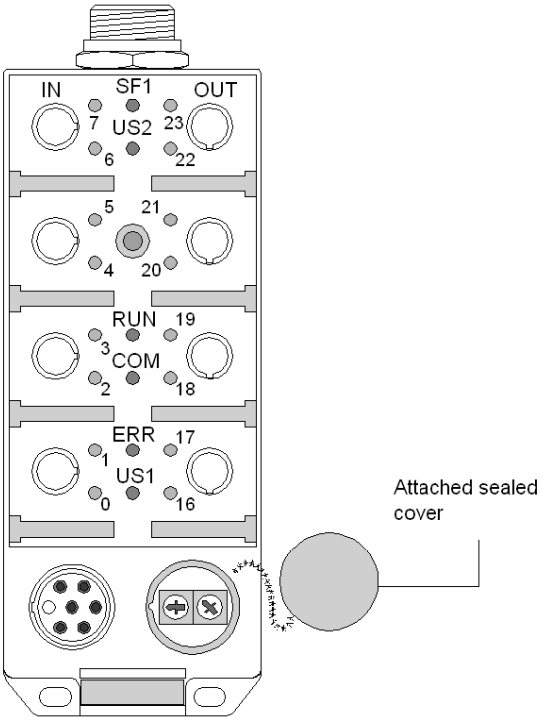
Introduction

The connection of the I/O modules of the IP67 family to the Fipio bus requires their address to be defined on the Fipio bus. This addressing must be carried out physically on the module using Unity Pro software (hardware configuration *(see page 99)* mode).

This addressing uses two thumbwheel switches and enables up to 98 I/O modules (1 to 62 and 64 to 99) to be connected to the bus.

Access to thumbwheels

The thumbwheels are protected in an M23 connector located to the bottom right of the module and the protective plug of the thumbwheels is attached to the module by a small chain.



Allocating the code

⚠WARNING

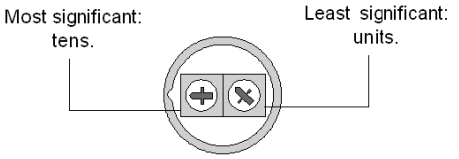
UNEXPECTED APPLICATION BEHAVIOR

Before changing module address, turn off the power supply and temporarily disconnect the Fipio bus connection to the module.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Address 0 is reserved for the Fipio bus controller and address 63 is reserved for the connection of the programming terminal.

The figure below shows the two thumbwheels when the plug has been removed:



The code is read directly, the most significant value (tens) is on the left and the least significant value (units) is on the right.

After changing the code, the plug must be screwed back in place correctly and the Fipio connection replaced to ensure that the module is sealed.

Section 2.3
Power supply for outputs

Subject of this Section

This section presents the methodology to be followed to power all IP67 module outputs.

What Is in This Section?

This section contains the following topics:

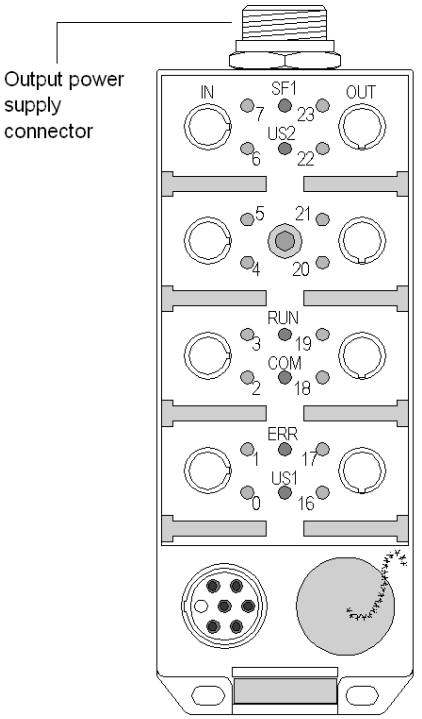
General

Introduction

The specific feature of the sealed I/O modules is that they allow the use of a remote-power supply. This means that the same cable transports the Fipio bus signals (1 pair) and the power supply of the modules and attached sensors (2 conductors).

The remote power supply does not involve the outputs, therefore power to the modules must be supplied using 24 VDC discrete outputs. Output modules: **TSX ESF 08T22** (8 outputs) and **TSX EMF 16DT2** (8 inputs and 8 outputs).

These modules have a connector specially designed for this purpose.



Output Power Supplies

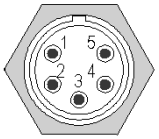
Introduction

Each module has a separate power supply for each group of 4 outputs.

Each of these power supplies is viewed using a module LED:

- **US1**: outputs 16, 17, 18, and 19,
- **US2**: outputs 20, 21, 22, and 23,

The connector used is a 7/8" male connector with the following pin configuration:



The following table describes the various contacts of the 7/8" male connector.

Number	Description
1	+24 VDC US1 power supply.
2	+24 VDC US2 power supply.
3	Ground.
4	0 VDC US1 power supply.
5	0 VDC US2 power supply.

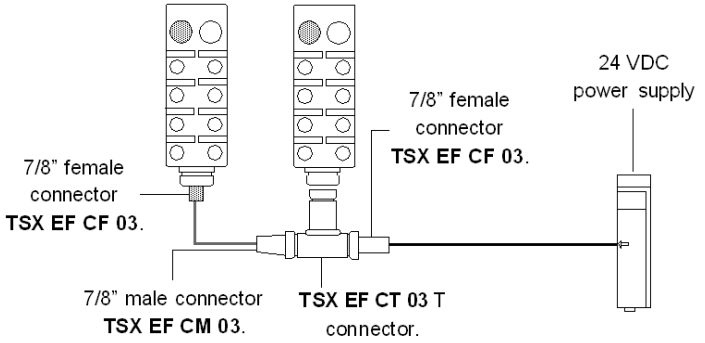
NOTE: A female connector with the reference number **TSX EF CF 03** can be used as a power supply cable.

Linking Several Modules

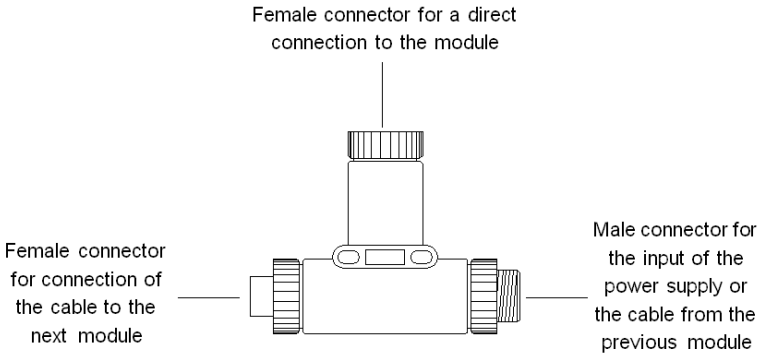
When several modules are to be linked, a T connection can be used to provide a power supply of 24 VDC to several modules.

This T connection is available under the reference number **TSX EF CT 03**.

It is used in the following configuration:

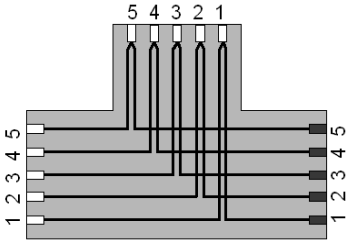


The following drawing shows the T connection **TSX EF CT 03**.



The T connector ensures the electrical continuity of the two power supplies with all links being point to point.

The following drawing shows the pin assignment for the T connection **TSX EF CT 03**.



The following table describes the various contacts of the T connector.

Number	Description
1	+24 VDC US1 power supply.
2	+24 VDC US2 power supply.
3	Ground.
4	0 VDC US1 power supply.
5	0 VDC US2 power supply.

Technical Specifications

These connectors and the T connector comply with the IP67 Protection rating and are compatible with a 12 mm cable with 1.5 mm^2 wires.

The connection is made by screw terminals and the maximum acceptable intensity is 8 Amperes at each connection point.

Section 2.4
Checking the power supply voltage of the IP67 sealed I/O modules

Subject of this Section

This section presents the methodology to be followed to check that the length of the power supply cabling enables enough voltage to be delivered to power all modules.

What Is in This Section?

This section contains the following topics:

General

Introduction

The specific feature of the sealed I/O modules is that they allow the use of a remote-power supply. This means that the same cable transports the Fipio bus signals (1 pair) and the power supply of the modules and attached sensors (2 wires).

This feature allows wiring to be simplified. However, a check must be made to ensure that the structure of the chosen connection enables all modules to function correctly.

The number of IP67 modules that can be connected depends on the length of the line, the gauge of the electrical wires of the power supply cable and the precision of the power supply.

Checking the power supply voltage

Introduction

The wiring check must ensure that the voltage of the module furthest away from the power supply source is not less than 19.2 V.

The consumption of the installation is due to the electricity supply to the modules and sensors.

Calculating the line loss

Line loss is calculated using the following values:

- consumption per module (130 mA), mean value using 2-wire sensor,
- cross-section of power supply wires 1.5 mm^2, (18 AWG gauge),
- the distribution of modules on the cable is taken to be uniform.

The following table outlines the calculation of line loss.

	Length (m)										
	10	**20**	**30**	**50**	**75**	**100**	**125**	**150**	**200**	**250**	**300**
Number of modules											
5	0.09	0.18	0.28	0.46	0.70	0.90	1.20	1.40	1.90	2.30	2.80
10	0.17	0.34	0.51	0.86	1.30	1.70	2.10	2.60	3.40	4.30	5.10
15	0.25	0.50	0.75	**1.25**	1.90	**2.50**	3.10	3.70	5.00	6.20	7.50
20	0.32	0.65	0.98	1.63	2.50	3.30	4.00	4.90	6.50	8.20	9.80
25	0.40	0.80	1.20	2.00	3.00	4.00	5.00	6.00	8.10	10.00	12.00
30	0.48	0.96	1.45	2.40	3.60	**4.80**	6.00	7.20	9.60	12.00	14.50

Examples

First example using the table.

24 VDC supplies power at +/- 3 %, the length of the bus is 100 m and 15 IP67 sealed I/O modules are used.

The voltage available in the last module shall be:

24 V - 3 % - (100 m and 15 modules = 2.5 V) = 20.78 V

Since the available voltage is greater than 19.2 V, a single power supply connected to the start of the bus can be used.

Second example using the table.

24 VDC supplies power at +/-5 %, the length of the bus is 100 m and 30 IP67 sealed I/O modules are used.

The voltage available at the last module shall be:

24 V - 5 % - (100 m and 30 modules = 4.8 V) = 18 V

Since the available voltage is less than 19.2 V, a second power supply must be inserted after 75 m using a **TSX EF ACC 99** connection box.

Using 3-wire sensors

The connection of 3-wire sensors increases energy consumption. Using the table given above, the line loss will be multiplied by a coefficient of 1.77.

Third example using the table.

24 VDC supplies power at +/-5 %, the length of the bus is 50 m and 15 IP67 sealed I/O modules are used.

The voltage available in the last module shall be:

24 V - 5 % - (50 m and 15 modules = 1.25 V * 1.77) = 20.58 V

Since the available voltage is greater than 19.2 V, a single power supply connected to the start of the bus can be used.

Section 2.5
Wiring and checking the length of the Fipio bus

Subject of this Section

This section presents the procedure to be to check that the length of the Fipio bus is compatible with the correct operation of the assembly.

What Is in This Section?

This section contains the following topics:

General

Introduction

The Fipio field bus is a standard field bus which allows a PLC to be connected to various other components of a control system (IP20 TBX modules and IP65 TBX modules, ATV and Momentum variable speed drives, Magelis terminals, etc.), including IP67 sealed I/O modules.

The Fipio field bus is made up of one or more sections interconnected by repeaters. The maximum length of a bus segment is 1000 m. The use of electrical or optical repeaters enables the length of the bus to be increased to 15 000 m.

Without repeaters, up to 31 IP67 sealed I/O modules can be connected with a remote-power supply over a maximum distance of 1000 m.

Using electrical or optical repeaters, it is possible to connect up to 98 IP67 sealed I/O modules over a maximum length of 15 000 m.

Types of connection

Devices may be connected to a segment:

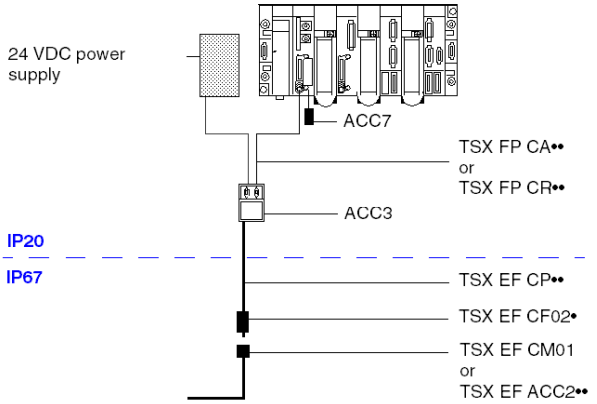
- by linking, each element is simply connected to the previous segment by the cable, this is the case for an electrical point-to-point link,
- by branching, each device is connected by branching on the main cable. A branch consisting of several devices can be created to control a geographically localized assembly,
- by a mixed topology which enables equipment to be connected by both linking and branching.

For all such cases, the length of each section must be checked to ensure that it is compatible with the correct operation of the assembly.

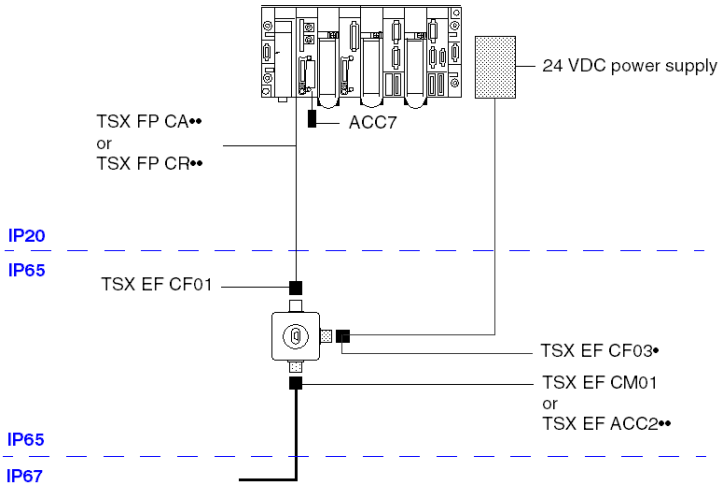
Start of Fipio network for IP67

Connection

The following diagram outlines the connection principle.



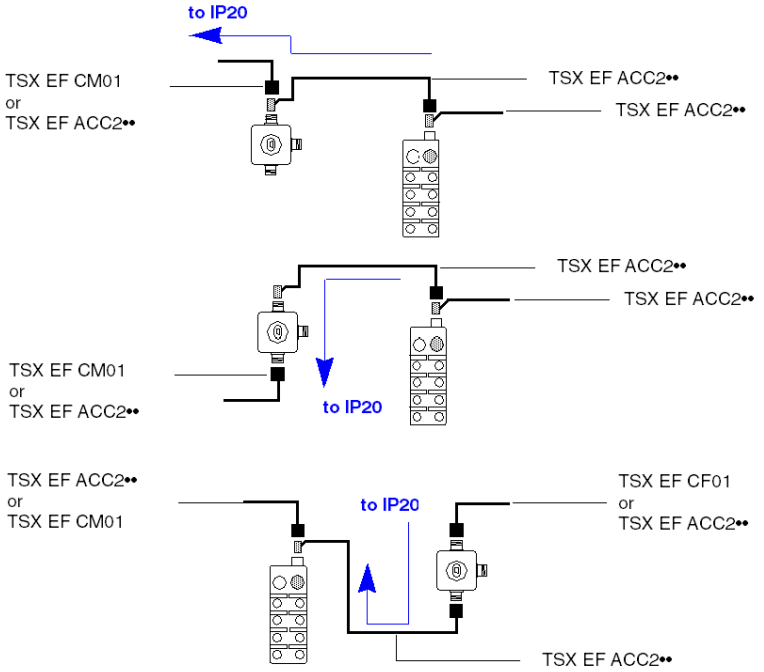
The following diagram outlines the connection principle.



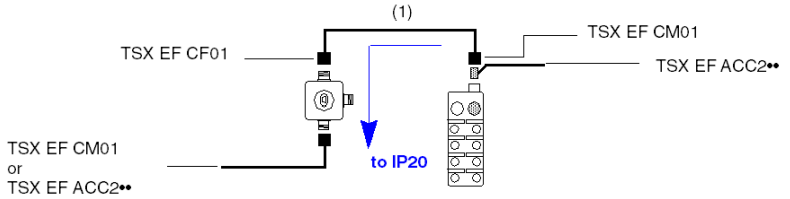
Link between the Fipio IP67 discrete I/O modules and the TSX EF ACC99 branch box

Connection

The following diagrams outline the connection principles for Fipio IP67 **TXS EF ACC2•••/••••** cables.



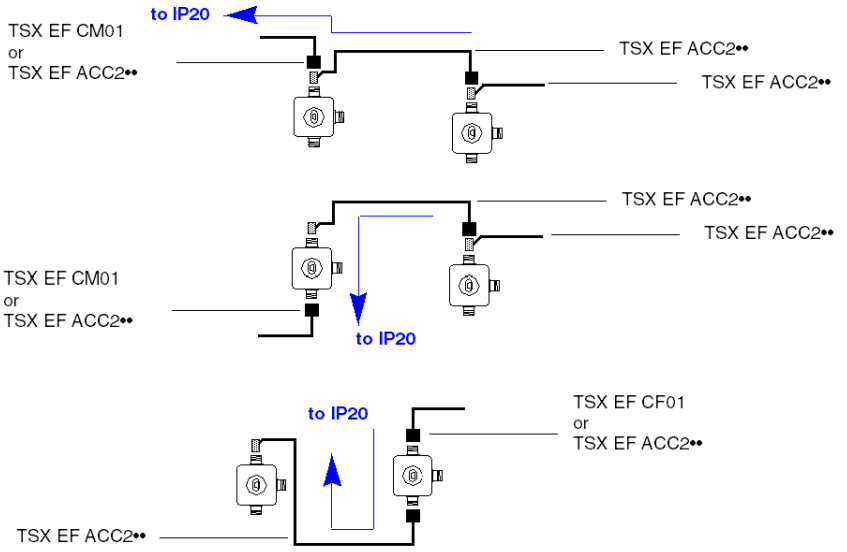
The following diagram outlines the connection principle with a user cable (1).



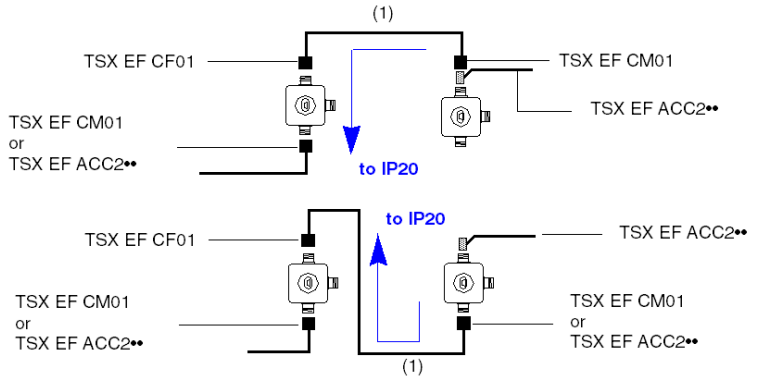
Link between two TSX EF ACC99 branch boxes

Connection

The following diagrams outline the connection principles for Fipio IP67 **TXS EF ACC2•••/••••** cables.



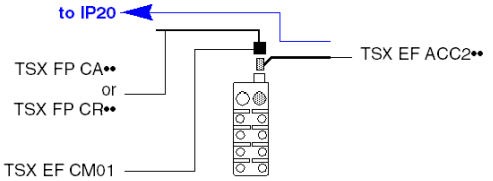
The following diagrams outline the connection principle for a user cable (1).



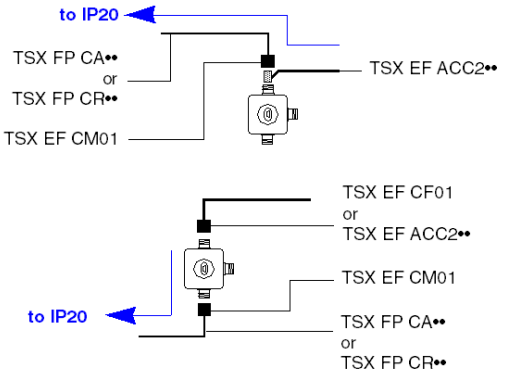
Insertion of IP20 modules

Connection

The following diagram outlines the connection principle for an IP67 module.



The following diagrams outline the connection principles for a **TSX EF ACC 99** branch box.



Checking principles

General

The check should be carried out for the total length of the Fipio bus. When using a **TSX EF ACC 99** connection box to form a branch, it must be remembered that the Fipio standard does not authorize an electrical branch and that the length of the **TSX FP CC •00** branch cable must be multiplied by 2.

The length of a section must never exceed 1000 m. If this is the case, a second section with an electrical or optical repeater must be used.

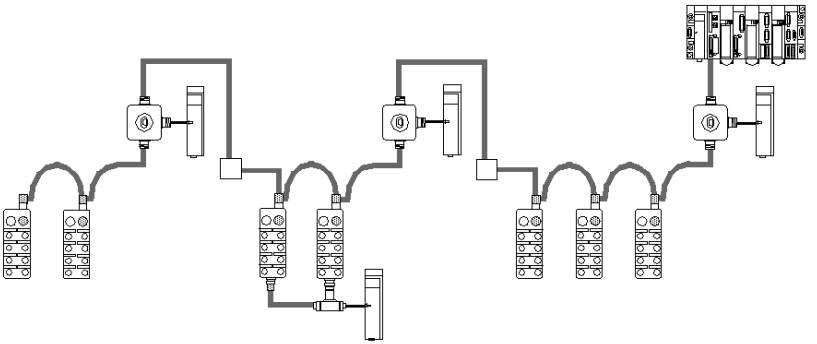
All information concerning the operating details of the Fipio *(see Premium and Atrium Using Unity Pro, Fipio Bus, Setup Manual)* field bus are available in the Fipio bus reference manual.

Connection by chaining

Introduction

To connect all the IP67 together, use the procedure of chaining directly from connection point to connection point.

The total length to be taken into consideration is the sum of the lengths of the different cables running from the PLC.



Where a single IP67 segment is used, each end of the segment must be connected to an end of line adaptor (**TSX EF ACC 7** for IP67 modules).

Connection by branching

Connection

The IP67 connection system enables a block of I/Os to be linked by branching of the main cable *(see page 28)*.

The total length to be taken into account here is the sum of the following distances:

- 2 times the length of the cable linking the two **TSX EF ACC 99** connection boxes,
- length from the connection box to the first module,
- connection length of the different modules,
- return to the connection box.

Section 2.6
Installation on the machine

Subject of this Section

This section presents the installation and attachment of IP67 modules and branch boxes on the machine frames.

What Is in This Section?

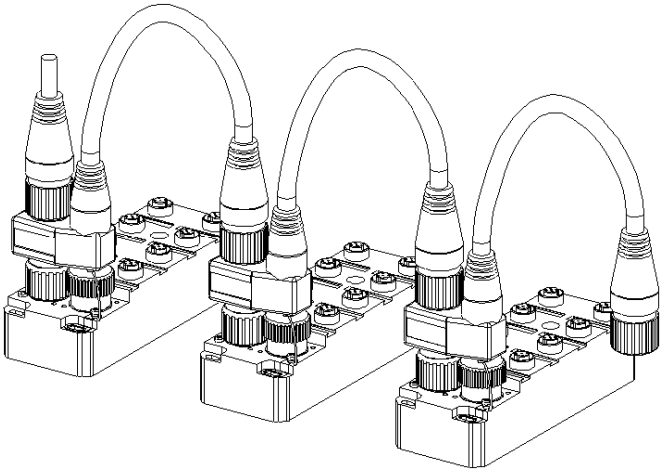
This section contains the following topics:

Installation principles

Introduction

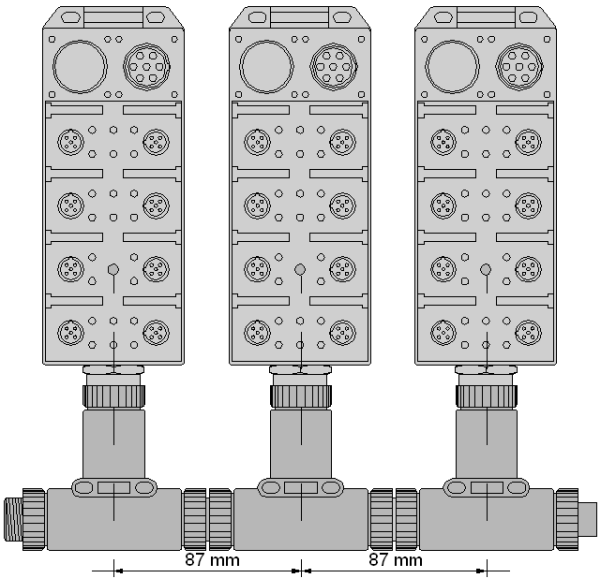
The IP67 modules are designed to be installed directly on the machine frames.

The input or output modules can be mounted side-by-side, whilst maintaining a distance of 87 mm between the axes of consecutive modules.



Installation

The use of a T connection for the output power supplies requires a minimum distance of 87 mm between two modules. This minimum distance is recommended in order to avoid mechanical stresses being exerted on the compound-filled cables.



The installation of the M12 connectors for the connection of sensors and preactuators is carried out as follows:

- the length of the **TSX EF ACC 2•••/••••** cables is that of the cable excluding connector,
- the maximum recommended distance between modules is the length of the **TSX EF ACC 2•••/••••** cables less 4 cm per bending radius at the M23 connectors (input and output of modules).

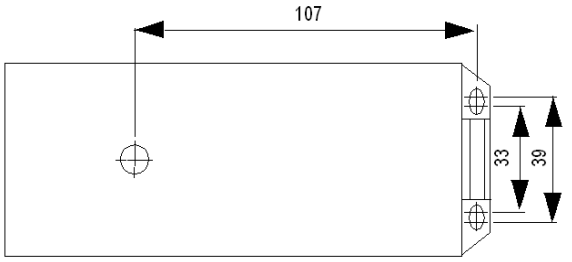
The following table shows the lengths available in IP67 cables.

Reference	Length of cable
TSX EF ACC 2002	0.2 m (-0 / +3 cm)
TSX EF ACC 2010	1 m (-0 / +3 cm)
TSX EF ACC 2030	3 m (-0 / +6 cm)
TSX EF ACC 2070	7 m (-0 / +6 cm)
TSX EF ACC 20120	12 m (-0 / +6 cm)
TSX EF ACC 20250	25 m (-0 / +6 cm)

Location of drill holes

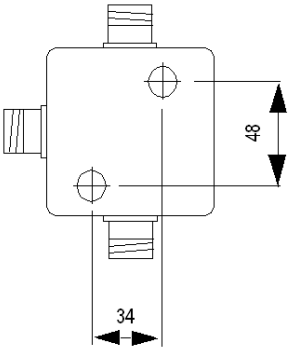
General

The IP67 modules are attached using 3 attachment holes positioned as follows:

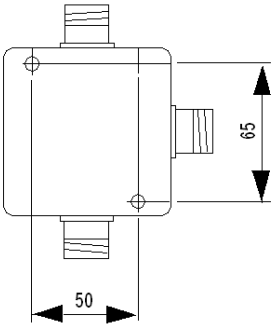


The **TSX EF ACC 99** branch box is attached using 2 attachment holes positioned as follows:

Rear attachment:
attachment to DIN rail.



Front attachment:
screw attachment.

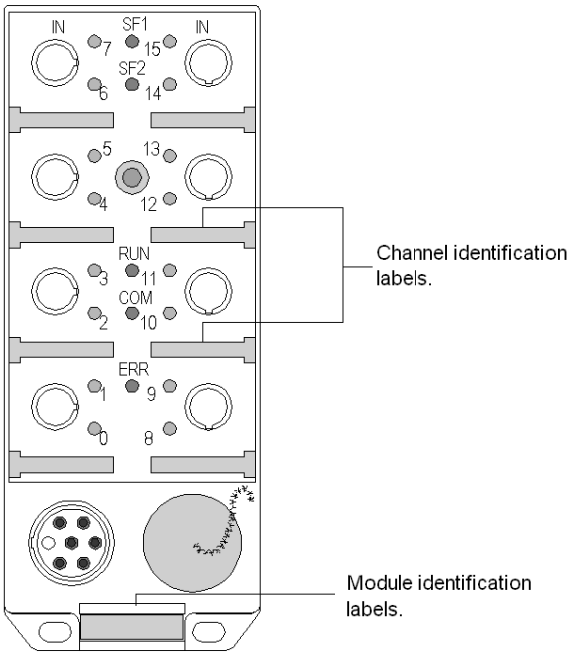


Identifying modules and I/Os

General

Each IP67 module and M12 connector for the connection of sensors and preactuators can be identified by a label positioned in the area designed for this purpose.

10 labels (**XG-LG101**) and two M12 shutters are supplied with each module.



Section 2.7
Overall dimensions

Subject of this Section

This section provides the overall dimensions of IP67 modules and branch boxes.

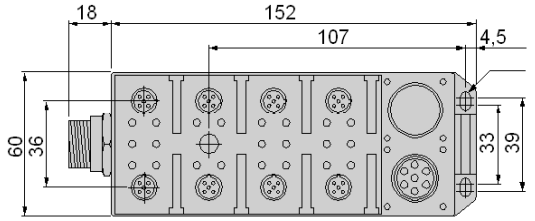
What Is in This Section?

This section contains the following topics:

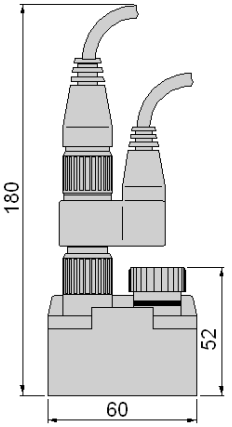
Dimensions of IP67 module

Module

The following drawing shows the horizontal dimensions of an IP67 module.



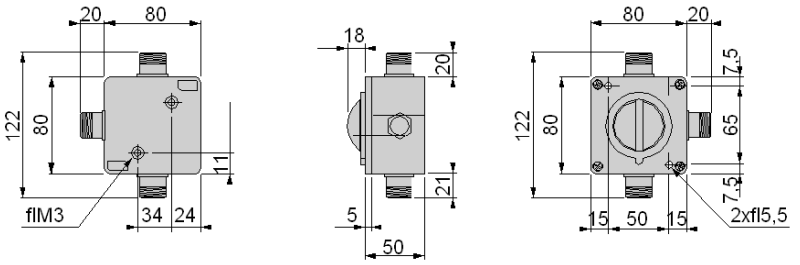
The following drawing shows the vertical dimensions of an IP67 module



Dimensions of branch box

Module

The following drawing shows the horizontal and vertical dimensions of a **TSX EF ACC 99** branch box.



Chapter 3
Fault diagnostics for sealed I/O modules

Subject of this Chapter

This chapter describes how the diagnostics LEDs for the IP67 family of sealed I/O modules work.

What Is in This Chapter?

This chapter contains the following topics:

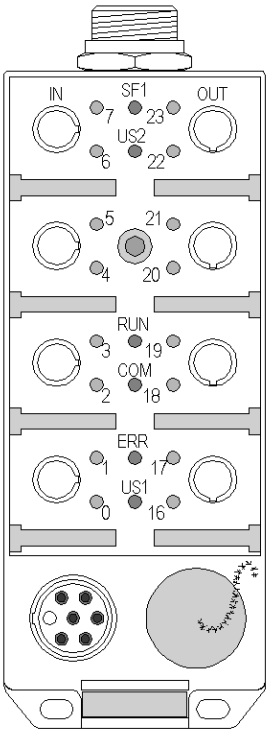
Interpretation of LEDs

Introduction

In the diagnostics phase, operating errors on the modules can be detected by looking at the status of the LED indicators on the front of the unit.

Operation

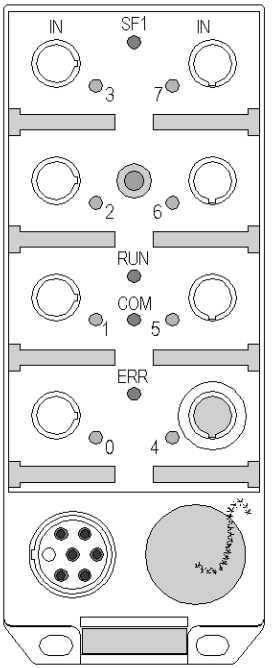
The following table describes how the **RUN**, **COM** and **ERR** LEDs of an IP67 module work.

LED	Color	Description	Illustration
RUN	Green	Module on: ● **off** if the device in not operational, ● **continuously on** if the device is operational, ● **flashing** if the Fipio link is faulty due to there being another module at the same address.	
COM	Yellow	Communication activity: ● **off** if there is no activity on the Fipio bus or if the Fipio link has been stopped, ● **flashing** during self-tests and during connection and initialization of the module, ● **flashing** if the Fipio exchange phase is in progress.	
ERR	Red	Module state: ● **off** when module is operating normally, ● **flashing** during self-tests and during connection and initialization of the module, ● **flashing** if the module is not logically connected to the Fipio network, ● **continuously on** in the event of a serious fault occurring which makes it necessary to replace the module.	

Interpretation of LEDs of TSX EEF 08D2 input module

Operation

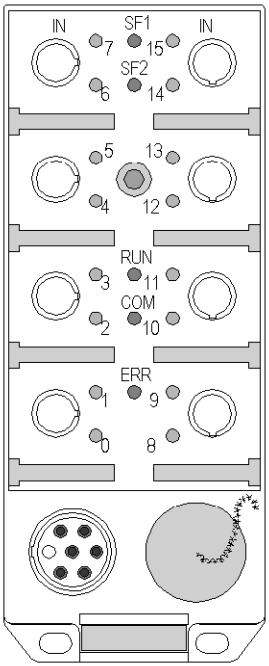
The following table describes how the LEDs of a **TSX EEF 08D2** module work.

LED	Function	Description	Illustration
0 to 7	State of inputs: inputs connected.	Green LED, the LED shows the state of the connected sensor.	
SF1	Power supply fault or overload.	Red LED, (on in the event of an error).	

Interpretation of LEDs of TSX EEF 16D2 input module

Operation

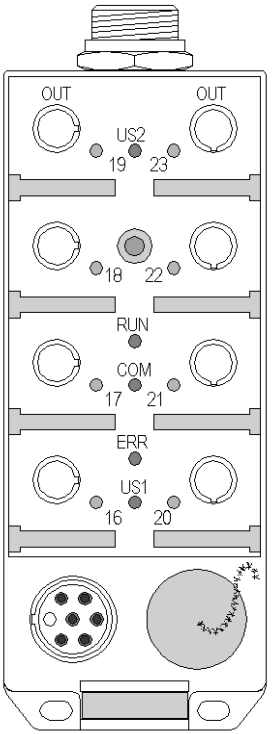
The following table describes how the LEDs of a **TSX EEF 16D2** module work.

LED	Function	Description	Illustration
0 to 15	State of inputs: inputs connected.	Green LED, the LED shows the state of the connected sensor.	
SF1	Power supply fault or overload (inputs 0 to 7).	Red LED (on in the event of an error).	
SF2	Power supply fault or overload (inputs 8 to 15).	Red LED (on in the event of an error).	

Interpretation of LEDs of TSX ESF 08T22 Output Module

Operation

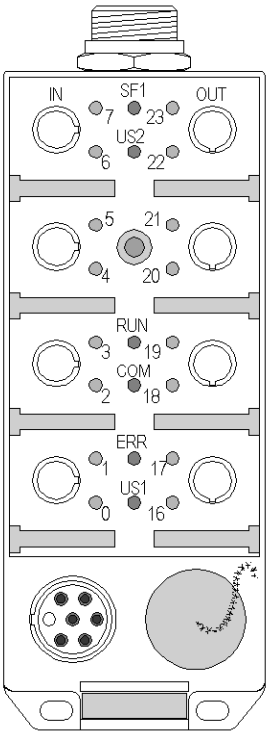
The following table describes how the LEDs of a **TSX ESF 08T22** module work.

LED	Function	Description	Illustration
16 to 23	State of outputs.	Two-color LEDs: ● green if the outputs are not faulty and if their monitoring function is activated, ● red if a short-circuit is detected.	
US1	Power supply for outputs 16 to 19.	Green LED for outputs (on if power supply is active).	
US2	Power supply for outputs 20 to 23.	Green LED for outputs (on if power supply is active).	

Interpretation of LEDs of TSX EMF 16DT2 mixed I/O module

Operation

The following table describes how the LEDs of a **TSX EMF 16DT2** module work.

LED	Function	Description	Illustration
0 to 7	State of inputs: inputs connected.	Green LED, the LED shows the state of the connected sensor.	
SF1	Power supply fault or overload.	Red LED, (on in the event of an error).	
16 to 23	State of outputs.	Two-color LEDs: ● green if the outputs are not faulty and if their monitoring function is activated, ● red if a short-circuit is detected.	
US1	Power supply for outputs 16 to 19.	Green LED (on if power supply is active).	
US2	Power supply for outputs 20 to 23.	Green LED (on if power supply is active).	

Chapter 4
TSX EEF 08D2 Sealed I/O module

Subject of this Chapter

This chapter presents the **TSX EEF 08D2** module, its characteristics and its connections for the different sensors.

What Is in This Chapter?

This chapter contains the following topics:

General

Introduction

Each IP67 module has 8 M12 connectors which are used to connect the sensors or actuators.

A label on the rear of the module shows how to connect all of these connectors.

NOTE: the label is not accessible on a mounted module.

The M23 connector is used for the remotely supplied Fipio bus.

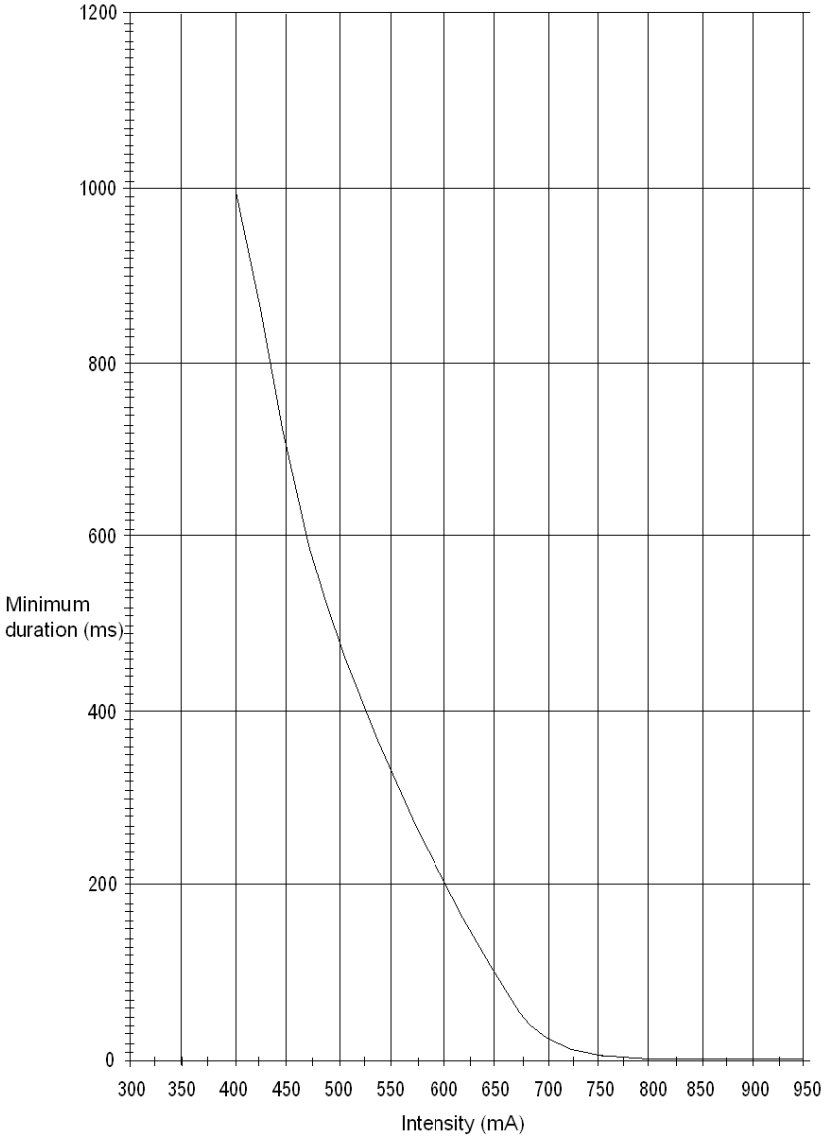
Electrical characteristics

Characteristics

The following table shows the electrical characteristics of the **TSX EEF 08D2** module.

TSX EEF 08D2		
Number of channels		8 inputs
IEC 1131-2 conformity		Yes, type 2
2-wire and 3-wire ddp compatibility		Yes
Nominal values (channels)	Voltage	24 VDC (positive logic)
	Current	7 mA
	Sensor supply (including ripple)	19.2 to 30 VDC
Max/min input values	Voltage at 0	< 5 V
	Voltage at 1	> 11 V
	Current at 0	< 2 mA at 11 V
	Current at 1	> 6 mA at 11 V
Built-in protection against short-circuits		350 mA per 4 channel group. Display for 8 channels: SF1
Standard response time	0 to 1	3.5 ms
	1 to 0	3.5 ms
Sensor power supply surveillance		between 14 and 18 Volts
Isolation	Between channels	no
	Between bus and internal logic	500 VAC
Module power consumption		80 mA with 5 inputs connected to 2 wire sensors (plus 10 mA per sensor input connected to each additional 2 wire sensor and plus 10 mA per 3 wire sensor used)

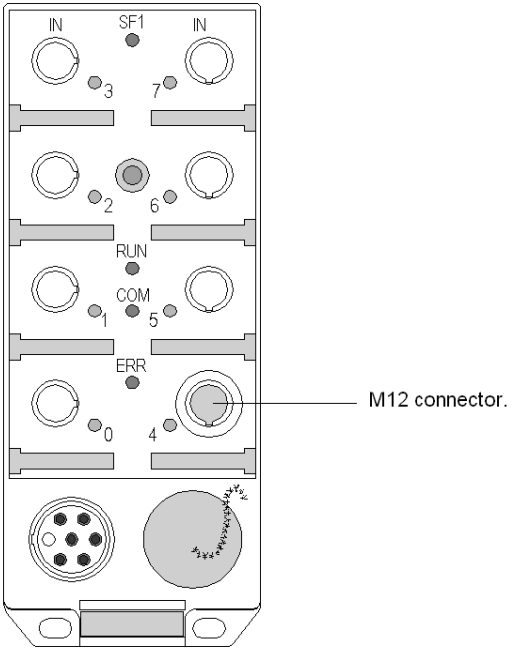
The following graph shows the standard response time for protection against short-circuits on sensor power supplies.



Connection of module inputs

Connection

Each of the inputs of the **TSX EEF 08D2** module uses an M12 connector (one input per connector).



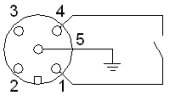
The following drawing shows the M12 connector.

The following table describes the function of each of the contacts of the M12 connector.

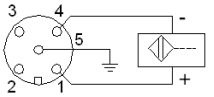
1	24 VDC.
2	nc.
3	0 VDC.
4	Sensor input.
5	Ground.

The following diagrams show the connections to the M12 connector.

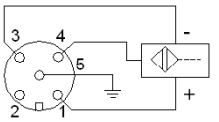
Mechanical contacts:



2-wire DDP:

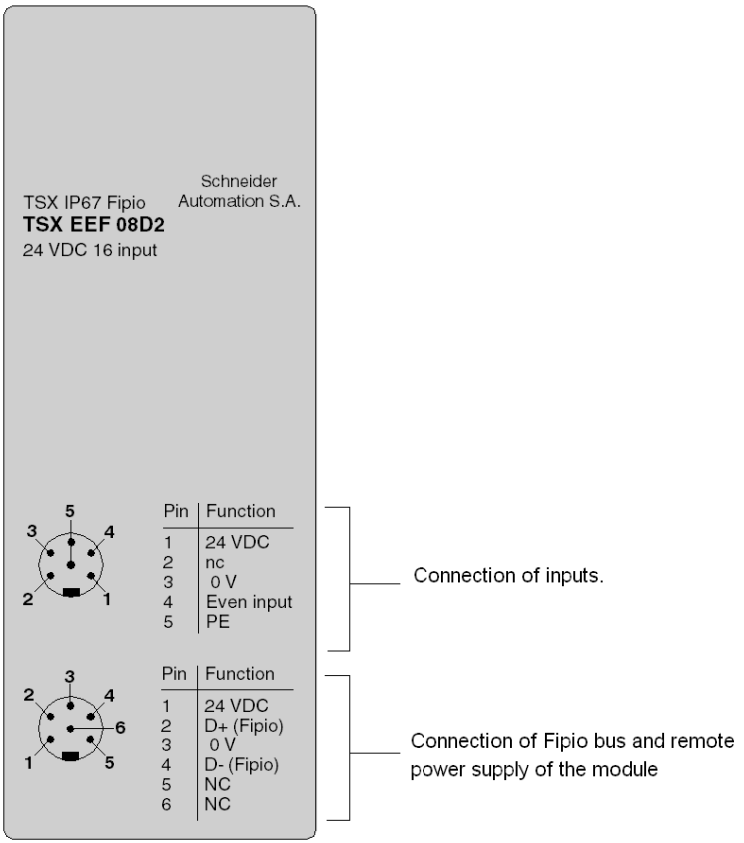


3-wire DDP:



Label

The following drawing shows the label on the rear of the **TSX EEF 08D2** module.



Chapter 5
TSX EEF 16D2 Sealed I/O module

Subject of this Chapter

This chapter presents the **TSX EEF 16D2** module, its characteristics and its connections for the different sensors.

What Is in This Chapter?

This chapter contains the following topics:

General

Introduction

Each IP67 module has 8 M12 connectors which are used to connect the sensors or actuators.

For the **TSX EEF 16D2** module with 16 inputs, an M12 connector is used for two outputs.

A label on the rear of the module shows how to connect all of these connectors.

NOTE: the label is not accessible on a mounted module.

The M23 connector is used for the remotely supplied Fipio bus.

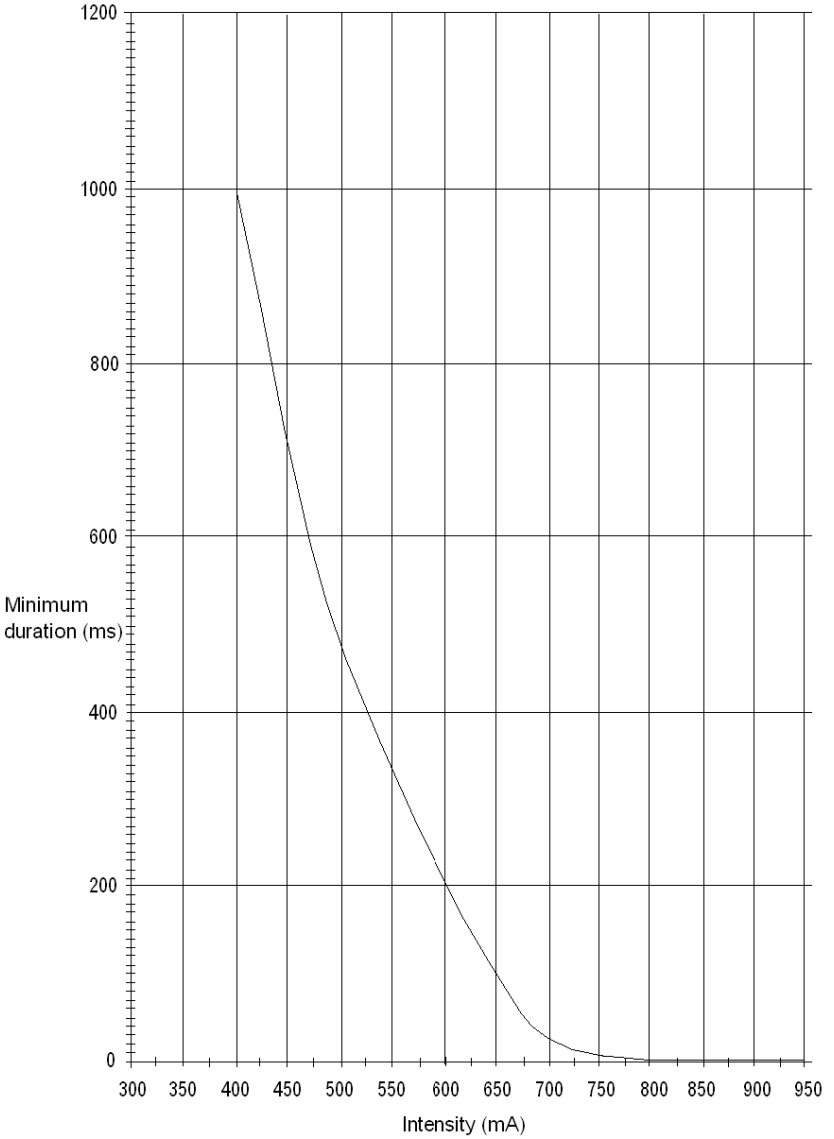
Electrical characteristics

Characteristics

The following table shows the electrical characteristics of the **TSX EEF 16D2** module.

TSX EEF 16D2		
Number of channels		16 inputs
IEC 1131-2 conformity		Yes, type 2
2-wire and 3-wire ddp compatibility		Yes
Nominal values (channels)	Voltage	24 VDC (positive logic)
	Current	7 mA
	Sensor supply (including ripple)	19.2 to 30 VDC
Max/min input values	Voltage at 0	< 5 V
	Voltage at 1	> 11 V
	Current at 0	< 2 mA at 11 V
	Current at 1	> 6 mA at 11 V
Built-in protection against short-circuits		350 mA per 4 channel group. Display per 8 channel group. ● SF1: channels 0 to 7, ● SF2: channels 8 to 15.
Standard response time	0 to 1	3.5 ms
	1 to 0	3.5 ms
Sensor power supply surveillance		between 14 and 18 Volts
Isolation	Between channels	no
	Between bus and internal logic	500 VAC
Module power consumption		130 mA with 10 inputs connected to 2 wire sensors (plus 10 mA per sensor input connected to each additional 2 wire sensor and plus 10 mA per 3 wire sensor used)

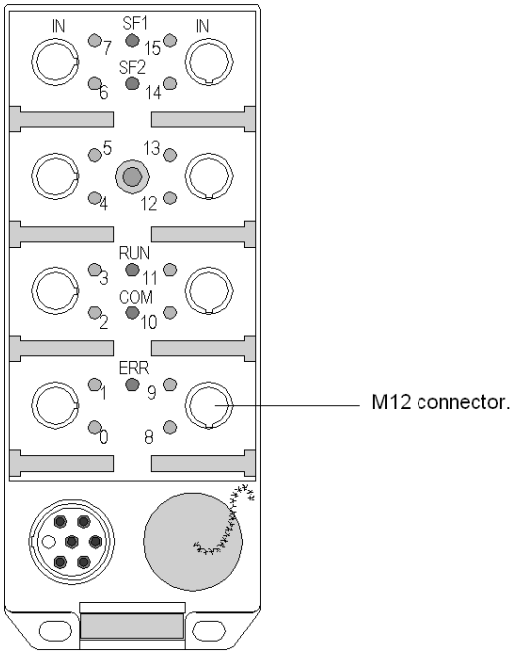
The following graph shows the standard response time for protection against short-circuits on sensor power supplies.



Connection of module inputs

Connection

Each group of two inputs of the **TSX EEF 16D2** module uses an M12 connector (two inputs per connector).



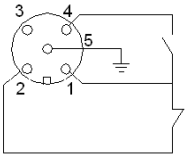
The following drawing shows the M12 connector.

The following table describes the function of each of the contacts of the M12 connector.

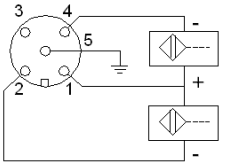
1	24VDC.
2	Odd sensor input.
3	0 VDC.
4	Even sensor input.
5	Ground.

The following diagrams show the connections to the M12 connector.

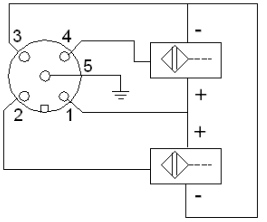
Mechanical contacts:



2-wire DDP:



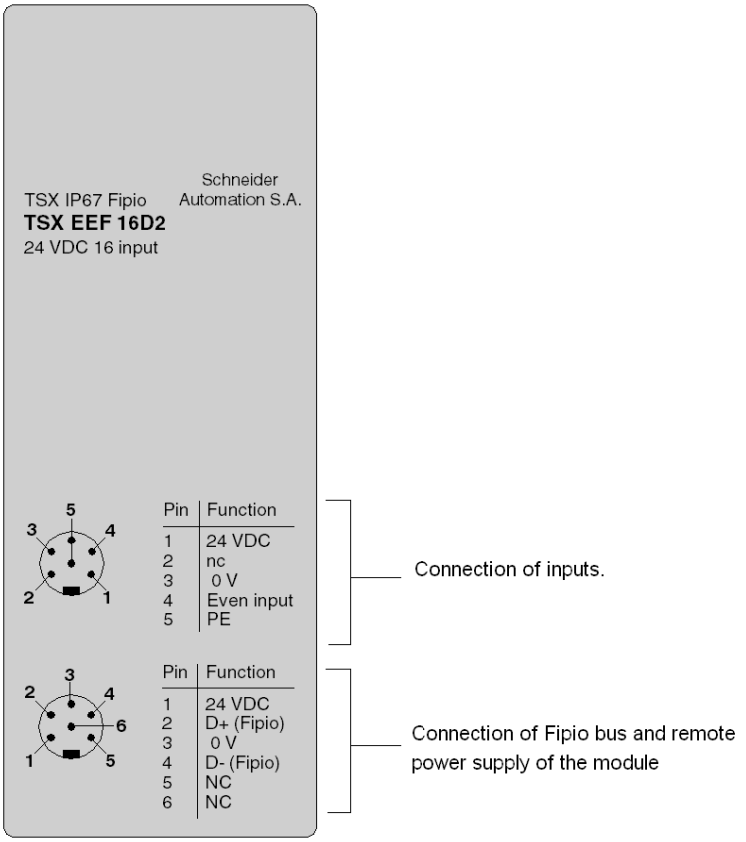
3-wire DDP:



NOTE: If SF1 and SF2 are both on, it is likely that the remote power supply is above the authorized threshold.

Label

The following drawing shows the label on the rear of the **TSX EEF 16D2** module.



Chapter 6
TSX ESF 08T22 Sealed I/O module

Subject of this Chapter

This chapter presents the **TSX ESF 08T22** module, its characteristics and its connections for the different sensors.

What Is in This Chapter?

This chapter contains the following topics:

General

Introduction

Each IP67 module has 8 M12 connectors which are used to connect the sensors or actuators.

In order for the outputs to operate correctly, they must be powered by a 24 VDC power supply.

A label on the rear of the module shows how to connect all of these connectors.

NOTE: the label is not accessible on a mounted module.

The M23 connector is used for the remotely supplied Fipio bus.

Electrical characteristics

Characteristics

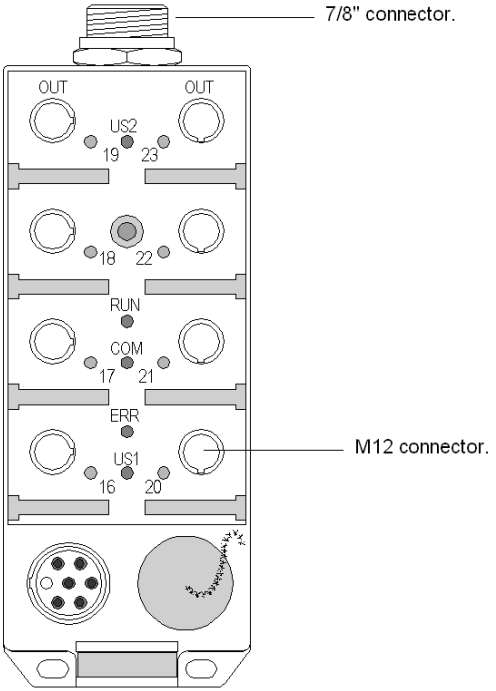
The following table shows the electrical characteristics of the **TSX ESF 08T22** module.

TSX ESF 08T22		
Type of output		static
Number of outputs		2 groups of 4
Nominal values	Voltage	24 VDC
	Current	2 A
Max/min output values	Voltage	19.2 to 30 VDC
	Maximum current per channel	2.5 A
	Current per 4 channel group at 40° C	8 A
	Current per 4 channel group at 60° C	4.8 A
Loss of current in state 0		< 1 mA
Drop-out voltage in state 1		< 0.5 V at 2 A
Standard response time in the module		< 0.5 ms (resistive load)
Preactuator power supply surveillance		between 14 and 18 Volts
Built-in protection	Against overvoltage	protection by transil diode
	Against short-circuits	4.5 A
	Against overloads	heat disjunction
Isolation	Between channels of the same group	no
	Between groups of channels	60 VAC
	Between groups of channels and internal logic	60 VAC
	Between bus and internal logic	500 VAC
Consumption		80 mA with 5 outputs at 1 (plus 10 mA per additional output at 1)

Connection of module outputs

Connection

Each output of the **TSX ESF 08T22** module uses an M12 connector (one output per connector).

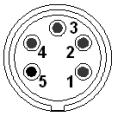


The following drawing shows the M12 connector.

The following table describes the function of each of the contacts of the M12 connector.

1	nc.
2	nc.
3	0 VDC.
4	2 A output.
5	Ground.

The following drawing shows the 7/8" connector.



The following table describes the various contacts of the 7/8" connector.

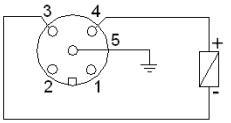
1	24 VDC (US1).
2	24 VDC (US2).
3	Ground.
4	0 V (US1).
5	0 V (US2).

For the outputs to operate correctly, the two 24 VDC power supplies (US1 and US2) shall be connected to the **TSX ESF 08T22** module via the output power supply connector:

- the outputs 16, 17, 18 and 19 are powered by the US1 power supply,
- the outputs 20, 21, 22 and 23 are powered by the US2 power supply.

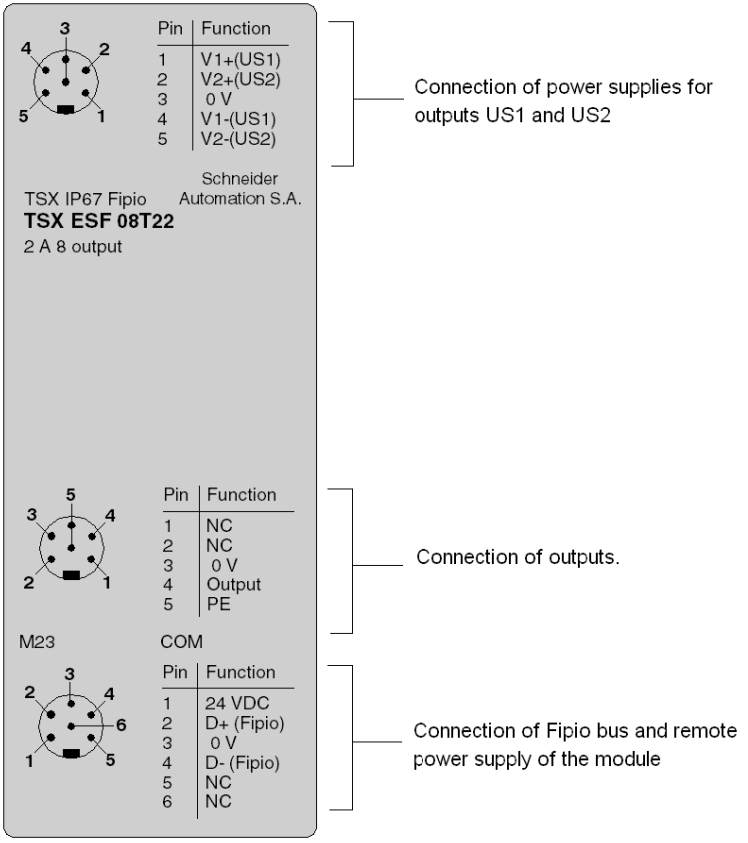
The following diagram shows the connection to the M12 connector.

Actuator:



Label

The following drawing shows the label on the rear of the **TSX ESF 08T22** module.



Chapter 7
TSX EMF 16DT2 Mixed sealed I/O module

Subject of this Chapter

This chapter presents the **TSX EMF 16DT2** module, its characteristics and its connections for the different sensors and actuators.

What Is in This Chapter?

This chapter contains the following topics:

General

Introduction

Each IP67 module has 8 M12 connectors which are used to connect the sensors or actuators.

In order for the outputs to operate correctly, they must be powered by a 24 VDC power supply.

A label on the rear of the module shows how to connect all of these connectors.

NOTE: the label is not accessible on a mounted module.

The M23 connector is used for the remotely supplied Fipio bus.

The 7/8" connector is attached to the power supply of the actuator.

Electrical characteristics

Characteristics

The following table shows the electrical characteristics of the inputs of the **TSX EMF 16DT2** module.

TSX EMF 16DT2		
Number of channels		8 inputs
IEC 1131-2 conformity		Yes, type 2
2-wire and 3-wire ddp compatibility		Yes
Nominal values (channels)	Voltage	24 VDC (positive logic)
	Current	7 mA
	Sensor supply (including ripple)	19.2 to 30 VDC
Max/min input values	Voltage at 0	< 5 V
	Voltage at 1	> 11 V
	Current at 0	< 2 mA at 11 V
	Current at 1	> 6 mA at 11 V
Built-in protection against short-circuits		350 mA per 4 channel group. Display for 8 channels: SF1.
Standard response time	0 to 1	3.5 ms
	1 to 0	3.5 ms
Sensor power supply surveillance		between 14 and 18 Volts
Isolation	Between channels	no
	Between bus and internal logic	500 VAC
Module power consumption		130 mA with 5 inputs connected to 2-wire sensors and 5 outputs at 1 (plus 10 mA per sensor input connected to each additional 2 wire sensor and plus 10 mA per 3 wire sensor used; plus 10 mA per additional output at 1).

Characteristics

The following table shows the electrical characteristics of the outputs of the **TSX EMF 16DT2** module.

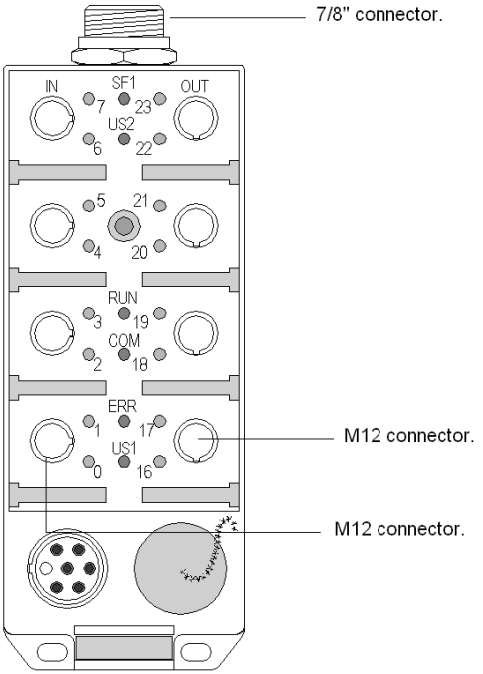
TSX EMF 16DT2		
Type of output		static
Number of outputs		8 (2 groups of 4)
Nominal values	Voltage	24 VDC
	Current	0.5 A

TSX EMF 16DT2		
Max/min output values	Voltage	19.2 to 30 VDC
	Maximum current per channel	0.625 A
	Current per 4 channel group at 40° C	2 A
	Current per 4 channel group at 60° C	1.2 A
Loss of current in state 0		< 1 mA
Drop-out voltage in state 1		< 0.5 V at 2 A
Standard response time in the module		< 0.5 ms (resistive load)
Preactuator power supply surveillance		between 14 and 18 Volts
Built-in protection	Against overvoltage	protection by transil diode
	Against short-circuits	1.5 A
	Against overloads	heat disjunction
Isolation	Between channels of the same group	no
	Between groups of channels	60 VAC
	Between groups of channels and internal logic	60 VAC
	Between input and output channels	60 VAC
	Between bus and internal logic	500 VAC
Consumption		130 mA with 5 inputs connected to 2 wire sensors and 5 outputs at 1 (plus 10 mA per sensor input connected to each additional 2 wire sensor and plus 10 mA per 3 wire sensor used; plus 10 mA per additional output at 1).

Connection of module inputs and outputs

Connection

Each group of two inputs or two outputs of the **TSX EMF 16DT2** module uses an M12 connector (two inputs or outputs per connector).



The following drawing shows the M12 connector (2 outputs).

The following table describes the function of each of the contacts of the M12 connector (2 outputs).

1	nc.
2	Odd output.
3	0 VDC.
4	Even output.
5	Ground.

The following drawing shows the M12 connector (2 inputs).

The following table describes the function of each of the contacts of the M12 connector (2 inputs).

1	24 VDC.
2	Odd sensor input.
3	0 VDC.
4	Even sensor input.
5	Ground.

The following drawing shows the 7/8" connector.

The following table describes the various contacts of the 7/8" connector.

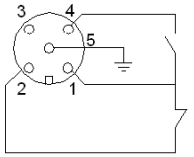
1	24 VDC (US1).
2	24 VDC (US2).
3	Ground.
4	0 V (US1).
5	0 V (US2).

For the outputs to operate correctly, the two 24 VDC power supplies (US1 and US2) shall be connected to the **TSX EMF 16DT2** module via the output power supply connector.

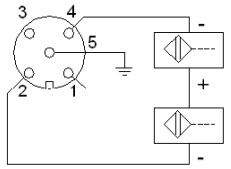
- the outputs 16, 17, 18 and 19 are powered by US1,
- the outputs 20, 21, 22 and 23 are powered by US2.

The following diagrams show the connections to the M12 connector.

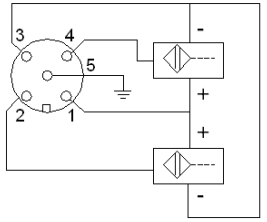
Mechanical contacts:



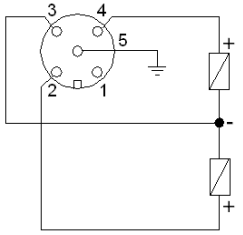
2-wire DDP:



3-wire DDP:

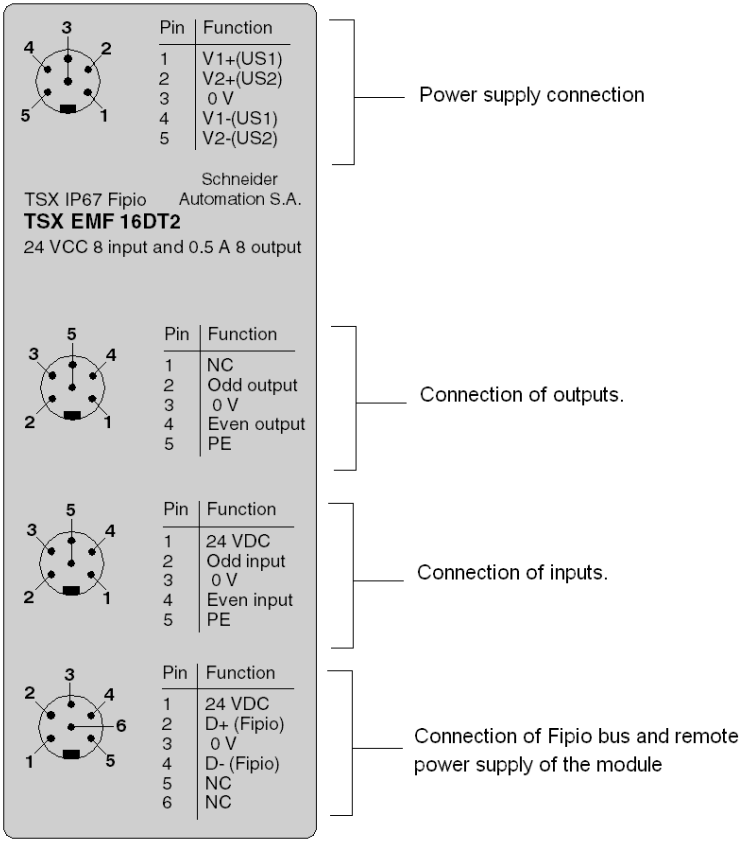


Actuator:



Label

The following drawing shows the label on the rear of the **TSX EMF 16DT2** module.



Part II
Software installation for IP67 Sealed I/O Modules

Subject of this Part

This part describes the installation of IP67 sealed input/output modules with Unity Pro software.

What Is in This Part?

This part contains the following chapters:

Chapter 8
General Introduction to the Discrete Application - Specific Function Applied to IP67 Sealed Modules

Overview

Introduction

The software installation for the modules is carried out from the various Unity Pro editors:

- In offline mode,
- In online mode.

The following order of installation phases is recommended but it is possible to change the order of certain phases (for example, starting with the configuration phase).

Installation Phases with Processor

The following table shows the various phases of installation with the processor.

Phase	Description	Mode
Declaration of variables	Declaration of IODDT-type variables for the application-specific modules and variables of the project.	Offline (1)
Programming	Project programming.	Offline (1)
Configuration	Declaration of modules.	Offline
	Module channel configuration.	
	Entry of configuration parameters.	
Association	Association of IODDTs with the channels configured (variable editor).	Offline (1)
Generation	Project generation (analysis and editing of links).	Offline
Transfer	Transfer project to PLC.	Online
Adjustment / Debugging	Project debugging from debug screens, animation tables.	Online
	Modifying the program and adjustment parameters.	
Documentation	Building documentation file and printing miscellaneous information relating to the project.	Online (1)

Phase	Description	Mode
Operation/Diagnostic	Displaying miscellaneous information necessary for supervisory control of the project.	Online
	Diagnostic of project and modules.	
Key:		
(1)	These various phases can also be performed in the other mode.	

Chapter 9
Discrete Application Configuration

Subject of this Chapter

This chapter describes the Configuration aspect of the installation of the discrete application applied to IP67 sealed modules.

What Is in This Chapter?

This chapter contains the following sections:

Section 9.1
Configuration of an IP67 Input/Output Module: General

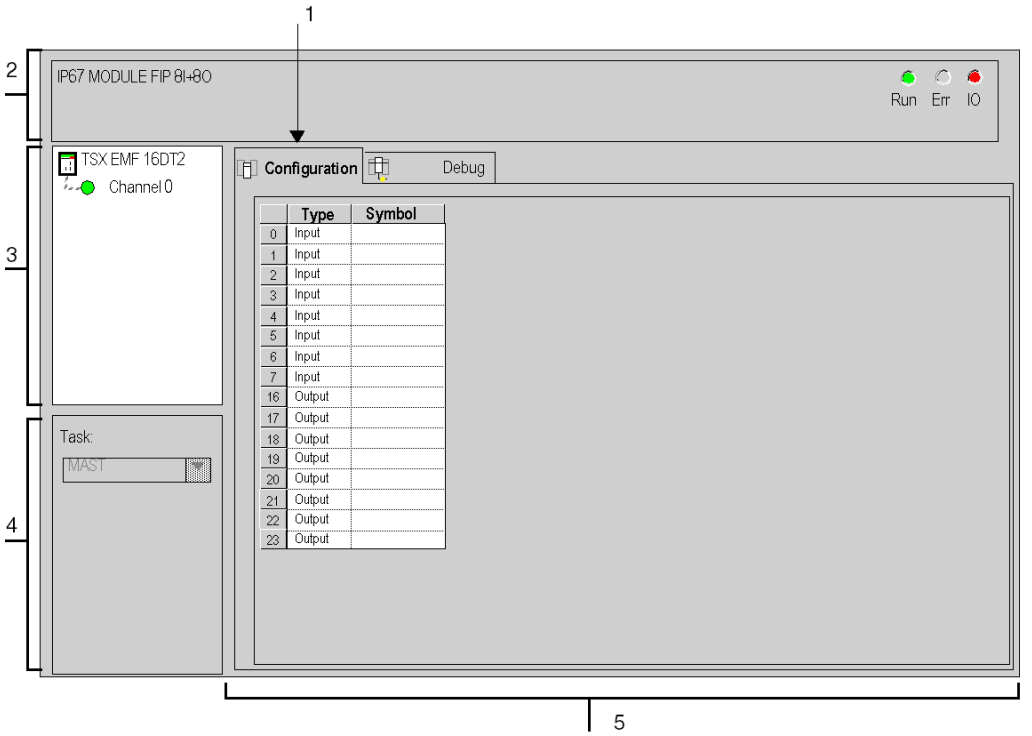
Description of the Discrete Remote Module Configuration Screen

At a Glance

The module configuration screen, selected on the Fipio bus, displays the parameters associated with the Discrete IP67 input or output channels

Illustration

The figure below represents a configuration screen.



Description

The following table shows the various elements of the configuration screen and their functions.

Number	Element	Function
1	Tabs	The tab in the foreground indicates the mode in progress (**Configuration** in this example). Every mode can be selected using the respective tab. The available modes are: ● **Configuration**, ● **Debug** which can be accessed only in online mode,
2	**Module** area	Gives a reminder of the device's shortened name.

3	**Channel** area	Is used:
		● By clicking on the reference number, to display the tabs:
		  ● **Description** which gives the characteristics of the device.
		  ● **I/O Objects** *(see Unity Pro, Operating Modes)* which is used to presymbolize the input/output objects.
		  ● **Fault**, which shows the device faults (in online mode only).
		● By clicking on the **Channel**, to select the group of channels (maximum 16) to configure.
		To the right of the **Channel** is the **Symbol**. This is the name of the channel defined by the user (using the variable editor).

4	**General parameters** area	This area is used to define the task (**MAST** or **FAST**) in which the channel implicit exchange objects will be exchanged.
5	**Configuration** area	The **Type** column displays the Input or Output type associated with the channel. The **Symbol** column displays the symbol associated with the input or output when it has been defined by the user (using the variable editor).

Section 9.2
IP67 Sealed Input/Output Channel Parameters

Subject of this Section

This section introduces the different input and output channel parameters of IP67 sealed input/output modules.

What Is in This Section?

This section contains the following topics:

Parameters of IP67 Discrete Remote Inputs on Fipio Bus

At a Glance

Discrete IP67 input modules on Fipio buses have the following parameters for all channels.

Parameters

The table below shows the parameters available for each IP67 discrete input module.

Module reference	No. of inputs	Associated task (for the module)
TSX EEF 08D2	8	**Mast** / Fast
TSX EEF 16D2	16	**Mast** / Fast
TSX EMF 16DT2	8 (inputs)	**Mast** / Fast

NOTE: Parameters in bold correspond to the parameters configured by default.

Parameters of IP67 Discrete Remote Outputs on Fipio Bus

At a Glance

Discrete IP67 output modules on Fipio buses have the following parameters for all channels.

Parameters

The table below shows the parameters available for each IP67 discrete output module.

Module reference	No. of inputs	Associated task (for the module)
TSX EMF 16DT2	8 (outputs)	**Mast** / Fast
TSX ESF 08T22	8	**Mast** / Fast

NOTE: Parameters in bold correspond to the parameters configured by default.

Section 9.3
Configuration of Discrete Module Parameters

How to Modify the Task Parameter of an IP67 Discrete Module

At a Glance

This parameter defines the processor task in which inputs are acquired and outputs are updated.

The task is defined for all channels.

The possible choices are as follows:

- the **MAST** task,
- the **FAST** task.

NOTE: This parameter can only be modified in offline mode.

Procedure

The table below shows the procedure for defining the type of task assigned to the channels of a module.

Step	Action
1	Access the hardware configuration screen of the required module.
2	In the **General parameters** area, click on the drop-down menu button in the **Task** field. **Result:** a drop-down list appears. 
3	Select the required task.

Chapter 10
Presentation of Discrete Application Language Objects

Subject of this Chapter

This chapter describes the language objects associated with the Discrete application using different IODDTs.

What Is in This Chapter?

This chapter contains the following sections:

Section 10.1
IP67 Sealed Input/Output Module Language Objects and IODDTs

Subject of this Section

This section presents general information about language objects and IODDTs of IP67 sealed modules.

What Is in This Section?

This section contains the following topics:

Presentation of Language Objects of the Discrete Application Function Associated with IP67 Sealed Modules on a Fipio Bus

General

Discrete modules have different associated IODDTs.

The IODDTs are predefined by the manufacturer. They contain input/output language objects belonging to a channel of an application-specific module.

NOTE: IODDT variables may be created in two ways:

- Using the **I/O objects** *(see Unity Pro, Operating Modes)* tab,
- Using the Data Editor *(see Unity Pro, Operating Modes)*.

There are several types of IODDT for remote IP67 sealed input/output modules on a Fipio bus:

- `T_DIS_IN_GEN`,
- `T_DIS_IN_FIP_STD`,
- `T_DIS_OUT_GEN`,
- `T_DIS_OUT_IP67_STD`

Likewise, there are several IODDT types for the following modules:

- TSX ESF 08T22 *(see page 126)*
- TSX EMF 16DT2 *(see page 128)*

Language Object Types

Each IODDT contains a group of language objects that are used to control them and check their operation.

There are two types of language objects:

- **Implicit exchange objects**, which are automatically exchanged on each cycle of the task associated with the module,
- **Explicit exchange objects**, which are exchanged when requested to do so by the project, using explicit exchange instructions.

Implicit exchanges concern the module inputs/outputs: process value results, information and commands.

Explicit exchanges are used for setting module parameters and for diagnostics.

Implicit Exchange Language Objects Associated with the Application-Specific Function

At a Glance

An integrated application-specific interface or the addition of a module automatically enhances the language objects application used to program this interface or module.

These objects correspond to the input/output images and software data of the module or integrated application-specific interface.

Reminders

The module inputs (`%I` and `%IW`) are updated in the PLC memory at the start of the task, the PLC being in RUN or STOP mode.

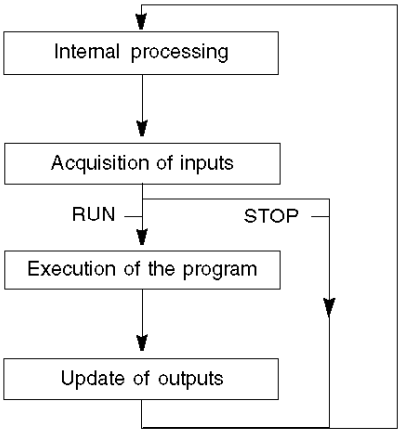
The outputs (`%Q` and `%QW`) are updated at the end of the task, only when the PLC is in RUN mode.

NOTE: When the task occurs in STOP mode, either of the following are possible, depending on the configuration selected:

- outputs are set to fallback position (fallback mode)
- outputs are maintained at their last value (maintain mode)

Figure

The following diagram shows the operating cycle of a PLC task (cyclical execution).



Explicit Exchange Language Objects Associated with the Application-Specific Function

At a Glance

Explicit exchanges are exchanges performed at the user program's request, and using instructions:

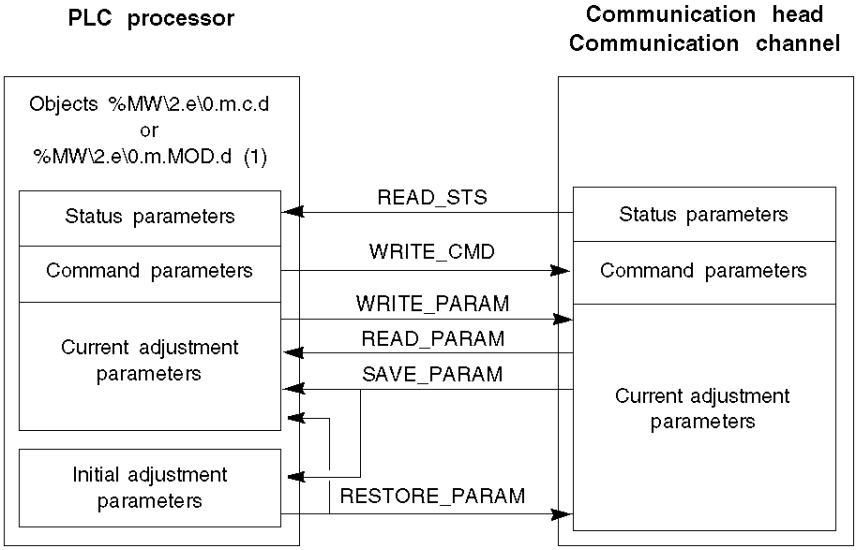
- READ_STS *(see Unity Pro, I/O Management, Block Library)* (read status words)
- WRITE_CMD *(see Unity Pro, I/O Management, Block Library)* (write command words)
- WRITE_PARAM *(see Unity Pro, I/O Management, Block Library)* (write adjustment parameters)
- READ_PARAM *(see Unity Pro, I/O Management, Block Library)* (read adjustment parameters)
- SAVE_PARAM *(see Unity Pro, I/O Management, Block Library)* (save adjustment parameters)
- RESTORE_PARAM *(see Unity Pro, I/O Management, Block Library)* (restore adjustment parameters)

These exchanges apply to a set of %MW objects of the same type (status, commands or parameters) that belong to a channel.

NOTE: These objects provide information about the module (e.g., type of channel fault, etc.), and are used to control the modules and to define their operating modes (saving and restoring currently applied adjustment parameters).

General Principle For Using Explicit Instructions

The diagram below shows the different types of explicit exchanges that can be made between the processor and module.



(1) Only with the instructions READ_STS and WRITE_CMD.

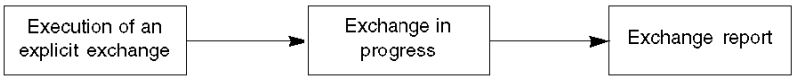
Managing exchanges

During an explicit exchange, it is necessary to check its performance in order that data is only taken into account when the exchange has been correctly executed.

To do this, two types of information are available:

- information concerning the exchange in progress *(see page 115)*
- the exchange report *(see page 116)*

The following diagram describes the management principle for an exchange:



NOTE: In order to avoid several simultaneous explicit exchanges for the same channel, it is necessary to test the value of the word EXCH_STS (`%MWr.m.c.0`) of the IODDT associated to the channel before to call any EF using this channel.

Management of Exchanges and Reports with Explicit Objects

At a Glance

When data is exchanged between the PCL memory and the module, the module may require several task cycles to acknowledge this information. All IODDTs use two words to manage exchanges:

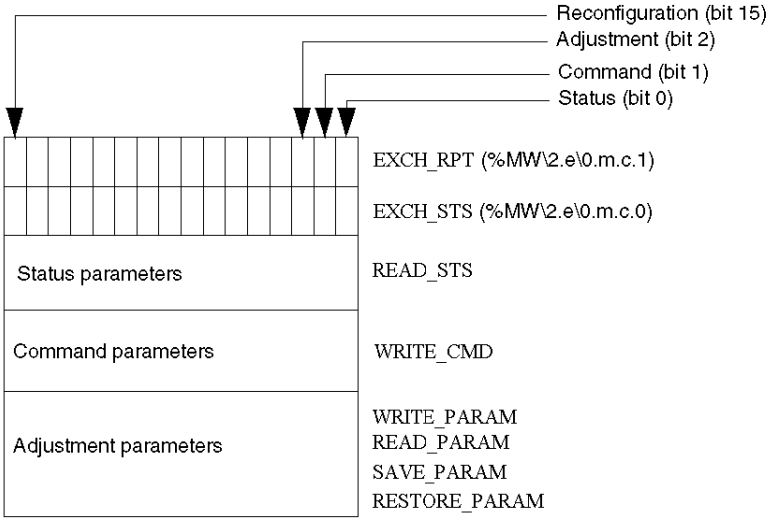
- `EXCH_STS` (%MW\2.e\0.m.c.0): exchange in progress
- `EXCH_RPT` (%MW\2.e\0.m.c.1): report

NOTE: Depending on the localization of the module, the management of the explicit exchanges `(%MW0.0.MOD.0.0 for example)will not be detected by the application:`

- For in-rack modules, explicit exchanges are done immediately on the local PLC Bus and are finished before the end of the execution task. So, the `READ_STS`, for example, is always finished when the `%MW0.0.MOD.0.0` bit is checked by the application.
- For remote bus (Fipio for example), explicit exchanges are not synchronous with the execution task. So, the detection is possible by the application.

Illustration

The illustration below shows the different significant bits for managing exchanges:



Description of the Significant Bits

Each bit of the words EXCH_STS (%MW\2.e\0.m.c.0) and EXCH_RPT (%MW\2.e\0.m.c.1) is associated with a type of parameter:

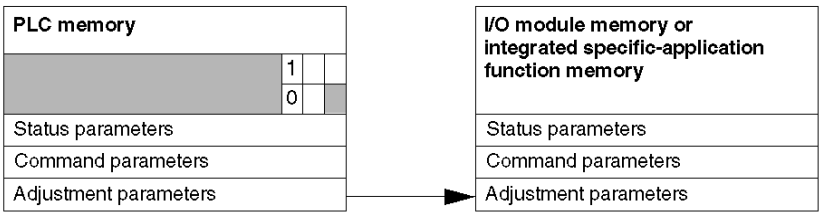
- Rank 0 bits are associated with the status parameters:
  - The STS_IN_PROGR bit (%MW\2.e\0.m.c.0.0) indicates whether a read request for the status words is in progress.
  - The STS_ERR bit (%MW\2.e\0.m.c.1.0) specifies whether a read request for the status words is refused by the module channel.
- Rank 1 bits are associated with the command parameters:
  - The CMD_IN_PROGR bit (%MW\2.e\0.m.c.0.1) indicates whether command parameters are being sent to the module channel.
  - The CMD_ERR bit (%MW\2.e\0.m.c.1.1) specifies whether the command parameters are refused by the module channel.
- Rank 2 bits are associated with the adjustment parameters:
  - The ADJ_IN_PROGR bit (%MW\2.e\0.m.c.0.2) indicates whether the adjustment parameters are being exchanged with the module channel (via WRITE_PARAM, READ_PARAM, SAVE_PARAM, RESTORE_PARAM).
  - The ADJ_ERR bit (%MW\2.e\0.m.c.1.2) specifies whether the adjustment parameters are refused by the module.
    If the exchange is correctly executed, the bit is set to 0.
- Rank 15 bits indicate a reconfiguration on channel c of the module from the console (modification of the configuration parameters + cold start-up of the channel).

NOTE: m stands for the position of the module; **c** stands for the channel number in the module.

NOTE: Exchange and report words also exist at module level EXCH_STS (%MW\2.e\0.m.MOD) and EXCH_RPT (%MW\2.e\0.m.MOD.1) in the IODDT type T_GEN_MOD.

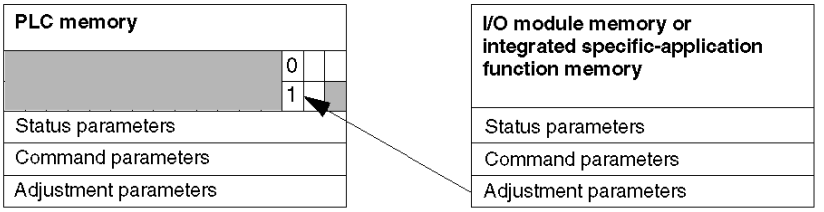
Example

Phase 1: Sending data by using the WRITE_PARAM instruction.



When the instruction is scanned by the PLC processor, the **Exchange in progress** bit is set to 1 in %MW\2.e\0.m.c.

Phase 2: Analysis of the data by the I/O module and report



When the data is exchanged between the PLC memory and the module, processing by the module is managed by the ADJ_ERR bit (%MW\2.e\0.m.c.1.2): Report (0 = correct exchange, 1 = faulty exchange).

NOTE: There is no adjustment parameter at module level.

Execution Indicators for an Explicit Exchange: EXCH_STS

The table below shows the control bits of the explicit exchanges: EXCH_STS (%MW\2.e\0.m.c.0).

Standard symbol	Type	Access	Meaning	Address
STS_IN_PROGR	BOOL	R	Reading of channel status words in progress	%MW\2.e\0m.c.0.0
CMD_IN_PROGR	BOOL	R	Command parameters exchange in progress	%MW\2.e\0m.c.0.1
ADJ_IN_PROGR	BOOL	R	Adjust parameters exchange in progress	%MW\2.e\0m.c.0.2
RECONF_IN_PROGR	BOOL	R	Reconfiguration of the module in progress	%MW\2.e\0.m.c.0.15

NOTE: If the module is not present or is disconnected, explicit exchange objects (Read_Sts for example) are not sent to the module (STS_IN_PROG (%MWr.m.c.0.0) = 0), but the words are refreshed.

Explicit Exchange Report: EXCH_RPT

The table below shows the report bits: EXCH_RPT (%MW\2.e\0.m.c.1).

Standard symbol	Type	Access	Meaning	Address
STS_ERR	BOOL	R	Error in reading status words of the channel (1 = failure)	%MW\2.e\0.m.c.1.0
CMD_ERR	BOOL	R	Error when exchanging command parameters (1 = failure)	%MW\2.e\0.m.c.1.1
ADJ_ERR	BOOL	R	Error when exchanging adjustment parameters (1 = failure)	%MW\2.e\0.m.c.1.2
RECONF_ERR	BOOL	R	Fault when reconfiguring the channel (1 = failure)	%MW\2.e\0.m.c.1.15

Section 10.2
IP67 Sealed Input/Output Module IODDTs

Subject of this Section

This section describes the different IODDTs and language objects associated with IP67 sealed input/output modules on a Fipio bus.

What Is in This Section?

This section contains the following topics:

Details of T_DIS_IN_GEN-Type IODDT Implicit Exchange Objects

At a Glance

This section presents implicit exchange objects of the T_DIS_IN_GEN-type IODDT applicable to all Discrete input modules.

Input Indicator

The following table presents the meaning of the VALUE bit (%I\2.e\0.m.c).

Standard symbol	Type	Access	Meaning	Number
VALUE	EBOOL	R	Indicates for input channel c that the output of the sensor controlling the input is activated.	%I\2.e\0.m.c

Error Bit

The following table presents the meaning of the error bit CH_ERROR (%I\2.e\0.m.c.ERR).

Standard symbol	Type	Access	Meaning	Number
CH_ERROR	BOOL	R	Indicates that input channel c is faulty.	%I\2.e\0.m.c.ERR

Details of T_DIS_IN_FIP_STD-Type IODDT Implicit Exchange Objects

At a Glance

This section presents T_DIS_IN_FIP_STD-type IODDT implicit exchange objects applicable to input modules and the inputs of mixed Discrete modules (TBX, IP67).

Input Indicator

The following table presents the meaning of the VALUE bit (%I\2.e\0.m.c).

Standard symbol	Type	Access	Meaning	Number
VALUE	EBOOL	R	Indicates for input channel c that the output of the sensor controlling the input is activated.	%I\2.e\0.m.c

Error Bit

The following table presents the meaning of the error bit CH_ERROR (%I\2.e\0.m.c.ERR).

Standard symbol	Type	Access	Meaning	Number
CH_ERROR	BOOL	R	Indicates that input channel c is faulty.	%I\2.e\0.m.c.ERR

Details of T_DIS_IN_FIP_STD-Type IODDT Explicit Exchange Objects

At a Glance

This section presents T_DIS_IN_FIP_STD-type IODDT explicit exchange objects applicable to input modules and the inputs of mixed Discrete modules (TBX, IP67). It includes the word type objects whose bits have a specific meaning. These objects are described in detail below.

Example of a declaration of a variable:

IODDT_VAR1 of the T_DIS_IN_FIP_STD type.

NOTE: In general, the meaning of the bits is given for bit status 1. In specific cases an explanation is given for each status of the bit.

NOTE: Not all bits are used.

Execution Indicators for an Explicit Exchange: EXCH_STS

The table below presents the meanings of the exchange control bits of the channel EXCH_STS (%MW\2.e\0.m.c.0).

Standard symbol	Type	Access	Meaning	Number
STS_IN_PROGR	BOOL	R	Reading of channel status words in progress.	%MW\2.e\0.m.c.0.0
CMD_IN_PROGR	BOOL	R	Current command parameters exchange in progress.	%MW\2.e\0.m.c.0.1

Explicit Exchange Report: EXCH_RPT

The table below presents the meaning of the exchange report bits EXCH_RPT (%MW\2.e\0.m.c.1).

Standard symbol	Type	Access	Meaning	Number
STS_ERR	BOOL	R	Error in reading status words of the channel (1 = failure).	%MW\2.e\0.m.c.1.0
CMD_ERR	BOOL	R	Error during a command parameter exchange (1 = failure).	%MW\2.e\0.m.c.1.1

Standard Channel Faults, CH_FLT

The table below shows the meaning of the bits of the status word CH_FLT (%MW\2.e\0.m.c.2). Reading is performed by a READ_STS (IODDT_VAR1).

Standard symbol	Type	Access	Meaning	Number
TRIP	BOOL	R	External fault: tripping.	%MW\2.e\0.m.c.2.0
FUSE	BOOL	R	External fault: fuse.	%MW\2.e\0.m.c.2.1
BLK	BOOL	R	Terminal block fault.	%MW\2.e\0.m.c.2.2

Standard symbol	Type	Access	Meaning	Number
EXT_PS_FLT	BOOL	R	External supply fault.	%MW\2.e\0.m.c.2.3
INTERNAL_FLT	BOOL	R	Internal fault: module not operational.	%MW\2.e\0.m.c.2.4
CONF_FLT	BOOL	R	Hardware or software configuration fault.	%MW\2.e\0.m.c.2.5
COM_FLT	BOOL	R	Communication fault with PLC.	%MW\2.e\0.m.c.2.6
SHORT_CIRCUIT	BOOL	R	External fault: short-circuit on a channel.	%MW\2.e\0.m.c.2.8
LINE_FLT	BOOL	R	External fault: line fault.	%MW\2.e\0.m.c.2.9

Details of the Implicit Exchange Objects of the IODDT of the T_DIS_OUT_GEN Type

At a Glance

This section presents implicit exchange objects of the T_DIS_OUT_GEN-type IODDT applicable to Discrete output modules.

Output Indicator

The following table presents the meaning of the VALUE bit (%Q\2.e\0.m.c).

Standard symbol	Type	Access	Meaning	Number
VALUE	EBOOL	R/W	Indicates that output channel c is activated.	%Q\2.e\0.m.c

Error Bit

The following table presents the meaning of the error bit CH_ERROR (%Ir.m.c.ERR).

Standard symbol	Type	Access	Meaning	Number
CH_ERROR	BOOL	R	Indicates that output channel c is faulty.	%I\2.e\0.m.c.ERR

Details of T_DIS_OUT_IP67_STD-Type IODDT Implicit Exchange Objects

At a Glance

This section presents implicit exchange bit objects of the T_DIS_OUT_IP67_STD-type IODDT applicable to IP67 Discrete output modules and the outputs of mixed IP67 Discrete modules.

Output Indicator

The following table presents the meaning of the VALUE bit (%Q\2.e\0.m.c).

Standard symbol	Type	Access	Meaning	Number
VALUE	EBOOL	R/W	Indicates that output channel c is activated.	%Q\2.e\0.m.c

Error Bit

The following table presents the meaning of the error bit CH_ERROR (%I\2.e\0.m.c.ERR).

Standard symbol	Type	Access	Meaning	Number
CH_ERROR	BOOL	R	Indicates that output channel c is faulty.	%I\2.e\0.m.c.ERR

Details of T_DIS_OUT_IP67_STD-Type IODDT Explicit Exchange Objects

At a Glance

This section presents explicit exchange objects of the T_DIS_OUT_IP67_STD-type IODDT applicable to IP67 Discrete output modules and the outputs of mixed IP67 Discrete modules. It includes the word type objects whose bits have a specific meaning. These objects are described in detail below.

Example of a declaration of a variable:

IODDT_VAR1 of the T_DIS_OUT_IP67_STD type.

NOTE: In general, the meaning of the bits is given for bit status 1. In specific cases an explanation is given for each status of the bit.

NOTE: Not all bits are used.

Execution Indicators for an Explicit Exchange: EXCH_STS

The table below presents the meanings of the exchange control bits of the channel EXCH_STS (%MW\2.e\0.m.c.0).

Standard symbol	Type	Access	Meaning	Number
STS_IN_PROGR	BOOL	R	Reading of channel status words in progress.	%MW\2.e\0.m.c.0.0
CMD_IN_PROGR	BOOL	R	Current command parameters exchange in progress.	%MW\2.e\0.m.c.0.1

Explicit Exchange Report: EXCH_RPT

The table below presents the meaning of the exchange report bits EXCH_RPT (%MW\2.e\0.m.c.1).

Standard symbol	Type	Access	Meaning	Number
STS_ERR	BOOL	R	Error in reading status words of the channel (1 = failure).	%MW\2.e\0.m.c.1.0
CMD_ERR	BOOL	R	Error during a command parameter exchange (1 = failure).	%MW\2.e\0.m.c.1.1

Standard Channel Faults, CH_FLT

The table below shows the meaning of the bits of the status word CH_FLT (%MW\2.e\0.m.c.2). Reading is performed by a READ_STS (IODDT_VAR1).

Standard symbol	Type	Access	Meaning	Number
TRIP	BOOL	R	External fault: tripping.	%MW\2.e\0.m.c.2.0
FUSE	BOOL	R	External fault: fuse.	%MW\2.e\0.m.c.2.1
BLK	BOOL	R	Terminal block fault.	%MW\2.e\0.m.c.2.2

Standard symbol	Type	Access	Meaning	Number
EXT_PS_FLT	BOOL	R	External supply fault.	%MW\2.e\0.m.c.2.3
INTERNAL_FLT	BOOL	R	Internal fault: module not operational.	%MW\2.e\0.m.c.2.4
CONF_FLT	BOOL	R	Hardware or software configuration fault.	%MW\2.e\0.m.c.2.5
COM_FLT	BOOL	R	Communication fault with PLC.	%MW\2.e\0.m.c.2.6
SHORT_CIRCUIT	BOOL	R	External fault: short-circuit on a channel.	%MW\2.e\0.m.c.2.8
LINE_FLT	BOOL	R	External fault: line fault.	%MW\2.e\0.m.c.2.9

Details of Implicit Exchange Objects for the TSX ESF 08T22 Module

At a Glance

This section describes the implicit exchange objects used to diagnose and manage channels of the **TSX ESF 08T22** module.

Description

The following table presents the meaning of the various EBOOL type objects.

IODDT type	Standard symbol	Access	Meaning	EBOOL address
T_DIS_ESF_IP67_0_STD	SHORT CIRCUIT CH16	R	Short circuit on output 16, bit set to 1.	%I\2.e\0.m.0.0
T_DIS_ESF_IP67_1_STD	SHORT CIRCUIT CH17	R	Short circuit on output 17, bit set to 1.	%I\2.e\0.m.1.0
T_DIS_ESF_IP67_2_STD	SHORT CIRCUIT CH18	R	Short circuit on output 18, bit set to 1.	%I\2.e\0.m.2.0
T_DIS_ESF_IP67_3_STD	SHORT CIRCUIT CH19	R	Short circuit on output 19, bit set to 1.	%I\2.e\0.m.3.0
T_DIS_ESF_IP67_4_STD	SHORT CIRCUIT CH20	R	Short circuit on output 20, bit set to 1.	%I\2.e\0.m.4.0
T_DIS_ESF_IP67_5_STD	SHORT CIRCUIT CH21	R	Short circuit on output 21, bit set to 1.	%I\2.e\0.m.5.0
T_DIS_ESF_IP67_6_STD	SHORT CIRCUIT CH22	R	Short circuit on output 22, bit set to 1.	%I\2.e\0.m.6.0
T_DIS_ESF_IP67_7_STD	SHORT CIRCUIT CH23	R	Short circuit on output 23, bit set to 1.	%I\2.e\0.m.7.0
T_DIS_ESF_EMF_IP67_14_STD	PWR FLT 16 19	R	Power supply missing on channels 16 to 19, bit set to 1.	%I\2.e\0.m.14.0
T_DIS_ESF_EMF_IP67_15_STD	PWR FLT 20 23	R	Power supply missing on channels 20 to 23, bit set to 1.	%I\2.e\0.m.15.0
T_DIS_ESF_EMF_IP67_26_STD	REACTIVE 16 19	R/W	Reactivate outputs 16-19, bit set to 1.	%Q\2.e\0.m.26.0
T_DIS_ESF_EMF_IP67_28_STD	REACTIVE 20 23	R/w	Reactivate outputs 20-23, bit set to 1.	%Q\2.e\0.m.28.0
T_DIS_ESF_EMF_IP67_30_STD	MASK_PWR_FLT_16_19	R/W	Mask the signaling of no power supply on outputs 16-19, bit set to 1.	%Q\2.e\0.m.30.0
T_DIS_ESF_EMF_IP67_31_STD	MASK_PWR_FLT_20_23	R/W	Mask the signaling of no power supply on outputs 20-23, bit set to 1.	%Q\2.e\0.m.31.0

Note

If bits %Q\2.e\0.m.26 and %Q\2.e\0.m.28 are forced to 1, the reset of outputs is automatic after the fault and its thermal effects disappear.

If %Q\2.e\0.m.30 or %Q\2.e\0.m.31 is set to 1, when the corresponding power supply is missing, the power supply missing bit, respectively %I\2.e\0.m.14 or %I\2.e\0.m.15, changes to 1 but %I\2.e\0.m.MOD.ERR remains at 0 and the I/O LED for the CPU remains off.

When the PLC changes to STOP, the missing power supply signaling masks become inoperative.

Details of Implicit Exchange Objects for the TSX EMF 16DT2 Module

At a Glance

This part describes the language objects used to diagnose and manage channels of the **TSX EMF 16DT2** module.

Description

The following table presents the meaning of the various EBOOL type objects.

IODDT type	Standard symbol	Access	Meaning	EBOOL address
T_DIS_EMF_IP67_8_STD	PWR_SUPPLY_0	R	Fault in the power supply module or the sensors (short circuit on 0 V), bit set to 1.	%I\2.e\0.m.8
T_DIS_EMF_IP67_10_STD	SH CIRCUIT CH16 17	R	Short circuit on outputs 16-17, bit set to 1.	%I\2.e\0.m.10
T_DIS_EMF_IP67_11_STD	SH CIRCUIT CH18 19	R	Short circuit on outputs 18-19, bit set to 1.	%I\2.e\0.m.11
T_DIS_EMF_IP67_12_STD	SH CIRCUIT CH20 21	R	Short circuit on outputs 20-21, bit set to 1.	%I\2.e\0.m.12
T_DIS_EMF_IP67_13_STD	SH CIRCUIT CH22 23	R	Short circuit on outputs 22-23, bit set to 1.	%I\2.e\0.m.13
T_DIS_ESF_EMF_IP67_14_STD	PWR FLT 16 19	R	Power supply fault on channels 16 to 19, bit set to 1.	%I\2.e\0.m.14
T_DIS_ESF_EMF_IP67_15_STD	PWR FLT 20 23	R	Power supply fault on channels 20 to 23, bit set to 1.	%I\2.e\0.m.15
T_DIS_ESF_EMF_IP67_26_STD	REACTIVE 16 19	R/W	Reactivate outputs 16-19, bit set to 1.	%Q\2.e\0.m.26
T_DIS_ESF_EMF_IP67_28_STD	REACTIVE 20 23	R/W	Reactivate outputs 20-23, bit set to 1.	%Q\2.e\0.m.28
T_DIS_ESF_EMF_IP67_30_STD	MASK_PWR_FLT_16_19	R/W	Mask the signaling of power supply fault on outputs 16-19, bit set to 1.	%Q\2.e\0.m.30
T_DIS_ESF_EMF_IP67_31_STD	MASK_PWR_FLT_20_23	R/W	Mask the signaling of power supply fault on outputs 20-23, bit set to 1.	%Q\2.e\0.m.31

Note

If bits %Q\2.e\0.m.26 and %Q\2.e\0.m.28 are forced to 1, the reset of outputs is automatic after the fault and its thermal effects disappear.

If %Q\2.e\0.m.30 or %Q\2.e\0.m.31 is set to 1, when the corresponding power supply is missing, the power supply missing bit, respectively %I\2.e\0.m.14 or %I\2.e\0.m.15, changes to 1 but %I\2.e\0.m.MOD.ERR remains at 0 and the I/O LED for the CPU remains off.

When the PLC changes to STOP, the missing power supply signaling masks become inoperative.

Chapter 11
Debugging of IP67 Sealed I/O Modules

Subject of this Chapter

This chapter describes the debug function and commands for IP67 sealed modules on a Fipio bus.

What Is in This Chapter?

This chapter contains the following topics:

Introduction to the Debug Function of a Remote Discrete Module

Introduction

The Debug function is used for each IP67 sealed input/output module present in the application:

- to view the state of each of the channels,
- to access the diagnostics and adjustment functions for the selected channel (channel forcing, SET, RESET).

The function also provides access to module diagnostics in the event of a fault.

NOTE: This function is only available in online mode.

NOTE: Access to the Debug function is limited a maximum of four screens open simultaneously.

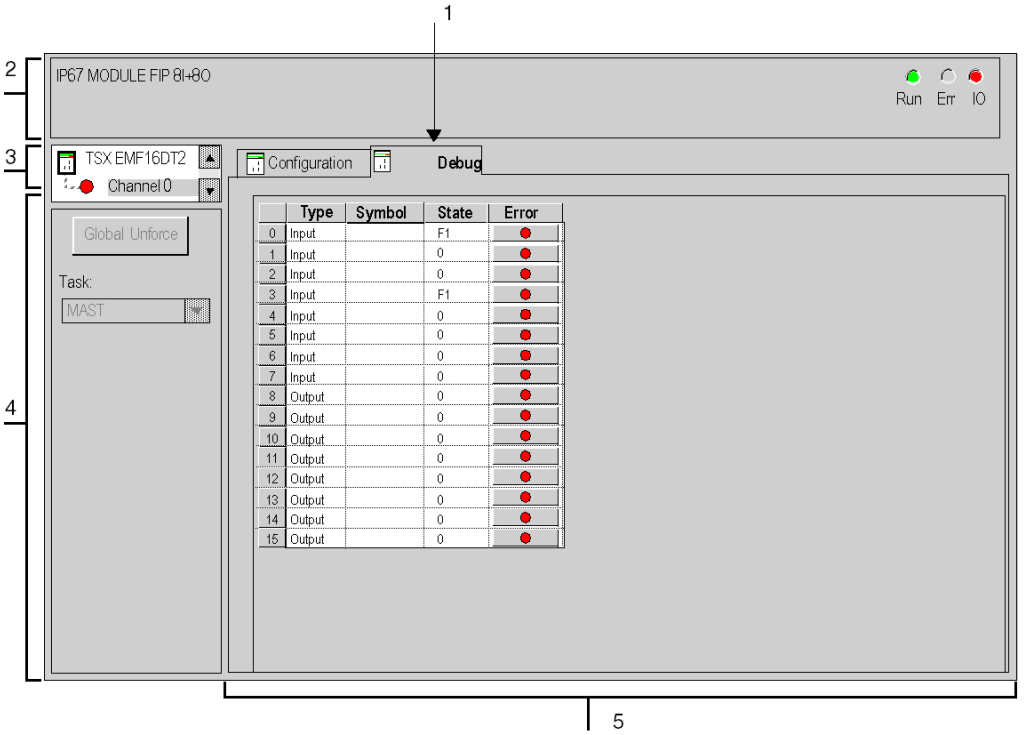
Description of the Debug Screen for an IP67 Module

At a Glance

The debug screen displays the value and state of each of the selected module's channels in real time. It is also used to access the channel commands (forcing of the input/output value, SET and RESET).

Illustration

The figure below represents a debug screen.



Description

The following table shows the different elements of the debug screen and their functions.

Number	Element	Function
1	Tabs	The tab in the foreground indicates the mode in progress (**Debug** in this example). Every mode can be selected using the respective tab. ● **Debug** which can be accessed only in online mode. ● **Configuration**.
2	**Module** area	Specifies the abbreviated heading of the module. In the same area there are 3 LEDs which indicate the module's operating mode: ● **RUN** indicates the operating status of the module, ● **ERR** indicates an internal fault in the module, ● **I/O** indicates a fault from outside the module or an application fault.

3	**Channel** area	Is used:
		● By clicking on the reference number, to display the tabs:
		  ● **Description** which gives the characteristics of the device.
		  ● **I/O Objects** *(see Unity Pro, Operating Modes)* which is used to presymbolize the input/output objects.
		  ● **Fault**, which shows the device faults (in online mode only).
		● **Channel:** module channel number. To the left of the symbol there is a copy of the **CHx** channel LED.

4	**General parameters** area	Gives a reminder of the channel setting: ● **Task:** specifies the **MAST** or **FAST** task configured. This heading is frozen. ● **Function:** the **Global Unforce** provides direct access to the channels' Global Unforce function.
5	**Parameters in progress** zone	This zone displays the state of the inputs and outputs, and the different parameters in progress. For each of the channels, there are four columns: ● The **Type** column for indicating the type (input or output), ● The **Symbol** column displays the symbol associated with the channel when it has been defined by the user (using the variable editor), ● The **State** column displays the state of each of the module's channels and enables their forcing, ● The **Fault** column creates direct access to the diagnostics for each channel when these are faulty (indicated by the indicator lamp built into the diagnostics access button, which turns red).

How to Access the Forcing/Unforcing Function

At a Glance

This function supports the modification of the state of all or some of the channels of a module.

The state of a forced output is fixed and can only be modified by the application after unforcing.

The different commands, which are available are:

- for one or more channels:
  - forcing to 1,
  - forcing to 0,
  - unforcing (when the selected channel or channels have been forced),
- for all the channels on the module (when at least one channel is forced):
  - global unforcing of channels.

Procedure

The following table shows the procedure for forcing or unforcing all or some of the channels of a module:

Step	Action for one channel	Action for all channels
1	Access the module's debug screen.	
2	In the **State** column, right click on the cell of the required channel.	Click on the **Global Unforce** button in the module area.
3	Select the desired function. ● Force to 0, ● Force to 1, ● Unforce.	-

How to access the SET and RESET commands

At a Glance

These commands are used to modify the state of a module's outputs to 0 (RESET) or 1 (SET).

NOTE: The state of the output assigned by one of these commands is temporary and can be modified at any time by the application when the PLC is in RUN.

Procedure

The following table shows the procedure for assigning the value 0 or 1 to all or some of the channels of a module.

Step	Action for one channel
1	Access the module's debug screen.
2	In the **State** column, right click on the cell of the required channel.
3	Select the desired function: ● **Set**, ● **Reset**.

Chapter 12
Diagnostics for IP67 Sealed I/O Modules

Subject of this Chapter

This chapter describes the diagnostics function and commands for IP67 sealed modules remoted on a Fipio bus.

What Is in This Chapter?

This chapter contains the following topics:

How to Access the Discrete Module Diagnostics Function

At a Glance

The Module diagnostics function displays current errors, where these exist, classed according to their category:

- **Internal faults:**
  - Module failures,
  - Self-tests running,
- **External faults:**
  - Terminal block fault,
- **Other faults:**
  - Configuration fault,
  - Module missing or off,
  - Faulty channel(s) *(see page 140)*.

A module fault is indicated when certain LEDs change to red, such as:

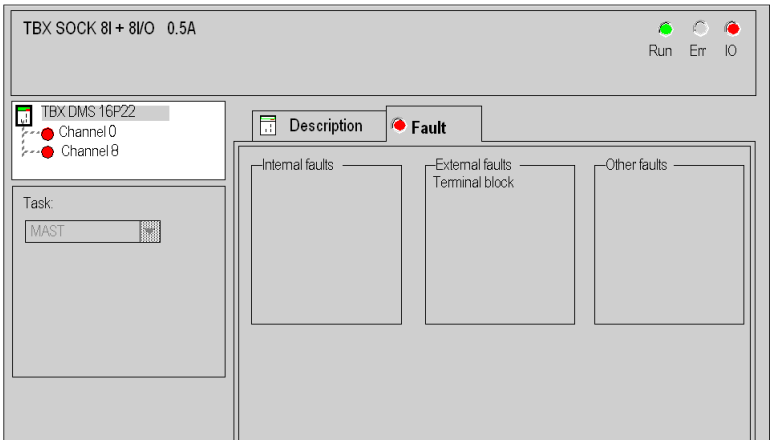
- In the Fipio bus window:
  - The connection point number of the module on the Fipio bus is red.
- In all screens at module level:
  - The **I/O** LED according to the type of fault,
  - The **Channel** LED in the **Channel** field.
- A red LED on the **Fault** tab.

NOTE: If you disconnect a TBX extension module from the base module when this is configured, on power up the TBX base module will appear faulty on the Fipio bus and the **I/O** LED will turn red.

Procedure

The following table shows the procedure for accessing the Module fault screen.

Step	Action
1	Open the module on which you would like to perform diagnostics.

Step	Action
2	Click on the module reference in the channel zone and select the **Fault** tab. **Result:** the list of module faults appears.  **Note:** In the event of major failure, absence of the module, certain configuration faults, or a major configuration fault, access to the module diagnostics screen is not possible. The following message then appears on the screen: `The module is not present or different from the one configured in this position.`

How to Access the Channel Diagnostics Function of a Discrete Module

At a Glance

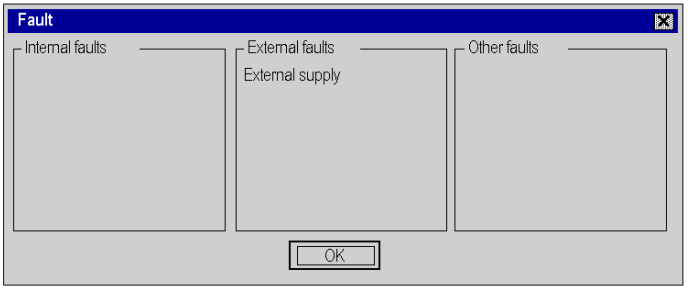
The Channel diagnostics module displays current errors, where these exist, classed according to their category:

- **Internal faults:**
  - Channel failure,
- **External faults:**
  - Link or sensor supply fault,
- **Other faults:**
  - Terminal block fault,
  - Configuration fault,
  - Communication fault.

A channel error appears in the **Debug** tab when the  LED, located in the **Fault** column, turns red.

Procedure

The following table shows the procedure for accessing the Channel fault screen.

Step	Action
1	Access the module's debug screen.
2	For the faulty channel, click on the button  situated in the **Fault** column. **Result:** the list of channel faults appears.  **Note:** Channel diagnostics information can also be accessed by program (`READ_STS` instruction).

Glossary

D

Discrete
Discrete inputs/outputs.

F

Fipio
Field bus used to connect sensor or actuator type devices.

I

IODDT
Input/Output Derived Data Type.

IP67
Family of Schneider Automation hardware products consisting of sealed I/O modules which connect to the Fipio field bus, used to produce automated systems with distributed I/Os.

U

Unity Pro
Schneider Automation PLC programming software.

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