

# Modicon TM3 expansion modules

Catalogue  
2014



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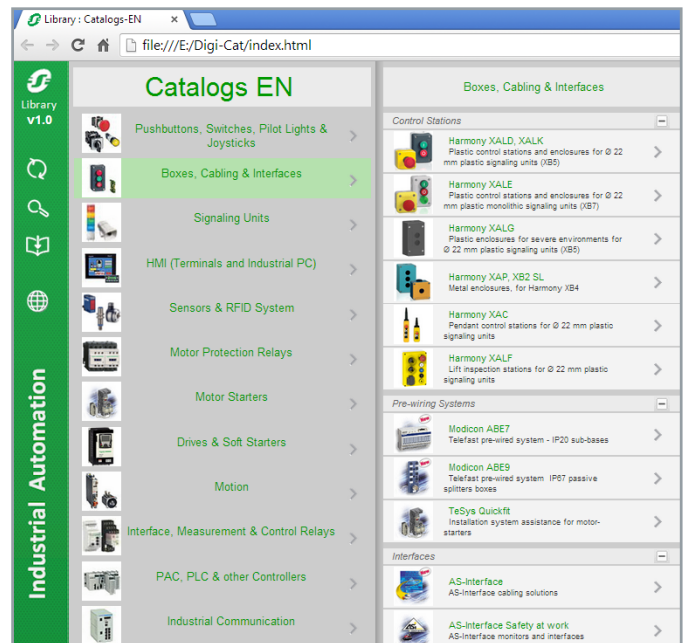
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#### Compatibility of offers

##### Modicon TM3 expansion modules

- > Modicon M221 logic controllers
- > Modicon M221 Book logic controllers
- > Modicon M241 logic controllers
- > Modicon M251 logic controllers
- > SoMachine Basic software
- > SoMachine software
- > Modicon TM2 expansion modules

#### Presentation

The Modicon TM3 expansion module offer provides an opportunity to enhance the capabilities of Modicon M221, M241 and M251 logic controllers:

- Digital I/O modules which can be used to create configurations with up to 264 digital I/O (according to the controller). These modules are available with the same connections as the controllers.
- Analog I/O modules which can be used to create configurations with up to 114 analog I/O (according to the controller) and are designed to receive, amongst other things, position, temperature or speed sensor signals. They are also capable of controlling variable speed drives or any device equipped with a current or voltage input.
- Expert modules for control of TeSys motor starters which simplify wiring up the control section due to connection with RJ45 cables.
- Functional Safety modules which simplify wiring and can be configured in the SoMachine Basic software.

In addition, the TM3 expansion system is flexible due to the possibility of remotely locating some of the TM3 modules in the enclosure or another cabinet (up to 5 meters (16.404 ft.) away, using a bus expansion system.

The Modicon TM3 expansion system is common to the whole range of Modicon M221, M241 and M251 logic controllers, meaning that the model of controller can be revised without changing expansion module.



Digital I/O modules



Analog I/O modules



Expert I/O modules



Functional Safety modules ▲



Bus expansion modules

#### Modicon TM3 range

See page

<b>Digital I/O modules</b>	<input type="checkbox"/> modules with 8 to 32 inputs/outputs: <ul style="list-style-type: none"> <li>- 24 V or 120 V <math>\overline{\text{---}}</math> 50/60 Hz inputs</li> <li>- relay or transistor outputs</li> </ul>	6
<b>Analog I/O modules</b>	<input type="checkbox"/> modules with 2 to 8 inputs/outputs: <ul style="list-style-type: none"> <li>- current/voltage or temperature inputs</li> <li>- current/voltage outputs</li> </ul>	10
<b>Expert module</b>	<input type="checkbox"/> module for control of one to four TeSys motor starters	14
<b>Functional Safety modules ▲</b>	<input type="checkbox"/> modules designed using <b>Preventa</b> technology for integral machine safety: <ul style="list-style-type: none"> <li>- control of emergency stops</li> <li>- control of switches</li> <li>- control of light curtains</li> <li>- control of pressure-sensitive mats or edges</li> </ul>	16
<b>Bus expansion system</b>	<input type="checkbox"/> transmitter module <input type="checkbox"/> receiver module <input type="checkbox"/> bus expansion cable	18

#### Specific features

Modicon TM3 expansion modules have been designed with a simple interlocking assembly mechanism. A bus expansion connector is used to distribute data and the power supply when assembling the Modicon TM3 expansion modules with logic controllers.

#### Connections

A wide choice of connections is available depending on the model of Modicon TM3 module:

- removable screw terminal blocks (1)
- removable spring terminal blocks (1)
- HE 10 connector, to be used with HE 10 cables/bare wires or HE 10/HE 10 and Telefast sub-bases (2)

The connectors (screw terminal blocks, spring terminal blocks, HE 10 connector, RJ 45) are located on the front of the TM3 expansion modules and are therefore accessible.

(1) The terminal blocks are supplied with Modicon TM3 expansion modules.

(2) Telefast Modicon ABE7 pre-wired system to be ordered separately (see on our website [www.schneider-electric.com](http://www.schneider-electric.com)).

▲ Available 2nd half of 2014.

# Expansion modules

## Modicon TM3 expansion modules

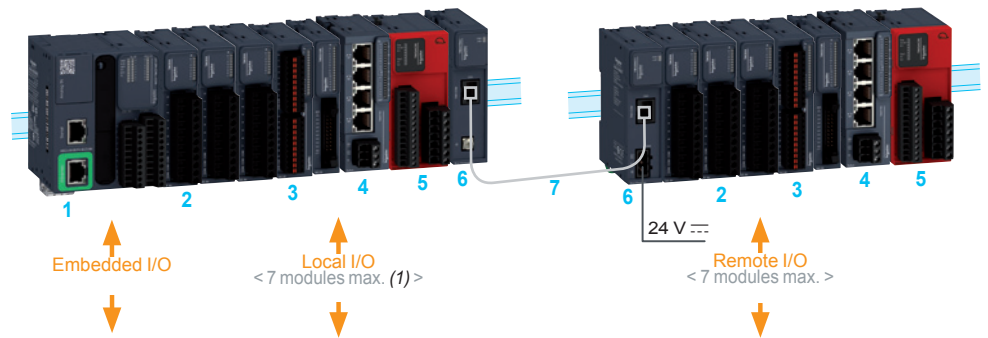
### Bus expansion system

#### Presentation

##### Modicon TM3 bus expansion system

A PLC configuration consists of a controller with its embedded input and output channels, used in conjunction with local or remote expansion modules which are used to increase the number of channels and/or functions.

- Expansion modules are connected directly by simple interlocking with the controller (local I/O) or remotely (remote I/O) with a TM3 bus expansion cable, up to 5 meters (16.404 ft.) away.
- The bus expansion connector, located on the side of the controllers and on each side of the Modicon TM3 expansion modules, transmits and synchronizes data.



- 1 Logic controller (M221, M221 Book, M241, M251)
- 2 Modicon TM3 digital I/O modules.
- 3 Modicon TM3 analog I/O modules.
- 4 Modicon TM3 expert module: control of TeSys motor starters.
- 5 Modicon TM3 functional safety modules ▲.
- 6 Modicon TM3 bus expansion module (transmitter and receiver).
- 7 TM3 bus expansion cable.

##### ■ Local I/O

Maximum configuration: 7 Modicon TM3 expansion modules associated with an M2●● logic controller.

**With limited number of relay or transistor outputs (see page 6).**

##### ■ Remote I/O

Maximum configuration: 14 Modicon TM3 expansion modules (7 local modules + 7 remote modules) with the use of Modicon TM3 bus expansion system (transmitter and receiver modules).

The transmitter and receiver bus expansion modules can be used to:

- increase from 7 to 14 the number of I/O expansion modules that can be connected to an M2●● logic controller
- locate Modicon TM3 expansion modules remotely, up to 5 meters (16.404 ft.) away

The transmitter module and receiver module are physically linked by a **VDIP184546●●●** bus expansion cable.

##### Mounting

- Modicon TM3 expansion modules are mounted on a  $\perp$  symmetrical rail. They have a locking clip on the top of their casing.
- For plate or panel mounting, use the **TMAM2** kit.

(1) Depending on type of TM3 module used (see page 5).

▲ Available 2nd half of 2014.

# Expansion modules

## Modicon TM3 digital I/O modules

<b>Applications</b>	<b>Expansion module type</b>
	<b>Compatibility</b>

<b>Digital inputs</b>
<ul style="list-style-type: none"> <li>Modicon M221 and Modicon M221 Book logic controllers</li> <li>Modicon M241 logic controllers</li> <li>Modicon M251 logic controllers</li> </ul>

<b>Digital outputs</b>	<b>Digital inputs/ outputs</b>
------------------------	--------------------------------



<b>Inputs</b>	Number and type of inputs	8 logic inputs	8 logic inputs	16 logic inputs	32 logic inputs
	Rated voltage	24 V $\overline{\text{DC}}$	120 V $\sim$	24 V $\overline{\text{DC}}$	24 V $\overline{\text{DC}}$
	Input type	Type 1 (IEC 61131-2, Edition 3)			
	Input logic	sink/source	–	sink/source	sink/source

<b>Outputs</b>	No. and type of outputs	–	–	–	–
	Rated voltage	–	–	–	–
	Type of contact	–	–	–	–
	Logic	–	–	–	–
	Max. output current	–	–	–	–
	□ Per output	–	–	–	–
	□ Per group of channels	–	–	–	–

<b>Supply voltage</b>	Power supplied by the controller via the bus expansion connector
<b>Format (w x h x d)</b>	mm (in.)
	23.6 x 90 x 70 (0.93 x 3.54 x 2.76)
	23.6 x 90 x 70 (0.93 x 3.54 x 2.76)
	TM3DI16, TM3DI16G: 23.6 x 90 x 70 (0.93 x 3.54 x 2.76) TM3DI16K: 17.6 x 90 x 70 (0.69 x 3.54 x 2.76)
	30.2 x 90 x 70 (1.19 x 3.54 x 2.76)

Mounting on  $\perp$  symmetrical rail or panel with specific mounting kit TMAM2

<b>Module type</b>	Channels connected:				
	with removable screw terminal blocks with a thread of 5.08 mm (0.2 in.)	TM3DI8	TM3DI8A	–	–
	with removable screw terminal blocks with a thread of 3.81 mm (3.81 mm.)	–	–	TM3DI16	–
	with removable spring terminal blocks with a thread of 5.08 mm (0.2 in.)	TM3DI8G	–	–	–
	with removable spring terminal blocks with a thread of 3.81 mm (3.81 mm.)	–	–	TM3DI16G	–
with HE 10 connectors (1)	–	–	TM3DI16K	TM3DI32K	

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(1) Compatible with the Telefast Modicon ABE7 pre-wired system (see on our website [www.schneider-electric.com](http://www.schneider-electric.com)).

–	–	–	–	–	–	–	–	–	4 logic inputs	16 logic inputs
–	–	–	–	–	–	–	–	–	24 V $\overline{\text{DC}}$	24 V $\overline{\text{DC}}$
–	–	–	–	–	–	–	–	–	Type 1 (IEC 61131-2, Edition 3)	
–	–	–	–	–	–	–	–	–	sink/source	sink/source

8 relay outputs	8 transistor outputs	8 transistor outputs	16 relay outputs	16 transistor outputs	16 transistor outputs	32 transistor outputs	32 transistor outputs	4 relay outputs	8 relay outputs
24 V $\overline{\text{DC}}$ / 240 V $\sim$	24 V $\overline{\text{DC}}$	24 V $\overline{\text{DC}}$	24 V $\overline{\text{DC}}$ / 240 V $\sim$	24 V $\overline{\text{DC}}$	24 V $\overline{\text{DC}}$	24 V $\overline{\text{DC}}$	24 V $\overline{\text{DC}}$	24 V $\overline{\text{DC}}$ / 240 V $\sim$	24 V $\overline{\text{DC}}$ / 240 V $\sim$
1 N/O contact	–	–	1 N/O contact	–	–	–	–	1 N/O contact	1 N/O contact
–	Source	Sink	–	Source	Sink	Source	Sink	–	–
2 A	0.5 A	0.5 A	2 A	0.5 A for TM3DQ16T and TM3DQ16TG 0.1 A for TM3DQ16TK	0.5 A for TM3DQ16U and TM3DQ16UG 0.1 A for TM3DQ16UK	0.1 A	0.1 A	2 A	2 A
7 A	4 A	4 A	8 A	4 A for TM3DQ16T and TM3DQ16TG 2 A for TM3DQ16TK	2 A	2 A	2 A	7 A	7 A

<b>Supply voltage</b>	Power supplied by the controller via the bus expansion connector
<b>Format (w x h x d)</b>	mm (in.)
	23.6 x 90 x 70 (0.93 x 3.54 x 2.76)
	TM3DQ16T, TM3DQ16TG, TM3DQ16U, TM3DQ16UG: 23.6 x 90 x 70 (0.93 x 3.54 x 2.76) TM3DQ16TK, TM3DQ16UK: 17.6 x 90 x 70 (0.69 x 3.54 x 2.76)
	30.2 x 90 x 70 (1.19 x 3.54 x 2.76)
	23.6 x 90 x 70 (0.93 x 3.54 x 2.76)
	39.1 x 90 x 70 (1.53 x 3.54 x 2.76)

Mounting on  $\perp$  symmetrical rail or panel with specific mounting kit TMAM2

TM3DQ8R	TM3DQ8T	TM3DQ8U	–	–	–	–	–	–	TM3DM8R	–
–	–	–	TM3DQ16R	TM3DQ16T	TM3DQ16U	–	–	–	–	TM3DM24R
TM3DQ8RG	TM3DQ8TG	TM3DQ8UG	–	–	–	–	–	–	TM3DM8RG	–
–	–	–	TM3DQ16RG	TM3DQ16TG	TM3DQ16UG	–	–	–	–	TM3DM24RG
–	–	–	–	TM3DQ16TK	TM3DQ16UK	TM3DQ32TK (1)	TM3DQ32UK (1)	–	–	–

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(1) Compatible with the Telefast Modicon ABE7 pre-wired system (see on our website [www.schneider-electric.com](http://www.schneider-electric.com)).

# Expansion modules

## Modicon TM3 digital I/O modules

### Presentation

The Modicon TM3 digital I/O module offer consists of 27 modules: input modules, output modules and mixed I/O modules. These digital I/O modules complement the embedded I/O on M221, M221 Book, M241 and M251 logic controllers.

### Breakdown of the offer

- Digital I/O modules**
- with 8, 16 or 32 x 24 V  $\overline{\text{DC}}$  inputs
  - with 8 x 120 V  $\sim$  inputs
  - with 8 or 16 relay outputs
  - with 8, 16 or 32 source transistor 24 V  $\overline{\text{DC}}$  outputs
  - with 8, 16 or 32 sink transistor 24 V  $\overline{\text{DC}}$  outputs
  - with 4 x 24 V  $\overline{\text{DC}}$  inputs and 4 relay outputs
  - with 16 transistor 24 V  $\overline{\text{DC}}$  inputs and 8 relay outputs

### Connections

- Thanks to a wide choice of modules, it is possible to create homogenous configurations in terms of connections:
- Screw terminal blocks with a thread of 5.08 mm (0.2 in.) for ease of wiring: identical to the connectors on M221 and M241 logic controllers.
  - Screw or spring-type connectors with a thread of 3.81 mm (0.15 in.) for compact dimensions: identical to the connectors on **TM221M16●●** and **TM221ME16●●** controllers.
  - HE10 type connectors that can minimize wiring costs thanks to the Telefast pre-wired system: identical to the connectors on **TM221M32TK** and **TM221ME32TK** controllers.

### Configuration

- Local I/O (1): up to 7 I/O modules can be attached to the controller while complying with the restrictions indicated in the table below.
- Remote I/O (1) with TM3 bus expansion system: 7 additional I/O modules can be used without restriction. These modules are attached to a **TM3XREC1** receiver module.

Logic controllers	TM221									TM241/TM251	
	C16R CE16R	C16T CE16T	C24R CE24R	C24T CE24T	C40R CE40R	C40T CE40T	M16R ME16R M16RG ME16RG	M16T ME16T M16TG ME16TG	M32TK ME32TK		TM241●●●● TM251●●●●
Maximum number of TM3 module transistor (local) outputs directly connected to the controller (2)	104	136	144	176	(3)						
Maximum number of TM3 module relay (local) outputs directly connected to the controller (2)	23	28	32	40	48	60	92	96	96	(3)	

(1) Local I/O and remote I/O: see page 3.

(2) If using bus expansion system: maximum number of TM3 module relay or transistor outputs installed between the controller and the **TM3XTRA1** transmitter module (local outputs).

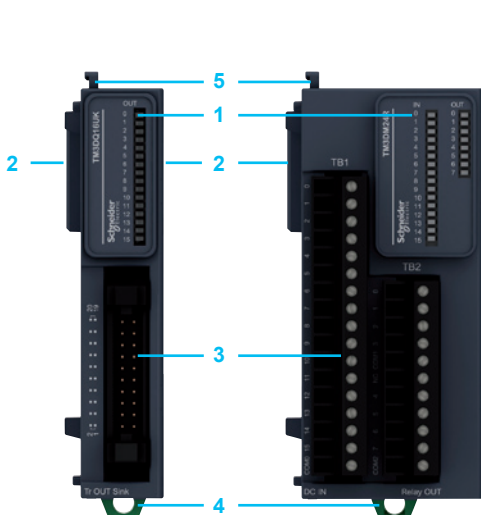
(3) Up to 7 TM3 modules regardless of the number of outputs used.

### Mounting

- Digital I/O modules are mounted on a  $\perp$  symmetrical rail.
- For plate or panel mounting, use the **TMAM2** kit.

### Description

#### Modicon TM3 digital I/O modules



- 1 LED display block for the module channels and diagnostics
- 2 TM3 bus connectors (one on each side). These are designed to provide continuity of the link between connected modules.
- 3 Input or output channel terminal blocks (depending on model: screw terminal blocks, spring terminal blocks or HE 10 connector).
- 4  $\perp$  symmetrical rail locking clip.
- 5 Adjacent module locking latch.



TM3DI8 TM3DI8G



TM3DI8A TM3DI32K



TM3DQ16U TM3DQ16UG



TM3DQ16UK



TM3DQ32TK TM3DQ32UK



TM3DM24R TM3DM24RG

### References

#### Modicon TM3 digital input modules

Number of logic inputs	Input type	Term. block for input conn. (1) Thread (mm/in.)	References	Weight kg lb
8 inputs	sink/source 24 V $\overline{\text{---}}$	screw 5.08/0.2	TM3DI8	0.110 0.243
		spring 5.08/0.2	TM3DI8G	0.095 0.209
	120 V $\sim$	screw 5.08/0.2	TM3DI8A	0.110 0.243
		spring 5.08/0.2	TM3DI8G	0.095 0.209
16 inputs	sink/source 24 V $\overline{\text{---}}$	screw 3.81/0.15	TM3DI16	0.105 0.231
		spring 3.81/0.15	TM3DI16G	0.095 0.209
	HE 10 connector –	HE 10 connector (2)	TM3DI16K	0.075 0.165
		HE 10 connector (2)	TM3DI32K	0.110 0.243

#### Modicon TM3 digital output modules

Number of logic outputs	Output type	Output current	Term. block for output conn. (1) Thread (mm/in.)	References	Weight kg lb		
8 outputs	Relay	2 A	screw 5.08/0.2	TM3DQ8R	0.130 0.287		
			spring 5.08/0.2	TM3DQ8RG	0.115 0.254		
		Transistor, source	screw 5.08/0.2	TM3DQ8T	0.110 0.243		
			spring 5.08/0.2	TM3DQ8TG	0.095 0.209		
	Transistor, sink	0.5 A	screw 5.08/0.2	TM3DQ8U	0.110 0.243		
			spring 5.08/0.2	TM3DQ8UG	0.095 0.209		
	16 outputs	Relay	2 A	screw 3.81/0.15	TM3DQ16R	0.140 0.309	
				spring 3.81/0.15	TM3DQ16RG	0.130 0.287	
			Transistor, source	0.5 A	screw 3.81/0.15	TM3DQ16T	0.105 0.231
					spring 3.81/0.15	TM3DQ16TG	0.095 0.209
		Transistor, sink	0.5 A	HE 10 connector –	TM3DQ16TK (2)	0.075 0.165	
				screw 3.81/0.15	TM3DQ16U	0.105 0.231	
32 outputs		Transistor, source	0.1 A	HE 10 connector (2)	TM3DQ32TK	0.115 0.254	
				HE 10 connector (2)	TM3DQ32UK	0.115 0.254	
	Transistor, sink	0.1 A	HE 10 connector –	TM3DQ16TK (2)	0.075 0.165		
			HE 10 connector (2)	TM3DQ16UK	0.075 0.165		

#### Modicon TM3 digital mixed I/O modules

No. of logic I/O	Number and type of inputs	Number and type of outputs	Term. block for output conn. (1) Thread (mm/in.)	References	Weight kg lb
8 inputs/outputs	4 sink/source 24 V $\overline{\text{---}}$ inputs	4 relay outputs 2 A	screw 5.08/0.2	TM3DM8R	0.120 0.265
			spring 5.08/0.2	TM3DM8RG	0.100 0.220
24 inputs/outputs	16 sink/source 24 V $\overline{\text{---}}$ inputs	8 relay outputs 2 A	screw 3.81/0.15	TM3DM24R	0.165 0.364
			spring 3.81/0.15	TM3DM24RG	0.155 0.342

#### Separate parts

Designation	Description	Reference	Weight kg lb
Mounting kit Sold in lots of 10	For plate or panel mounting of digital I/O modules	TMAM2	0.065 0.143
Set of terminal blocks for connecting the I/O	4 x 10-way and 4 x 11-way removable terminal blocks with screw terminals for TM3DI16, TM3DQ16R, TM3DQ16T and TM3DQ16U modules	TMAT2MSET	0.127 0.280
		TMAT2MSETG	0.127 0.280

(1) Removable screw or spring-type terminal blocks, supplied.

(2) Modules compatible with the Telefast Modicon ABE7 pre-wired system (on our website [www.schneider-electric.com](http://www.schneider-electric.com)).



# Expansion modules

## Modicon TM3 analog I/O modules

Applications	Type of expansion module	Analog inputs	Analog inputs	Analog outputs	Analog inputs/outputs
	Compatibility	<ul style="list-style-type: none"> <li>Modicon M221 and M221 Book logic controllers</li> <li>Modicon M241 logic controllers</li> <li>Modicon M251 logic controllers</li> </ul>			



Inputs	Number	2 inputs	4 inputs	4 inputs	8 inputs
	Type		Voltage/current	Voltage/current	Temperature or voltage/current
Range		- 10...+ 10 VDC, 0...+ 10 VDC/ 0...20 mA, 4...20 mA	- 10...+ 10 VDC, 0...+ 10 VDC/ 0...20 mA, 4...20 mA	Thermocouples (J, K, R, S, B, T, N, E, C)  Temperature probes (RTDs): (Ni100, Ni1000, PT100, PT1000)  - 10...+ 10 VDC, 0...+ 10 VDC / 0...20 mA, 4...20 mA	- 10...+ 10 VDC, 0...+ 10 VDC/ 0...20 mA, 4...20 mA
Resolution		16 bits or 15 bits + sign	12 bits or 11 bits + sign	16 bits or 15 bits + sign	12 bits or 11 bits + sign
Read time		1 or 10 ms (configurable)	1 or 10 ms (configurable)	100 ms per channel for temperature signals, 1 or 10 ms (configurable) for voltage/current signals	1 or 10 ms (configurable)

Inputs	Number	8 inputs	2 inputs	4 inputs
	Type		Temperature	Temperature or voltage/current
Range		Thermocouples (J, K, R, S, B, T, N, E, C)  NTC and PTC thermistors	Thermocouples (J, K, R, S, B, T, N, E, C)  Temperature probes (RTDs): (Ni100, Ni1000, PT100, PT1000)  - 10...+ 10 VDC, 0...+ 10 VDC / 0...20 mA, 4...20 mA	- 10...+ 10 VDC, 0...+ 10 VDC/ 0...20 mA, 4...20 mA
Resolution		16 bits or 15 bits + sign	16 bits or 15 bits + sign	12 bits or 11 bits + sign
Read time		100 ms per channel	100 ms per channel for temperature signals, 1 or 10 ms (configurable) for voltage/current signals	1 or 10 ms (configurable)

Outputs	Number	-	-	-	-
	Type		-	-	-
Range		-	-	-	-
Resolution		-	-	-	-
Transfer time		-	-	-	-

Outputs	Number	2 outputs	4 outputs	1 output	2 outputs
	Type		Voltage/current	Voltage/current	Voltage/current
Range		- 10...+ 10 VDC, 0...+ 10 VDC/ 0...20 mA, 4...20 mA	- 10...+ 10 VDC, 0...+ 10 VDC/ 0...20 mA, 4...20 mA	- 10...+ 10 VDC, 0...+ 10 VDC/ 0...20 mA, 4...20 mA	- 10...+ 10 VDC, 0...+ 10 VDC/ 0...20 mA, 4...20 mA
Resolution		12 bits or 11 bits + sign	12 bits or 11 bits + sign	12 bits or 11 bits + sign	12 bits or 11 bits + sign
Transfer time		1 or 10 ms (configurable)	1 or 10 ms (configurable)	1 or 10 ms (configurable)	1 or 10 ms (configurable)

Supply voltage	With a 24 V $\overline{\text{DC}}$ external power supply
Format (w x h x d) mm (in.)	23.6 x 90 x 70 (0.93 x 3.54 x 2.76)
Mounting	Mounting on $\perp$ symmetrical rail or panel with specific mounting kit TMAM2

Supply voltage	With a 24 V $\overline{\text{DC}}$ external power supply
Format (w x h x d) mm (in.)	23.6 x 90 x 70 (0.93 x 3.54 x 2.76)
Mounting	Mounting on $\perp$ symmetrical rail or panel with specific mounting kit TMAM2

Type of module	Channel connection:	TM3AI2H	TM3AI4	TM3AI4G	TM3AI8
		via removable screw terminal blocks at intervals of 5.08 (0.2 in.)	-	TM3TI4	TM3TI4G
	via removable spring terminal blocks at intervals of 5.08 (0.2 in.)	TM3AI2HG	-	-	-
	via removable spring terminal blocks at intervals of 3.81 (0.15 in.)	-	TM3AI4G	TM3TI4G	TM3AI8G

Type of module	Channel connection:	TM3AQ2	TM3AQ4	TM3AQ2G	TM3AQ4G
		via removable screw terminal blocks at intervals of 5.08 (0.2 in.)	TM3TM3	TM3TM3	TM3TM3G
	via removable spring terminal blocks at intervals of 5.08 (0.2 in.)	TM3TI8T	-	-	-
	via removable spring terminal blocks at intervals of 3.81 (0.15 in.)	-	TM3AM6	-	-
	via removable spring terminal blocks at intervals of 3.81 (0.15 in.)	TM3TI8TG	-	-	TM3AM6G

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### Presentation

The Modicon TM3 analog I/O module offer consists of 18 input, output and mixed input/output modules. The input modules acquire various analog values encountered in industrial applications.

These I/O modules complement the embedded I/O in Modicon M221, M221 Book and M241 logic controllers.

- **TM3AI●●** and **TM3TI●●** analog input modules are used to acquire various analog values (voltage, current or temperature) encountered in industrial applications.
- **TM3AQ●●** analog output modules are used to control preactuators in physical units, such as variable speed drives or valves and applications where process control is required.
- **TM3TM●●** and **TM3AM●●** mixed modules combine voltage/current or temperature analog inputs as well as one or two voltage/current outputs in the same case.
- When the controller stops, the outputs of each TM3 analog modules can be configured to fall back (hold the last value or a specified value). This function, when set to "hold", is useful when debugging the application or when a fault occurs, in order not to disturb the process being controlled.

### Breakdown of the offer

- Analog I/O modules**      Modules with 2 to 8 analog I/O:
- voltage/current or temperature inputs
  - voltage/current outputs

### Format

A single format: 23.6 x 90 x 70 (0.93 x 3.54 x 2.76 in.).

### Connection

With a wide selection of modules, uniform configurations can be created in terms of connectors:

- Screw-type or spring-type connectors at intervals of 5.08 (0.2 in.) for ease of wiring: identical to the connectors on Modicon M221 (TM221C●●●●) and Modicon M241 (TM241C●●●●) logic controllers.
- Screw-type or spring-type connectors at intervals of 3.81 (0.15 in.) for compact dimensions: identical to the connectors on Modicon M221 Book (TM221M16●● and TM221ME16●●) logic controllers.

### Configuration

- Analog I/O modules connect to Modicon M221 and M221 Book, M241 and M251 logic controllers according to the general rules for the Modicon TM3 system: 7 modules max. and 14 modules max. with use of Modicon TM3 bus expansion system (transmitter and receiver).
- An external 24 V  $\overline{\text{---}}$  power supply is required for each Modicon TM3 analog module.
- The I/O modules are designed with isolation by an optocoupler between the internal electronics and the I/O channels.

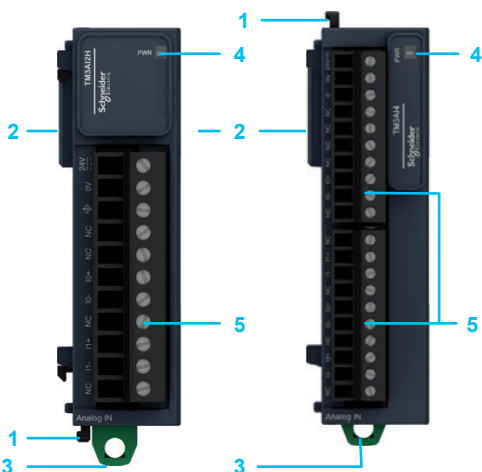
### Mounting

- The analog modules are mounted on a  $\perp$  symmetrical rail.
- For plate or panel mounting, use the **TMAM2** kit.
- The **TM2XMTGB** grounding plate simplifies connection of the analog sensor and actuator cable shielding (shielding to be connected to the device's functional ground).

### Description

#### Modicon TM3 analog modules

- 1 Locking latch for the adjacent module.
- 2 TM3 bus connectors (one on each side). These are designed to provide continuity of the link between connected modules.
- 3 Clip for locking on  $\perp$  symmetrical rail.
- 4 Module "Power on" LED.
- 5 Removable spring or screw terminal blocks (depending on the model) for connecting the analog channels and the 24 V power supply.



TM3AI2H, TM3AQ2,  
TM3AQ4, TM3TM3

TM3AI4, TM3TI4, TM3AI8,  
TM3TI8T, TM3AM6



TM3AI2H TM3AI4



TM3TI4 TM3AI8



TM3TI8T



TM3AQ2 TM3AQ4



TM3TM3 TM3AM6



TM200RSRCEMC



TM2XMTGB

### References

#### Modicon TM3 analog I/O modules

Number and type of channels	Input range	Output range	Resolution	Conn. block for the inputs (1) Pitch (in.)	Reference	Weight kg lb
2 voltage/current inputs	- 10...+ 10 VDC, 0...+ 10 VDC/ 0...20 mA, 4...20 mA	-	16 bits or 15 bits + sign	Screw 5.08/0.2	TM3AI2H	0.115 0.254
				Spring 5.08/0.2	TM3AI2HG	0.100 0.220
4 voltage/current inputs	- 10...+ 10 VDC, 0...+ 10 VDC/ 0...20 mA, 4...20 mA	-	12 bits or 11 bits + sign	Screw 3.81/0.15	TM3AI4	0.110 0.243
				Spring 3.81/0.15	TM3AI4G	0.100 0.220
4 voltage/current or temperature inputs (2)	<input type="checkbox"/> Thermocouples (J, K, R, S, B, T, N, E, C) <input type="checkbox"/> Temperature probes (RTDs) (Ni100, Ni1000, PT100, PT1000) <input type="checkbox"/> - 10...+ 10 VDC, 0...+ 10 VDC) /0...20 mA, 4...20 mA)	-	16 bits or 15 bits + sign	Screw 3.81/0.15	TM3TI4	0.110 0.243
				Spring 3.81/0.15	TM3TI4G	0.100 0.220
8 voltage/current inputs	- 10...+ 10 VDC, 0...+ 10 VDC/ 0...20 mA, 4...20 mA	-	12 bits or 11 bits + sign	Screw 3.81/0.15	TM3AI8	0.110 0.243
				Spring 3.81/0.15	TM3AI8G	0.100 0.220
8 temperature inputs	<input type="checkbox"/> Thermocouples (J, K, R, S, B, T, N, E, C) <input type="checkbox"/> NTC and PTC thermistors	-	16 bits or 15 bits + sign	Screw 3.81/0.15	TM3TI8T	0.110 0.243
				Spring 3.81/0.15	TM3TI8TG	0.100 0.220

#### Modicon TM3 analog output modules

2 voltage/current outputs	-	- 10...+ 10 VDC, 0...+ 10 VDC/ 0...20 mA, 4...20 mA	12 bits or 11 bits + sign	Screw 5.08/0.2	TM3AQ2	0.115 0.254
				Spring 5.08/0.2	TM3AQ2G	0.100 0.220
4 voltage/current outputs	-	- 10...+ 10 VDC, 0...+ 10 VDC/ 0...20 mA, 4...20 mA	12 bits or 11 bits + sign	Screw 5.08/0.2	TM3AQ4	0.115 0.254
				Spring 5.08/0.2	TM3AQ4G	0.100 0.220

#### Modicon TM3 analog mixed I/O modules

2 temperature or voltage/current outputs (2) and 1 voltage/current output	<input type="checkbox"/> Thermocouples (J, K, R, S, B, T, N, E, C) <input type="checkbox"/> Temperature probes (RTDs) (Ni100, Ni1000, PT100, PT1000) <input type="checkbox"/> - 10...+ 10 VDC, 0...+ 10 VDC) /0...20 mA, 4...20 mA)	- 10...+ 10 VDC, 0...+ 10 VDC/ 0...20 mA, 4...20 mA	16 bits or 15 bits + sign (for I) 12 bits or 11 bits + sign (for O)	Screw 5.08/0.2	TM3TM3	0.115 0.254
				Spring 5.08/0.2	TM3TM3G	0.100 0.220
4 voltage/current inputs and 2 voltage/current outputs	- 10...+ 10 VDC, 0...+ 10 VDC/ 0...20 mA, 4...20 mA	- 10...+ 10 VDC, 0...+ 10 VDC/ 0...20 mA, 4...20 mA	12 bits or 11 bits + sign (for I and O)	Screw 3.81/0.15	TM3AM6	0.110 0.243
				Spring 3.81/0.15	TM3AM6G	0.100 0.220

#### Separate parts

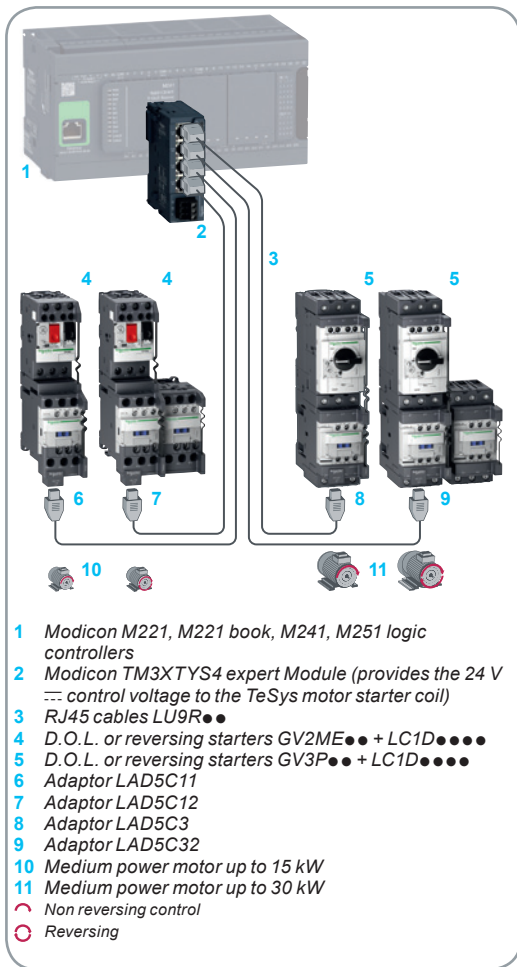
Description	Details	Unit reference	Weight kg lb
Grounding plate	Support equipped with 10 male Faston connectors for connecting the cable shielding (via 6.35 connectors, not supplied) and the functional grounds (FE)	TM2XMTGB	0.045 0.099
Shielding connection clamps Sold in lots of 25	Assembly and earthing of the cable shielding. Pack of 25 clamps including 20 for Ø 4.8 (0.189 in.) cable and 5 for Ø 7.9 (0.311 in.) cable	TM200RSRCEMC	-
Mounting kit Sold in lots of 10	For mounting the analog I/O modules on a plate or panel	TMAM2	0.065 0.143
Set of I/O terminal blocks	4 terminal blocks with 10 pins and 4 terminal blocks with 11 removable screw terminal pins for TM3AI4, TM3TI4, TM3AI8, TM3TI8, TM3AM6 modules	TMAT2MSET	0.127 0.280
	4 terminal blocks with 10 pins and 4 terminal blocks with 11 removable spring terminal pins for TM3AI4G, TM3TI4G, TM3AI8G, TM3TI8G, TM3AM6G modules	TMAT2MSETG	0.127 0.280

(1) Removable screw terminal blocks supplied with each module.

(2) Each input can be configured independently for temperature or voltage/current.

# Expansion modules

## Modicon TM3 expert module for TeSys motor starter applications



### Presentation

The **TM3XTYS4** expert module is a pre-wired interface for use with Modicon M221, M241 and M251 logic controllers, designed to monitor and control up to four motor starters.

The **TM3XTYS4** expert module is a component of TeSys Solink system that allows a simple, fast and error free wiring of the motor starter.

### Controlling motor starters with the TM3XTYS4 expert module

Each of the four channels on the **TM3XTYS4** expert module has:

- Two outputs for the command of the motor starter:

- direction 1 command
- direction 2 command, if reversing starter.

- Three inputs for the motor starter status:

- Ready
- Run
- Fault

The inputs are connected in series with the motor starter auxiliary contacts.

### Connections

- The **TM3XTYS4** Expert module is equipped with four RJ 45 connectors for connection to the motor starters.
- **LU9R●●●** type cordsets are dedicated to the connection of TeSys motor starter and equipped with an RJ 45 connector at each end.

### Configuration

- The expert module is connected directly to the logic controllers on the TM3 bus connector or to the bus expansion system (receiver module).
- One or more expert modules can be connected to M221, M221 Book, M241 and M251 logic controllers according to the general rules for the TM3 system: 7 modules max. and 14 modules max. with the use of Modicon TM3 bus expansion system (transmitter and receiver).

### Mounting

- The **TM3XTYS4** expert module is mounted on a  $\perp$  symmetrical rail.
- For plate or panel mounting, use the **TMAM2** kit.

### Format

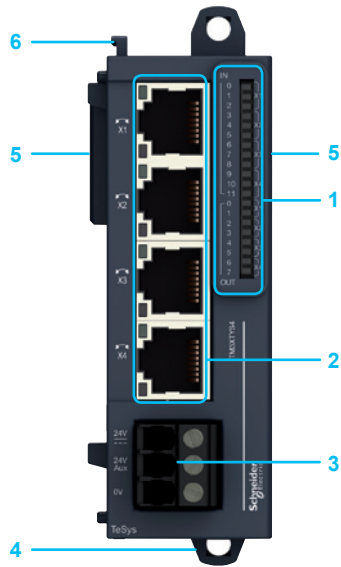
A single format: 23.6 x 90 x 70 mm (0.93 x 3.54 x 2.76 in.).

### TeSys motor starter applications examples

	Direct Up to 15 kW / 400 V	From 18.5 to 30 kW / 400 V	Reversing Up to 15 kW / 400 V	From 18.5 to 30 kW / 400 V
<b>TeSys D</b>				
1 Motor circuit breaker	GV2ME●● or GV2P●●	GV3P●●	GV2ME●● or GV2P●●	GV3P●●
2 Contactor 24 V $\overline{\text{---}}$	LC1D09BL to LC1D32BL LC1D09BD to LC1D32BD	LC1D40ABD to LC1D65ABD	LC2D09BL to LC2D32BL LC2D09BD to LC2D32BD	LC2D40BD to LC2D65BD
3 Combination block	GV2AF3	–	GV2AF3	–
4 Auxilliary contact	GVAE20	GVAE20	GVAE20	GVAE20
5 Connection module	LAD5C11	LAD5C31	LAD5C12	LAD5C32
<b>Connection cable</b>				
6 Length of 0.3 m	LU9R03			
6 Length of 1 m	LU9R10			
6 Length of 3 m	LU9R30			
<b>Modicon TM3 module</b>				
7 Modicon TM3	TM3XTYS4			
<b>TeSys U</b>				
8 Power base	LUB120 or LUB320		LUB120 or LUB320	
9 Control unit 24 V $\overline{\text{---}}$	LUCA/LUCB/LUCC/LUCD●●BL		LUCA/LUCB/LUCC/LUCD●●BL	
10 Terminal blocks	LU9BN11C		LU9MRC	
11 Parallel wiring module	LUF00		LUF00	

For further information about TeSys motor starter applications, please consult our website [www.schneider-electric.com](http://www.schneider-electric.com).





TM3XTYS4

### Description

#### TM3XTYS4 expert module

- 1 Block with 20 LEDs displaying the status of the 12 input channels and 8 output channels.
- 2 Four RJ 45 connectors for cordsets connecting to the motor starters.
- 3 Screw terminal block for connecting the 24 V  $\overline{\text{m}}$  power supply for the inputs and starter coils.
- 4  $\perp$  symmetrical rail locking clip.
- 5 TM3 bus connectors (one on each side). These are designed to provide continuity of the link between connected modules.
- 6 Adjacent module locking latch.

### References

#### Expert module (1)

Designation	Number and type of channels	Reference	Weight kg lb
Expert modules for control of TeSys motor starters 24 V $\overline{\text{m}}$ power supply (1.2 A)	4 motor starters	TM3XTYS4	0.115 0.254

#### Separate parts

Designation	Description	Reference	Weight kg lb
Mounting kit Sold in lots of 10	For plate or panel mounting of expert modules	TMAM2	0.065 0.143

(1) The TM3XTYS4 module is supplied with a screw removable terminal block for connecting the power supply.

# Expansion modules

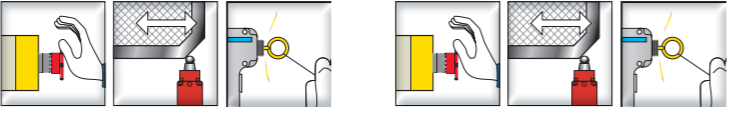
## Modicon TM3 functional safety modules

(Powered by **Preventa** technology)

**Safety application**



**Compatibility**



**Control of Emergency stop and switches**

- Modicon M221 and Modicon M221 Book logic controllers
- Modicon M241 logic controllers
- Modicon M251 logic controllers



<b>Maximum achievable safety level</b>	PLd/Category 3 conforming to EN/ISO 13849-1 SILCL2 conforming to EN/IEC 61508 and EN/IEC 62061
<b>Standards (product)</b>	EN/IEC 60947-1 EN/IEC 60947-5-1
<b>Standards (machine assembly)</b>	Emergency stop circuits
	Switches in protective devices
	Type 4 light curtains equipped with solid-state safety outputs with test function
	4-wire pressure-sensitive mats or edges
<b>Product certifications</b>	UL, CSA, TÜV, CCC

PLd/Category 3 conforming to EN/ISO 13849-1 SILCL2 conforming to EN/IEC 61508 and EN/IEC 62061	PLe/Category 4 conforming to EN/ISO 13849-1 SILCL3 conforming to EN/IEC 61508 and EN/IEC 62061
EN/IEC 60947-1 EN/IEC 60947-5-1	EN/IEC 60947-1 EN/IEC 60947-5-1
EN/IEC 60204-1 EN/ISO 13850	EN/IEC 60204-1 EN/ISO 13850
EN/ISO 14119	EN/ISO 14119
–	–
–	–
UL, CSA, TÜV, CCC	UL, CSA, TÜV, CCC

<b>Safety circuits</b>	Number	3 NO
	Type	Instantaneous opening relay
<b>Module fuse protection</b>		Internal, electronic
<b>LEDs</b>		6 LEDs
<b>Power supply</b>		24 V ~

3 NO	3 NO
Instantaneous opening relay	Instantaneous opening relay
Internal, electronic	Internal, electronic
6 LEDs	6 LEDs
24 V ~	24 V ~

<b>Synchronization time between inputs</b>	Unlimited
<b>Input channel voltage</b>	24 V ~


Unlimited	Unlimited
24 V ~	24 V ~

<b>Safety module type</b>	Channels and power supply connected:	
	with removable screw terminals	<b>TM3SAC5R ▲</b>
	with removable spring terminal blocks	<b>TM3SAC5RG ▲</b>

<b>TM3SAF5R ▲</b>	<b>TM3SAF5RG ▲</b>
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▲ Available 2nd half of 2014.



**Control of Emergency stop, switches or solid-state output safety light curtains**

- Modicon M221 and Modicon M221 Book logic controllers
- Modicon M241 logic controllers
- Modicon M251 logic controllers



PLd / Category 3 conforming to EN/ISO 13849-1 SILCL2 conforming to EN/IEC 61508 and EN/IEC 62061	PLe/Category 4 conforming to EN/ISO 13849-1 SILCL3 conforming to EN/IEC 61508 and EN/IEC 62061
EN/IEC 60947-1 EN/IEC 60947-5-1	EN/IEC 60947-1 EN/IEC 60947-5-1
EN/IEC 60204-1 EN/ISO 13850	EN/IEC 60204-1 EN/ISO 13850
EN/ISO 14119	EN/ISO 14119
Also designed for use with equipment conforming to EN/IEC 61496-1 up to type 4	Also designed for use with equipment conforming to EN/IEC 61496-1 up to type 4
–	Also designed for use with equipment conforming to standard EN 1760-1
UL, CSA, TÜV, CCC	UL, CSA, TÜV, CCC

3 NO	3 NO
Instantaneous opening relay	Instantaneous opening relay
Internal, electronic	Internal, electronic
6 LEDs	6 LEDs
24 V ~	24 V ~

Unlimited	Unlimited or 2 s, 4 s (depending on wiring), can be configured in the software
24 V ~	24 V ~

<b>TM3SAFL5R ▲</b>	<b>TM3SAK6R ▲</b>
<b>TM3SAFL5RG ▲</b>	<b>TM3SAK6RG ▲</b>

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▲ Available 2nd half of 2014.

# Expansion modules

## Modicon TM3 functional safety modules

(Powered by **Preventa** technology)



### Presentation

Modicon TM3 functional safety modules ▲ are designed using Preventa technology. They can be used to incorporate machine safety into the overall machine control.

#### Data acquisition: control of safety products

- Emergency stop button: complementary protection measures
- Monitoring devices used in protective systems to control access to hazardous areas
- Light curtains and safety mats to detect intrusion into hazardous areas

#### Monitoring and processing

- Modicon TM3 functional safety modules control the input signals from monitoring devices and act as an interface with contactors and variable speed drives, causing the machine to stop.
- Modicon TM3 functional safety modules complement the embedded I/O on M221, M221 Book, M241 and M251 logic controllers.

Modicon TM3 functional safety modules	Safety system/Performance level reached
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<b>For control of emergency stops</b>	Category 3/PLd, SIL2 architecture 
---------------------------------------	---------------------------------------

<b>For control of switches</b>	Category 4/PLe, SIL3 architecture 
--------------------------------	---------------------------------------

<b>For control of type 4 light curtains</b>	Category 3/PLd, SIL2 architecture 
---	---------------------------------------

<b>For control of pressure-sensitive mats or edges</b>	Category 4/PLe, SIL3 architecture 
--	---------------------------------------

- The safety outputs available on the 4 modules are relay type, guided by microprocessor technology.
- Diagnostic utilities use LEDs, found on the module front face. They provide information on the monitoring circuit status.
- The diagnostic information is shared via the TM3 bus.
- The Start button monitoring function is configurable depending on the wiring.

### Connections

Equipped, depending on the model, with removable screw or spring-type terminals for connecting the safety channels.

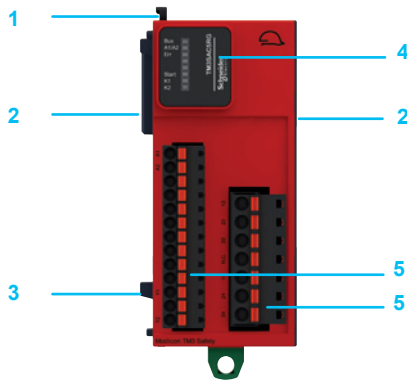
### Configuration

Modicon TM3 functional safety modules connect to M221, M221 Book, M241 and M251 logic controllers according to the general rules for the TM3 system: 7 modules max. and 14 modules max. with the use of Modicon TM3 bus expansion system (transmitter and receiver).

### Mounting

- Modicon TM3 functional safety modules are mounted on a symmetrical rail.
- For plate or panel mounting, use the **TMAM2** kit.

▲ Available 2nd half of 2014.



TM3SAC5R



TM3SAC5RG



TM3SAF5R



TM3SAF5RG



TM3SAFL5R



TM3SAFL5RG



TM3SAK6R



TM3SAK6RG

### Description

#### Modicon TM3 functional safety modules

- 1 Adjacent module locking latch.
- 2 TM3 bus connectors (one on each side). These are designed to provide continuity of the link between connected modules.
- 3 symmetrical rail locking clip.
- 4 Display block (6 LEDs - green, red) for the module channels and diagnostics.
- 5 Removable spring or screw-type terminal blocks (depending on the model) for connecting the safety channels and the power supply.

### References

Designation	Maximum achievable safety level	Term. block for input conn. (1)	Reference	Weight kg lb
<b>24 V ~ power supply</b>				
Functional Safety modules for control of <input type="checkbox"/> emergency stops <input type="checkbox"/> switches	PLd/Category 3 conforming to EN/ISO 13849-1 SILCL2 conforming to EN/IEC 61508 and EN/IEC 62061	screw	<b>TM3SAC5R ▲</b>	0.190 0.420
		spring	<b>TM3SAC5RG ▲</b>	0.190 0.420
Functional Safety modules for control of <input type="checkbox"/> emergency stops <input type="checkbox"/> switches	PLe/Category 4 conforming to EN/ISO 13849-1 SILCL3 conforming to EN/IEC 61508 and EN/IEC 62061	screw	<b>TM3SAF5R ▲</b>	0.190 0.420
		spring	<b>TM3SAF5RG ▲</b>	0.190 0.420
Functional Safety modules for control of <input type="checkbox"/> emergency stops <input type="checkbox"/> switches <input type="checkbox"/> safety light curtains with solid-state outputs	PLd / Category 3 conforming to EN/ISO 13849-1 SILCL2 conforming to EN/IEC 61508 and EN/IEC 62061	screw	<b>TM3SAFL5R ▲</b>	0.190 0.420
		spring	<b>TM3SAFL5RG ▲</b>	0.190 0.420
Functional Safety modules for control of <input type="checkbox"/> emergency stops <input type="checkbox"/> switches <input type="checkbox"/> safety light curtains with solid-state outputs <input type="checkbox"/> pressure-sensitive mats or edges	PLe/Category 4 conforming to EN/ISO 13849-1 SILCL3 conforming to EN/IEC 61508 and EN/IEC 62061	screw	<b>TM3SAK6R ▲</b>	0.190 0.420
		spring	<b>TM3SAK6RG ▲</b>	0.190 0.420

#### Separate parts

Designation	Description	Reference	Weight kg lb
<b>Mounting kit</b> Sold in lots of 10	For mounting Functional Safety modules on a plate or panel	<b>TMAM2</b>	0.065 0.143

(1) Removable terminal blocks equipped with screw terminals or spring terminals, supplied with the controller.

▲ Available 2nd half of 2014.




#### Presentation

Modicon TM3 transmitter and receiver modules can be used to:

- increase from 7 to 14 the number of I/O expansion modules that can be connected to an M2●● logic controller
- locate Modicon TM3 expansion modules remotely, up to 5 m (16.404 ft.) away


The transmitter and receiver modules are physically linked by a **VDIP184546●●●** bus expansion cable.

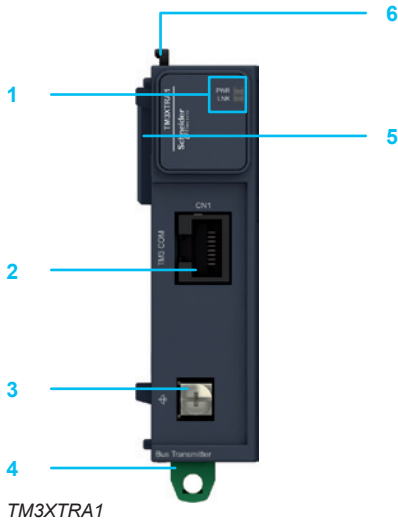
#### Mounting

- TM3 bus expansion modules are mounted on a  symmetrical rail.
- For plate or panel mounting, use the **TMAM2** kit.

#### Description


##### TM3XTRA1 transmitter module

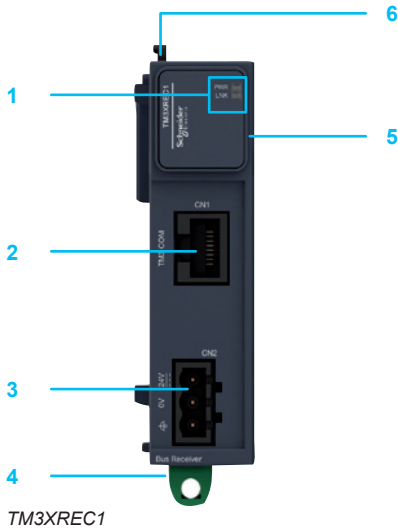
- 1 Block with 2 LEDs displaying the communication status and power supply status.
- 2 RJ 45 connector for connecting the **VDIP184546●●●** bus expansion cable.
- 3 Screw terminal for the functional ground (FG) connection.
- 4  symmetrical rail locking clip.
- 5 TM3 bus connector providing continuity of the link with the connected module.
- 6 Adjacent module locking latch.



TM3XTRA1

##### TM3XREC1 receiver module

- 1 Block with 2 LEDs displaying the communication status and power supply status.
- 2 RJ 45 connector for connecting the **VDIP184546●●●** bus expansion cable.
- 3 Screw terminal block for connecting the power supply.
- 4  symmetrical rail locking clip.
- 5 TM3 bus connector providing continuity of the link with the connected module.
- 6 Adjacent module locking latch.



TM3XREC1

# Expansion modules

## Modicon TM3 bus expansion system

### Transmitter module and receiver module



TM3XTRA1



TM3XREC1

#### References

##### Modicon TM3 bus expansion system

Designation	Characteristics	Reference	Weight kg lb
<b>Transmitter module</b>	Data transmission module Power supply: using the TM3 bus	<b>TM3XTRA1</b>	0.065 0.143
<b>Receiver module</b>	Data reception module Power supply: 24 V $\overline{\text{DC}}$ (with external power supply)	<b>TM3XREC1</b> (1)	0.075 0.165

#### Cordsets

Designation	Used for	Length	Reference	Weight kg lb
<b>Shielded category 5E TM3 bus expansion cables</b>	TM3 bus expansion by linking transmitter and receiver modules Equipped with an RJ 45 connector at each end	0.5 m 1.64 ft	<b>VDIP184546005</b>	–
		1 m 3.28 ft	<b>VDIP184546010</b>	–
		2 m 6.56 ft	<b>VDIP184546020</b>	–
		3 m 9.84 ft	<b>VDIP184546030</b>	–
		5 m 16.40 ft	<b>VDIP184546050</b>	–
<b>Functional ground cable</b>	Functional ground for the TM3XTRA1 transmitter module	0.12 m 0.39 ft	Cable supplied with the TM3XTRA1 transmitter module	

#### Spare parts

Designation	Description	Unit reference	Weight kg lb
<b>Mounting kit</b> <i>Sold in lots of 10</i>	For mounting bus expansion modules on a plate or panel	<b>TMAM2</b>	0.065 0.143
<b>Set of terminal blocks for connecting the power supply</b>	8 removable terminal blocks with screw terminals	<b>TMAT2PSET</b>	0.127 0.280

(1) The TM3XREC1 module is supplied with a removable screw terminal block for connecting the power supply.

<b>T</b>			
TM2XMTGB	11	TMAT2MSET	7 11
TM3AI2H	11	TMAT2MSETG	7 11
TM3AI2HG	11	TMAT2PSET	19
TM3AI4	11	<b>V</b>	
TM3AI4G	11	VDIP184546005	19
TM3AI8	11	VDIP184546010	19
TM3AI8G	11	VDIP184546020	19
TM3AM6	11	VDIP184546030	19
TM3AM6G	11	VDIP184546050	19
TM3AQ2	11		
TM3AQ2G	11		
TM3AQ4	11		
TM3AQ4G	11		
TM3DI8	7		
TM3DI8A	7		
TM3DI8G	7		
TM3DI16	7		
TM3DI16G	7		
TM3DI16K	7		
TM3DI32K	7		
TM3DM8R	7		
TM3DM8RG	7		
TM3DM24R	7		
TM3DM24RG	7		
TM3DQ8R	7		
TM3DQ8RG	7		
TM3DQ8T	7		
TM3DQ8TG	7		
TM3DQ8U	7		
TM3DQ8UG	7		
TM3DQ16R	7		
TM3DQ16RG	7		
TM3DQ16T	7		
TM3DQ16TG	7		
TM3DQ16TK	7		
TM3DQ16U	7		
TM3DQ16UG	7		
TM3DQ16UK	7		
TM3DQ32TK	7		
TM3DQ32UK	7		
TM3SAC5R	17		
TM3SAC5RG	17		
TM3SAF5R	17		
TM3SAF5RG	17		
TM3SAFL5R	17		
TM3SAFL5RG	17		
TM3SAK6R	17		
TM3SAK6RG	17		
TM3TI4	11		
TM3TI4G	11		
TM3TI8T	11		
TM3TI8TG	11		
TM3TM3	11		
TM3TM3G	11		
TM3XREC1	19		
TM3XTRA1	19		
TM3XTYS4	13		
TM200RSRCMC	11		
TMAM2	7 11 13 17 19		

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