Presentation of sealed I/O modules

1

Presentation

Subject of section

This section presents sealed I/O modules of the TSX IP 67 family (TSX EEF 08D2, TSX EEF 16D2, TSX ESF 08T22, TSX EMF 16DT2).

In this section

This section deals with the following subjects:

Presentation of the modules in their environment

Introduction

The IP67 family is constituted of sealed I/O modules which may be connected to the FIPIO terrain bus, making it possible to produce PLCs with distributed I/Os.

Its great flexibility of use makes it possible to include all available technologies (TBX I P20 and IP, 65, TSX IP 67, MOMENTUM) and to mix the connection principles (branch or point to point).

Type of application

The IP67 modules permits having 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 and the addressing of the sealed I/O modules on the FIPIO bus is performed using the design and setup software PL7 Junior/pro.

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

Functions offered

Introduction

The overall range of functions offered by the IP 67 is designed amongst other things to meet the demands of the manufacturing and agri-food industry, and of all uses in a severe environment Thanks to its rapid connection technology and its diagnostic resources it makes it possible to reduce downtime to a maximum.

Functions

The IP 67 modules make it possible to satisfy the most frequently used values such as:

- 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 diagnostics of faults appearing during the process.

Physical presentation of the modules

TSX IP67 modules

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

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

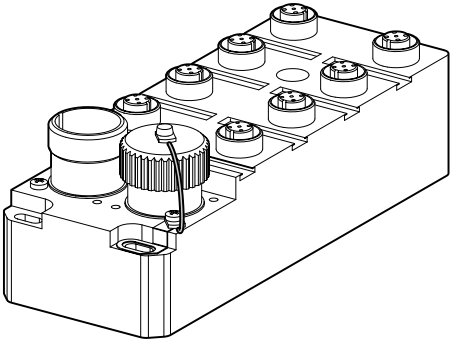
Standards and certifications

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.

Illustration

The figure below shows the standard configuration of the modules.



Electrical connections on sealed I/O modules

2

Presentation

Subject of section

This section presents the various possibilities of making electrical connections to sealed I/O modules of the TSX IP 67 family (TSX EEF 08D2, TSX EEF 16D2, TSX ESF 08T22, TSX EMF 16DT2).

In this section

This section deals with the following subjects:

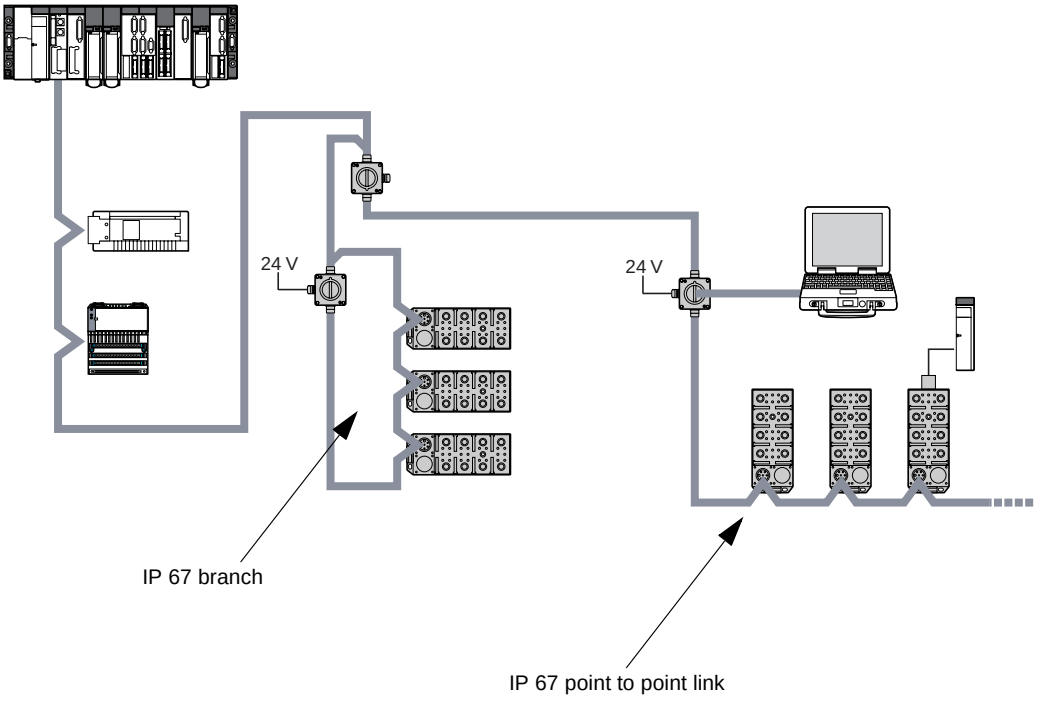
General connection principles

Introduction

Each of the four modules in the TSX IP 67 family can be connected to the FIPIO bus by using a series of accessories including connectors, branch cables and boxes.

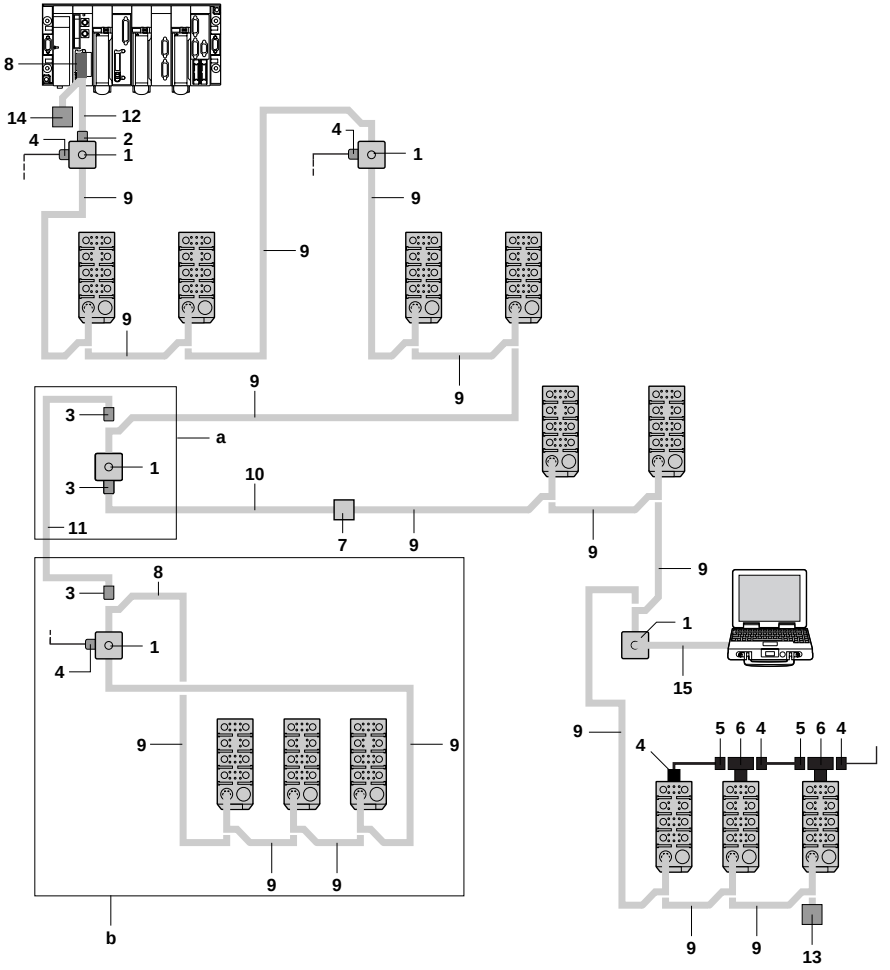
On account of the necessity of maintaining the level of protection of the whole unit, Schneider supplies the accessories necessary to conserve the IP 67 protection index.

The modules are connected in accordance with the FIPIO bus connection principles and can provide a mixture of point to point connection and branch connection.



Accessories

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 : shunt connected head
b : IP 67 shunt connected

This architecture as a whole uses the following accessories:

	Reference	Type of connection	Description
1	**TSX EF ACC 99**	Branch box	This IP 65 branch box can be used to perform 3 functions: • connection of a 24 Vdc power supply • creation of an IP 67 branch • connection of a programming terminal
2	**TSX EF CF 01**	IP 67 Female connector, type M23	IP 67 female screw 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 a TSX FP CA/CC/CP•00/CR cable.
3	**TSX EF CF 01**	IP 67 male connector, type M23	IP 67 male screw 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 a TSX FP CA/CC/CP•00/CR cable.
4	**TSX EF CF 03**	7/8" type IP 67 female connector (24 Vdc power supply)	7/8" type IP 67 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 on each contact on the connector is 8 A.
5	**TSX EF CM 03**	7/8" type IP 67 male connector (24 Vdc power supply)	7/8" type IP 67 male connector, 5 contacts for linked connection using the T connector TSX EF CT 03 designed to supply the preactuators with 24 Vdc.
6	**TSX EF CT 03**	T connector (for linking of 24 Vdc power supply)	7/8" type IP 67 T connector, 5 contacts for linking of the preactuators' 24 V power supply. The maximum authorized current for each contact on this connector is 8 A.
7	**TSX EF CF 02**	IP 67 Female connector, type M23	IP 67 M23 type female threaded connector, 6 contacts for extending TSX FP CA/CC/CP•00/CR FIPIO cables.
8	**TSX FP ACC 2 or TSX FP ACC 12**	SUB-D 9 type female connector	SUB-D 9 type connectors contacts for FIPIO/FIPWAY connection to PLCs. Can be used for linked or branched connection (output 90× high or low, output 45× high or low).
9	**TSX EF ACC 2....**	IP 67 compound-filled FIPIO cable for linking of modules	Main compound-filled cable of a predefined length, 150 W 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**	IP 67 FIPIO cable (1 pair, 2 1.5 mm^2 power supply conductors, in 100 m or 500 m)	Main IP 67 FIPIO cable, a 150 W shielded twisted 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 CF 01/02 and TSX CM 01 screw connectors.

	Reference	Type of connection	Description
11	**TSX FP CC.00**	FIPIO branch cable (2 pairs, in 100 m or 500 m)	Branch cable, 150 W double shielded twisted pair (Ø 8 mm) for standard environments and building interiors. Free wire ends to be fitted with IP 67 M23 type TSX CF01/02 and TSX CM 01 screw connectors.
12	**TSX FP CA.00**	FIPIO link cable (one pair, in 100 m, 200 m or 500 m)	Main cable, a 150 W shielded twisted pair (Ø 8 mm) for standard environments and building interiors. Free wire ends to be equipped with IP 67 M23 type screw connectors TSX CF 01/02 and TSX CM 01.
13	**TSX EF ACC 7**	IP 67 M23 type line terminator	IP 67 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	IP 20 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 FP 10/20 PCMCIA interface card for Micro/Premium, FT 2000 terminals and PC-compatible PLCs. This cable allows a PLC or a programming terminal to be connected to a TSX EF ACC 99 branch box.
16			Branch head
17			IP 67 branch

Together these accessories make it possible to assemble the desired configuration whilst observing all the operating constraints of the FIPIO bus.

Other available accessories

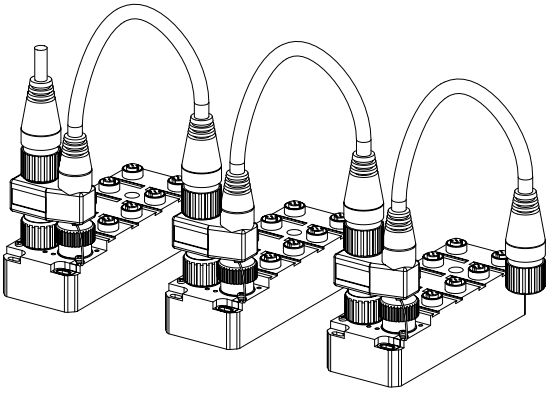
	XZ-LG101	Identification labels	Strip of 10 additional identification labels, (a strip is already supplied with each module).
	XZ-LG102	IP 67 sealing plugs	Batch of 10 M12 sealing plugs for unused I/O connectors. Each module is supplied with two plugs.
	170 XTS 050 00	IP 67 sealing plug	Sealing plug for M23 connector.

Types of connection

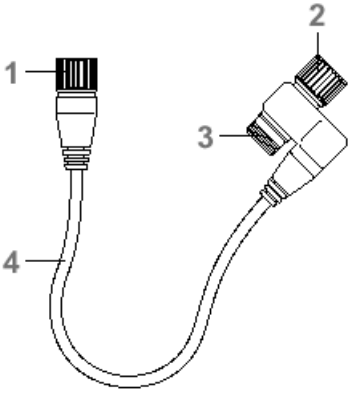
Point to point connection of modules to power supply

A point to point connection allows IP 67 modules to be connected together from a PLC.

Its structure is as follows:



The cable which allows the IP 67 modules to be linked up is a TSX EF ACC 20 cable. This cable has an compound-filled M23 connection system and ensures that the IP 67 protection index 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.



- (1) A male IP 67 compound-filled connector with M23 type ring, 6 contacts for the FIPIO connection to the previous module n -1 (or to the upstream branch box).

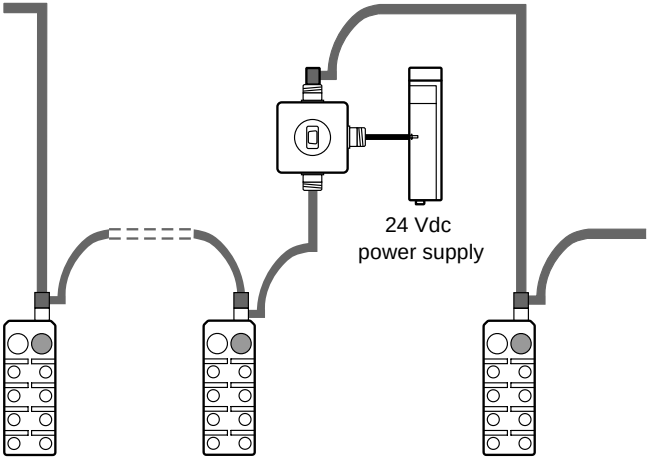
At the other end there is a double compound-filled connector with:

- (2) A female IP 67 compound-filled connector with M23 type ring, 6 contacts for the connection to module n.
- (3) A female IP 67 connector with M23 type thread, 6 contacts for outgoing cable of the same type intended for connection to the next module n+1 (or to the downstream branch box).
- (4) A main cable, a 150 Ω shielded twisted pair and a 1.5 mm² 24 Vdc power supply pair, length 0.2, 1, 3, 7, 12 or 25 m (45 mm bending radius, Ø 9,5 mm).

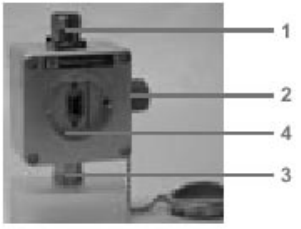
Inserting a new power supply for IP 67 modules and sensors

The power to the IP 67 modules and sensors is supplied by the only cable which links the modules (TSX EF ACC 2, etc.). For distance and consumption reasons, it may be necessary to power a group of IP 67 modules with a second power supply.

If so, a TSX EF ACC 99 branch box is used to configure the power supply insertion and the cabling diagram shall be as follows:



Presentation of the TSX EF ACC 99 branch box:



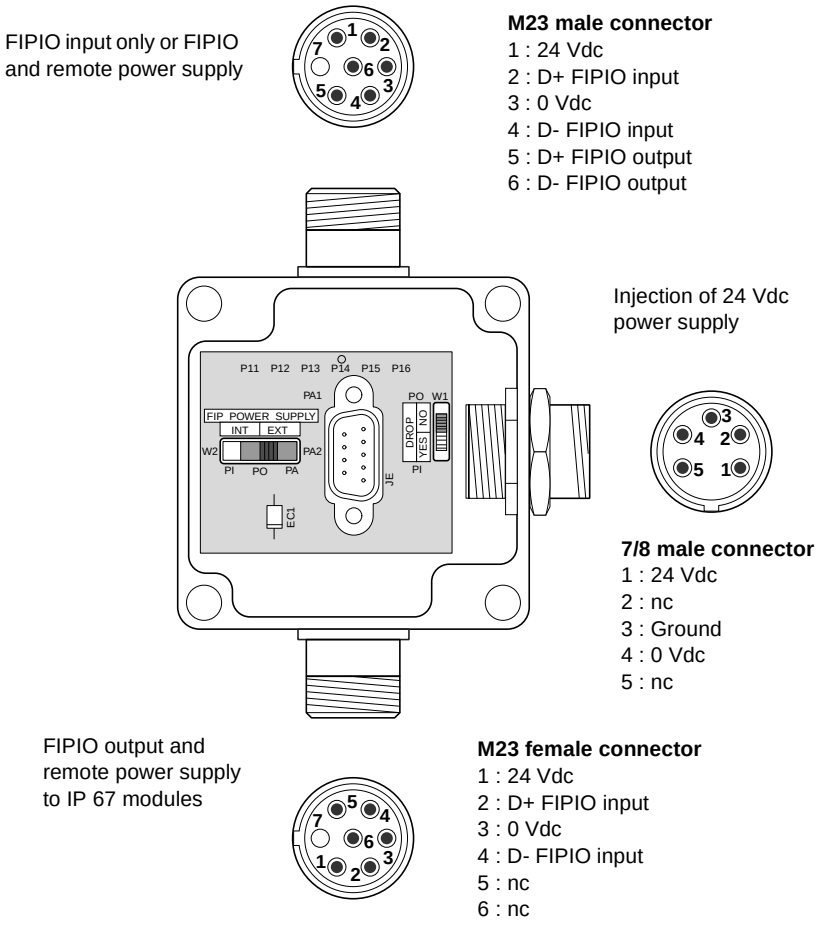
(1) An IP 67 M23 type male screw connector for the connection to the Fipio bus (input and output).

(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 IP 67 M23 type female screw 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.

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



When in use during power supply insertion, the W1 switch shall be in the "ON" position (no branch) and the W2 switch in the "EXT" (external position). The product is delivered in this configuration.

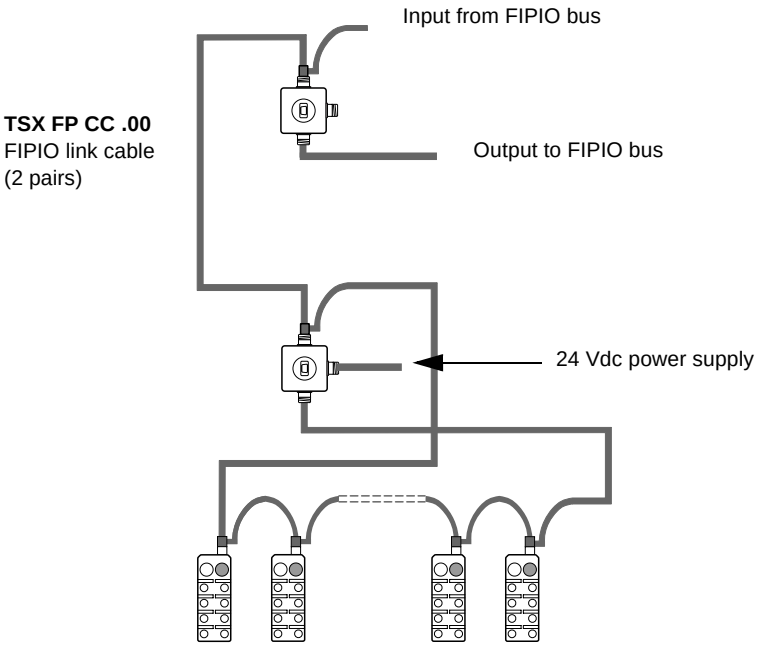
On the other hand, even if the input link of the bus carries a power supply, it is the external power supply that provides the power for the FIPIO output as the two power supply systems are separate.

Creating a branch

Introduction

Depending on the topology of the installation, a group of IP 67 modules can be connected via a branch to the main installation.

Structure of a branch:



The branch uses two TSX EF ACC 99 branch boxes and must be powered locally. The TSX FP CC .00 branch cable which ensures the go-between link of the FIPIO bus, but not the remote power supply.

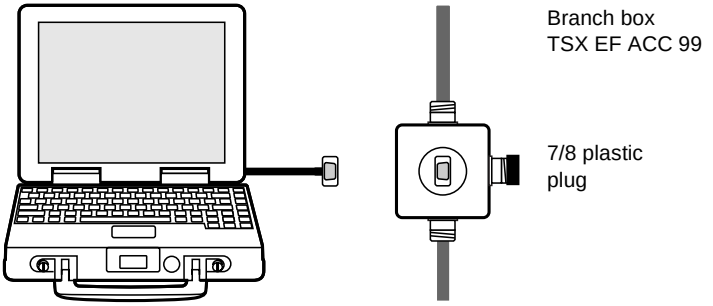
When in use, in the two branch boxes, the W1 switches shall be in the on "YES" position (branch activated) and the W2 switch of the box which is powered by a voltage of 24 Vdc in the "EXT" position (external power supply).

Connecting a programming terminal

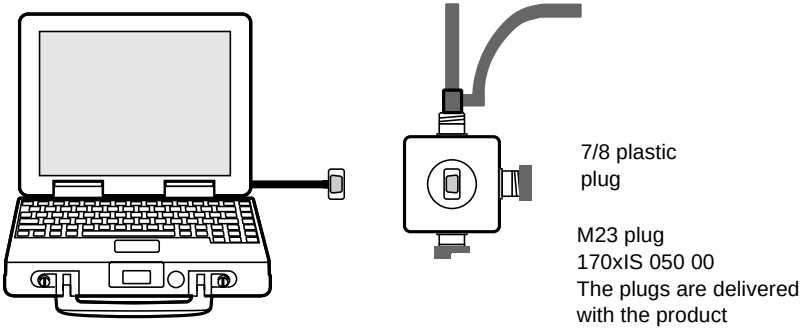
Introduction

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

Inserting 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.



For these types of use, the W1 switch in the branch box shall be in the "NO" position (no branch) and the switch W2 of the box which makes the branching shall be in the "EXT" position (continued power supply).

FIPIO addressing of sealed I/O modules

3

Presentation

Subject of section

This section presents the addressing procedure for the connection of sealed I/O modules of the family TSX IP 67 on the FIPIO bus.

In this section

This section deals with the following subjects:

FIPIO addressing of the modules

Introduction

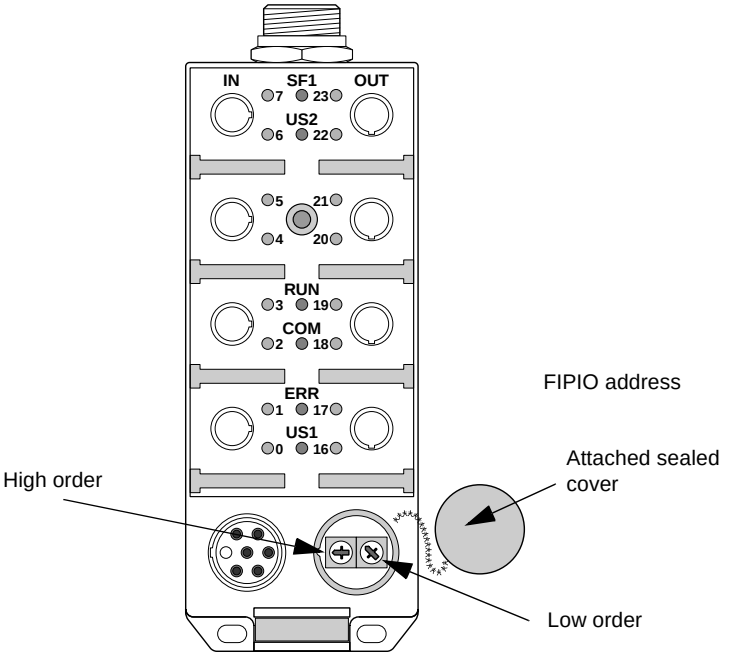
The connection of the I/O modules of the family to the FIPIO bus requires their address to be defined on the FIPIO bus. This addressing shall be carried out on the module using the PL7 software (hardware configuration mode).

This addressing uses two thumbwheel switches and enables up to 98 I/O modules to be connected to the bus.

Address 0 is reserved for the inspection of the FIPIO bus and address 63 is reserved for the connection of the programming terminal.

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.

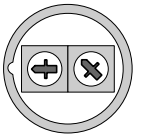


Allocating the code

NB: the change in module address must be carried out with the power supply turned off and the connection of the module to the FIPIO bus shall be temporarily unplugged (connection safety).

Address 0 is reserved for the inspection of the FIPIO bus and address 63 is reserved for the connection of the programming terminal.

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



Reading the code is direct, the high order (tens) is on the left and the low order (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.

Power supply for outputs

4

Presentation

Subject of section

This section presents the methodology to follow to power all IP 67 module outputs.

In this section

This section deals with the following subjects:

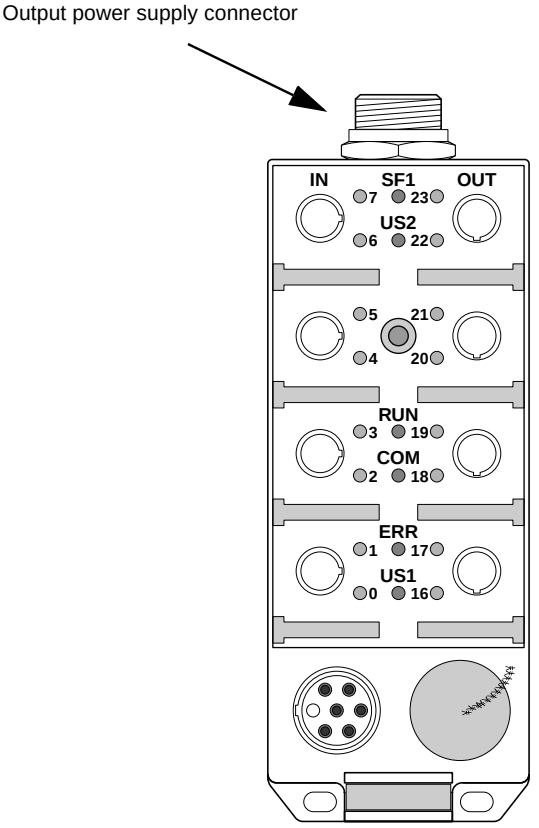
General

Introduction

The particularity of the sealed I/O modules is authorizing the 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. TSX ESF 0822 (8 outputs) and TSX EMF 16 DT2 (8 inputs and 8 outputs) output modules.

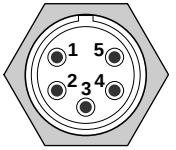
These modules have a connector specially designed for this purpose.



Output power supplies

Each module is powered separately for a group of 4 outputs. Each power supply is indicated with an LED on the module (US1 and US2).

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

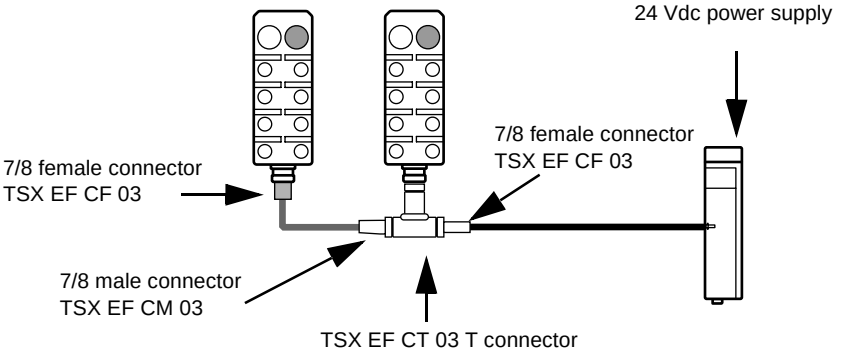


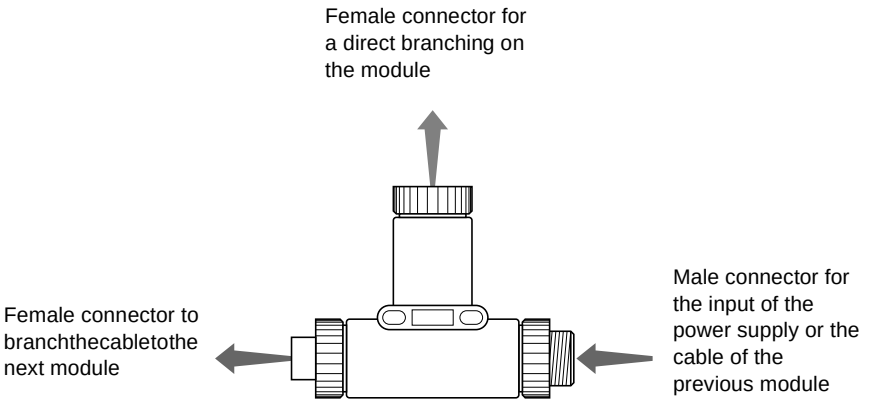
1 : +24 Vdc US1 power supply
2 : +24 Vdc US2 power supply
3 : Ground
4 : 0 Vdc US1 power supply
5 : 0 Vdc US2 power supply
US1: outputs 16, 17, 18, 19
US2: outputs 20, 21, 22, 23

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

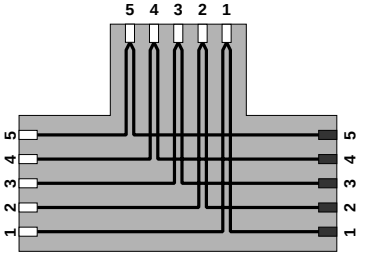
Linking several modules

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 T connection ensures a continuous electric power supply and that the links are point to point links.



T connection pin configuration
TSX EF CT 03
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 characteristics

These connectors and the T connector are in the Protection IP 67 index and are compatible with a 12 mm cable with 1.5 mm² conductors.

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

Checking the power supply voltage of the sealed IP 67 I/O modules

5

Presentation

Subject of section

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

In this section

This section deals with the following subjects:

General

Introduction

The particularity of the sealed I/O modules and authorizing the 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).

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

The number of the IP 67 modules depends on the length of the line, the capacity of the electrical conductors which consist of the power supply cable and the precision of the power supply.

Checking the power supply voltage

The cabling shall be checked whilst ensuring that the voltage of the module furthest away from the power supply source is not less than 19.2 Volts.

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

The following table presents the calculation of in-line energy losses in the line based on the following:

- consumption per module (130 mA), mean value using a 2-wire sensor.
- cross-section of power supply conductors 1.5 mm² (AWG 18 capacity).
- distribution of modules on the cables is presumed to be uniform.

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	15.50

Example of the use of this table.

24 Vdc supplies power at +/- 3%, the length of the bus is 100 m and 15 sealed IP 67 I/O modules are used.

The voltage available in the last module shall be:

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

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

Another example:

24 Vdc supplies power at +/- 5 %, the length of the bus is 100 m and 30 sealed IP 67 I/O modules are used.

The voltage available for the last module shall be:

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

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

Sensors 3-wire

The connection of 3-wire sensors increases energy consumption. In the table below, the in-line loss is multiplied by a coefficient of 1.77.

Example:

24 Vdc supplies power at +/- 5 %, the length of the bus is 50 m and 15 sealed IP 67 I/O modules are used.

The voltage available in the last module shall be:

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

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

Checking the length of the FIPIO bus

6

Presentation

Subject of section

This section presents the methodology to be followed to check that the length of the FIPIO bus is compatible with the correct operation of the assembly.

In this section

This section deals with the following subjects:

General

Introduction

The FIPIO terrain bus is a standard terrain bus which provides the connection to a PLC with various PLC components (IP 20 modules, ATV variators, Momentum, TBX, Mageli terminals, etc.), including sealed IP 67 I/O modules.

The FIPIO terrain bus is made up of one or more sections interconnected by repeaters. The maximum length of a bus section 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 sealed IP 67 I/O modules can be connected with remote power supply over a maximum distance of 1000 m.

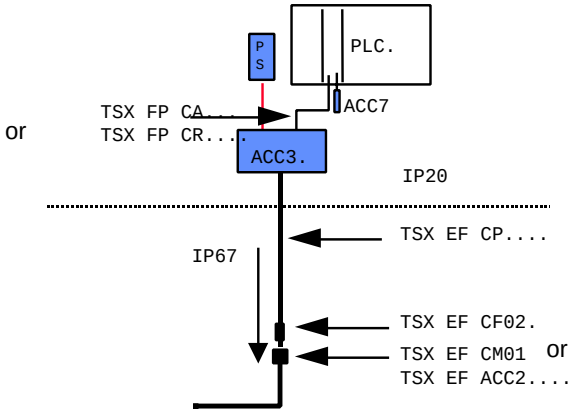
Using electrical or optical repeaters, it is possible to connect up to 98 sealed IP 67 I/O modules over a maximum length of 15 000 m.

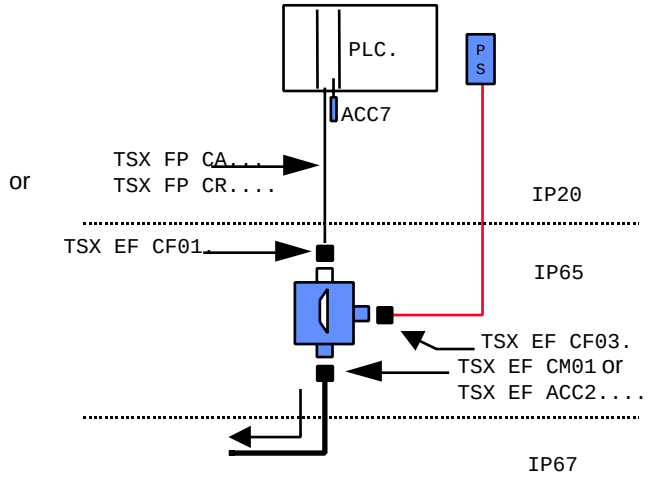
Devices may be connected to a section:

- 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 inspect a geographically localized assembly.
- by a mixed topology which enables equipment to be connected by both linking and branching.

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

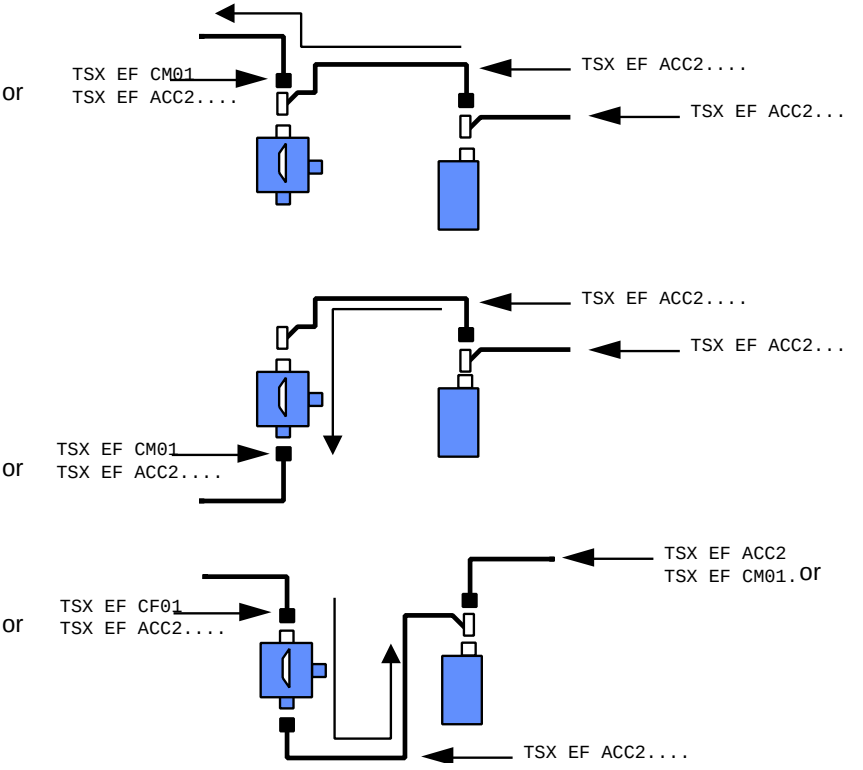
Start of the FIPIO network for IP 67.



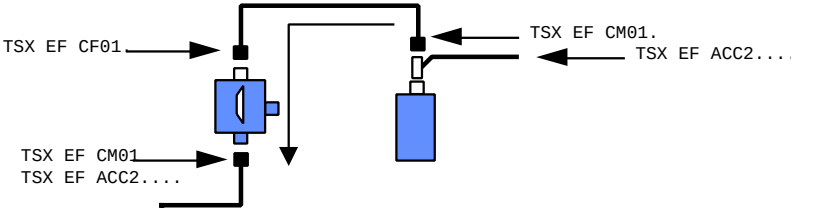


Link between TSX EF ACC99 and the FIPIO IP 67 discrete I/O modules

With TSX EF ACC2•••

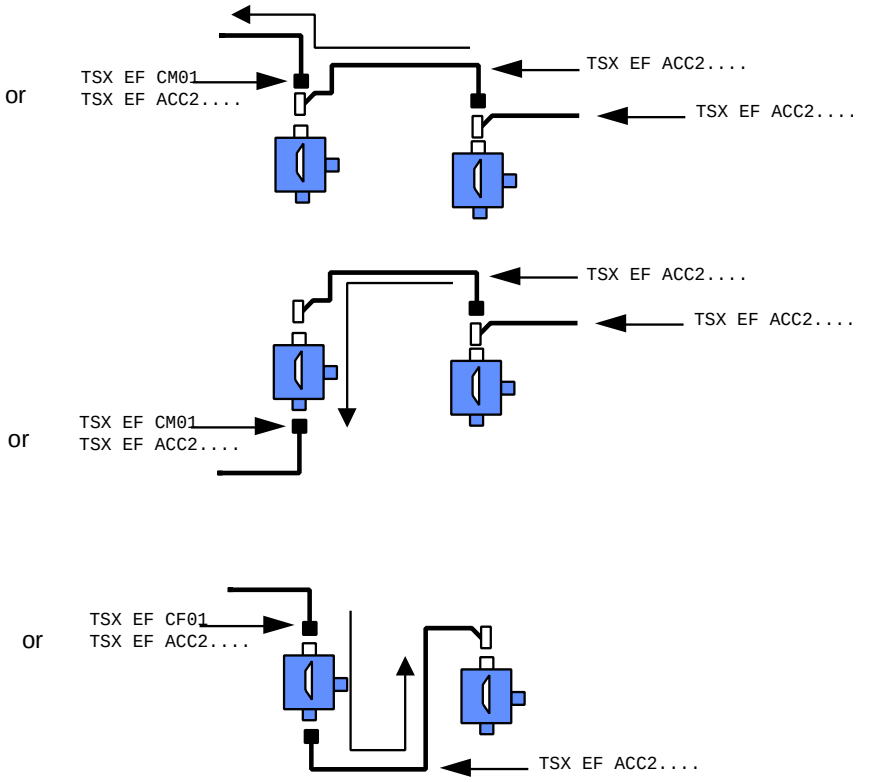


With user cables

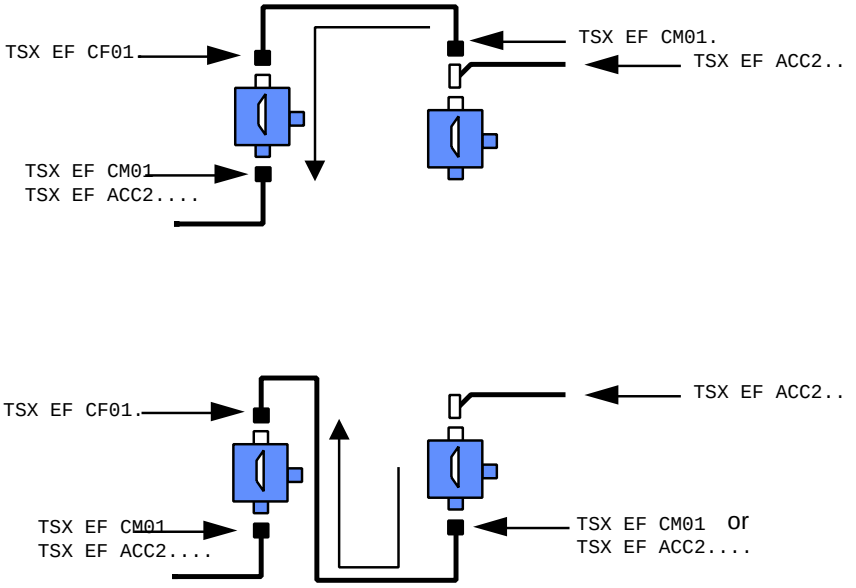


Link between two TSX EF ACC99

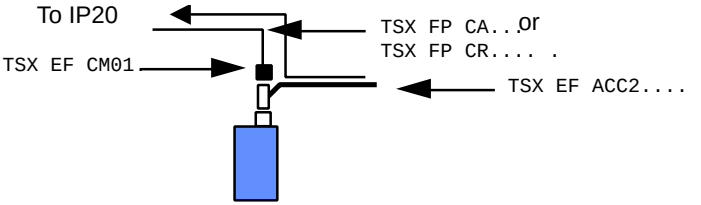
with TSX EF ACC2•••

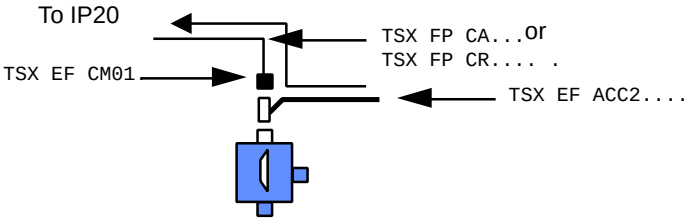


With user cables

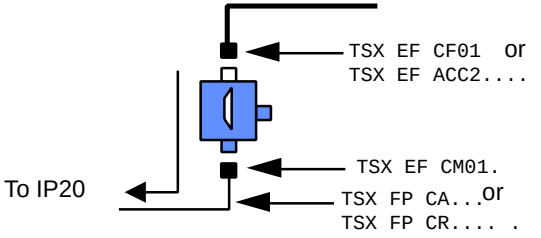


Insertion of IP 20 modules





From an IP 67 module



Check principles

The check shall be carried out over the entire length of the FIPIO bus. When using a TSX EF ACC99 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.

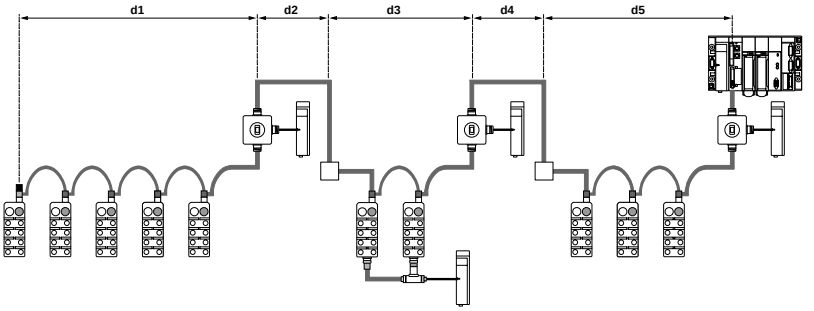
The length of a section must never exceed 1000m. If this is the case, a second section with an electrical or optical repeater must be used.

All information regarding the detailed operation of the FIPIO terrain bus and the use of connection accessories is available in the Bus FIPIO reference manual (TSX DR FIP F).

Connection by linking

Connection of the IP 67 modules can be achieved by directly linking the connection points.

Here, the total length to be taken into account is the sum of the lengths of the different cables (sum of lengths d).



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

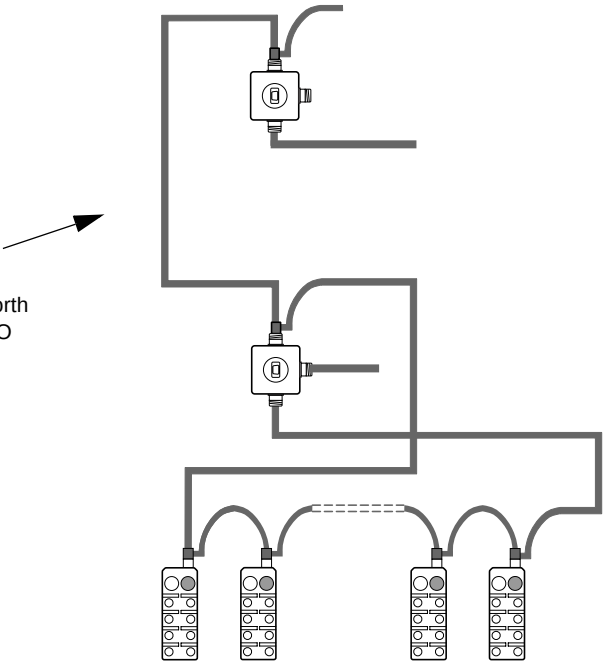
- Length from the PLC to the TSX EF ACC99 connection point,
- Length from the connection box to the first module,
- Connection length of the different modules.

When a single IP 67 section is being used, each end of the section shall be connected to an end-of-line adapter (TSX EF ACC7 for IP 67 modules).

Connection by branching

The IP 67 connection system enables a block of I/Os to be linked by branching of the main cable.

Example of connection by branching:



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

Twice the length of the cable linking two TSX EF ACC 99 connection boxes

- Length from the connection box to the first module,
- Connection length from the different modules,
- Return to the connection box.

Input characteristics and connections on the TSX EEF 08D2 module

7

Presentation

Subject of section

This section presents the methodology to be followed to connect the TSX EEF 08D2 module inputs.

In this section

This section deals with the following subjects:

General

Introduction

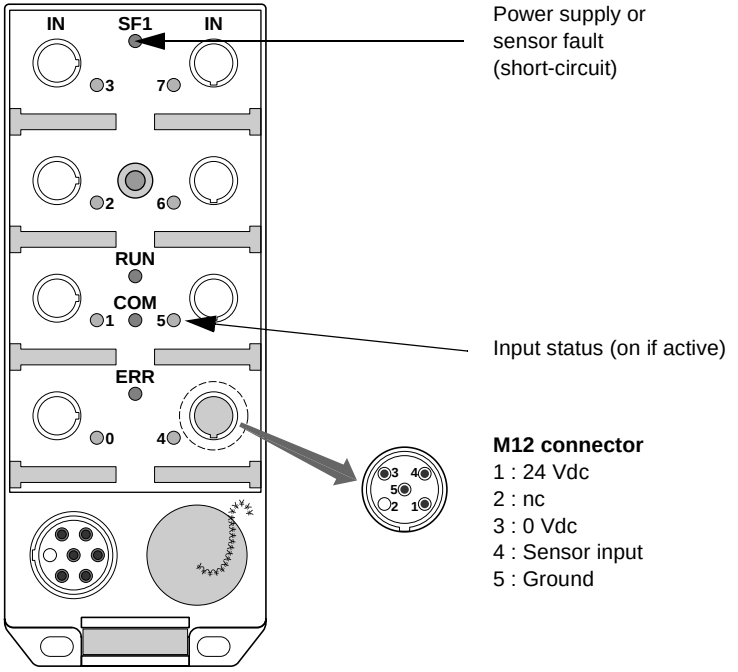
Each IP 67 module has 8 M12 connectors which are used to connect the sensors.

The connection of all connectors is displayed on a label on the back of the module (inaccessible on a fitted module).

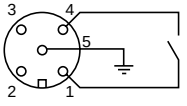
The M23 connector is attached to the remote supply FIPIO bus.

Connecting the module inputs

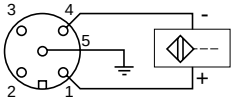
Each of the inputs uses a M12 module connector (one input per connector).



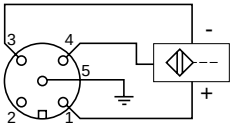
Mechanical contact



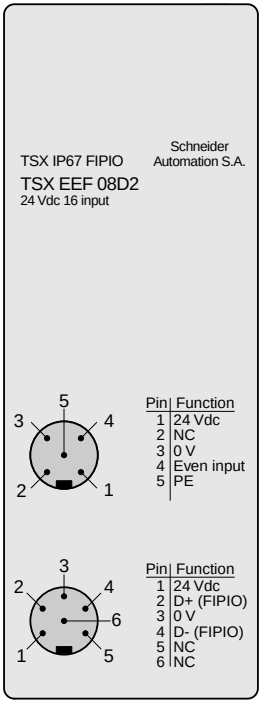
2 wire DDP



3 wire DDP



View of etiquette on the back of the module



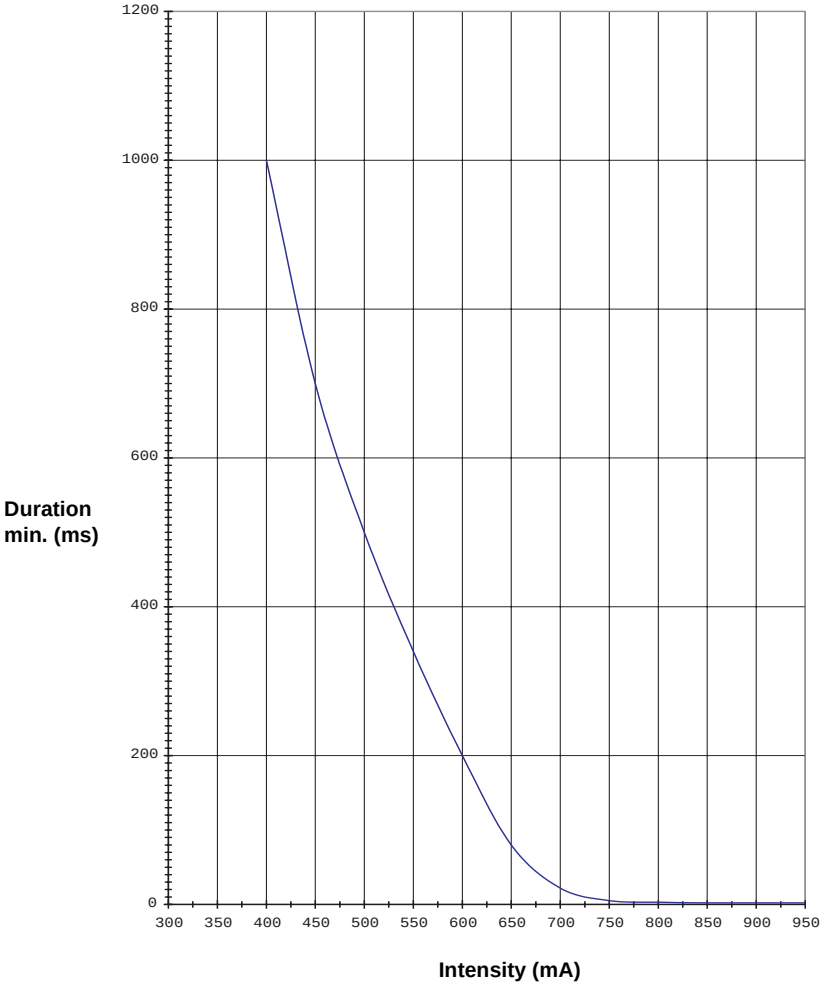
Connection of inputs

FIPIO bus connection and remote power supply of the module

Electrical characteristics

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

Standard response time for excess current in the power supply to the sensors.



Input characteristics and connections on the TSX EEF 16D2 module

8

Presentation

Subject of section

This section presents the methodology to be followed to connect the TSX EEF 16D2 module inputs.

In this section

This section deals with the following subjects:

General

Introduction

Each IP 67 module has 8 M12 connectors which are used to connect the sensors.

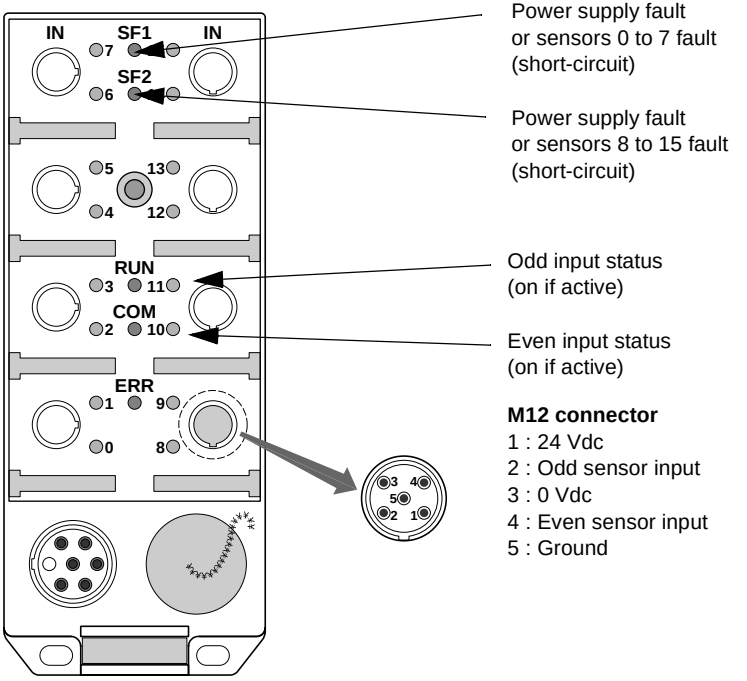
For the TSX EEF 16D2 module with 16 inputs, an M12 connector is used for two outputs.

The connection of all connectors is visible on a label stuck on the back of the module (non-accessible on an assembled module).

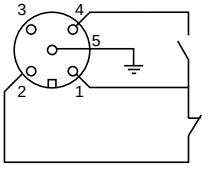
The M23 connector is attached to the remote supply FIPIO bus.

Connecting the module inputs

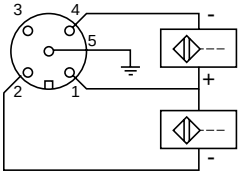
Each group of inputs uses a M12 module connector (two inputs per connector).



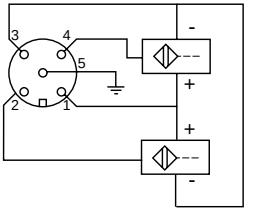
Mechanical contact



2 wire DDP

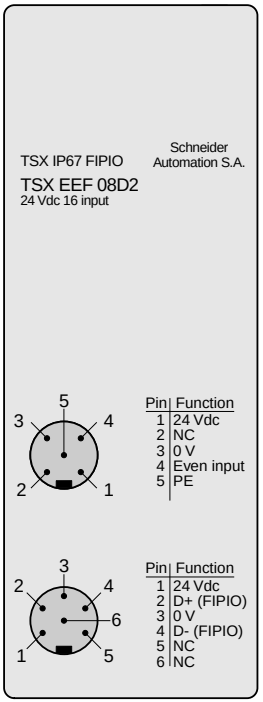


3 wire DDP



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

View of etiquette on the back of the module



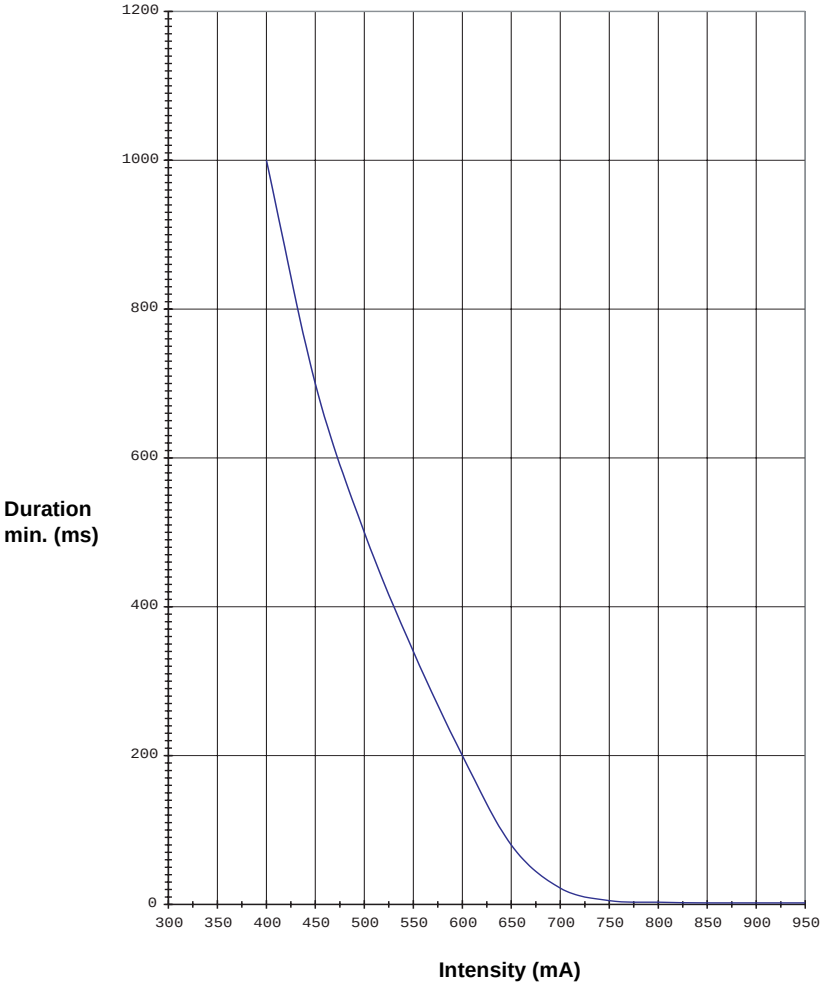
Connection of inputs

FIPIO bus connection and remote power supply of the module

Electrical characteristics

Number of channels	16 inputs
IEC 1131-2 conformity	Yes, type 2
2-wire and 3-wire ddp compatibility	Yes
Nominal values (channels): Voltage Current Sensor power supply (wave included)	 24 Vdc (positive logic) 7 mA 19.2 to 30 Vdc
Max/min input values: Voltage in states 0 and 1 Voltage in states 0 and 1	 < 5 Volts / > 11 Volts < 2 mA / > 6 mA to 11 Volts
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: States 0 to 1 States 0 to 1	 3.5 ms 3.5 ms
Power supply surveillance sensors	between 14 and 18 Volts
Isolation: Between channels Between bus and internal logic	 no ~ 500 V
Module consumption	130 mA with 10 2-wire sensor inputs (plus 10 mA for each additional 2-wire sensor input and 10 mA for each 3-wire sensor used)

Standard response time for excess current in the power supply to the sensors.



Output characteristics and connections on the TSX EEF 08T22 module

9

Presentation

Subject of section

This section presents the methodology to be followed to connect the TSX EEF 08T22 module outputs.

In this section

This section deals with the following subjects:

General

Introduction

Each IP 67 module has 8 M12 connectors which are used to connect the actuators.

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

The connection of all connectors is visible on a label stuck on the back of the module (non-accessible on an assembled module).

The M23 connector is attached to the remote supply FIPIO bus.

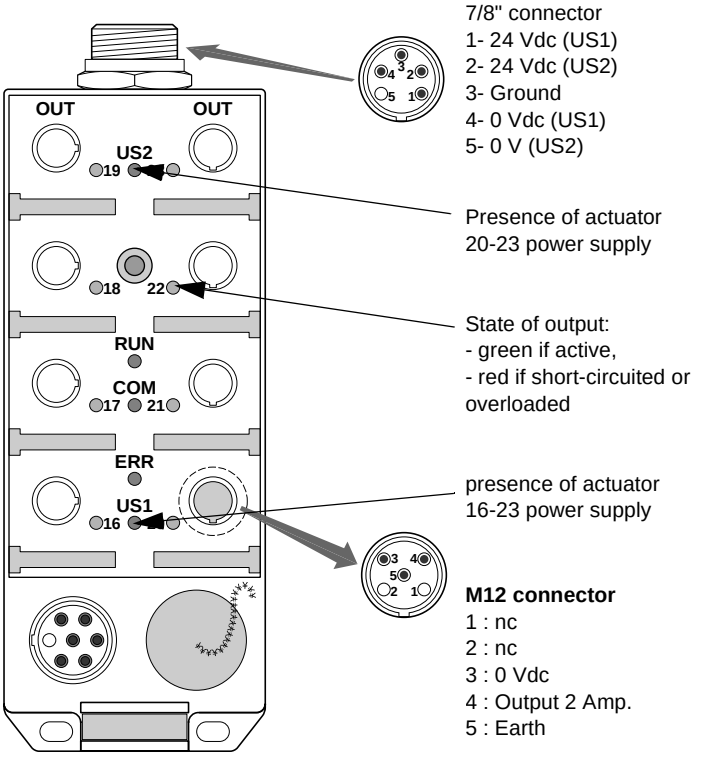
The 7/8" connector is attached to the power supply of the actuator.

Connecting the module outputs

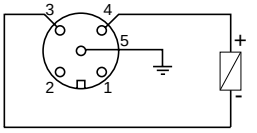
Each output uses a M12 module connector (one output per connector).

For the outputs to operate correctly, the TSX ESF 08T22 module shall receive two 24 Vdc power supplies (US1 and US2) at the output power supply connector.

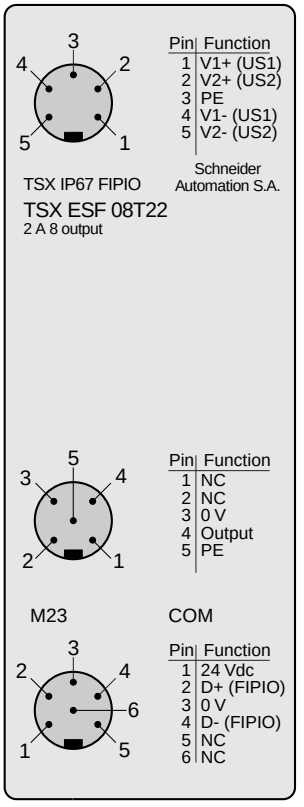
- The outputs 16, 17, 18 and 19 are powered by the US1 power supply.
- The outputs 20, 21, 22 and 23 are powered by the US2 power supply.



Activation



View of etiquette on the back of the module



Connection of outputs US1 and US2 to the power supplies

Output connection

FIPIO bus connection and remote power supply of the module

Electrical characteristics

Type of output	Static
Number of outputs	2 groups of 4
Nominal values: Voltage Current	 24 Vdc 2 Amperes
Max/min output values: Voltage Maximum current per channel Current per 4 channels group at 40 °C at 60 °C	 19.2 at 30 Vdc 2.5 Amperes 8 Amperes 4.8 Amperes
Loss of current in state 0	< 1 mA
Drop-out voltage in state 1	< 0.5 Volts at 2 Amperes
Standard response time in the module: **Surveillance** **Preactuator power supply:**	< 0.5 ms (resistive load) between 14 and 18 Volts
Integrated protection: Against excess voltage Against short-circuits Against excess loads	 protection by transil diode 4.5 Amperes heat disjunction
Isolation: between channels of the same group Between groups of channels Between groups of channels and internal logic Between bus and internal logic	 no 60 V eff. 60 V eff. 500 V
Consumption	80 mA with 5 outputs in status 1 (plus 10 mA for each additional output in status 1)

I/O characteristics and connections on the TSX EMF 16D2 module

10

Presentation

Subject of section

This section presents the methodology to be followed to connect the TSX EMF 16D2 module inputs and outputs.

In this section

This section deals with the following subjects:

General

Introduction

Each IP 67 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.

The 8 outputs are powered by two groups of 4 with US1 and US2 power supplies.

The connection of all connectors is visible on a label stuck on the back of the module (inaccessible on an assembled module).

The M23 connector is attached to the remote supply FIPIO bus.

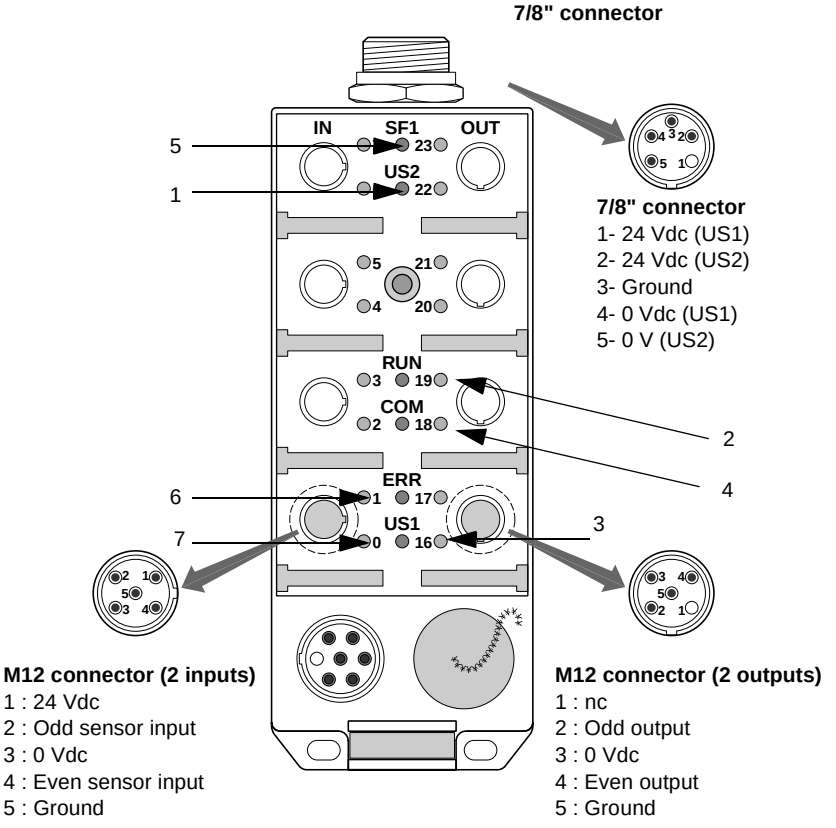
The 7/8" connector is attached to the power supply of the actuator.

Connecting the module inputs and outputs

Each group of two inputs or two outputs will use an M12 module connector (two inputs or outputs per connector).

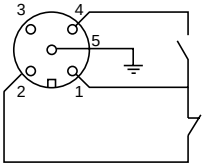
For the outputs to operate correctly, the two 24 Vdc power supplies (US1 and US2) shall be connected to the TSX EMF module via the output power supply connector.

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

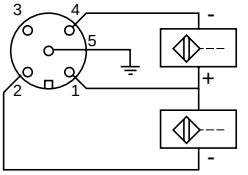


- (1) Presence of actuator 20 to 23 power supply.
- (2) State of odd output, green if active, red if short-circuited.
- (3) Presence of actuators 16 to 19 power supply.
- (4) State of odd output, green if active, red if short-circuited.
- (5) Power supply or sensor fault (short-circuit).
- (6) Odd input state (on if active).
- (7) Even input state (on if active).

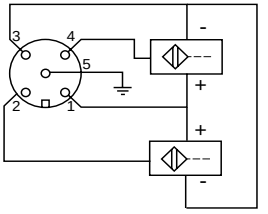
Mechanical contact



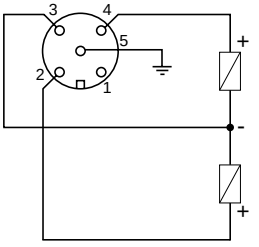
2 wire DDP



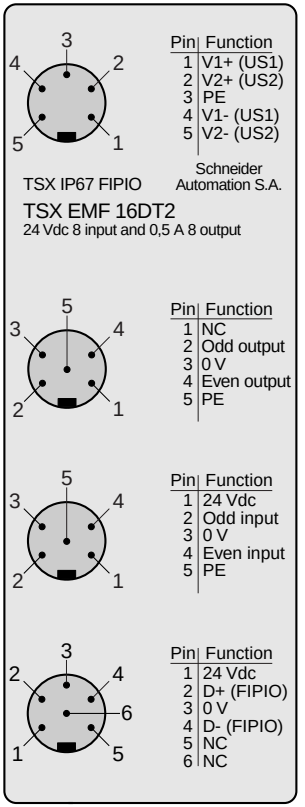
3 wire DDP



Activation



View of etiquette on the back of the module



Power supply connection

Connection of outputs

Connection of inputs

FIPIO bus connection and remote power supply of the module

Electrical characteristics of inputs

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

Electrical characteristics of outputs

Type of output	Static
Number of outputs	8 (2 groups of 4)
Nominal values: Voltage Current	 24 Vdc 0.5 Amperes
Max/min output values: Voltage Maximum current per channel Current per 4 channel group at 40 °C at 60 °C	 19.2 to 30 Vdc 0.625 Amperes 2 Amperes 1.2 Amperes
Loss of current in state 0	< 1 mA
Drop-out voltage in state 1	< 0.5 Volts at 2 Amperes
Standard response time in the module: **Surveillance** **Preactuator power supply:**	< 0.5 ms (resistive load) between 14 and 18 Volts
Built-in protection: Against excess voltage Against short-circuits Against excess loads	 protection by transil diode 1.5 Amperes (min. 0.7) heat disjunction
Isolation: between channels of the same group Between groups of channels Between groups of channels and internal logic Between input and output channels Between bus and internal logic	 no 60 V eff. 60 V eff. 60 V eff. 500 V
Module consumption	130 mA with five 2-wire sensor inputs and 5 outputs in state 1 (plus 10 mA for each additional 2-wire sensor input and plus 10 mA for each 3-wire sensor used; plus 10 mA for each additional output in state 1)

Installation on the machine

11

Presentation

Subject of section

This section presents the installation and attachment of the IP 67 modules and branching boxes on the machine frames.

In this section

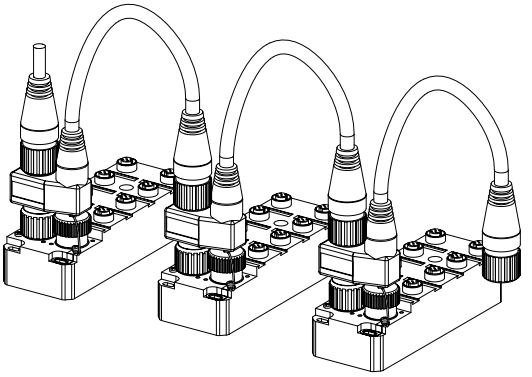
This section deals with the following subjects:

Installation principles

Introduction

The IP 67 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 3 cm between them.



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

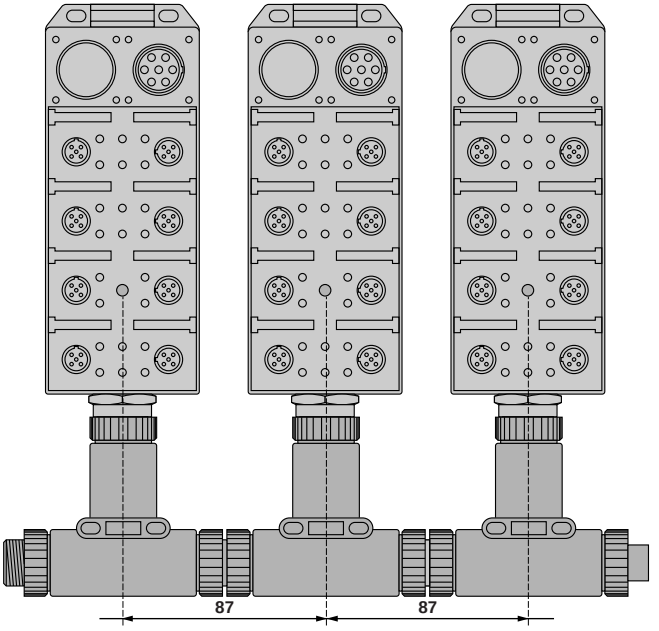
Cable and maximum recommended distance between the modules.

The length of TSX EF ACC 2••• is the same as that of the cable with no connector (-0 / +3 cm).

TSX EF ACC 2002: 0.2 m
TSX EF ACC 2010: 1 m
TSX EF ACC 2030: 3 m
TSX EF ACC 2070: 7 m
TSX EF ACC 20120: 12 m
TSX EF ACC 20250: 25 m

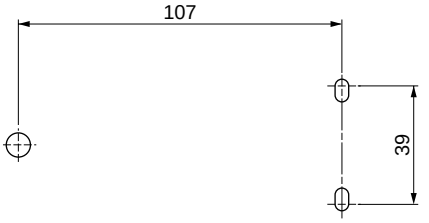
The use of a T connection for the output power supplies requires a minimum distance of 87 mm between two modules.

This minimum distance is recommended in order to avoid mechanical stresses being exerted on the compound-filled cables.

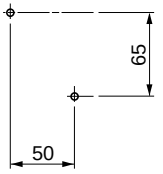


Location of drill holes

The IP 67 modules are attached using 3 attachment holes positioned as follows:



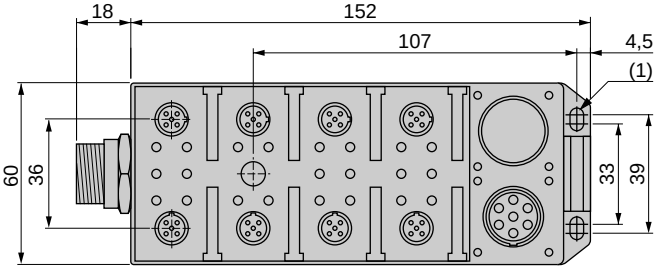
The TSX EF ACC 99 branch box is attached using 2 attachment holes positioned as follows:

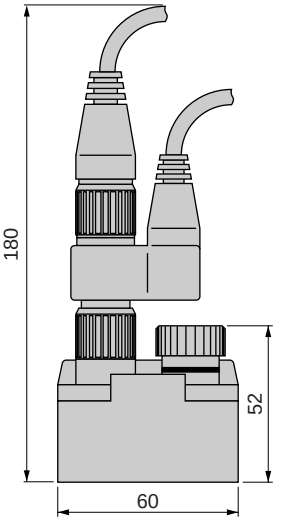


Dimensions

IP 67 modules

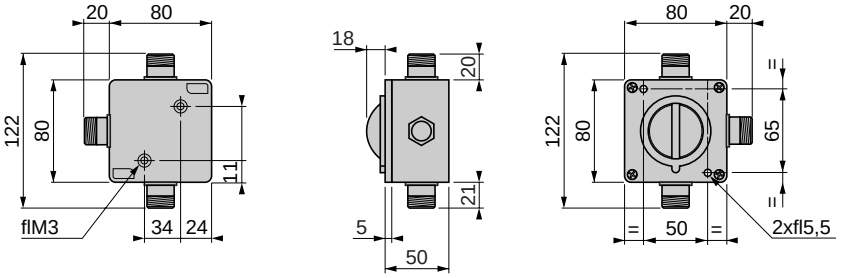
Horizontal and vertical dimensions





Branch box TSX EF ACC 99

The dimensions of a branch box with its connectors are as follows:



Identifying modules and I/Os

Each IP 67 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.