

# Logic controller Modicon M238

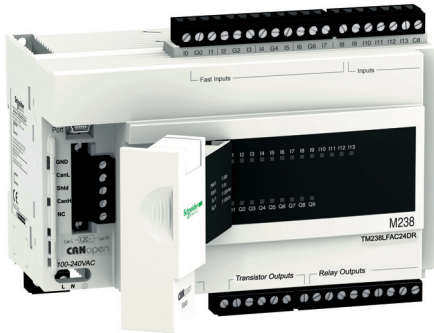
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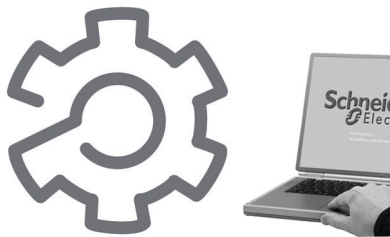
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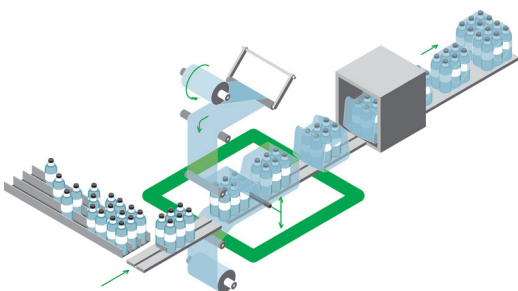
TM238 LFDC24DT



TM238 LFAC24DR



SoMachine software platform



### Presentation

Modicon M238 compact logic controllers offer an “all-in-one” solution in a compact unit (157 x 118 x 86 mm excluding extension modules). Four models are available, with different embedded communications and supply voltages.

Models TM238 LDD24DT and TM238 LFDC24DT, powered with 24 V  $\pm$  offer:

- 14 x 24 V  $\pm$  inputs, including 8 fast inputs, dedicated to special functions such as high-speed counting (HSC)

- 10 x 24 V  $\pm$  solid state outputs, including 4 fast outputs, dedicated to special functions such as PWM and PTO.

- An RS 232/RS 485 serial link (SoMachine-Network, Modbus, ASCII protocols)

Model **TM238 LFDC24DT** also has:

- A CANopen bus master link

- A second RS 485 serial link (SoMachine-Network, Modbus, ASCII protocols)

Models **TM238 LDA24DR** and **TM238 LFAC24DR**, powered with 100-240 V  $\sim$  offer:

- 14 x 24 V  $\pm$  inputs, including 8 fast inputs, dedicated to special functions such as high-speed counting (HSC)

- 4 x 24 V  $\pm$  solid state outputs, dedicated to HSC reflex functions, and 6 relay outputs

- An RS 232/RS 485 serial link (SoMachine-Network, Modbus, ASCII protocols)

Model **TM238 LFAC24DR** also has:

- A CANopen bus master link

- A second RS 485 serial link (SoMachine-Network, Modbus, ASCII protocols).

- The number of I/O can be expanded on all four models by adding up to 7 extension modules (1) of the following type on the right-hand side of the base unit:

- Discrete **TM2 DDI/DDO/DMM/DRA**

- Analog **TM2 AMI/ALM/ARI/AMO/AVO/AMM**

- up to 3 High-speed counter **TM200 HSC206DT/DF**

- up to 2 AS-Interface master module **TWD NOI 10M3**.

Modems or communication gateways can be connected to the serial links in order to expand the connectivity capability to include Ethernet Modbus/TCP, Profibus DP, DeviceNet, etc..

**Note:** A serial link on each controller delivers a 5 V  $\pm$  voltage dedicated primarily to powering a Magelis display unit or Small panel terminal **XBT N●00/R400/RT500** or the Ethernet gateway **499 TWD 01100**.

The compact controller solution also has great flexibility in terms of wiring. With discrete I/O extension modules, several connection options are available, including removable screw terminals, spring terminals and HE 10 connectors, providing simple, quick, safe wiring. The Advantys Telefast ABE 7 prewiring system can be used for easy connection of extension modules with HE 10 connectors.

(1) The addition of 7 extension modules allows a maximum number per configuration of 136/192/248 I/O (depending on whether extension modules with screw terminals, spring terminals or HE 10 connectors are being used).

### Design and installation of Modicon M238 applications

Schneider Electric's **SoMachine** software platform can be used to program Modicon M238 controllers using:

- IEC 61131-3 programming languages: Instruction List (IL), Ladder Diagram (LD), Function Block Diagram (FBD), Sequential Function Chart/Grafset (SFC) and Structured Text (ST)

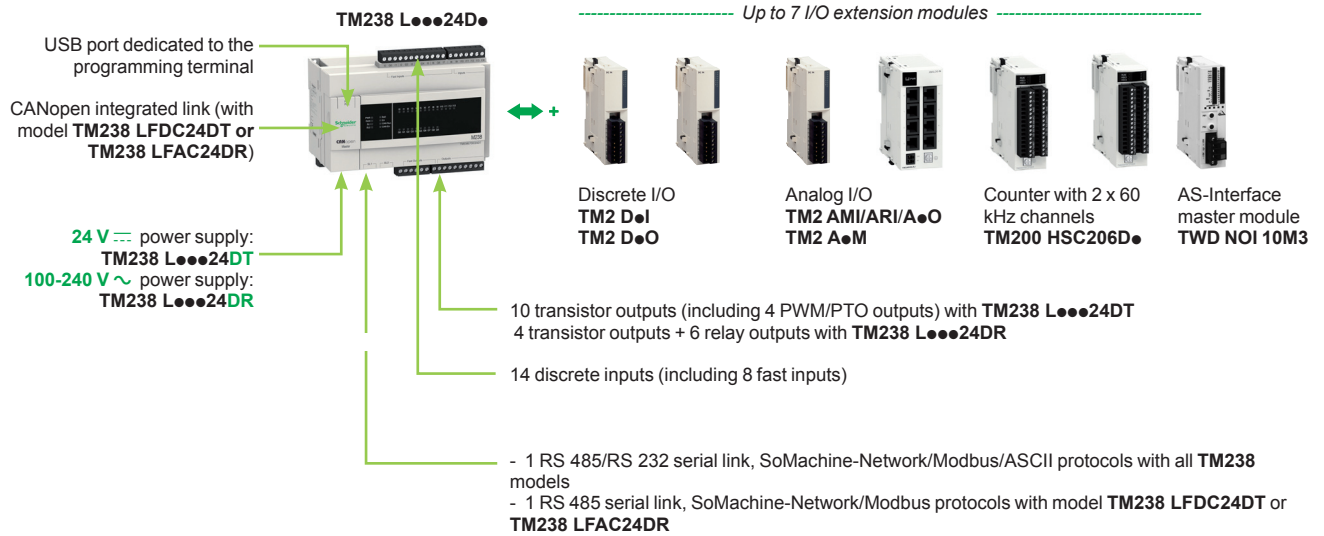
- CFC (Continuous Function Chart) language.

### Modicon M238, the solution for packaging and conveying machines

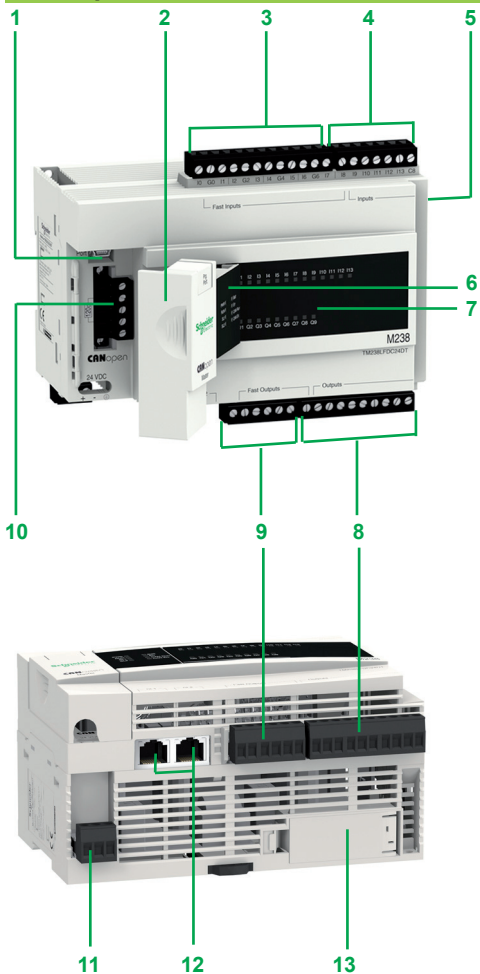
The Modicon M238 controller's languages, dedicated function blocks and integrated functions (HSC (high-speed counting), PTO (Pulse Train Outputs) and PWM (Pulse Width Modulation) mean that Modicon M238 controllers are ideal for use with Altivar variable speed drives, Lexium servo drives and Magelis HMI terminals in packaging machine applications:

- Vertical bagging machines
- Vertical packaging machines
- Rotary or linear labelling machines
- Conveyors
- Etc.

### Compact base configuration



### Description



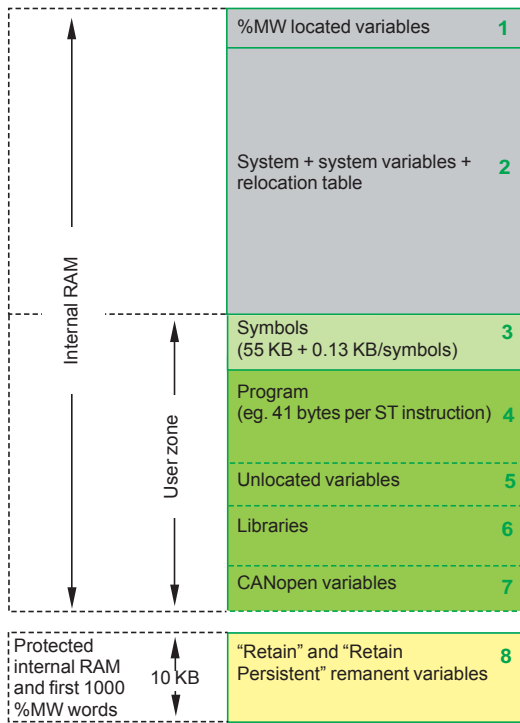
The Modicon M238 logic controller bases **TM238 LDD24DT/LFDC24DT** and **TM238 LDA24DR/LFAC24DR** comprise:

- 1 A mini B USB connector, marked Prg. Port, for connecting a programming terminal
- 2 A hinged access cover with 2 cable glands (1 removable for the terminal cordset and 1 for the CANopen cable)
- 3 A removable screw terminal block (12 terminals) for connecting the sensors (24 V  $\text{---}$  fast inputs)
- 4 A removable screw terminal block (7 terminals) for connecting the sensors (24 V  $\text{---}$  inputs)
- 5 A connector for up to 7 discrete **TM2 D...**, analog **TM2 A...**, counter **TM200 HSC206D**, and up to 2 AS-Interface master module **TWD NOI10M3** I/O extension modules
- 6 A display unit showing:
  - The controller status by means of 4 LEDs (PWR, RUN, Batt and Err)
  - The integrated communication port status by means of 4 LEDs (SL1, SL2, CAN Run and CAN Err)
- 7 A display unit showing the I/O states (I0...I13 and Q0...Q9)
- 8 A removable screw terminal block (10 terminals) for connecting 6 preactuators
- 9 A removable screw terminal block (6 terminals) for connecting 4 preactuators
- 10 A removable screw terminal block (5 terminals marked CANopen) for connection to the CANopen bus, with model **TM238 LFDC24DT** or **TM238 LFAC24DR**

**Accessible from the underside of the controller:**

- 11 A removable screw terminal block (3 terminals):
  - +, -,  $\text{---}$  marked 24 VDC for connecting the 24 V  $\text{---}$  power supply
  - L, N,  $\text{---}$  marked 100-240 VAC for connecting the 100-240 V  $\sim$  power supply
- 12 One RJ45 connector marked SL1 (with model **TM238 LDD24DT** or **TM238 LDA24DR**) or 2 RJ45 connectors marked SL1 and SL2 (with model **TM238 LFDC24DT** or **TM238 LFAC24DR**) for connecting the serial links
- 13 A hinged cover for accessing the RAM backup battery (optional) and the internal real-time clock

The compact bases are mounted as standard on a symmetrical  $\text{---}$  rail or on a metal plate (two  $\text{---}$   $\text{---}$  holes).



### Memory structure

Modicon M238 controllers offer great flexibility in memory management. Depending on the model used, they have a user memory zone of:

- 500 KB with **TM238 LDD24DT** or **TM238 LDA24DR** base
- 1024 KB with **TM238 LFDC24DT** or **TM238 LFAC24DR** base.

This user memory zone is divided according to the application program requirements and the volume needed by the symbols, unlocated variables and libraries required by the application.

The memory structure of Modicon M238 controllers is shown opposite.

The table below lists the maximum memory capacities depending on the model (1).

		<b>TM238 LDD24DT, TM238 LDA24DR</b>	<b>TM238 LFDC24DT, TM238 LFAC24DR</b>
<b>Internal RAM</b>	<b>KB</b>	1024	2048
<b>1</b> Located variables	<b>KB</b>	120 (60,000 %MW)	120 (60,000 %MW)
<b>2</b> System + system variables + relocation table	<b>KB</b>	400	900
<b>User zone</b>	<b>KB</b>	500	1000
<b>3</b> Symbols	<b>KB</b>	100 (max. 400 symbols)	200 (max. 1000 symbols)
<b>4</b> Program (including online program modification)		As required by the application, within the limits of the size of the user zone	
<b>5</b> Unlocated variables			
<b>6</b> Libraries			
<b>7</b> CANopen variables	<b>KB</b>	–	115 + 10 per slave
<b>Protected internal RAM</b>	<b>KB</b>	10	10
<b>8</b> "Retain" variables	<b>Bytes</b>	8168	8168
<b>8</b> "Retain Persistent" variables	<b>Bytes</b>	400	400
<b>8</b> First 1000 %MW words	<b>Bytes</b>	2000	2000

(1) Values given for information only.

### Storing variables

Remanent variables can be one of two types depending on their declaration in the application:

- "Retain" variables, 8168 bytes maximum
- "Retain Persistent" variables, 400 bytes maximum.

The first 1000 located variables **1** (first 1000 %MW words) and all the unlocated variables **5** configured as "Retain" and "Retain Persistent" type are backed up by the internal battery or by the optional external battery. They are maintained when the power returns if the startup context allows this (see "Restart context" below). In addition, "Retain Persistent" type variables are maintained on a change of application if the startup context allows this (see "Restart context" below).

### Restart context

The state of the remanent memory before disconnection is restored on the next power-up when the internal battery and/or the optional external battery is/are capable of protecting the internal RAM (no memory checksum error). If the internal battery or optional external battery does not have enough charge to back up the internal RAM, the values of the "Retain" and "Retain Persistent" remanent variables are reset to 0.

The external battery can be monitored by the *GetBatteryLevel* software function, and its charging status is visible from the status of the Batt LED on the front of the controller.

### Storing the program

Regardless of the context and status of the internal battery and/or optional external battery, the program is backed up in the Flash EEPROM during the "boot application" creation procedure (SoMachine software procedure).

Environment			
Type of base		TM238 LDD24DT, TM238 LDA24DR, TM238 LFDC24DT, TM238 LFAC24DR	
Certifications		<ul style="list-style-type: none"> <li>■ For all bases: CE, UL, CSA, ACA (C-Tick), GOST (pending)</li> <li>■ For TM238 LDA24DR and TM238 LFAC24DR bases: CSA (Class 1, Division 2, Groups A, B, C, D)</li> </ul>	
Temperature	Operation	°C	- 10...+ 55
	Storage	°C	- 40...+ 70
Relative humidity		95% max. without condensation	
Degree of	Protection	IP 20	
	Pollution	≤ 2	
Altitude	Operation	m	0...2000
	Storage	m	0...3000
Immunity to mechanical stress	Sinusoidal vibration	5...150 Hz with 3.5 mm amplitude at 1 g Endurance: 10 cycles of 1 octave/min per axis	
	Shock	15 g/11 ms; 3 shocks/direction/axis	

Characteristics of the compact bases						
Type of base		TM238 LDD24DT	TM238 LDA24DR	TM238 LFDC24DT	TM238 LFAC24DR	
Backup components	Protected internal RAM	"Retain" and "Retain Persistent" type variables (types declared at the time of configuration)				
	Type of component	Internal battery	Type VL1220, 7mAh non-replaceable			
		Optional battery	Lithium thionyl chloride TSX PLP 01			
	Backup autonomy	Internal battery	3 days			
		Optional battery	1 year			
	Charging time	Internal battery	hrs	22 for a full charge		
Service life	Internal battery	10 years max. (derating depending on the operating temperature)				
Discrete I/O	No. of 24 V $\overline{\text{V}}$ inputs	14, 8 of which can be configured as fast inputs				
	No. of outputs	10 transistor, 4 of which can be configured as fast outputs	4 transistor + 6 relay	10 transistor, 4 of which can be configured as fast outputs	4 transistor + 6 relay	
	Connection via	4 removable screw terminal blocks (supplied as standard) 4 removable spring terminal blocks with optional unit TM238 RSSPT (to be ordered separately)				
I/O extension	Max. number of modules	7: discrete, analog, high-speed counter, AS-Interface master (3 high-speed counter TM200HSC060●●, 2 TWDNOI10M3 AS-Interface master)				
	Max. number of discrete I/O	136/192/248 (1)				
Embedded communication	Serial link	1 RS 232/RS 485 channel (SL1) delivering a 5 V $\overline{\text{V}}$ voltage		1 RS 232/RS 485 channel (SL1) 1 RS 485 channel (SL2) delivering a 5 V $\overline{\text{V}}$ voltage		
	CANopen	-		1 master for 16 slaves max.		
Real-time clock		Integrated. Drift: 10 s a month at 25°C				
User zone in internal RAM (see page 4)	Capacity	KB	500	1000		
	No. of instructions	10 Kinstructions depending on the language and type of instruction used		25 Kinstructions depending on the language and type of instruction used		
Application structure	Master task	1 task configurable as "Freewheeling" or "Cyclic" 1 "Freewheeling" task max. among different choices				
	Auxiliary tasks	2 tasks configurable as "Freewheeling", "Cyclic", or "Event", tripped on the rising and/or falling edge of a Boolean variable				
	Interrupt tasks	4 "External" tasks tripped by the fast inputs or by the integrated counter channels				
	Priority between tasks	32 levels of priority of execution can be assigned to each of the 7 tasks				
I/O assignment	I/O on base	Read/write by the task which uses the I/O integrated in the base				
	I/O on extension modules	Read/write by the master task regardless of which task is using the extension module I/O				
	I/O on CANopen bus	-		Read/write by the master task regardless of which task is using the I/O on the CANopen bus		

(1) The 1<sup>st</sup> value corresponds to the maximum number of I/O (base and extensions) with extension modules with screw terminals, the 2<sup>nd</sup> to extension modules with spring terminals and the 3<sup>rd</sup> to extension modules with HE 10 connectors.

Characteristics of the compact bases						
Type of base			TM238 LDD24DT, TM238 LDA24DR, TM238 LFDC24DT, TM238 LFAC24DR			
Typical no. of Kinstructions executed per ms	70% Boolean + 30% fixed arithmetic	Kinst/ms	3			
Execution time for one instruction	Boolean	µs	0.971			
	Arithmetic +, -, x operations	µs	INT word	REAL floating point		
			0.439	5.111		
	/ operation	µs	–	7.25		
LD and ST	µs	0.42	0.459	0.648		
Event task execution time (1)		ms	0.75 min	0.95 typical		
Master task system overhead	I/O and system	ms	0.9			
	Counting	ms	0.15 (simple counting), 0.35 (advanced counting)			
	Motion	ms	0.15 (PWM, frequency meter), 0.20 (PTO) (2)			
Power supply						
Type of compact base			TM238 LDD24DT	TM238 LFDC24DT	TM238 LDA24DR	TM238 LFAC24DR
Voltage	Nominal	V	24 --- (- 15% / + 20 %)		100-240 V ~ (+ 10% / - 15 %)	
	Limit (including ripple)	V	19.2...28.8 ---		85...264 V ~ (Frequency 47...63 Hz)	
Sensor power supply			Use an external 24 V --- Phaseo power supply from the Optimum range			
Max. inrush current (Un)		A	35			
Immunity to micro-cuts (class PS-2)		ms	10			
Max. consumption		W	17.2		25 at 100 V ~, 42 at 264 V ~	
Dielectric strength	Between power supply terminals and earth terminals	V rms	500 --- for 1 min		1500 --- for 1 min	
	Between I/O terminals and earth terminals	V rms	500 --- for 1 min		1500 --- for 1 min	
Isolation resistance	Between power supply terminals and earth terminals	MΩ	> 10 (500 V ---)		> 10 (500 V ---)	
	Between I/O terminals and earth terminals	MΩ	> 10 (500 V ---)		> 10 (500 V ---)	

(1) Time including acquisition of the event, processing of 100 IL instructions and activation of an output.

(2) Only with **TM238 LDD24DT** and **TM238 LFDC24DT**.

Communication					
Type of compact base			TM238 LDD24DT, TM238 LDA24DR	TM238 LFDC24DT, TM238 LFAC24DR	
<b>Terminal port</b> "Prg. Port"	Type		1 USB 2.0		
	Connection		Mini B USB connector		
<b>RS 485/ RS 232 serial port</b>	Marking on front panel		<b>SL1</b>	<b>SL1 (1)</b>	
	Type		Master/slave type isolated serial link		
	Physical interface		RS 485/RS 232		
	Data rate	<b>Kbps</b>	1.2...115.2 (115.2 by default)	1.2...38.4 (19.2 by default)	
	Protocol	Default	SoMachine-Network (programming/ debugging)	Modbus slave	
			Modbus master/slave RTU/ASCII, ASCII, SoMachine-Network		
	Peripheral		Delivers a 5 V $\pm$ /200 mA power supply (2)	–	
Connection		RJ45 female connector			
<b>RS 485 serial port</b>	Marking on front panel		–	<b>SL2 (1)</b>	
	Type		–	Master/slave type isolated serial link	
	Physical interface		–	RS 485	
	Data rate	<b>Kbps</b>	–	1.2...115.2 (115.2 by default)	
	Protocol	Default	–	SoMachine-Network (programming/ debugging)	
			–	Modbus master/slave RTU/ASCII, ASCII, SoMachine-Network	
	Peripheral		–	Delivers a 5 V $\pm$ /200 mA power supply (2)	
Connection		–	RJ45 female connector		
<b>CANopen port</b>	Standards		–	DS 301 V4.02, DR 303-1	
	Class		–	Conformity class M20, limited to 16 slaves	
	Data rate	Max. length	<b>m</b>	–	<b>20</b>   <b>50</b>   <b>100</b>   <b>125</b>   <b>250</b>   <b>500</b>   <b>1000</b>
		Data rate	<b>Kbps</b>	–	1000   800   500   425   250   125   50
	No. of slaves		–	–	16 max. with max. limit of: 64 TPDOs and 64 RPDOs (3)
	Line matching		–	–	Line termination resistor supplied with the screw terminal block, to be mounted when necessary
	Connection		–	–	Removable screw terminal block supplied with the base
Integrated functions					
Type of compact base			TM238 LDD24DT, TM238 LFDC24DT	TM238 LDA24DR, TM238 LFAC24DR	
<b>HSC</b>	No. of channels		8 x 100 kHz simple channels, 4 x 100 kHz simple channels and 1 x 100 kHz advanced channel (4) or 2 x 100 kHz advanced channels (4)		
	Capacity		32 bits		
<b>Motion or Reflex functions</b>	No. of channels		2 advanced channels	4	
	Frequency		PMW: 20 kHz PTO: 100 kHz	100 Hz	
	Functions		PWM (Pulse Width Modulation) output PTO (Pulse Train Output)	HSC reflex	
<b>PID regulation</b>			Yes		
<b>Event processing</b>			Yes, up to 4 event tasks that can be activated by the base's fast inputs or by the integrated counter channels (threshold attained)		

(1) Serial link "SL1" and serial link "SL2" are not isolated from one another.


(2) 5 V  $\pm$ /200 mA power supply for self-powering of a Magelis XBT N/R HMI terminal or the Ethernet gateway 499 TWD 01100.


(3) TPDOs: transmitted process data objects (PDOs). RPDOs: received process data objects (PDOs).

(4) Advanced channel with two-phase signal inputs for encoder, threshold detection function and reflex function.



--- input characteristics				
Type of compact base			TM238 LDD24DT, TM238 LFDC24DT, TM238 LDA24DR, TM238 LFAC24DR	
Type of input			Physical inputs I8 to I13	Physical inputs I0 to I7
Number of input channels			6	8, 100 kHz max.
Nominal input values	Voltage	V	24 ---	
	Current	mA	10.4	8
Input logic			Sink/source (positive/negative)	Sink (positive)
Commons			1	4
Sensor power supply (including ripple)			V	19.2...30 ---
Input limit values	At state 1	Voltage	V	≥ 15
		Current	mA	≥ 2
	At state 0	Voltage	V	≤ 5
		Current	mA	≤ 1.5
Input impedance			kΩ	2.3
Response time				3 ms
Digital filtering (configurable)			ms	–
Anti-bounce filtering (configurable)			ms	0 - 1.5 - 4 or 12
IEC/EN 61131-2 conformity			Type 1	
Max. input frequency			100 Hz	Counter mode 100 kHz Normal mode 100 Hz
Length of sensor connection cables			m	30 max.
Isolation	Between channels	V	None	500 --- between groups of 2 channels
	Between channels and internal logic	V	500 ---	

Output characteristics				
Type of compact base ---			TM238 LDD24DT, TM238 LFDC24DT	
Type of output			Fast solid state outputs (Q0 to Q3)	Solid state outputs (Q4 to Q9)
Number of output channels			4	6
Output power supply	Nominal value	V	24 ---	
	Limit values	V	19.2...30 --- (including ripple)	
Output current	Minimum	mA	PWM mode	PTO mode
	Maximum	mA	Normal mode	
Max. frequency			20 kHz	100 kHz
Accuracy	Cyclic ratio 20...80%	%FS	1	–
	Accuracy		–	1%
Output logic			Source (positive)/Sink (negative)	Source (positive)
Commons			1	2
Response time			ms	–
Leakage current			mA	< 2
Voltage drop			V	< 2
Tungsten filament lamp max. power			W	< 3
Protection	Against short-circuits		Yes, against short-circuits at the 0 V 	Yes
	Against overloads		Yes	
	Against overvoltages		Yes	
Length of connection cables			m	10 max. with shielded cable
Isolation	Between channels	V	500 ---	30 max.
	Between channels and internal logic	V	500 ---	30 max.

 Never connect a positive polarity to fast outputs (see page 15).

Output characteristics (continued)			
Type of compact base ~		TM238 LDA24DR, TM238 LFAC24DR	
Type of output		Solid state outputs (Q0 to Q3)	Relay outputs (Q4 to Q9)
Number of output channels		4	6
Output power supply	Nominal value	V	24 ~ / 240 ~
	Limit values	V	19.2...30 ~ (including ripple)
Output current	Nominal	A	2: Q4 to Q8 (resistive load) 5: Q9 (resistive load)
	Minimum	mA	10 (~ 5V)
	Maximum	mA	–
Commons	Common 4 (C4)	–	2 "N/O" contacts (2 A per channel and 4 A per common)
	Common 6 (C6)	–	2 "N/O" contacts (2 A per channel and 4 A per common)
	Common 8 (C8)	–	1 "N/O" contact (2 A)
	Common 9 (C9)	–	1 "N/O" contact (5 A)
Min. switchable load		mA	10 for 5 V ~ (reference data)
Switch resistance	When new	mΩ	50 max.
Load on relay outputs Q4 to Q8	Resistive	A	2 at 240 V ~ or 2 at 30 V ~ (with 600 operations per hour max.)
	Min. electrical service life	–	1 x 10 <sup>5</sup> operations
	Minimum mechanical service life	–	20 x 10 <sup>6</sup> operations
	Inductive without protection device (1)/capacitive	–	Use of relays not guaranteed (significant reduction in their service life). For this type of application, it is advisable to use the transistor outputs of extension modules TM2 DDO●●●
Load on output Q9	Resistive	A	5 at 240 V ~ or 5 at 30 V ~ (with 1800 operations per hour max.)
	Min. electrical service life	–	5 x 10 <sup>4</sup> operations
	Minimum mechanical service life	–	20 x 10 <sup>6</sup> operations
	Inductive without protection device (1) /c apacitive	–	Use of relays not guaranteed (significant reduction in their service life). For this type of application, it is advisable to use the transistor outputs of extension modules TM2 DDO●●●
Max. frequency		100 Hz	–
Output logic		Source (positive)	–
Commons		1	–
Response time		ms	0.25
Leakage current		mA	< 2
Voltage drop		V	< 2
Tungsten filament lamp max. power		W	< 3
Protection	Against short-circuits		Yes, against short-circuits at the 0 V ⚠
	Against overloads		Yes
	Against overvoltages		Yes
Length of connection cables		m	30 max.
Insulation voltage	Between channels and internal logic	V rms	500 ~ for 1 min

⚠ Never connect a positive polarity to fast outputs (see page 15).

(1) Each inductive load must be equipped with a protection device such as a peak limiter, RC circuit or freewheel diode.



TM238 LFDC24DT



TM238 LFAC24DR



TSX PLP 101



TCS XCN AMUM3P



TM200 RSRCEMC



499 TWD 01100 LUF P●



SR2 MOD03



HMI ZSUSBB

### References

Number of I/O	Inputs	Outputs	No. of I/O extension modules	Integrated serial port	Integrated master CANopen port	Reference	Weight kg
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Compact bases, 24 V $\overline{\text{---}}$ power supply							
24 I/O (removable battery to be ordered separately)	6 x 24 V $\overline{\text{---}}$ inputs (sink/source) 8 x 24 V $\overline{\text{---}}$ fast inputs (sink)	10 transistor outputs (source) including 4 fast	7 modules max.	1 RS 232/485 (1) – (marked SL1)	–	TM238 LDD24DT	0.560
				1 RS 232/485 (marked SL1) 1 RS 485 (1) (marked SL2)			

Compact bases, 100-240 V $\sim$ power supply							
24 I/O (removable battery to be ordered separately)	6 x 24 V $\overline{\text{---}}$ inputs (sink/source) 8 x 24 V $\overline{\text{---}}$ fast inputs (sink)	4 transistor outputs (source) and 6 relay outputs	7 modules max.	1 RS 232/485 (1) – (marked SL1)	–	TM238 LDA24DR	0.560
				1 RS 232/485 (marked SL1) 1 RS 485 (1) (marked SL2)			

### Separate parts

Designation	Use	Length Sold	Reference	Weight kg
Removable backup batteries	Lithium thionyl chloride type for Modicon M238 compact bases TM238 L●●●●●	Individual	TSX PLP 01	0.012
		Pack of 10	TSX PLP 101	0.189
Terminal port/USB port cordset	From the mini B USB port on the Modicon M238 base to the type A USB port on the PC terminal for programming and updating firmware	3 m	TCS XCN AMUM3P	0.065
RS 232 serial link cordsets for DTE/DCE terminal device	1 RJ45 connector For DTE terminal (printer) and one 9-way SUB-D connector For DCE terminal (modem, converter)	3 m	TCS MCN 3M4F3C2	0.150
		3 m	TCS MCN 3M4M3S2	0.150
Removable spring connectors for discrete I/O	Set of 5 removable spring connectors. Replaces the 5 screw connectors supplied with Modicon M238 compact bases	–	TM238 RSSPT	0.048
Shielding connection clamps	Attachment and earthing of the cable shielding Pack of 25 clamps including 20 clamps for $\varnothing$ 4.8 mm cable and 5 for $\varnothing$ 7.9 mm cable	Pack of 25	TM200 RSRCEMC	–
Modbus communication gateways	Connection of Modicon M238 base to network/bus	Ethernet Modbus/TCP (2)	499 TWD 01100	0.200
		Profibus DP (3)	LUF P7	0.245
		DeviceNet (3)	LUF P9	0.245
GSM/GPRS modem (DCE terminal)	4-band 900/1800 MHz (Europe) and 850/1900 MHz (United States) IP 31 casing supplied with: - 1.5 m power cable - SMA-M magnetic GSM 4-band aerial with 2.5 m cable - Fixed on panel or $\perp$ 5.5...24 V $\overline{\text{---}}$ supply voltage	–	SR2 MOD03	0.335

Designation	Use From	To	Length	Reference	Weight kg
Modbus cables equipped with 2 RJ45 connectors	Serial port marked SL1/SL2	Ethernet gateway 499 TWD 01100	2.5 m	XBT Z9980	–
		Profibus DP LUF P7 or DeviceNet	1 m	VW3 A8 306 R10	0.050
		LUF P9, TSX CUSB 485	3 m	VW3 A8 306 R30	0.150
		converter	0.3 m	VW3 A8 306 R03	0.030

### Accessories

Designation	Description	Length	Reference	Weight kg
Remote location of the USB port for M238 controllers and XBT GT2●●0...GT7340, GT1●●5, GK●●●, GTW●●● terminals	Used to locate the USB port of M238 controllers (front) and XBTG terminals (rear) remotely on panel or enclosure door ( $\varnothing$ 21 mm fixing device)	1 m	HMI ZSUSBB	0.100

(1) RS 485 link delivering a 5 V  $\overline{\text{---}}$ /200 mA power supply.

(2) Connection to serial port SL1 on controllers TM238 LDD24DT and TM238 LDA24DR or to serial port SL2 on controllers TM238 LFDC24DT and TM238 LFAC24DR via Modbus cable XBT Z9980 (to be ordered separately).

(3) Connection to serial port SL1 on controller controllers TM238 LDD24DT and TM238 LDA24DR, to serial port SL1 or SL2 on controllers TM238 LFDC24DT and TM238 LFAC24DR via Modbus cable VW3 A8 306 R●● (to be ordered separately). Requires a 24 V  $\overline{\text{---}}$  external power supply.

Gateway configurable via the ABC Config Tool software, downloadable from our website [www.schneider-electric.com](http://www.schneider-electric.com)



TSX CUSB 485

### References

#### Connection elements for RS 485 OS download port for M238 version V1.0 (1)

Designation	Use	Length	Reference	Weight kg
USB/RS 485 converter	Used to connect the RS 485 port (SL1) to the USB port on the PC to update the controller operating system. Requires Modbus cable VW3 A8 306 R●● for the PC end connection at the controller end	0.4 m (integrated cable at)	TSX CUSB 485	0.144

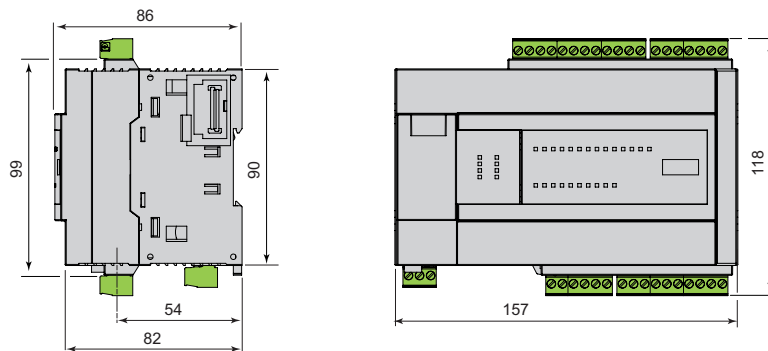
### Replacement parts

Designation	Use	Reference	Weight kg
Removable screw connectors, supplied with Modicon M238 compact bases	Set of 5 removable screw connectors for discrete I/O One 5-way connector with line terminator for CANopen link	TM238 RSSCT TM238 CNTLSCT	0.055 0.010

(1) For later versions, use the USB port and cable.

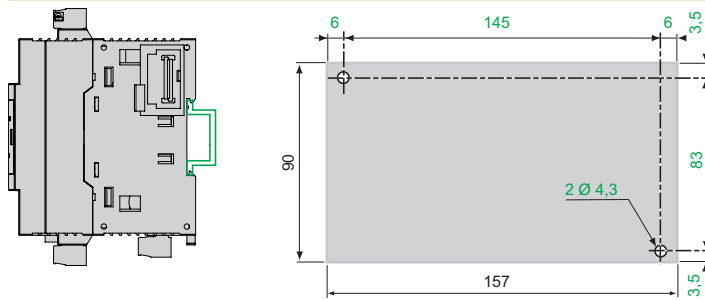
### Dimensions, mounting

#### TM238 LDD24DT, TM238 LFDC24DT, TM238 LDA24DR and TM238 LFAC24DR



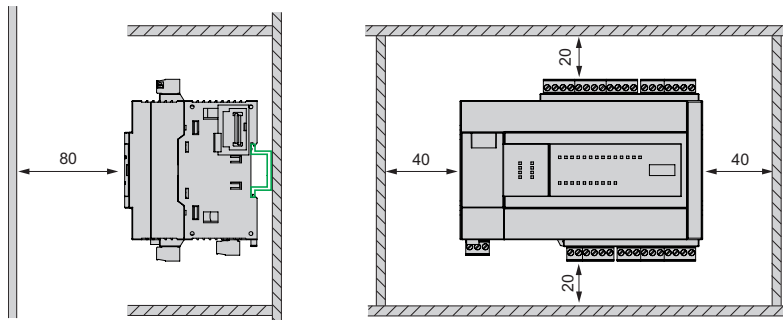
### Mounting

#### On rail (1) On panel, attached with two M4 screws x 6/8 mm



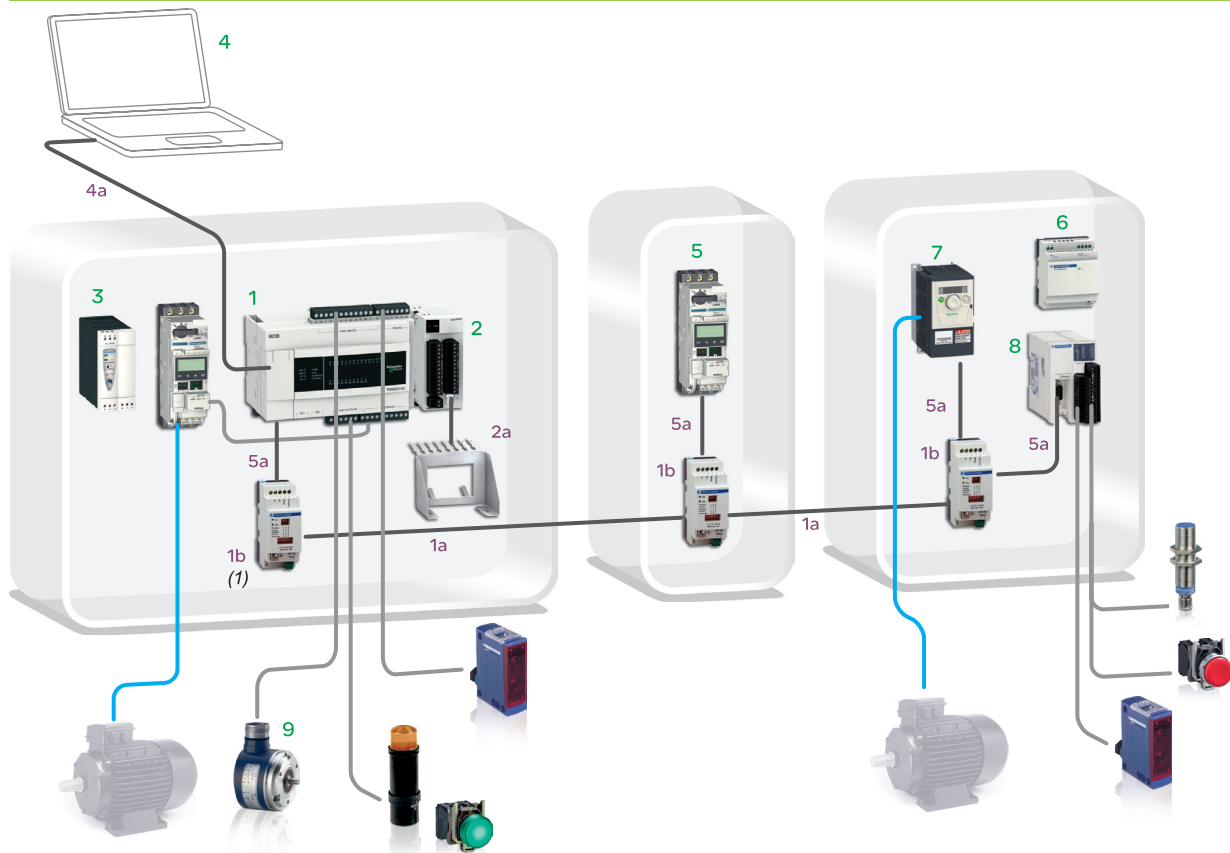
(1) Use of 35 x 15 mm rail recommended to ensure vibration resistance (see page 5).

### Installation rules



- ⚠ Important:**
- Vertical mounting: Possible with extension modules facing up.
  - Flat mounting: Not possible.
  - Avoid placing heat-generating equipment (transformers, power supplies, power contactor, etc.) below the controller.

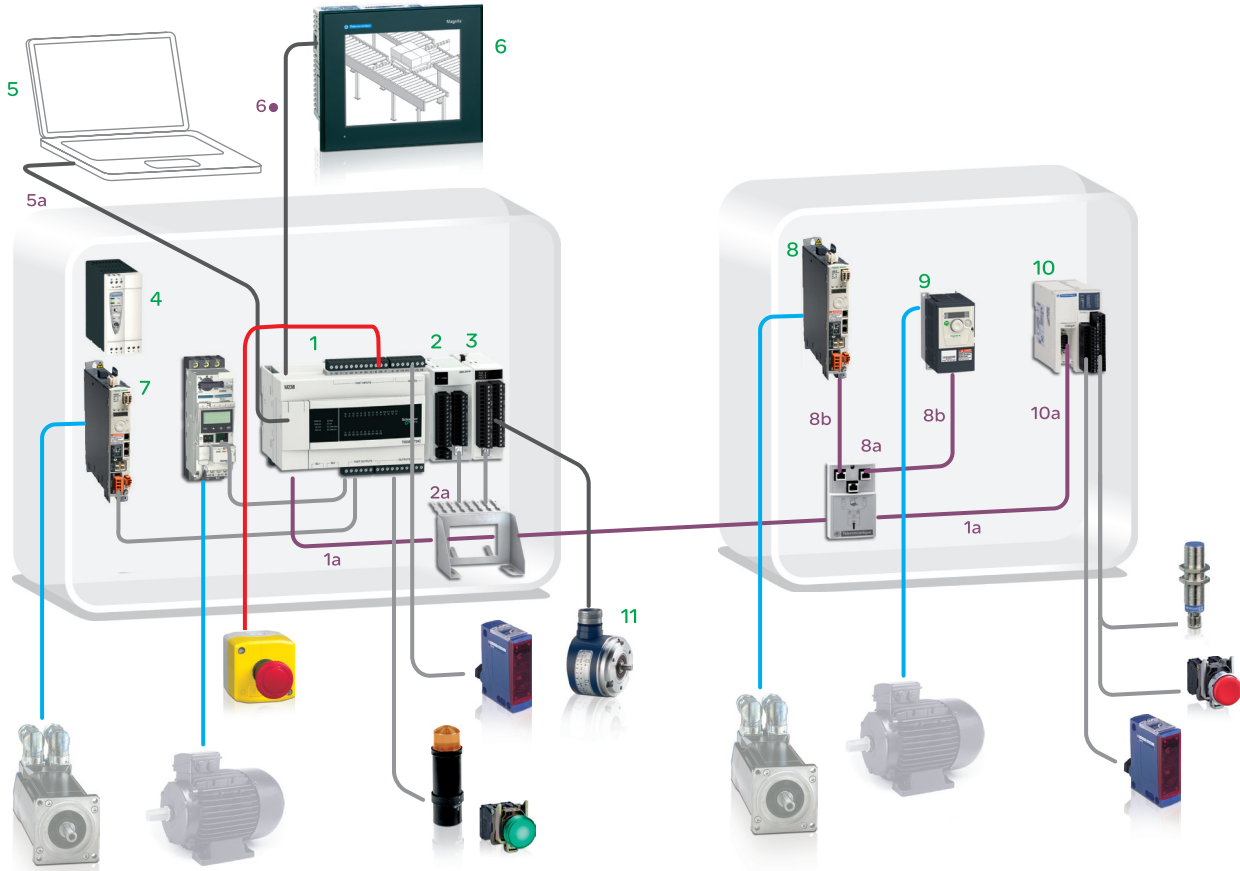
**Modicon M238 logic controller-based solutions, using the Modbus RS 485 port**



No.	Device	Reference	Description	Voir page
1	Logic controller	TM238 LDD24DT, TM238 LDA24DR	Controller with 24 I/O (including 2 inputs used as fast inputs) and SL1 port (Modbus protocol)	10
2	Module with 8 analog inputs	TM2 ARI 8LT	Module with eight 2 or 3-wire temperature probe inputs, connected on 2 screw terminal blocks	10
3	Phaseo 24 V ~ power supply	ABL 8REM24●●●	Optimum power supply, ●●●: 030 for I = 3 A, 050 for I = 5 A	94
4	Programming PC	MSD CHNSFUV20	SoMachine software, 1-station license	73
5	TeSysU starter-controller	LUB 320	32 A power base with multifunction control unit LUCM 32BL and Modbus communication module LUL C032	-
6	Phaseo 24 V ~ power supply	ABL 7RM24025●●●●●	Modular power supply 2.5 A	-
7	Altivar 312 variable speed drive	ATV 312●●●●●●●	Drive for asynchronous motor (integrated Modbus and CANopen)	-
8	Advantys OTB distributed I/O	OTB 1S0 DM9LP	Modbus bus interface module, 12 x 24 V ~ inputs, 2 x 24 V ~ outputs and 6 relay outputs	57
9	Osicoder incremental encoder	XCC 14●K/15●Y/19●KN	Rotary Ø 40/58/90 mm with Push-pull outputs with extension XCC PM23121L●	-
1a	Modbus trunk cable	TSX SCA 100/200/500	RS 485 double shielded twisted pair cables (100/200/500 m)	-
1b	Modbus junction box	TWD XCA ISO	Screw terminal block for trunk cable, 2 RJ45 connectors for tap junction, line isolation and line termination. 24 V ~ power supply	-
2a	Earthing plate	TM2 XMTGB	Connection of cable shielding and functional earth (FE) on module 2	38
4a	Terminal port/PC USB port cordset	TCS XCN AMUM3P	Cordset from USB port on Modicon M238 base to PC terminal USB port (3 m)	10
5a	Modbus drop cables	VW3 A8 306 R03/10/30	Cable with 2 RJ45 connectors (0.3/1/3 m)	10

(1) Recommended wiring diagram for connecting the Modbus trunk cable on screw terminal block and for distances  $\geq 30$  m.

**Modicon M238 logic controller-based solutions, using the CANOpen integrated port**



No.	Device	Reference	Description	Voir page
1	Logic controller	TM238 LFDC24DT TM238 LFAC24DR	Controller with 24 I/O (including 2 outputs as PTO signals) and integrated CANOpen port Controller with 24 I/O (without PTO and PWM functionality)	10 10
2	Module with 8 analog inputs	TM2 ARI 8LT	Module with eight 2 or 3-wire temperature probe inputs, connected on 2 screw terminal blocks	38
3	High-speed counter module	TM200 HSC 206DF	Module with two 60 kHz high-speed counting channels, connected on 2 spring terminal blocks	48
4	Phaseo 24 V ~ power supply	ABL 8REM24●●● ABL 8RPS24●●●	Optimum power supply, ●●●: 030 for I = 3 A, 050 for I = 5 A Universal power supply, ●●●: 050 for I = 5 A, 100 for I = 10 A	94 -
5	Programming PC	MSD CHNSFUV20	SoMachine software, 1-station license	73
6	Magelis HMI terminal (Modbus protocol)	XBT N200/R400 + 6a XBT RT500/RT511 + 6a	Small Panel with keypad for displaying text messages of 2...10 lines. Connection to controller serial port SL2, 5 V ~ power supply via controller (1)	88
		XBT N401/N410 + 6b XBT R410/R411 + 6b	Small Panel with keypad for displaying text messages and control/configuration of data, 5.7" screen, external 24 V ~ power supply. Connection to controller port SL1 or SL2	88
		XBT GT11●●/ GT1335 + 6a	Advanced Touch Panel with graphic display, 3.8" screen, external 24 V ~ power supply. Connection on COM1 port to controller port SL1 or SL2	90
	Magelis HMI terminal (SoMachine-Network protocol)	XBT GT2●●0...7340 + 6c XBT GK●●●0 + 6c	Advanced Touch Panel with graphic display, 5.7"...15" screen, external 24 V ~ power supply. Connection on COM1 port to controller port SL1 or SL2	-
7	Lexium 32 servo drive	LXM 32●●●●	Servo drive on CANOpen bus, to be used with BRH/BSH motor	-
8	Lexium 32 servo drive	LXM 32●●●●	Servo drive on CANOpen bus, to be used with BRH/BSH motor	-
9	Altivar 312 variable speed drive	ATV 312●●●●●●	Drive for asynchronous motor (integrated Modbus and CANopen)	-
10	Advantys OTB distributed I/O	OTB 1C0 DM9LP	CANOpen bus interface module, 12 x 24 V ~ inputs, 2 x 24 V ~ outputs and 6 relay outputs	57
11	Osicoder incremental encoder	XCC 14●K/15●Y/19●KN	Rotary Ø 40/58/90 mm with Push-pull outputs with extension XCC PM23121L●	-
1a	CANOpen cable	TSX CAN CA 50/100/300	Cables for standard environments (50/100/300 m)	66
2a	Earthing plate	TM2 XMTGB	Connection of cable shielding and functional earth (FE) on modules 2 and 3	38
5a	Terminal port/PC USB port cordset	TCS XCN AMUM3P	Cordset from USB port on Modicon M238 base to PC terminal USB port (3 m)	10
6●	Magelis HMI cordsets	6a XBT Z9980 6b XBT Z938 6c XBT Z9008	2 RJ45, RS 485 Modbus connectors (2.5 m) 1 SUB-D25 and 1 RJ45, RS 485 Modbus (2.5 m) 1 SUB-D9 and 1 RJ45, RS 485 Modbus (2.5 m)	- - -
8a	IP 20 junction box	VW3 CAN TAP2	IP20 junction box with 2 CANOpen RJ45 connectors and 1 diagnostic terminal RJ45 connector	66
8b	CANOpen preassembled cordset	VW3 CAN CARR03/1	Cordset with 1 RJ45 connector at each end (0.3/1 m)	67
10a	IP20 9-way SUB-D connector	TSX CAN KCDF 90T/180T	Connector with line terminator, straight/right-angled	66

(1) Except for XBT RT511, connection to controller serial port SL1 or SL2, external 24 V ~ power supply.

# Modicon M238 logic controller

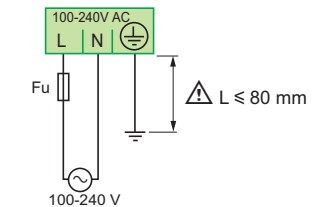
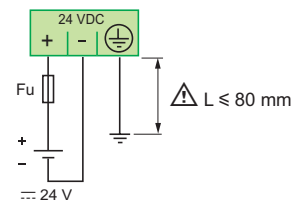
Compact bases  
Power supply and inputs

## Connections

**Conductor cross-section and tightening torque on removable screw terminals (power supply and I/O)**

6 mm						
Cross-section (mm <sup>2</sup> )	0.2...1.5	0.25...1.5	0.2...1	0.2...1.5	0.25...1	0.5...1.5
AWG gauge	24...14	24...14	26...16	24...14	24...16	20...14
Screwdriver				Ø 3.5 mm		
Tightening torque				0.6 Nm, max.		

<b>24 V <math>\bar{\bar{}}</math> power supply</b>	<b>100-240 V <math>\sim</math> power supply</b>
<b>TM238 LDD24DT/LFDC24DT</b>	<b>TM238 LDA24DR/LFAC24DR</b>



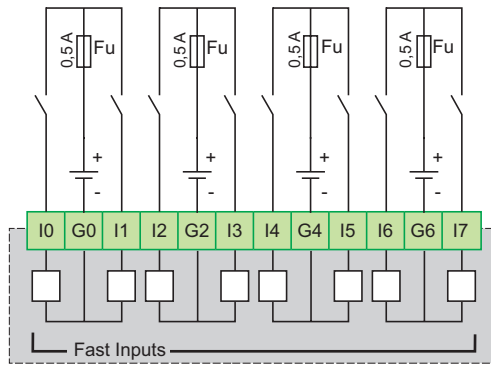
Fu: 2 A fast-blow fuse ABE 7FU200

2A Type T fuse

**TM238 LDD24DT/LFDC24DT, TM238 LDA24DR/LFAC24DR bases**

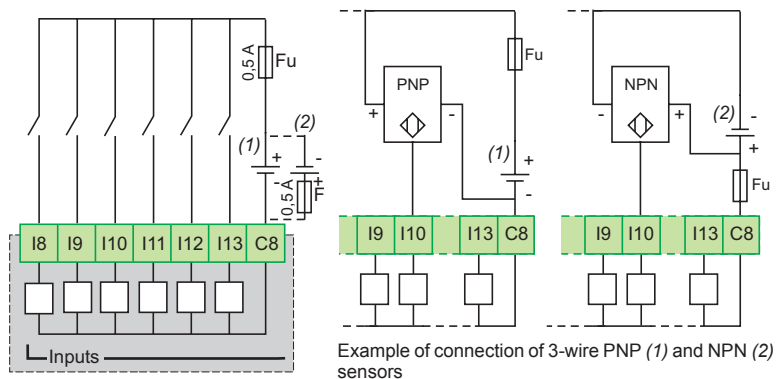
### 24 V $\bar{\bar{}}$ inputs

**Fast sink inputs (positive logic)**



Fu: 0.5 A fast-blow fuse

**Sink/source inputs (positive/negative logic)**



Example of connection of 3-wire PNP (1) and NPN (2) sensors

Fu: 0.5 A fast-blow fuse

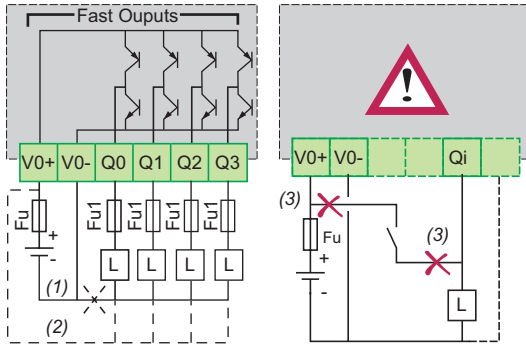
- (1) Sink inputs (positive logic)
- (2) Source inputs (negative logic)

#### Connections (continued)

##### TM238 LDD24DT/LFDC24DT bases

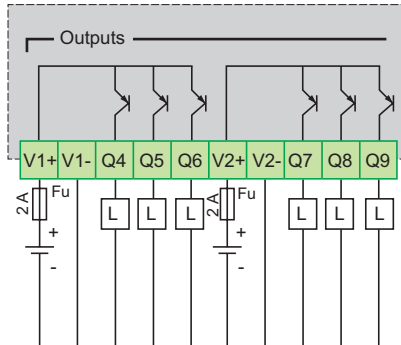
##### 24 V $\square$ solid state outputs

###### Fast outputs (positive logic/negative logic)



- Fu: 2 A fast-blow fuse.
- Fu1: fast-blow fuse: 0,1A for PTO use, 0,5A for standard use.
- (1) ——— Outputs positive logic cabling.
- (2) - - - - Outputs negative logic cabling.
- (3) Never connect a positive polarity to fast outputs Q0, Q1, Q2 and Q3.

###### Source outputs (positive logic)



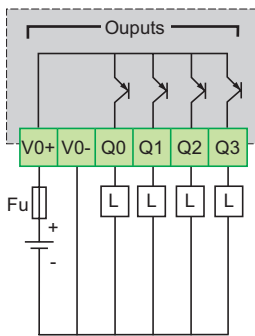
**Note:** The power supply for the outputs  $\frac{+}{-}$  must be placed:

- Close to the Modicon M238 base with a connection < 3 m
- Or close to the preactuators for connections with the base Modicon M238 > 10 m. The cables for connection to the preactuators and the power supply must be within a single strand or be routed in the same cable duct.

##### TM238 LDA24DR/LFAC24DR bases

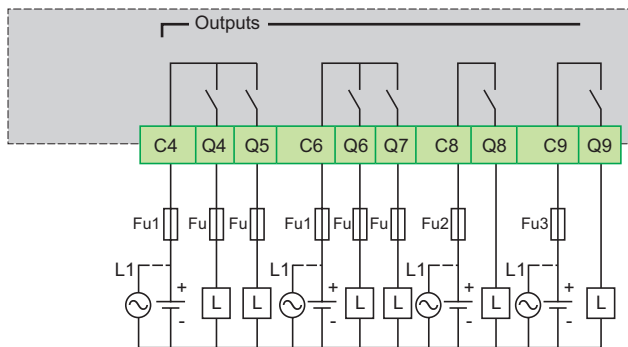
##### 24 V $\square$ solid state outputs and relay outputs

###### Solid state outputs



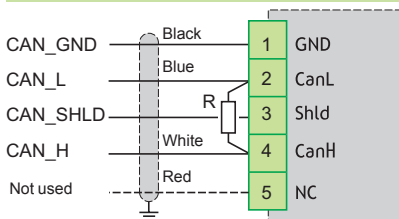
Fu: 2 A fast-blow fuse

###### Relay outputs



Fu: 2A fast-blow fuse  
Fu1: 4 A delayed fuse  
Fu2: 2 A delayed fuse  
Fu3: 5 A delayed fuse

##### Terminal cabling for Bus CANopen (with models TM238 LFDC24DT and TM238 LFAC24DR)



- Connection with CANopen 4-wire cable TSX CAN CA/CB/CD ●00 (50, 100 or 300 m).
- Colour of conductors: black, blue, white and red
- R: 120  $\Omega$  line termination resistor (supplied with the CANopen screw terminal block)
- Terminal 3 (Shld): for connecting the CANopen cable shielding
- Terminal 5 (NC): not used

##### Serial links SL1 and SL2

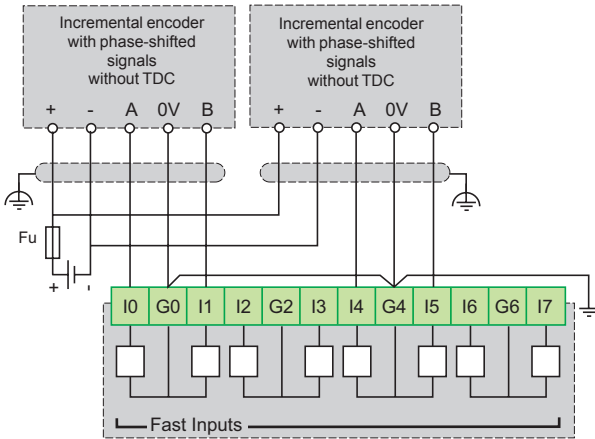
Compact base	TM238 LDD24DT/LDA24DR		TM238 LFDC24DT/LFAC24DR		
Link number	SL1		SL1	SL2	
Physical interface	RS 232	RS 485	RS 232	RS 485	RS 485
1	RXD	-	RXD	-	-
2	TDX	-	TDX	-	-
3	RTS	-	RTS	-	-
4	-	D1 (A+)	-	D1 (A+)	D1 (A+)
5	-	D0 (B-)	-	D0 (B-)	D0 (B-)
6	CTS	-	CTS	-	-
7	+ 5 V, for HMI power supply	+ 5 V, for HMI power supply	-	-	+ 5 V, for HMI power supply
8	0 V common	0 V common	0 V common	0 V common	0 V common



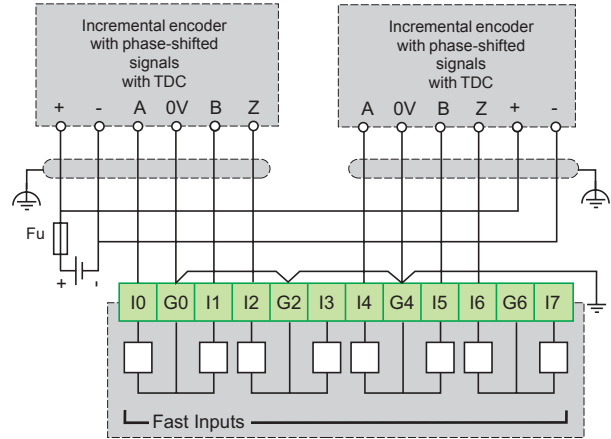
### Connections (continued)

#### Connection of 24 V $\bar{\bar{}}$ fast inputs

##### Using 2 incremental encoders with phase-shifted signals without TDC

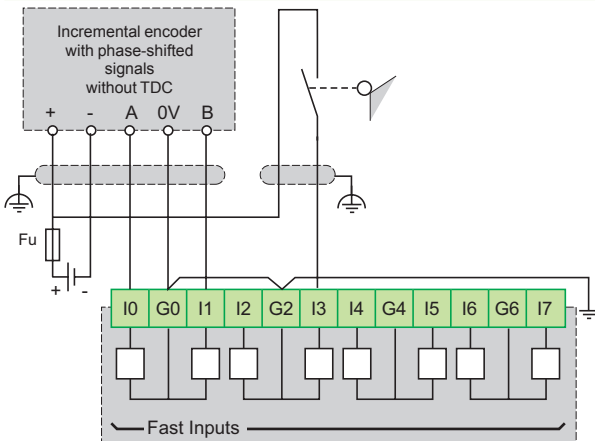


##### Using 2 incremental encoders with phase-shifted signals with TDC

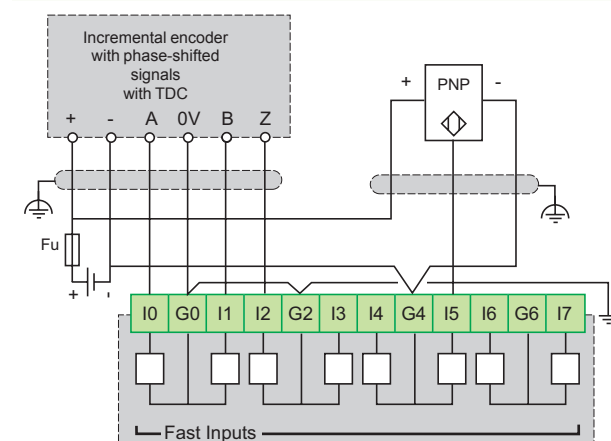


Note: It is possible to use the available fast inputs I2, I3, I6, and I7 as "normal mode" inputs: 30 m unshielded cables max. and separate 24 V  $\bar{\bar{}}$  power supply from the specific auxiliary power supply for the fast inputs.

##### Using 1 incremental encoder with phase-shifted signals without TDC and 1 electromechanical sensor



##### Using 1 incremental encoder with phase-shifted signals with TDC and one 3-wire PNP sensor



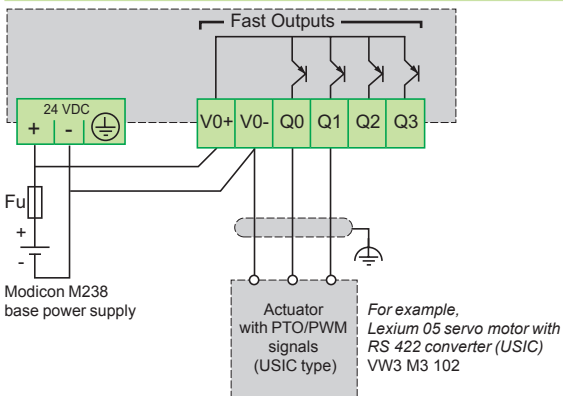
Cordsets with mandatory shielding: 10 m max. and shielding to be connected to the metal support for mounting the Modicon M238 controller.

Specific auxiliary power supply for the encoders and sensors connected to the fast inputs and used in "fast counter" mode.

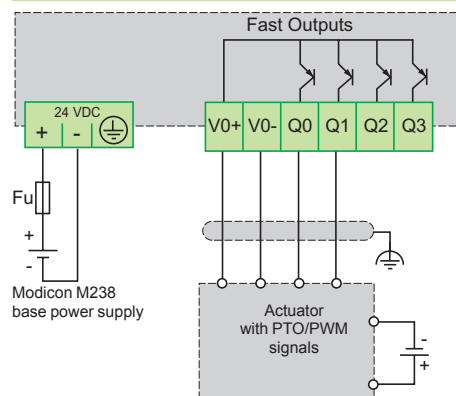
0.5 A fast-blow fuse.

#### Connection of 24 V $\bar{\bar{}}$ fast outputs (TM238 LDD24DT, TM238 LFCD24DT)

##### Using actuators with USIC type PTO/PWM signals



##### Using actuators with PTO/PWM signals delivering a 24 V $\bar{\bar{}}$ power supply



Cordsets with mandatory shielding: 10 m max. and shielding to be connected to the metal support for mounting the Modicon M238 controller.

#### Principle

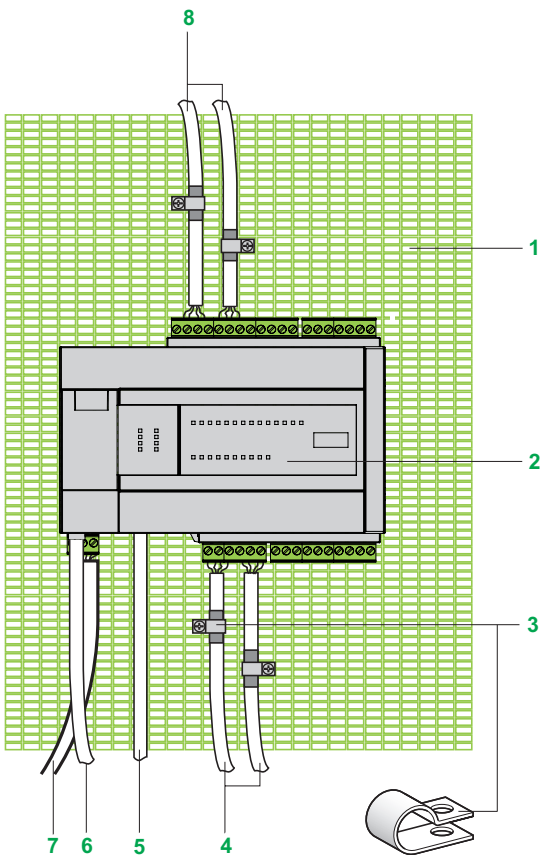
In order to protect against external interference, cables and cordsets carrying the signals below must be shielded:

- Incremental encoders and sensors connected to the fast inputs and used in counter mode (> 100 Hz)
- Actuators with PTO/PWM signals connected to the fast outputs for **TM238 LDD24DT** and **TM238 LFCD24DT**
- Sensors and actuators connected to the extension modules' analog I/O
- Serial links and CANopen buses

The use of shielded cables requires compliance with the following wiring rules:

- Shielding 360° connected to earth at both ends of the cables. Metal conduit or ducting can be used for part of the shielding length provided that there is no break in the continuity of the earth connections.
- Keep cables carrying signals of different categories as far apart as possible.

#### Installation diagram for Modicon M238 controller



- 1 Metal plate or metal panel (earthed casing) connected to the device's protective earth (PE)
- 2 Modicon M238 logic controller
- 3 **Shielding connection clamp TM200 RSRCEMC**: Attach and earth the shielding of cables 4 and 8 as close as possible to the controller base:
  - Strip the shielding (on the clamp)
  - Attach the cable to the metal support 1 by attaching the clamp to the stripped part of the shielding.
- 4 The shielding must be clamped tightly enough to the metal support to ensure good contact.
- 4 Shielded cables for connecting the fast outputs to the actuators with PTO/PWM signals
- 5 Shielded cordset for connecting serial links SL1 and SL2 (TCS MCN 3M4●●2 cordsets include the earthing lug). Use "TM200 RSRCEMC shielding connection clamp" in the serial lines cable 5
- 6 Shielded cable for connecting the CANopen bus. The shielding is connected to terminal 3 on the connection terminal block (see page 11). Use "TM200 RSRCEMC shielding connection clamp" in the CANopen cable 6
- 7 Unshielded power supply wires or cable (2 conductors + Earth)
- 8 Shielded cable for connecting the encoder and sensor signals used on the fast inputs in counter mode

**Note:** The shielding of the shielded cables used for connecting the sensors/actuators to the analog I/O extension modules should be attached and earthed via earthing plate **TM2 XMTGB** (see page 40).

**Note:** These shielding connections do not remove the need to connect the PE protective conductors (green-yellow) to the appropriate terminals on each unit or product.

<b>Applications</b>	Type of extension modules	<b>Discrete inputs with removable screw terminal block</b>
	Compatibility	



<b>Number and type</b>	8 $\overline{\text{---}}$ 24 V inputs	8 $\sim$ 120 V inputs	16 $\overline{\text{---}}$ 24 V inputs
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<b>Connection</b>	By removable screw terminal block		
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<b>Inputs</b>	Voltage range	$\overline{\text{---}}$ 20.4...28.8 V	$\sim$ 85...132 V	$\overline{\text{---}}$ 20.4...28.8 V	
	Input current	7 mA per channel	7.5 mA per channel	7 mA per channel	
	Input logic	Sink/source (1)	-	Sink/source (1)	
	Commons	1 x 8 channels	1 x 8 channels	1 x 16 channels	
	Response time	<input type="checkbox"/> Off-on	4 ms	25 ms	4 ms
		<input type="checkbox"/> On-off	4 ms	30 ms	4 ms

<b>Outputs</b>	Output types				
	Voltage range				
	Commons				
	Output current	<input type="checkbox"/> Per output			
		<input type="checkbox"/> Per group of channels			

<b>Isolation</b>	Between channels	None		
	Between channels and internal logic	500 V rms $\sim$ for 1 min	1500 V rms $\sim$ for 1 min	500 V rms $\sim$ for 1 min

<b>I/O module type</b>	<b>TM2 DDI 8DT</b>	<b>TM2 DAI 8DT</b>	<b>TM2 DDI 16DT</b>
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<b>Pages</b>	26
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(1) Sink input: positive logic, source input: negative logic.

**Discrete inputs with HE10 connector**

- Modicon M238 logic base controllers
- Twido compact and modular controllers
- Magelis HMI Controller
- Modicon OTB I/O distributed Interfaces

**Discrete I/O with removable screw terminal block**

**Discrete I/O with non-removable spring terminal block**



16  $\leftrightarrow$  24 V inputs

32  $\leftrightarrow$  24 V inputs

4  $\leftrightarrow$  24 V inputs/4 relay outputs

16  $\leftrightarrow$  24 V inputs/8 relay outputs

By HE10 connector  
Allows use of the Modicon Telefast ABE 7 pre-wired system

By removable screw terminal block

By non-removable spring terminal block

$\leftrightarrow$  20.4...28.8 V

$\leftrightarrow$  20.4...28.8 V

5 mA per channel

7 mA per channel

Sink/source (1)

Sink/source (1)

1 x 16 channels

2 x 16 channels

1 x 4 channels

1 x 16 channels

4 ms

4 ms

4 ms

4 ms

1 N/O contact

$\sim$  240 V,  $\leftrightarrow$  30V

1 x 4 channels

2 x 4 channels

2 A (lth)

7 A (lth)

None

None between input channels, none between output channels

Between input group and output groups: 1500 V rms  $\sim$  for 1 min

Between output groups: 1500 V rms  $\sim$  for 1 min

Between input channels and internal logic: 500 V rms  $\sim$  for 1 min

Between output channels and internal logic: 2300 V rms  $\sim$  for 1 min

500 V rms  $\sim$  for 1 min

**TM2 DDI 16DK**

**TM2 DDI 32DK**

**TM2 DMM 8DRT**

**TM2 DMM 24DRF**

<b>Applications</b>	Type of extension modules	<b>8/16 outputs with removable screw terminal block</b>
	Compatibility	



<b>Type</b>	8 --- 24 V transistor outputs	8 relay outputs	16 relay outputs
-------------	-------------------------------	-----------------	------------------

<b>Connection</b>	By removable screw terminal block		
-------------------	-----------------------------------	--	--

<b>Outputs</b>	Output types	Transistor		Relay with 1 N/O contact		
	Voltage range	--- 20.4...28.8 V		~ 240 V, --- 30 V		
	Logic (1)	Sink	Source	-		
	Commons	1 x 8 channels		2 x 4 channels	2 x 8 channels	
	Output current	0.3 A max.	0.5 A max.	2 A max.		
	<input type="checkbox"/> Per output <input type="checkbox"/> Per group of channels	3 A at 28.8 V	4 A at 28.8 V	7 A max.	8 A max.	
Protection against overload and short-circuit	-	Yes, with automatic reactivation on elimination of the fault	-			

<b>Isolation</b>	Between channels	None	None
	Between group of channels	-	1500 V rms for 1 min
	Between channels and internal logic	500 V rms ~ for 1 min	2300 V rms ~ for 1 min

<b>Output module type</b>	<b>TM2 DDO 8UT</b>	<b>TM2 DDO 8TT</b>	<b>TM2 DRA 8RT</b>	<b>TM2 DRA 16RT</b>
---------------------------	--------------------	--------------------	--------------------	---------------------

<b>Pages</b>	26 (1) Source output: positive logic, sink output: negative logic.
--------------	---

**16/32 outputs with HE 10 connectors**

- Modicon M238 logic base controllers
- Twido compact and modular controllers
- Magelis HMI Controller
- Modicon OTB I/O distributed Interfaces



16 --- 24 V transistor outputs

16 --- 24 V transistor outputs

32 --- 24 V transistor outputs

32 --- 24 V transistor outputs

By HE10 connector

By HE10 connector  
Allows use of the Modicon  
Telefast ABE 7 pre-wired system

By HE10 connector

By HE10 connector  
Allows use of the Modicon  
Telefast ABE 7 pre-wired system

**Transistors**

--- 20.4...28.8 V

Sink

Source

Sink

Source

1 x 16 channels

2 x 16 channels

0.1 A max.

0.4 A max.

0.1 A max.

0.4 A max.

1 A at 28.8 V

2 A at 28.8 V

1 A at 28.8 V

2 A at 28.8 V

–

Yes, with automatic reactivation on  
elimination of the fault

–

Yes, with automatic reactivation on  
elimination of the fault

None

–

500 V rms ~ for 1 min

**TM2 DDO 16UK**

**TM2 DDO 16TK**

**TM2 DDO 32UK**

**TM2 DDO 32TK**

26

### Presentation

The offer discrete I/O extension modules includes input modules, output modules and mixed input/output modules. With the 15 I/O modules offered, in addition to the I/O integrated in 24 I/O compact base controllers and modular base controllers, configurations can be adapted to best suit application requirements, so optimising costs.

The following discrete I/O modules are available:

- Four 24 V discrete input modules comprising an 8, 16 and a 32-channel module, equipped with either removable screw terminal blocks or HE 10 connector, depending on the model. These modules can be either “sink or source”.
- One ~ 120 V discrete input module, 8 channels, equipped with a removable screw terminal block.
- Eight discrete output modules comprising two output modules with 8 and 16 relay outputs, output modules with 8, 16 or 32-channel “sink” or “source” transistor outputs, equipped with either removable screw terminal blocks or HE 10 connector, depending on the model.
- Two mixed discrete input and output modules, comprising one 4-channel input/4-channel relay output module with removable screw terminal block and one 16-channel input/8-channel relay output module with non-removable spring terminal block.

The narrow width of these I/O modules (17.5 mm, 23.5 mm, 29.7 mm or 39.1 mm) makes it possible to build Modicon M238, Twido or Modicon OTB configurations of up to 248 I/O with a minimal overall size of L 364.9 mm x H 90 mm x D 81.3 mm.

Discrete I/O extension modules and the analogue I/O modules are connected to the different base controller according to the following rules:

- Modicon M238 24 I/O compact base controllers, **TM238 L●●●●●●**: 7 modules max.
- Twido 24 E/S compact base controllers, **TWD LC●A 24DRF**: 4 modules max.
- Twido 40 E/S compact base controllers, **TWD LC●● 40DRF**: 7 modules max.
- Twido 20 E/S modular base controllers, **TWD LMDA 20D●K**: 4 modules max.
- Twido 20 E/S and 40 E/S modular base controllers, **TWD LMDA 20DRT/40D●K**: 7 modules max.
- Magelis HMI Controller, **XBT GC1100●**: 2 modules max.
- Magelis HMI Controller, **XBT GC2●●0●**: 3 modules max.
- Modicon OTB Interface 20 E/S, **OTB 1●0 DM9LP**: 7 modules max.

All the discrete I/O modules are electrically isolated with the use of a photocoupler between the internal electronic circuit and the input/output channels.

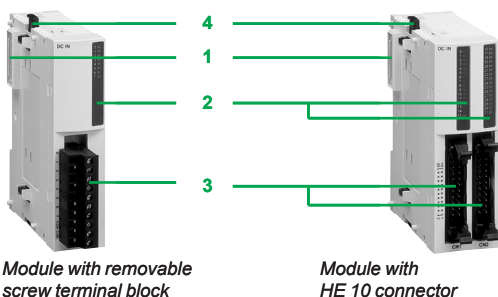
### Description

Discrete I/O extension modules comprise:

- 1 An extension connector for electrical connection to the previous module (1).
- 2 One or two blocks for displaying the channels and module diagnostics.
- 3 One or two connection components of varying type, depending on the model:
  - removable screw terminal block (1 or 2) for modules whose reference ends in **T**,
  - HE 10 connector (1 or 2) for modules whose reference ends in **K**,
  - non-removable spring terminal block for module **TM2 DMM 24DRF**.
- 4 Latching mechanism for attachment to the previous module.

These modules are mounted on a symmetrical rail. Fixing kit **TWD XMT 5** (supplied in lots of 5) allows plate or panel mounting. For modules with removable screw terminal block, the terminal blocks are supplied with the module.

The **OTB 9ZZ 61JP** supply common distribution module (2 isolated groups of 10 terminals) simplifies the wiring of supply commons of sensors or actuators via 2 removable screw terminal blocks.



(1) A connector on the right-hand side ensures continuity of the electrical link with the next I/O module.

Characteristics of $\bar{0}$ input channels										
Type of modules	TM2	DAI 8DT	DDI 8DT	DDI 16DT	DDI 16DK	DDI 32DK	DMM 8DRT	DMM 24DRF		
Number of input channels		8		16		32	4	16		
Nominal input voltage	V	$\sim 120$ V	$\bar{0}$ 24 sink/source							
Connection		Removable screw terminal block			HE 10 connector		Removable screw terminal block	Spring terminal block		
Commons		1 x 8 channels		1 x 16 channels		2 x 16 channels	1 x 4 channels	1 x 16 channels		
Input limit values (at states 0 and 1 guaranteed)	V	$\sim 85 \dots 132$ V	$\bar{0}$ 20.4...28.8	$\bar{0}$ 20.4...28.8 (1)			$\bar{0}$ 20.4...28.8	$\bar{0}$ 20.4...28.8 (1)		
Nominal input current	mA	7.5	7		5		7			
Input impedance	k $\Omega$	11	3,4		4,4		3,4			
Response time	At state 1	ms	25	4		4		4		
	At state 0	ms	30	4		4		4		
Isolation	Between channels		None							
	Between input groups and output groups	V rms	–	–				1500 for 1 min		
	Between channels & internal logic	V rms	1500 for 1 min	500 for 1 min				500 for 1 min		
Max. consumption on internal extension bus	All inputs at state 1	$\bar{0}$ 5 V	mA	55	25	40	35	65	25 (2)	65 (2)
		$\bar{0}$ 24 V	mA	0					20 (2)	45 (2)

(1) Derating temperature curves depends on nominal input voltage, see page 29.

(2) Consumption values are indicated for all mixte inputs/output modules at state 1.



Characteristics of transistor output modules								
Type of modules	TM2	DDO 8UT	DDO 8TT	DDO 16UK	DDO 16TK	DDO 32UK	DDO 32TK	
Number of output channels		8		16		32		
Output logic (1)		Sink	Source	Sink	Source	Sink	Source	
Connection		Removable screw terminal block		HE 10 connector				
Commons		1 x 8 channels		1 x 16 channels		2 x 16 channels		
Nominal output values	Voltage	V						24
	Current	A	0,3	0,5	0,1	0,4	0,1	0,4
Output limit values	Voltage	V						20.4...28.8
	Current per channel	A	0.36	0.6	0.12	0.48	0.12	0.48
	Current per common	A	3	4	1	2	1	2
Response time	State 0 to state 1	μs	300	450	300	450	300	450
	State 1 to state 0	μs	300	450	300	450	300	450
Leakage current		mA	–	0,1	–	0,1	–	0,1
Residual voltage	At state 1	V	≤ 1	≤ 0.4	≤ 1	≤ 0.4	≤ 1	≤ 0.4
Inductive load	L/R	ms	–	≤ 10	–	≤ 10	–	≤ 10
Internal protection of the outputs against overload and short-circuit	with automatic reactivation		No	Yes	No	Yes	No	Yes
Maximum power of filament lamp		W	8	12	8	9,6	8	9,6
Isolation	Between channels		None					
	Between channels & int. logic	V rms	500 for 1 min					
Max. consumption on internal extension bus	All outputs	mA	10		10	15	20	25
	at state 1	mA	20		40	20	70	40

(1) Source output: positive logic, sink output: negative logic.

Characteristics of relay output channels						
Type of modules	TM2		DRA 8RT	DRA 16RT	DMM 8DRT	DMM 24DRF
Number of output channels			8 NO contacts	16 NO contacts	4 NO contacts	8 NO contacts
Connection			Removable screw terminal block			Non removable spring terminal block
Output currents	Current per channel	A	2 (5 max. surge current)			
	Max. Current per common	A	7	8	7	
Commons			2 x 4 channels	2 x 8 channels	1 x 4 channels	2 x 4 channels
Minimum switching load		mA	0,1 under $\sim$ 0,1 V			
Contact resistance		When new	m $\Omega$ 45 max.			
Mechanical life time		Unload	20 x 10 <sup>6</sup> operations			
Loads on relay outputs	Resistive	e.g.: heating element	Electric life time : 1 x 10 <sup>5</sup> operations min.: - 2 A at $\sim$ 240 V - 2 A at $\sim$ 30 V with 600 operations max./hour			
	Inductive with protection (1)	e.g.: relay, solenoid valve	Electric life time : 1 x 10 <sup>5</sup> operations min.: - régime inductif AC-15 : $\sim$ 240 V 1 A, cos $\varphi$ = 0,7 - régime inductif AC-15 : $\sim$ 240 V 0,5 A, cos $\varphi$ = 0,35 - régime inductif DC-13 : $\sim$ 24 V 1 A, L/R = 7 ms			
	Capacitive	e.g.: TeSys U starters, Festo solenoid valves	Use of relay outputs not guaranteed (reduction of life). For this type of application, <b>it is advisable to use the transistor outputs of extension modules TM2 DDO ●●●●</b>			
Response time	State 0 to state 1	ms	$\leq$ 10			
	State 1 to state 0	ms	$\leq$ 5			
Isolation voltage	Between channels	V rms	1500 for 1 min		None	
	Between output groups	V rms	1500 for 1 min			
	Between input groups and output groups	V rms	-		1500 for 1 min	
	Between channels & internal logic	V rms	2300 for 1 min			
Max. consumption on internal extension bus	All outputs at state 1	$\sim$ 5 V	mA 30	45	25 (2)	65 (2)
		$\sim$ 24 V	mA 40	75	20 (2)	45 (2)

(1) Inductive load fitted with a protection device such as an RC peak limiter or flywheel diode.

(2) Consumption values are indicated for all inputs/outputs at state 1.

### References

These discrete I/O modules are mounted as standard on symmetrical  $\perp$  rails to the right of the Twido base controller. The maximum number of discrete and/or analogue I/O modules which may be mounted depends on the type of base controller:

Base controller type	Twido compact TWD				Twido modular TWD			Modicon M238	Magelis HMI Controller		Modicon OTB Interface
	LC●A 10DRF	LC●A 16DRF	LC●A 24DRF	LC●● 40DRF	LMDA 20D●K	LMDA 20DRT	LMDA 40D●K	TM238 L●●●●●	XBT GC 1100●	XBT GC 2●●0●	OTB 1●0 DM9LP
Number of modules	0	0	4	7	4	7	7	7	2	3	7



TM2 DDI 8DT



TM2 DDI 32DK



TM2 DDO 8●T/DRA 8RT



TM2 DDO 16●K



TM2 DDO 32●K



TM2 DRA 16RT



TM2 DDM 8DRT



TM2 DDM 24DRF

### Discrete input modules

Input voltage	Nb of channels	Nb of common points	Connection	Reference	Weight kg
≡ 24 V sink/source	8	1	Removable screw terminal block (supplied)	TM2 DDI 8DT	0.085
	16	1	Removable screw terminal block (supplied)	TM2 DDI 16DT	0.100
	32	2	HE 10 connector	TM2 DDI 16DK (1) TM2 DDI 32DK (1)	0.065 0.100
~ 120 V	8	1	Removable screw terminal block (supplied)	TM2 DAI 8DT	0.081

### Discrete output modules

Type de sortie	Nb of channels	Nb of common points	Connection	Reference	Weight kg
Transistors ≡ 24 V	8, sink 0.3 A	1	Removable screw terminal block (supplied)	TM2 DDO 8UT	0.085
	8, source 0.5 A	1	Removable screw terminal block (supplied)	TM2 DDO 8TT	0.085
Transistors ≡ 24 V	16, sink 0.1 A	1	HE 10 connector	TM2 DDO 16UK	0.070
	16, source 0.4 A	1	HE 10 connector	TM2 DDO 16TK (1)	0.070
	32, sink 0.1 A	2	HE 10 connector	TM2 DDO 32UK	0.105
	32, source 0.4 A	2	HE 10 connector	TM2 DDO 32TK (1)	0.105
Relay 2 A (lth) ~ 230 V/≡ 30 V	8 (N/O contact)	2	Removable screw terminal block (supplied)	TM2 DRA 8RT	0.110
	16 (N/O contact)	2	Removable screw terminal block (supplied)	TM2 DRA 16RT	0.145

### Discrete mixed input/output modules

Nb of I/O	Nb, type of input	Nb, type of output	Nb of common points	Connection	Reference	Weight kg
8	4 I, ≡ 24 V sink/source	4 O, relay (N/O contact) 2 A (lth)	Inputs: 1 common Outputs: 1 common	Removable screw terminal block (supplied)	TM2 DMM 8DRT	0.095
24	16 I, ≡ 24 V sink/source	8 O, relay (N/O contact) 2 A (lth)	Inputs: 1 common Outputs: 2 commons	Non-removable spring terminal block	TM2 DMM 24DRF	0.140

(1) Module that allows use of the Modicon Telefast ABE 7 pre-wired system.



OTB 9ZZ 61JP

### References

#### Separate components

Description	Application	Reference	Weight kg
<b>Fixing kit</b> Sold in lots of 5	For plate or panel mounting of the discrete modules.	<b>TWD XMT 5</b>	0.065
<b>Commun distribution module</b>	For distribution of supply commons. 8 A max. Connection on 2 removable screw terminal blocks	<b>OTB 9ZZ 61JP</b>	0.100
<b>Modicon Telefast ABE 7 pre-wired system</b>	Connection sub-bases I/O connection sub-bases Pre-wired solutions Cables and accessories	See page 78	–

Description	Number of ways	Reference	Weight kg
<b>HE 10 female connectors</b> Sold in lots of 5	20	<b>TWD FCN 2K20</b>	–
	26	<b>TWD FCN 2K26</b>	–

#### Pre-formed cables for discrete I/O modules with HE 10 connectors

Description	For use with Twido	Gauge C.s.a.	Cable length	Reference	Weight kg
<b>Pre-formed cables</b> 1 pre-formed cable: one end fitted with HE 10 connector, one end with free wires	I/O extensions TM2 DDI 16DK/32DK	AWG 22 0.035 mm <sup>2</sup>	3 m	<b>TWD FCW 30K</b>	0.405
	TM2 DDO 16●K/32●K	AWG 22 0.035 mm <sup>2</sup>	5 m	<b>TWD FCW 50K</b>	0.670

#### Pre-formed connecting cables (1)

Description	Association	Jauge Section	Longueur cordon	Reference	Weight kg
<b>Discrete input pre-formed cables,</b> 1 pre-formed cable: one end with 20-way HE 10 connector on TM2 side, one end with 20-way HE 10 connector on sensor side	Inputs TM2 DDI 16DK/32DK	AWG 28 0.080 mm <sup>2</sup>	1 m	<b>ABF TE20EP100</b>	0,080
		AWG 28 0.080 mm <sup>2</sup>	2 m	<b>ABF TE20EP200</b>	0.140
		AWG 28 0.080 mm <sup>2</sup>	3 m	<b>ABF TE20EP300</b>	0.210
<b>Discrete output pre-formed cables</b> 1 pre-formed cable: one end with 20-way HE 10 connector on TM2 side, one end with 20-way HE 10 connector on preactuator side	Outputs TM2 DDO 16TK/32TK	AWG 28 0.080 mm <sup>2</sup>	1 m	<b>ABF TE20SP100</b>	0,080
		AWG 28 0.080 mm <sup>2</sup>	2 m	<b>ABF TE20SP200</b>	0.140
		AWG 28 0.080 mm <sup>2</sup>	3 m	<b>ABF TE20SP300</b>	0.210

(1) Cables strictly for applications other than use of Modicon Telefast ABE 7 sub-bases with Twido controllers. For use of Modicon Telefast ABE 7 sub-bases with Twido controllers, see page 75.

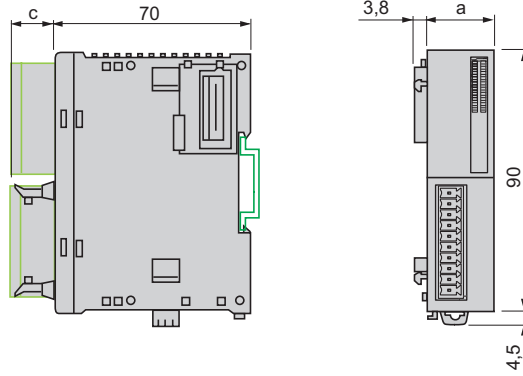
### Dimensions

#### Discrete I/O modules

TM2	a	c
DDI 8DT/DAI 8DT	23,5	14,6
DDI 16DT	23,5	14,6
DDI 16DK	17,6	11,3
DDI 32DK	29,7	11,3
DDO 8UT/8TT	23,5	16,6
DDO 16UK/16TK	17,6	11,3
DDO 32UK/32TK	29,7	11,3
DRA 8RT/16RT	23,5	14,6
DMM 8DRT	23,5	14,6
DMM 24DRF	39,1	1,0

OTB	a	c
9ZZ 61JP	23,5	14,6



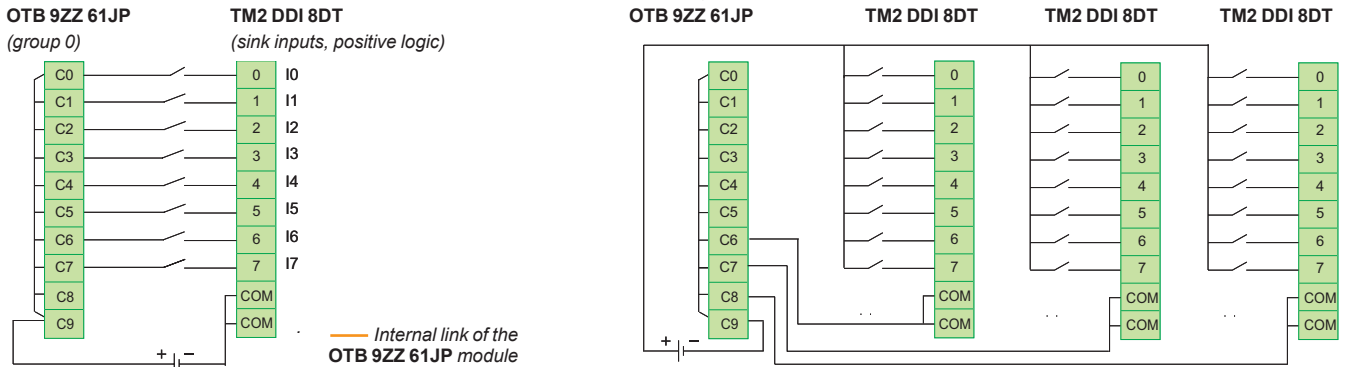
### Connections

ABF TP26MP●00 (1)			ABF TE20EP●00 (1)		ABF TE20SP●00 (1)	
HE 10 26-way A	HE 10 20-way B	HE 10 20-way C	HE 10 20-way A	HE 10 20-way B	HE 10 20-way A	HE 10 20-way B
Twido side	Sensor side	Preactuator side	TM2 side	Sensor side	TM2 side	Preactuator side
1	–	18	1	–	1	18
2	20	–	2	–	2	20
3	–	20	3	18	3	19
4	12	–	4	20	4	17
5	–	17	5	16	5	16
6	11	–	6	8	6	8
7	–	19	7	15	7	15
8	10	–	8	7	8	7
9	–	–	9	14	9	14
10	9	–	10	6	10	6
11	–	8	11	13	11	13
12	8	–	12	5	12	5
13	–	7	13	12	13	12
14	7	–	14	4	14	4
15	–	6	15	11	15	11
16	6	–	16	3	16	3
17	–	5	17	10	17	10
18	5	–	18	2	18	2
19	–	4	19	9	19	9
20	4	–	20	1	20	1
21	–	3				
22	3	–				
23	–	2				
24	2	–				
25	–	1				
26	1	–				

(1) Cordsets do not be associated with a Modicon Telefast ABE 7 bases.  
For Modicon Telefast ABE 7 bases association, see page 75.

#### OTB 9ZZ 61JP

Examples of connection: input module **TM2 DDI 8DT** with distribution module of supply commons **OTB 9ZZ 61JP**



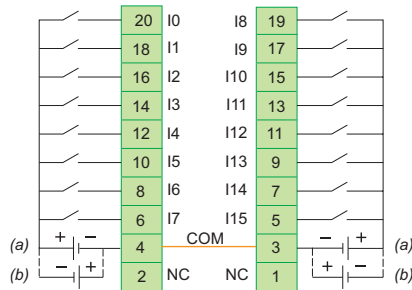
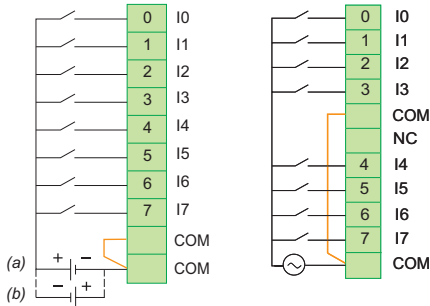
Connections

Input modules

TM2 DDI 8DT (--- 24 V)

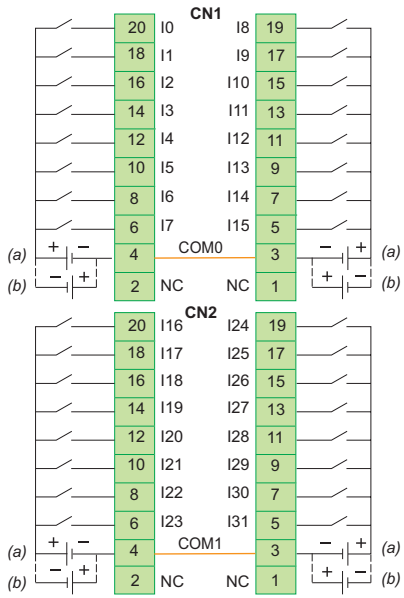
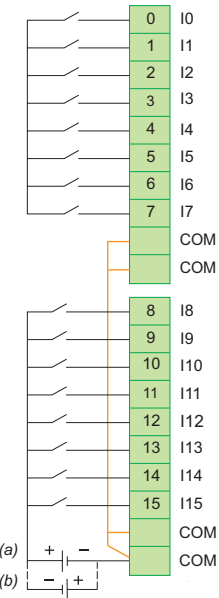
TM2 DAI 8DT (~ 120 V)

TM2 DDI 16DK (--- 24 V)



TM2 DDI 16DT (--- 24 V)

TM2 DDI 32DK (--- 24 V)

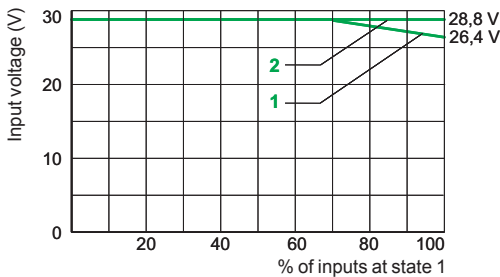


(a) Sink input (positive logic).  
(b) Source input (negative logic).  
— COM or COM● internal links.

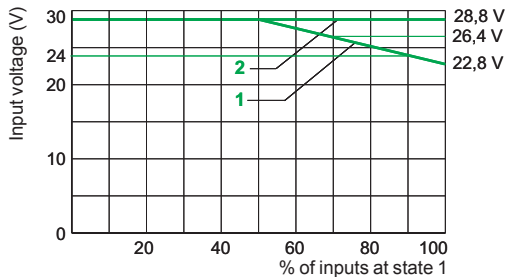
Temperature derating curves of input modules

TM2 DDI 16DT

TM2 DDI 16DK/32DK



1 Input voltage at 45 °C  
2 Input voltage at 55 °C



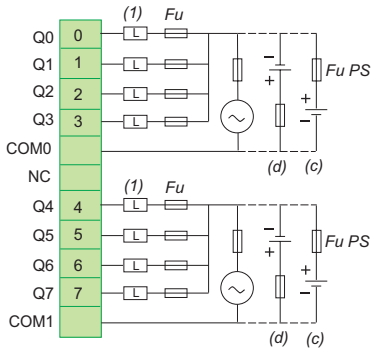
1 Input voltage at 30 °C  
2 Input voltage at 55 °C



### Connections (continued)

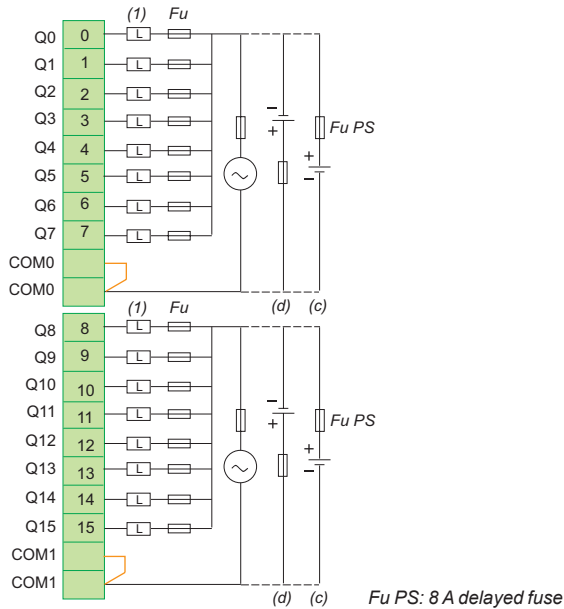
#### Relay output modules

##### TM2 DRA 8RT



Fu PS: 8 A delayed fuse

##### TM2 DRA 16RT



Fu PS: 8 A delayed fuse

(1) L inductive load: must be equipped with a protection device such as an RC peak limiter or flywheel diode.

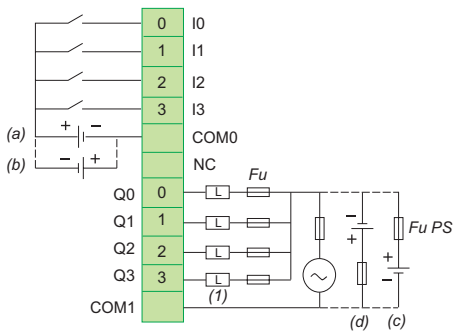
(c) Sink output (negative logic).

(d) Source output (positive logic).

COM● internal links.

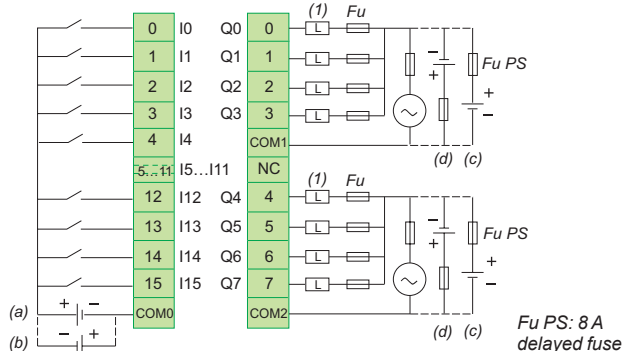
#### Input/output mixed modules

##### TM2 DMM 8DRT



Fu PS: 8 A delayed fuse

##### TM2 DMM 24DRF



Fu PS: 8 A delayed fuse

(1) L inductive load: must be equipped with a protection device such as an RC peak limiter or flywheel diode.

(a) Sink input (positive logic).

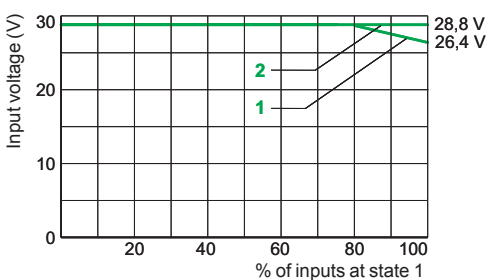
(b) Source input (negative logic).

(c) Sink output (negative logic).

(d) Source output (positive logic).

#### Temperature derating curves of mixed input/output modules (continued)

##### TM2 DMM 24DRF



1 Input voltage at 45 °C

2 Input voltage at 55 °C



<b>Applications</b>		<b>Type of extension modules</b>		<b>Analogue inputs</b>			
		<b>Compatibility</b>		<ul style="list-style-type: none"> <li>- Modicon M238 logic base controllers</li> <li>- Twido compact and modular controllers</li> <li>- Magelis HMI controller</li> <li>- Modicon OTB I/O distributed Interfaces</li> </ul>			
							
<b>Type</b>		2 inputs		4 inputs		8 inputs	
<b>Nature</b>		Voltage/current		Thermocouple inputs		Voltage/current Temperature probe	
<b>Connection</b>		Removable screw terminal block					
<b>Inputs</b>		<b>Range</b>		0...10 V 4...20 mA (non differential)		Thermocouple type J, K and T (differential)	
		<b>Resolution</b>		12 bits (4096 points)		12 bits (4096 points)	
		<b>Acquisition period</b>		10 ms per channel + 1 controller cycle time		160 ms per channel ● 320 ms per channel ■ + 1 controller cycle time	
				12 bits (4096 points)		12 bits (4096 points)	
				200 ms per channel + 1 controller cycle time		160 ms per channel + 1 controller cycle time	
				10...10 V ● 0...20 mA ● Temperature probe 2, 3 or 4-wire Pt100/1000 ■ : - 200...600 °C Ni 100/1000 ■ : - 50...150 °C (non differential)		0...10 V 0...20 mA (non differential)	
				12 bits (4096 points)		10 bits (1024 points)	
<b>Outputs</b>		<b>Range</b>					
		<b>Resolution</b>					
		<b>Transfer time</b>					
<b>External supply</b>		<b>Nominal voltage</b>		☐ 24 V			
		<b>Limit values</b>		☐ 20.4...28.8 V			
<b>Isolation</b>		<b>Between channels</b>		Non isolated			
		<b>Between channels and sensor supply</b>		~ 500 V rms		Non isolated	
		<b>Between channels and internal logic</b>		~ 500 V rms		~ 2500 V rms	
				~ 2500 V rms		~ 2500 V rms	
<b>Analogue I/O module type</b>		<b>TM2 AMI 2HT</b>		<b>TM2 AMI 2LT</b>		<b>TM2 AMI 4LT</b>	
						<b>TM2 AMI 8HT</b>	
<b>Pages</b>		38					

Analogue inputs (continued)	Analogue outputs	Analogue I/O
-----------------------------	------------------	--------------

- Modicon M238 logic base controllers
- Twido compact and modular controllers
- Magelis HMI controller
- Modicon OTB I/O distributed Interfaces



8 inputs	1 output	2 outputs	2 inputs/1 output	4 inputs/2 outputs
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Temperature probe inputs	Voltage/current	Voltage	Voltage/current	Thermocouple/ temperature probe inputs Voltage/current output	Voltage/current
--------------------------	-----------------	---------	-----------------	--	-----------------

Removable screw terminal block	Removable screw terminal block and RJ11 connectors	Removable screw terminal block			
--------------------------------	--	--------------------------------	--	--	--

NTC probe (non differential)	PTC probe  Threshold detection (high and low) (non dif.)	Temperature probe 2 or 3-wire Pt100: - 200...600 °C Pt1000 :- 50...200 °C (non differential)	0...10 V 4...20 mA (non differential)	Thermocouple type J, K and T Temperature probe 2 or 3-wire Pt100: - 100...500 °C (non differential)	0...10 V 4...20 mA (non differential)
10 bits (1024 pts)	1 < range 2 = range 4 > range	12 bits (4096 points)	12 bits or 11 bits + sign (4096 points)		12 bits (4096 points)
160 ms per channel + 1 controller cycle time	320 ms per channel (1280 ms maxi.) + 1 controller cycle time		10 ms per channel + 1 controller cycle time	50 ms per channel + 1 controller cycle time	64 ms per channel + 1 controller cycle time

0...10 V 4...20 mA	± 10 V	0...10 V 4...20 mA
12 bits (4096 points)	11 bits (2048 points) + sign	12 bits (4096 points)
10 ms + 1 controller cycle time	2 ms + 1 controller cycle time	20 ms + 1 controller cycle time

~ 24 V	~ 24 V
~ 20.4...28.8 V	~ 19.2...30 V

Non isolated					
Non isolated	~ 500 V rms	~ 500 V rms	Non isolated	~ 500 V rms	~ 800 V rms
~ 2500 V rms	~ 500 V rms	~ 500 V rms	~ 2500 V rms	~ 500 V rms	~ 1500 V rms

TM2 ARI 8HT	TM2 ARI 8LT (1) TM2 ARI 8LRJ (2)	TM2 AMO 1HT	TM2 AVO 2HT	TM2 AMM 3HT	TM2 ALM 3LT	TM2 AMM 6HT
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(1) Connection by a removable screw terminal block.  
 (2) Connection by a RJ11 connector.

### Presentation

Analog I/O extension modules enable the acquisition of various analog values encountered in industrial applications.

Analog output modules are used to control the preactuators in devices such as variable speed drives, valves and applications that require process control. The output current or voltage is proportional to the numerical value defined by the user program. When the controller stops, the outputs can be configured with fallback (reset to the lowest scale value or hold the last value received). This function, when set to 'hold', is useful when debugging the application or when a fault occurs, to ensure that the process being controlled is not disturbed.

The following 10 analog I/O modules are available:

- One module with 2 inputs: 0...10 V, 4...20 mA
- One module with 2 inputs for type J, K and T thermocouples
- One module with 4 inputs: 0...10 V, 0...20 mA, Pt 100/1000 range - 200...600°C, Ni100/1000 range - 50...150°C
- Two modules with 8 temperature probe inputs: Pt100 range - 200...600°C and Pt1000 range - 50...200°C (with RJ11 connectors or removable screw terminal block)
- One module with 8 inputs: 0...10 V, 0...20 mA
- One module with 8 inputs: PTC/NTC (1)
- One module with 1 output: 0...10 V, 4...20 mA
- One module with 2 outputs: ± 10 V
- One mixed module with 2 inputs (0...10 V, 4...20 mA) and 1 output (0...10 V, 4...20 mA)
- One mixed module with 2 thermocouple (type J, K and T) or temperature probe inputs and 1 output 0...10 V, 4...20 mA
- One mixed module with 4 inputs (0...10 V, 4...20 mA) and 2 outputs (0...10 V, 4...20 mA)

Analog extension modules offer a resolution of 10 bits, 11 bits + sign and 12 bits, with connection by removable screw terminal block. An external 24 V  $\overline{\text{DC}}$  power supply is required for each analog module.

Discrete I/O extension modules and analog I/O modules are connected to the different base controllers according to the following rules:

- Modicon M238 24 I/O compact base controllers, **TM238 L●●●●●●**: 7 modules max.
- Twido 24 I/O compact base controllers, **TWD LC●A 24DRF**: 4 modules max.
- Twido 40 I/O compact base controllers, **TWD LC●● 40DRF**: 7 modules max.
- Twido 20 I/O modular base controllers, **TWD LMDA 20D●K**: 4 modules max.
- Twido 20 I/O and 40 I/O modular base controllers, **TWD LMDA 20DRT/40D●K**: 7 modules max.
- Magelis HMI Controller, **XBT GC1100●**: 2 modules max.
- Magelis HMI Controller, **XBT GC2●●0●**: 3 modules max.
- Modicon OTB Interface 20 I/O, **OTB 1●0 DM9LP**: 7 modules max.

All analog I/O modules are electrically isolated with the use of a photocoupler between the internal electronic circuit and the input/output channels.

### Description

Analog I/O modules comprise:

- 1 An extension connector for electrical connection to the adjacent module (2)
- 2 A PWR display block
- 3 One (or two, depending on model) removable screw terminal block(s) for connecting the 24 V  $\overline{\text{DC}}$  external power supply, the sensors and the preactuators
- 4 A latching mechanism for attachment to the adjacent module

For modules with 8 temperature probe inputs:

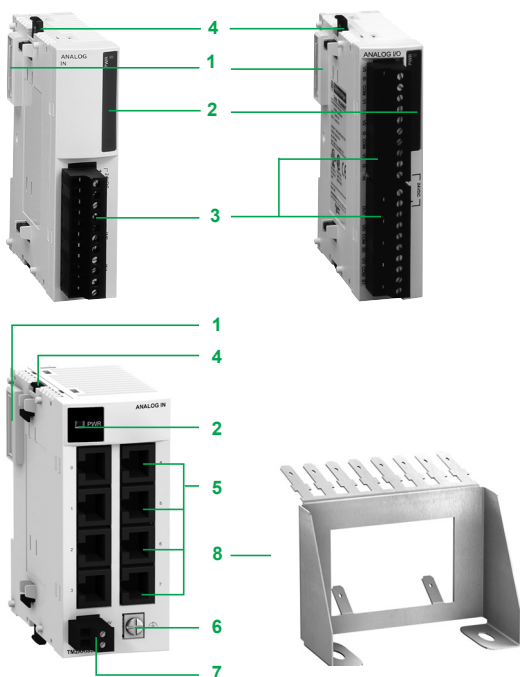
- 5 8 RJ11 connectors. A version of this module is available with 2 removable screw terminal blocks (2 x 13 terminals)
- 6 A screw terminal for connecting the functional ground (FG)
- 7 A removable screw terminal block for connecting the 24 V  $\overline{\text{DC}}$  power supply

The **TM2 XMTGB** ground connection plate 8 simplifies connection of the analog sensor and actuator cable shielding. This shielding must be connected to the device's functional ground (FG).

These modules are mounted on a symmetrical  $\perp$  rail. Mounting kit **TWD XMT 5** (supplied in lots of 5) can be used for plate or panel mounting.

(1) With PTC probe, threshold detection inputs (high and low).

(2) A connector on the right-hand side panel ensures continuity of the electrical link with the adjacent I/O module.



Characteristics of 2 and 4-channel analog input modules

Module type		TM2 AMI 2HT		TM2 AMI 2LT		TM2 AMI 4LT	
<b>Number of channels</b>		2 high-level inputs		2 low-level inputs		4 inputs	
<b>Range</b>		Voltage	Current	Thermocouple		Voltage	Current Temperature probe
		0...10 V	4...20 mA	Type J: - 200...760° Type K: - 270...1370°C Type T: - 270...400°C No isolation between the input channels		0...10 V	0...20 mA Pt100/1000: - 200... 600°C Ni100/1000: - 50...150°C
<b>Type</b>		Non-differential		Differential		Non-differential	
<b>Resolution</b>		12 bits		12 bits		12 bits	
<b>LSB value</b>		2.5 mV	4.8 µA	Type J: 0.3°C Type K: 0.325°C Type T: 0.1°C		2.5 mV	4.8 µA 0.15 ° K
<b>Connection</b>		Removable screw terminal block					
<b>Sensor cabling</b>		Shielded cable (shielding to be connected to the TM2 XMTGB ground connection plate)					
<b>Permissible continuous overload</b>		13 V $\overline{\text{---}}$	40 mA	$\pm 7.5$ V $\overline{\text{---}}$		40 mA	13 V $\overline{\text{---}}$
<b>Input impedance</b>		1 M $\Omega$ min.	10 $\Omega$	1 M $\Omega$ min.		10 K $\Omega$	470 $\Omega$ > 10 k $\Omega$
<b>Maximum sampling duration</b>		ms		10		200	
<b>Acquisition period</b>		ms		10 per channel + 1 controller cycle time		200 per channel + 1 controller cycle time	
<b>Measuring precision</b>		Max. error at 25°C		% FS		$\pm 0.2$	
		Temperature coefficient		% FS/°C		$\pm 0.006$	
		Repeat accuracy after stabilization time		% FS		$\pm 0.5$	
		Nonlinearity		% FS		$\pm 0.2$	
		Total error		% FS		$\pm 1$	
<b>Crosstalk</b>		2 low significance bits max.		1 low significance bit max.			
<b>Dielectric strength</b>		Between channels		Non-isolated		Non-isolated	
		Between channels and external supply		V rms		500 $\sim$	
		Between channels and internal logic		V rms		500 $\sim$ 2500 $\sim$	
<b>Isolation</b>		Photocoupler between the input and the internal circuit					
<b>External supply</b>		Nominal voltage 24 $\overline{\text{---}}$ ; Limit values: 20.4...28.8 $\overline{\text{---}}$ (ripple included)					
<b>Consumption</b>		Internal 5 V $\overline{\text{---}}$ supply		mA		50	
		External 24 V $\overline{\text{---}}$ supply		mA		40 30 60	

Characteristics of 8-channel analog input modules

Module type		TM2 ARI 8HT		TM2 AMI 8HT		TM2 ARI 8LRJ/8LT	
<b>Number of channels</b>		8 inputs		8 inputs		8 inputs (2 groups of 4 inputs)	
<b>Range</b>		Temperature NTC probe, PTC probe, 100 $\Omega$ < R < 10 k $\Omega$		Current	Voltage	Temperature probe	
				0...20 mA	0...10 V	Pt100: - 200...600°C Pt1000: - 50...200°C	
<b>Type</b>		Non-differential					
<b>Resolution</b>		10 bits with NTC (2)		10 bits		12 bits	
<b>LSB value</b>		-		19.5 µA	9.7 mV	0.2°C (Pt 100), 0.06°C (Pt 1000)	
<b>Connection</b>		Sensors		Removable screw terminal block			
		External supply		Removable screw terminal block			
<b>Sensor cabling</b>		Shielded cable (shielding to be connected to the TM2 XMTGB ground connection plate)					
<b>Permissible continuous overload</b>		-		40 mA	13 V	-	
<b>Input impedance</b>		>1 M $\Omega$		470 $\Omega$	> 10 k $\Omega$	> 10 k $\Omega$	
<b>Maximum sampling duration</b>		ms		160			
<b>Acquisition period</b>		ms		160 per channel + 1 controller cycle time			
<b>Measuring precision</b>		Max. error at 25°C		% FS		$\pm 0.2$	
		Temperature coefficient		% FS		$\pm 0.01$	
		Repeat accuracy after stabilization time		% FS		$\pm 0.4$ FS	
		Nonlinearity		% FS		$\pm 0.002$	
		Total error		% FS		$\pm 1$ FS	
<b>Crosstalk</b>		1 low significance bit max.		-			
<b>Dielectric strength</b>		Between channels		Non-isolated			
		Between channels and external supply		V rms			
		Between channels and internal logic		2500 $\sim$			
<b>Isolation</b>		Photocoupler between the input and the internal circuit					
<b>External supply</b>		Nominal voltage		V		24 $\overline{\text{---}}$	
		Limit values		V		20.4...28.8 $\overline{\text{---}}$ (ripple included)	
<b>Consumption</b>		Internal 5 V $\overline{\text{---}}$ supply		mA		60	
		External 24 V $\overline{\text{---}}$ supply		mA		45 90 140 max.	

(1)  $\pm 5^\circ\text{C}$ : Precision of cold junction compensation

(2) With PTC probe, 2 threshold detection (1: value  $\leq$  low threshold, 2: value included between low and high threshold, 4: value  $\geq$  high threshold)


### Characteristics of 3 and 6-channel analog input/output modules

Analog inputs		TM2 AMM 3HT		TM2 AMM 6HT		TM2 ALM 3LT	
Module type		2 high-level inputs		4 high-level inputs		2 low-level inputs	
Number of channels		Voltage	Current	Voltage	Current	Thermocouple	Temperature probe
Range		0...10 V	4...20 mA	0...10 V	4...20 mA	Type: - J: 0...1200°C - K: 0...1300°C - T: 0...400°C	3-wire Pt probe: - 100...500°C
Type		Non-differential		Non-differential		Non-differential	
Resolution		12 bits					
LSB value		2.5 mV	4.8 µA	2.5 mV	4 µA	0.1°C	0.15°C
Permissible continuous overload		13 V ---	40 mA	13 V ---	40 mA	-	
Input impedance		1 MΩ min.	10 Ω min.	1 MΩ min.	250 Ω max.	1 MΩ min.	
Maximum sampling duration		ms 10		16		60	
Acquisition period		ms 60 + 1 controller cycle time		16 per channel, configurable software + 1 controller cycle time		60 + 1 controller cycle time	
Measuring precision		% FS		% FS		% FS	
Max. error at 25°C		± 0.2		± 0.5		0.2 ± 4°C max. (1)	
Temperature coefficient		% FS/°C ± 0.006		± 0.015		± 0.006	
Repeat accuracy after stabilization time		% FS ± 0.5		± 0.5		± 0.5	
Nonlinearity		% FS ± 0.2		± 0.4		± 0.2	
Total error		% FS ± 1		± 1		± 1	
Crosstalk		2 low significance bits max.					
Isolation		Photocoupler between the inputs and the internal circuit					
Analog outputs		TM2 AMM 3HT		TM2 AMM 6HT		TM2 ALM 3LT	
Module type		1 output		2 outputs		1 output	
Number of channels		Voltage	Current	Voltage	Current	Voltage	Current
Range		0...10 V	4...20 mA	0...10 V	4...20 mA	0...10 V	4...20 mA
Resolution		12 bits					
LSB value		2.5 mV	4.8 µA	2.5 mV	4 µA	2.5 mV	4.8 µA
Load		Resistive					
Type							
Impedance		Ω	2000 min.	300 max.	2000 min.	300 max.	2000 min.
Stabilization time		ms 20					
Recovery time		ms 20 + 1 controller cycle time					
External supply		V Nominal voltage: 24 ---; Limit values: 20.4...28.8 --- (ripple included)					
Measuring precision		% FS		% FS		% FS	
Max. error at 25°C		± 0.2		± 0.9		± 0.2	
Temperature coefficient		% FS/°C ± 0.015		± 0.02		± 0.015	
Repeat accuracy after stabilization time		% FS ± 0.5		± 1		± 0.5	
Output error		% FS ± 1					
Nonlinearity		% FS ± 0.2		± 0.5		± 0.2	
Output ripple		1 low significance bit max.					
Total error		% FS ± 1		± 1.5		± 1	
Isolation		Photocoupler between the inputs and the internal circuit					
Analog I/O common		TM2 AMM 3HT		TM2 AMM 6HT		TM2 ALM 3LT	
Module type		TM2 AMM 3HT		TM2 AMM 6HT		TM2 ALM 3LT	
Connection		Removable screw terminal block					
Sensor and preactuator cabling		Shielded cable (shielding to be connected to the TM2 XMTGB ground connection plate)					
Dielectric strength		Non-isolated					
Between input channels							
Between input and output channels		V rms	500 ~	800 ~	500 ~		
Between channels and external supply		V rms	500 ~	800 ~	500 ~		
Between channels and internal logic		V rms	500 ~	1500 ~	500 ~		
External supply		V					
Nominal voltage		24 ---					
Limit values		19.2...30 --- (ripple included)					
Module consumption		mA		mA		mA	
Internal 5 V --- supply		50		60		50	
External 24 V --- supply		50		80		50	

(1) ± 4°C: Precision of cold junction compensation

Characteristics of 1 and 2-channel analog output modules					
Module type			TM2 AMO 1HT		TM2 AVO 2HT
<b>Number of channels</b>			1 output		2 outputs
<b>Range</b>			Voltage	Current	Voltage
<b>Resolution</b>			0...10 V		±10 V
<b>LSB value</b>			4...20 mA		±11 bits + sign
<b>Connection</b>			2.5 mV		4.8 μA
<b>Cabling</b>			4.8 μA		± 9.8 mV
<b>Load</b>		Type	Resistive		
		Impedance	Ω	2000 min.	300 max.
<b>Stabilization time</b>			ms	10	2
<b>Recovery time</b>			ms	10 + 1 controller cycle time	2 + 1 controller cycle time
<b>Measuring precision</b>		Max. error at 25°C	% FS	± 0.2	± 0.5
		Temperature coefficient	% FS/°C	± 0.015	± 0.01
		Repeat accuracy after stabilization time	% FS	± 0.5	± 0.1
		Nonlinearity	% FS	± 0.2	
		Output ripple		1 low significance bit max.	
		Total error	% FS	± 1	
<b>Dielectric strength</b>		Between channels		–	Non-isolated
		Between channel(s) and external supply	V rms	500 ~	Non-isolated
		Between channel(s) and internal logic	V rms	500 ~	2500 ~
<b>Isolation</b>			Photocoupler between the outputs and the internal circuit		
<b>External supply</b>		Nominal voltage	V	24 ~	
		Limit values	V	19.2...30 ~ (ripple included)	
<b>Module consumption</b>		Internal 5 V ~ supply	mA	50	60
		External 24 V ~ supply	mA	40	60

### References

These analog I/O extension modules are mounted on symmetrical  rails to the right of base controller below. The maximum number of I/O and/or analog modules which may be mounted depends on the type of base controller:

Base controller type	Twido compact TWD				Twido modular TWD			Modicon M238	Magelis HMI Controller		Modicon OTB Interface
	LC●A 10DRF	LC●A 16DRF	LC●A 24DRF	LC●● 40DRF	LMDA 20D●K	LMDA 20DRT	LMDA 40D●K	TM238 L●●●●●	XBT GC 1100●	XBT GC 2●●0●	OTB 1●0 DM9LP
Number of modules	0	0	4	7	4	7	7	7	2	3	7



TM2 AMI 2HT



TM2 AMI 2LT



TM2 ARI 8LRJ



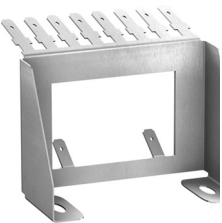
TM2 ARI 8LT



TM2 ALM LT



TM2 AMM 6HT



TM2 XMTGB



TM200 RSRCEMC

#### Analog input modules

Channel type	Input range	Output range	Resolution	Connection by Reference		Weight kg
2 inputs	0...10 V 4...20 mA	–	12 bits	Removable screw terminal block (supplied)	TM2 AMI 2HT	0.085
	Thermocouple K, J, T	–	12 bits	Removable screw terminal block (supplied)	TM2 AMI 2LT	0.085
4 inputs	0...10 V 0...20 mA Temperature	–	12 bits	Removable screw terminal block (supplied)	TM2 AMI 4LT	0.085
	8 inputs	0...10 V 0...20 mA	–	10 bits	Removable screw terminal block (supplied)	TM2 AMI 8HT
Pt 100 Pt 1000		–	12 bits	RJ11 connector Removable screw terminal block (supplied)	TM2 ARI 8LRJ TM2 ARI 8LT	0.190 0.190
PTC/NTC		–	10 bits for NTC 2-threshold detection with PTC	Removable screw terminal block (supplied)	TM2 ARI 8HT	0.085

#### Analog output modules

1 output	–	0...10 V 4...20 mA	12 bits	Removable screw terminal block (supplied)	TM2 AMO 1HT	0.085
2 outputs	–	± 10 V	11 bits + sign	Removable screw terminal block (supplied)	TM2 AVO 2HT	0.085

#### Analog I/O modules

2 inputs and 1 output	0...10 V 4...20 mA	0...10 V 4...20 mA	12 bits	Removable screw terminal block (supplied)	TM2 AMM 3HT	0.085
	J, K, T thermocouple 3-wire Pt 100 temperature probe	0...10 V 4...20 mA	12 bits	Removable screw terminal block (supplied)	TM2 ALM 3LT	0.085
4 inputs and 2 outputs	0...10 V 4...20 mA	0...10 V 4...20 mA	12 bits	Removable screw terminal block (supplied)	TM2 AMM 6HT	0.085

#### Separate components

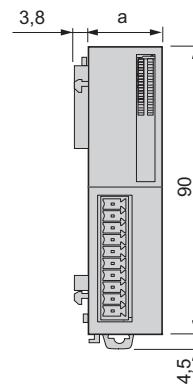
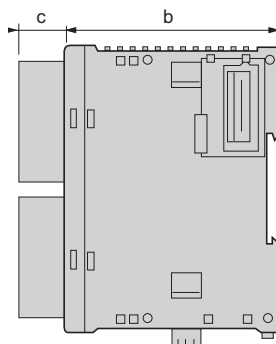
Description	Description	Reference	Weight kg
Ground connection plate	Plate equipped with male Faston connector for connecting cable shielding (via Faston clamp 6.35 mm, not supplied) and functional grounds (FG)	TM2 XMTGB	0.045
Shielding connection clamps	Attach and ground the shielding of the cables <b>Sold in lots of 25 (20 for cable Ø 4.8 mm and 5 for cable Ø 7.9 mm)</b>	TM200 RSRCEMC	–
Mounting kit	For plate or panel mounting of the analog modules. <b>Sold in lots of 5</b>	TWD XMT 5	0.065

### Dimensions

#### Analog I/O modules

TM2	a	b	c
AMI ●●T	23.5	70	14.6
ARI 8HT	23.5	70	14.6
ARI 8LT	39.1	70	14.6
ARI 8LRJ	39.1	70	14.6 (1)
AMO ●HT	23.5	70	14.6
A●M ●●T	23.5	70	14.6

(1) Included removable screw terminal block for connecting 24 V ~ power supply





#### Connections for ensuring conformity to EMC standards

##### Principle


In order to protect against external interference, cables and cordsets carrying the signals below must be shielded:

- Extension modules:
  - Sensors and actuators connected to **TM2 AMI/ARI** and **TM2 A●O/A●M** analog I/O
  - Sensors connected to **TM200 HSC206D●** high-speed counter inputs
- Modicon M238 controller base:
  - Incremental encoders and sensors connected to the high-speed inputs and used in counter mode (> 100 Hz)
  - Actuators with PTO/PWM signals connected to the high-speed outputs
  - Serial links and CANopen buses

The use of shielded cables requires compliance with the following wiring rules:

- Shielding earthed at both ends of the cables. Metal conduit or ducting can be used for part of the shielding length, provided there is no break in the continuity of the ground connections.
- Wherever possible, keep cables carrying signals of different categories separate.

##### Installation diagram for Modicon M238 controller

- 1 Metal plate connected to the device's protective earth (PE)
- 2 Modicon M238 logic controller
- 3 Analog or high-speed counter extension modules
- 4 Shielded cables for connecting the high-speed inputs **4a** and high-speed outputs **4b** to the actuators with PTO/PWM signals
- 5 Shielded cordset for connecting serial links SL1 and SL2. **TCS MCN 3M4●●●2** cordsets include the earthing lug.
- 6 Shielded cable for connecting the CANopen bus. The shielding is connected to terminal 3 on the terminal block (see page 10).
- 7 Unshielded power supply wires or cable; see connection of the  terminal on page 40.
- 8 Shielded cable for connecting the extension module sensors/actuators (analog or high-speed counter)
- 9 Earth connection plate **TM2 XMTGB** for attaching and earthing the shielding of the cables numbered **8** in the diagram (see detail **A**)

##### Connecting the shielding of cables 4a and 4b

Shielding of cables **4a** and **4b** (connection of sensors/actuators to the base) via shielding connection clamp **15** (1):

- Attach and ground the shielding of the cables **4** as close as possible to the controller base.
- Strip the shielding (at the clamp **15**).
- Attach the cable to the metal support **1** by tightening the clamp onto the stripped part of the shielding.

The shielding must be clamped tightly enough to the metal support to ensure good contact.

##### Connecting the shielding of cables 8

The shielding for cables **8** (connection of the extension modules' sensors/actuators) must be attached to the ground connection plate **TM2 XMTGB** (see detail **A** opposite)

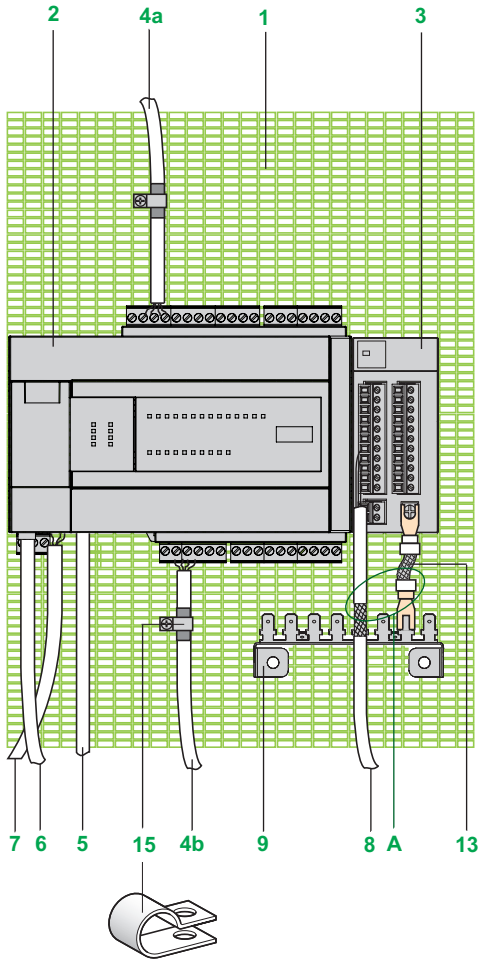
##### Connecting the functional ground terminals

The functional ground terminals (FG) of the:

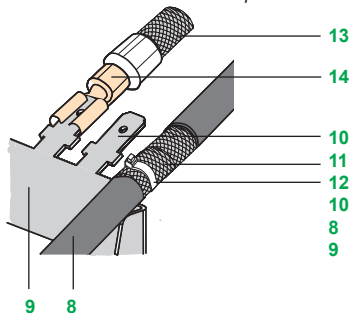
- 24 V  $\overline{\text{---}}$  power supply of the Modicon M238 controller base
- Analog I/O or high-speed counter extension modules (see detail **A**)

##### Installing the ground connection plate TM2 XMTGB

- **8, 9, 10, 11** and **12**: The shielding on cable **8** is stripped at the male Faston connector **10** for a length of 15 mm **11**, then tightly clamped on it using the Rilsan clamp **12** (width 2.5...3 mm).
- **13** and **14**: Functional ground terminal (FG). Each earth terminal on the extension modules (analog and counter) must be connected to the **TM2 XMTGB** plate **9** via an earth braid **13** (2) (width **W** 2...5 mm, thickness **W/5**) and using a 6.35 mm Faston connector **14**.



Detail A: Ground connection plate TM2 XMTGB



**Note:** These shielding connections do not remove the need to connect the PE protective conductors (green-yellow) to the appropriate terminals on each unit or product.

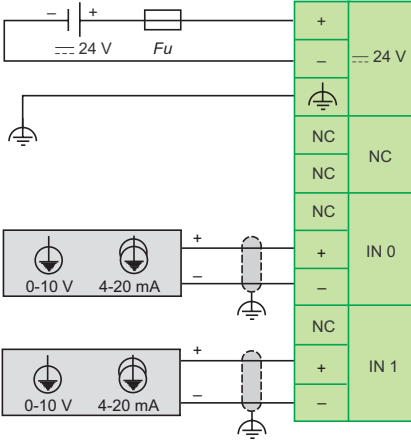
(1) The shielding of cables **4a** and **4b** can be attached to plate **TM2 XMTGB**, in the same way as cable **8**.

(2) Earth braid supplied with **TM2 ARI 8LT/LRJ** analog modules and **TM200 HSC206D●** counter module.

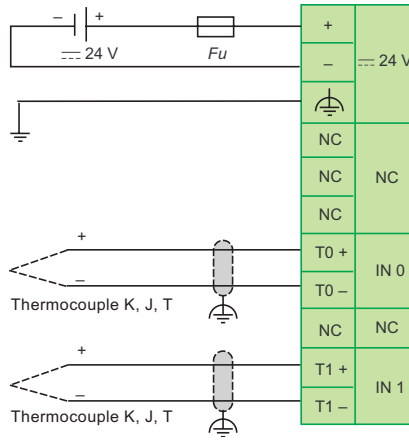
### Connections

#### Analog input modules

##### TM2 AMI 2HT



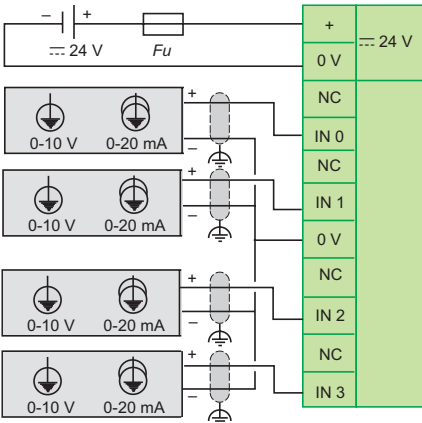
##### TM2 AMI 2LT



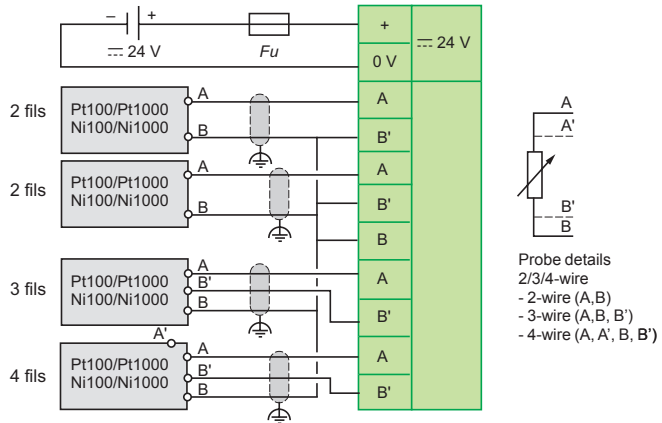
⚠ Do not connect any wires to an unused channel.

##### TM2 AMI 4LT

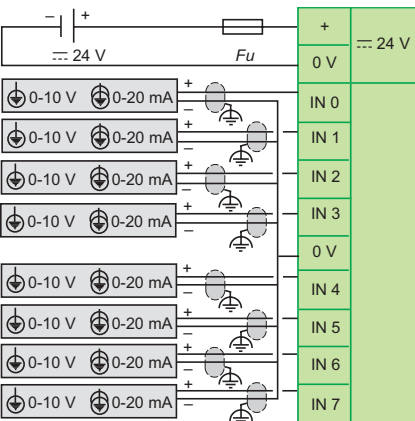
#### Voltage/current configuration



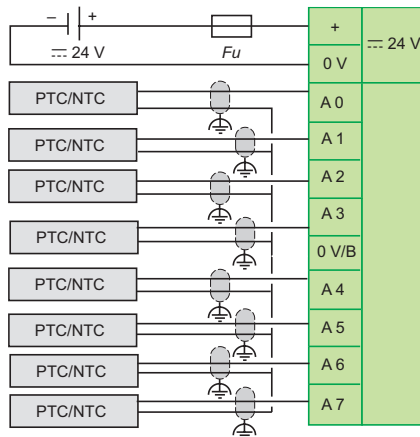
#### PT100/PT1000 temperature probe, Ni100/Ni1000 configuration



##### TM2 AMI 8HT



##### TM2 ARI 8HT



⚠ With PTC probe, threshold detection input (high and low)

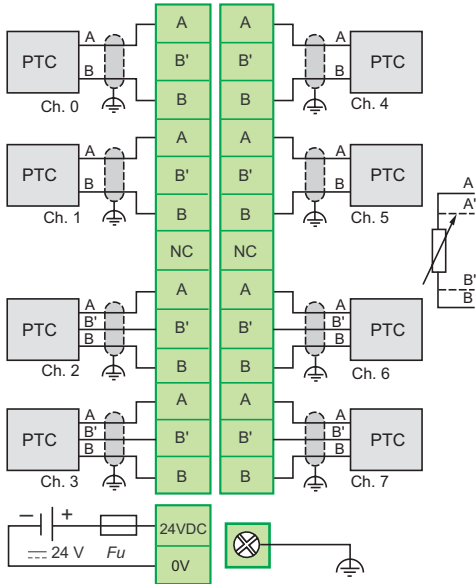
⚠ Do not connect any wires to an unused channel.

Fu: 2 A delayed fuse

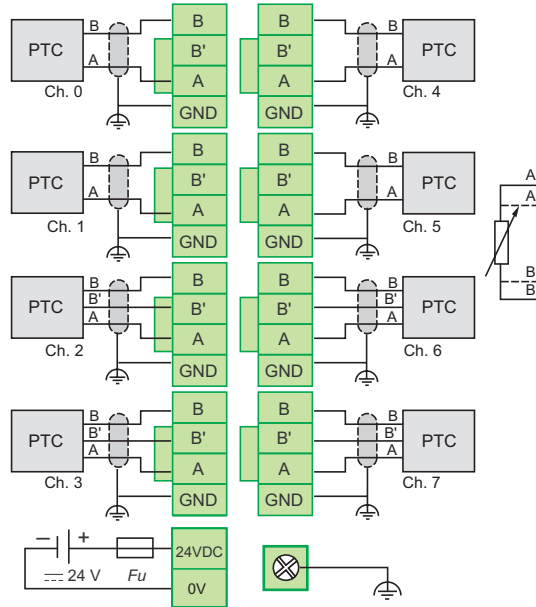
### Connections (continued)

#### Analog input modules (continued)

##### TM2 ARI 8LT



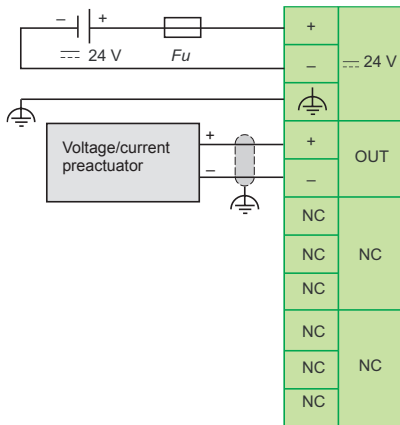
##### TM2 ARI 8LRJ



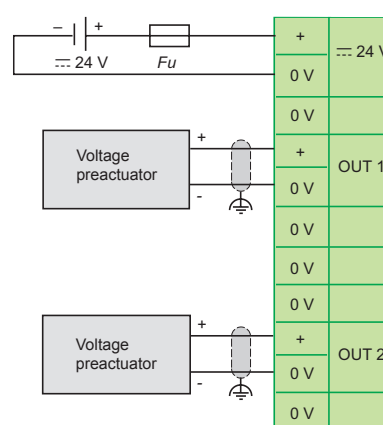
Each channel of the TM2 ARI 8LT/8LRJ module can be used as either 2-wire or 3-wire.

#### Analog output modules

##### TM2 AMO 1HT



##### TM2 AVO 2HT



⚠ Do not connect any wires to an unused channel.

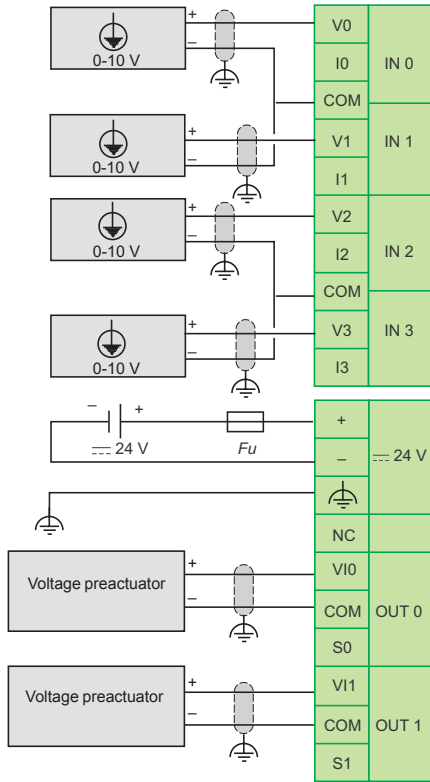
Fu: 2 A delayed fuse

**Connections (continued)**

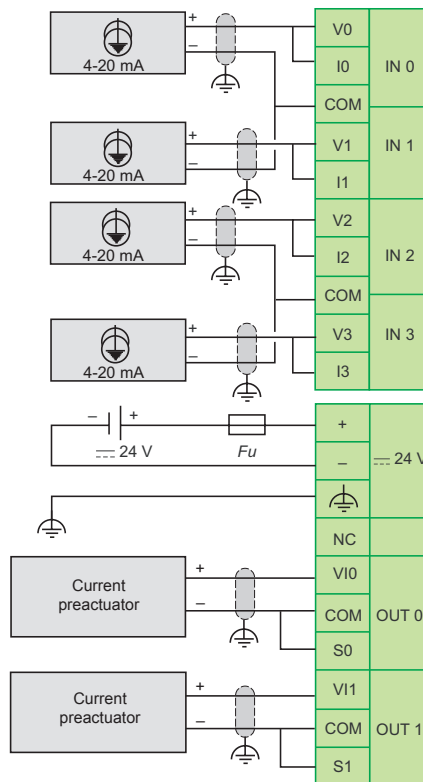
**Mixed input/output modules**

**TM2 AMM 6HT**

**Voltage configuration**

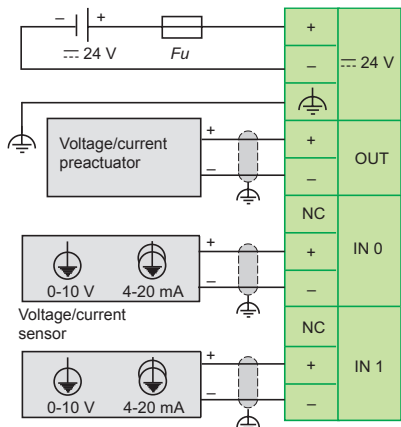


**Current configuration**

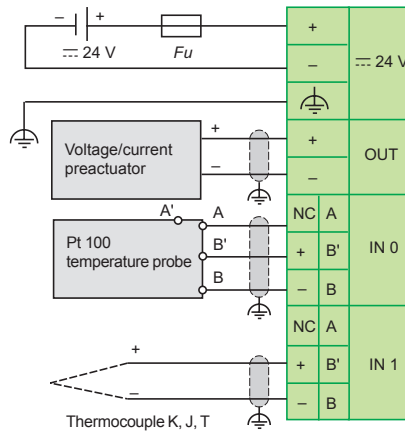


⚠ Do not connect any wires to an unused channel.

**TM2 AMM 3HT**



**TM2 ALM 3LT**



- For a Pt 100 3-wire temperature probe (RTD), connect the three wires to terminals A, B' and B (channels IN0 and IN1).
- For a Pt 100 2-wire temperature probe (RTD), connect the two wires to terminals A and B' and make a bridge between B' and B (channels IN0 and IN1).
- For a thermocouple, connect the two wires to terminals B' and B (channels IN0 and/or IN1).

⚠ Do not connect any wires to an unused channel.

$F_u$ : 2 A delayed fuse

### Presentation

**TM200 HSC 206DT/DF** counter modules for the Modicon M238 logic controller are used to count the pulses generated by a sensor or to process the signals from an incremental encoder.

The two modules, both with two 60 KHz counter channels, differ in the way they are connected:

- Removable screw terminal block (2 x 16 contacts): **TM200 HSC 206DT**
- Removable spring terminals **TM200 HSC 206DF**

Counter modules	No. of channels	Maximum frequency	Integrated functions	Physical I/O per channel	
				Inputs	Outputs
<b>TM200 HSC 206DT</b> <b>TM200 HSC 206DF</b> (3 modules max. per TM238 base)	2	60 KHz	Upcounting Downcounting Period meter Frequency meter Frequency generator Axis following with encoder	6	2

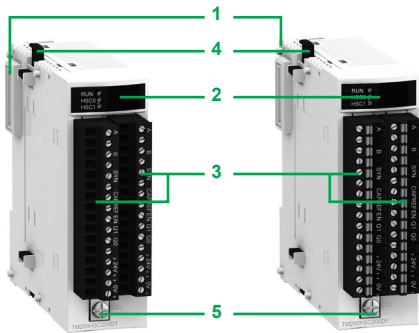
The sensors used on each channel can be:

- 2-wire 24 V proximity sensors,
- 3-wire PNP 24 V proximity sensors,
- Limit switches (N/O or N/C contact),
- 15/30 V output signal incremental encoders and source outputs (positive logic).

**TM200 HSC 206D●** counter modules meet the requirements of such applications as:

- Alarm generation on empty unwinder status using the ratio,
- Sorting small parts using the period meter,
- Single electronic cam using the dynamic setting thresholds,
- Speed control using the period meter,
- Grouping/ungrouping for packaging machines,
- Event counting,
- Flow or speed measurement.

**TM200 HSC 206D●** counter modules are considered to be extension modules and as such are connected to the Modicon 238 base by stacking them on a  $\perp$  rail starting at the right-hand side panel of the base (7 extension modules are permitted in total, a maximum of 3 of which can be **TM200 HSC 206D●** counter modules). The function parameters are set by configuration using SoMachine software.



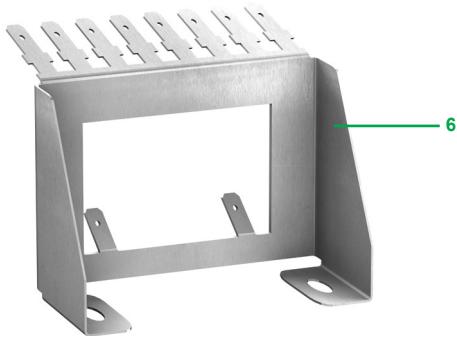
### Description

TM200 HSC 206D 60 KHz counter modules comprise:

- 1 An extension connector for linking with the adjacent module (1).
- 2 A channel and module diagnostics display block.
- 3 2 removable screw or spring terminal blocks marked TB0 and TB1 for connecting the sensors and preactuators.
- 4 A mechanical device for locking to the adjacent module.
- 5 A screw terminal for the functional ground (FG) connection.

The **TM2 XMTGB** ground connection plate **6** simplifies connection of the sensor and encoder cable shielding. This shielding must be connected to the device's functional ground.

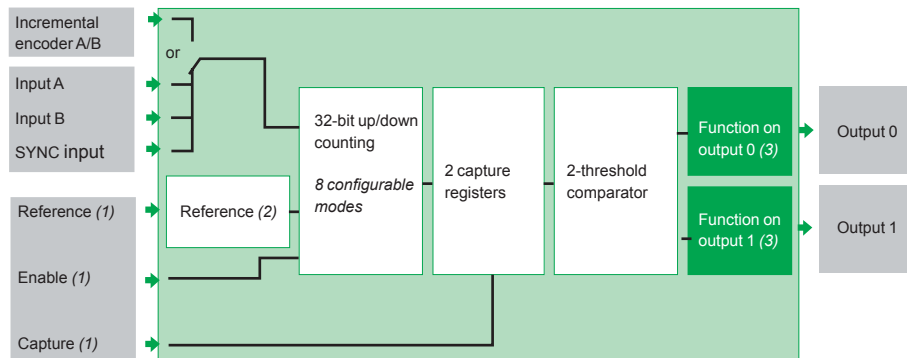
These modules are mounted as standard on a symmetrical  $\perp$  rail. The **TWD XMT 5** mounting kit (supplied in lots of 5) can be used for plate or panel mounting.



(1) A connector on the right-hand side panel ensures continuity of the link with the adjacent I/O module.

### Operation

#### Block diagram of a TM200 HSC 206DT/DF module counter channel



(1) Optional inputs.

(2) Reference: 4 operating modes for "IN\_SYNC" SYNC and "IN\_REF" Reference inputs.

(3) Function on outputs: 11 possible types of behaviour.

### Functional characteristics of TM200 HSC 206DT/DF modules

8 configurable modes	Frequency meter	<p>This mode measures a frequency, speed, data rate or an event stream. As standard, this mode measures the frequency received on the IN_A input. This frequency is always expressed in Hz (number of pulses/second), with a precision of 1 Hz.</p> <p>The maximum frequency on the IN_A input is 60 kHz. The maximum cyclic ratio at 60 kHz is 60%.</p>
	Event counting	<p>This mode is used to determine the number of events received. In this mode, the counter calculates the number of pulses applied to the IN_A input at time intervals defined by the user.</p> <p>The module counts the pulses applied to the IN_A input each time the pulse for this input lasts longer than 5 μs (without anti-bounce filter).</p>
	Period measurement	<p>This mode is used to:</p> <ul style="list-style-type: none"> <li>■ Determine the duration of an event</li> <li>■ Determine the time between 2 events</li> <li>■ Time and measure the execution time of a process</li> </ul> <p>It measures the time elapsed during an event or between 2 events (IN_A input) according to a selectable time base of 1 μs, 100 μs or 1 ms. The IN_SYNC input can be used to enable or stop a measurement. The module can carry out a maximum of 1 measurement every 5 ms. The shortest measurable pulse is 100 μs, even if the unit defined by the user is 1 μs. The maximum measurable duration is 4,294,967,295 units (unit to be defined).</p>
	Ratio counting	<p>Ratio counting mode only uses the IN_A and IN_B inputs. There are 2 possible modes:</p> <ul style="list-style-type: none"> <li>■ Ratio 1: Used to divide 2 frequencies. This is intended for applications such as flowmeters, mixers, etc.</li> <li>■ Ratio 2: Used to subtract 2 frequencies. This is intended for the same applications, but for those requiring more precise regulation (more similar frequencies).</li> </ul> <p>Ratio 1 mode gives the results in thousandths for better accuracy (a display of 2000 corresponds to a value of 2) and ratio 2 mode gives the results in Hz.</p> <p>The maximum frequency that the module can measure on the IN_A and IN_B inputs is 60 kHz.</p>
	Downcounting	<p>This mode is used to list a group of operations. In this mode, activating the synchronization function starts the counter which, starting from a user-defined preset value, decreases with each pulse applied to the IN_A input, until it reaches 0. This downcounting is made possible when the enable function has been activated. The counting register is thus updated at 1 ms intervals.</p> <p>One basic use of this mode is to signal, using an output, the end of a group of operations (when the counter reaches 0).</p> <p>The shortest pulse applied to the IN_SYNC input is 100 μs. The maximum frequency applied to the IN_SYNC input is 1 pulse every 5 ms. The maximum user-defined preset value is 4,294,967,295. The maximum count value is 4,294,967,295 units.</p>
	Loop (modulo) counting	<p>This mode is used in packaging and labelling applications where actions are repeated on sets of moving objects.</p> <ul style="list-style-type: none"> <li>■ In upcounting, the counter increases until it reaches the user-defined “modulo - 1” value. On the next pulse, the counter is reset to 0 and counting restarts.</li> <li>■ In downcounting, the counter decreases until it reaches 0. On the next pulse, the counter is reset to the user-defined “modulo - 1” value. Downcounting can then restart.</li> </ul> <p>The maximum frequency applied to the IN_A and IN_B inputs is 60 kHz. The maximum frequency of the modulo event is 1 event every 5 ms. The maximum modulo value is 4,294,967,296 (possible by declaring 0 in the modulo setting value).</p>
	32-bit counter counting	<p>This mode is mainly used in axis following.</p> <p>The maximum frequency applied simultaneously to the IN_A and IN_B inputs is 60 kHz. The maximum frequency of the referencing event is 1 event every 5 ms. The counter value is between - 2,147,483,648 and + 2,147,483,647.</p>

Environnement					
Module			TM200 HSC 206DT	TM200 HSC 206DF	
<b>Certifications</b>			CE, UL, CSA, ACA (C-Tick), GOST (pending)		
<b>Temperature</b>	Operation	°C	- 10...+ 55		
	Storage	°C	- 40...+ 70		
<b>Relative humidity</b>			95% max, without condensation		
<b>Degree of</b>	Protection		IP 20		
	Pollution		≤ 2		
<b>Altitude</b>	Operation	m	0...2000		
	Storage	m	0...3000		
<b>Immunity to mechanical constraints</b>	Sinusoidal vibrations		5...150 Hz with 3,5 mm amplitude under 1 g Endurance : 10 cycles of 1 octave/min		
	Shocks		15 g / 11 ms; 3 shocks/direction/axis		
General characteristics					
Module			TM200 HSC 206DT	TM200 HSC 206DF	
<b>Modularity</b>			2 channels		
<b>No. of counter modules per TM238 base</b>			3		
<b>No. of sensor inputs</b>			6 per channel		
<b>No. of actuator outputs</b>			2 per channel		
<b>Applications</b>			Upcounting, downcounting, period measurement, frequency meter, frequency generator, axis following		
<b>Configurable modes</b>			8 modes		
<b>Counter capacity</b>			31 bits + sign		
<b>Frequency on counter inputs</b>		kHz	60 (cyclic ratio 60/40)		
<b>Module cycle time</b>		ms	1		
<b>Encoder</b>			15...30 V incremental encoder and source outputs (positive logic)		
<b>Connection</b>			1 screw terminal block (16 terminals) per channel	1 spring terminal block (16 contacts) per channel	
<b>Wiring</b>			Shielded cable for the signals carrying the counter information > 1 kHz		
<b>Insulation voltage</b>	Between channels and internal logic	V rms	1500 for 1 min		
<b>Maximum consumption</b>	5 V ∴ internal power supply	mA	100		
	24 V ∴ internal power supply	mA	100		
	24 V ∴ external power supply	A	2		
Input characteristics					
<b>Input type</b>	High-speed inputs per channel		IN_A, IN_B and IN_SYNC		
	Auxiliary inputs		IN_EN, IN_REF and IN_CAP		
<b>Inputs</b>	No. per channel	V	6		
	Voltage	V	24 ∴		
	IEC/EN 61131-2 conformity		Type 1		
	Input logic		Positive (sink)		
	At state 1	Voltage	V	15...30 ∴	
		Current	mA	5 up to 30 V ∴	
	At state 0	Voltage	V	< 5 ∴	
		Current	mA	< 0.5	
Current	At 11 V ∴	mA	> 2		
Output characteristics					
<b>Outputs</b>	No. per channel		2, 24 V ∴, 0.5 A		
<b>Voltages</b>	Nominal	V	24 ∴		
	Limits	V	19.2...30 ∴		
<b>Maximum load current</b>	Per output	A	0.5		
	Per module	A	2		
<b>Response time</b>	On energization/de-energization	µs	< 200		
<b>Leakage current</b>	At state 0	mA	≤ 0.1		
<b>Voltage drop</b>	At state 1	V	≤ 3		
<b>current short-circuit</b>	Per channel	A	< 1.5		
<b>Internal protection against overloads and short-circuits</b>			Protection per output: 0.5 A...1.5 A max. trip current with automatic reset after disappearance of fault		
<b>Output logic</b>			Positive (source)		
<b>Fallback state on fault</b>	Default		Faulty channel set to 0		
	By user configuration		Each channel individually held at its last value or set to the predefined value (0 or 1)		
<b>Maximum load</b>	Capacitance	µF	50		
	Inductance	H	L = 0.5/I <sup>2</sup> × F where:		
		H	- L: load inductance		
		A	- I: load current		
	Hz	- F: switching frequency			

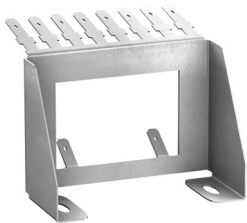




TM2 00HSC 206DT



TM2 00HSC 206DF



TM2 XMTGB

### References

**Counter modules** (3 modules max. per TM238 base)

Description	No. of channels	Characteristics	Connection	Reference	Weight kg
<b>Counter modules</b> for: - 24 V $\overline{\text{DC}}$ 2 and 3-wire sensors - 15/30 V $\overline{\text{DC}}$ incremental encoders with source outputs (positive logic)	2	60 kHz counting	Screw terminals	<b>TM200 HSC 206DT</b>	0,150
			Spring terminals	<b>TM200 HSC 206DF</b>	0,150

### Separate parts

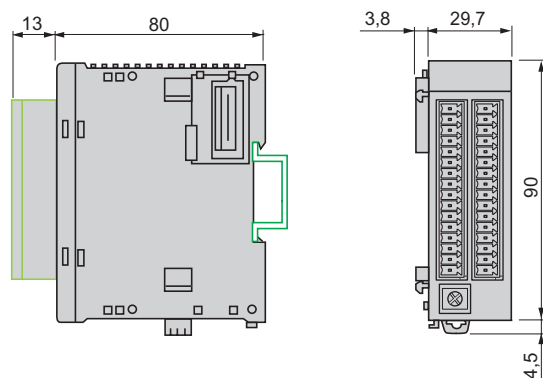
Designation	Description	Reference	Weight kg
<b>Ground connection plate</b>	Support equipped with 10 male Faston connectors for connecting the cable shielding (via 6.35 mm connectors, not supplied) and the functional grounds (FG)	<b>TM2 XMTGB</b>	0.045
<b>Mounting kit</b> Sold in lots of 5	For plate or panel mounting of the analog	<b>TWD XMT 5</b>	0.065

**Note:** The shielding of the cordsets carrying the counter signals must be connected to the metal plate or panel (earthed casing) which is connected to the device's protective ground (PE). See 13 and detail A on page 40.

⚠ Connecting the shielding does not remove the need to connect the functional ground screw terminal FG (item 5 on page 45) on the module to ground via the TM2 XMTGB ground connection plate.

### Dimensions

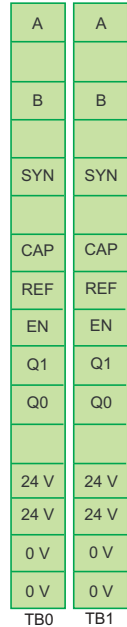
TM200 HSC206D● counter modules



### Connections

#### Pinout of the screw or spring terminals on the TM200 HSC 206D● module

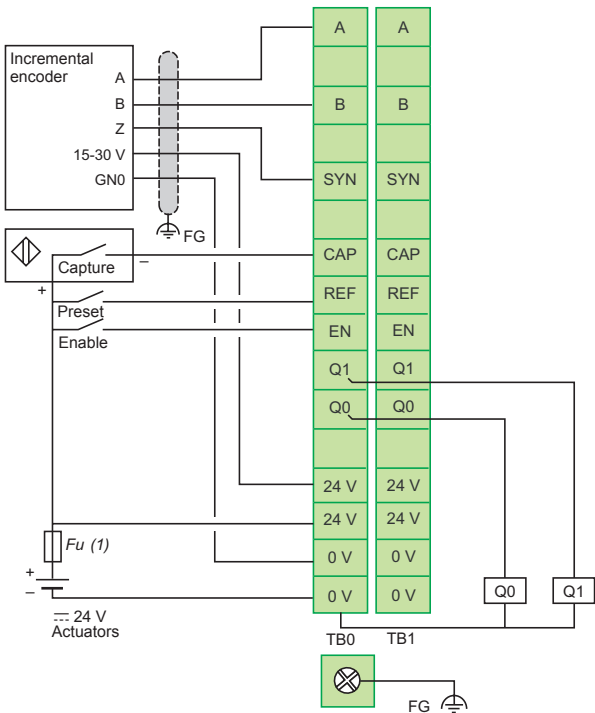
Channel 0 Channel 1



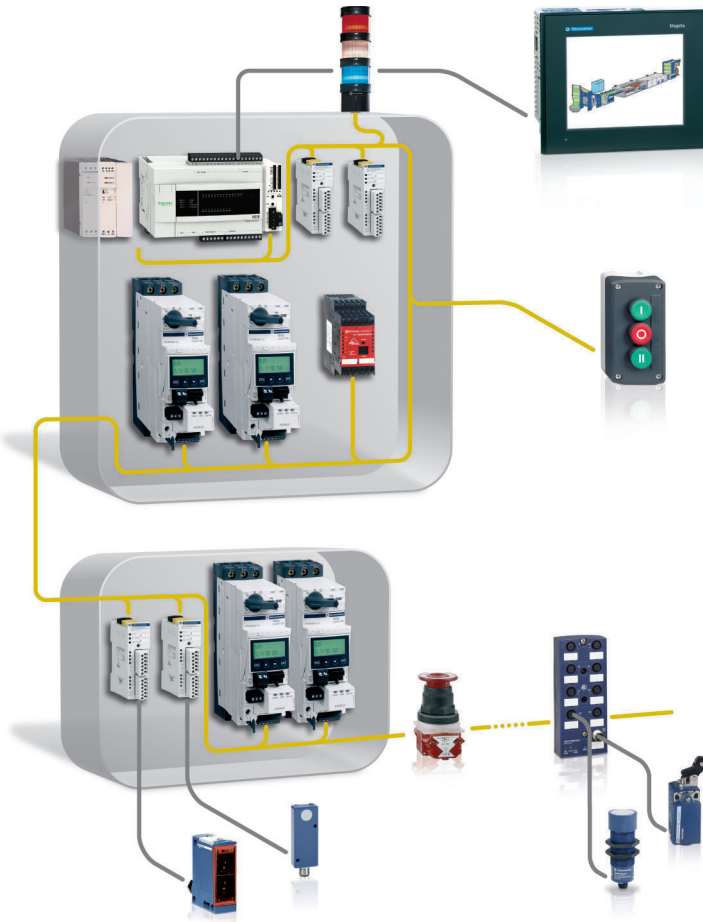
Marking terminal	Symbol	Description/channel
A	IN_A	Sensor input A
B	IN_B	Sensor input B
SYN	IN_SYNC	Synchronization input
CAP	IN_CAP	Capture input
REF	IN_REF	Referencing input
EN	IN_EN	Enable input
Q1	Q1	Counter channel Q1 output
Q0	Q0	Counter channel Q0 output
24 V	24V	+ 24 V --- external power supply
0 V	0V	0 V --- external power supply



#### Example of connecting incremental encoder, 2-wire sensors and actuators on channel 0 (TB0)



(1) Fu: 3.15 A fast-blow fuse to protect the module electronics in the event of reversed polarity of the output power supplies. For connection of the functional ground (FG), see page 40, detail A.



## Presentation

AS-Interface master module **TWD NOI 10M3** allows the M238 compact logic controller (version  $\geq 2.0$ ) to perform the function of AS-Interface master.

The AS-Interface consists of a master station (M238 compact logic controller) and slave stations. The master, which supports the AS-Interface profile, polls each of the devices connected to the AS-Interface, in turn, and stores information gathered (sensor/actuator status, operating status of the devices) in the controller memory. Communication on the AS-Interface is managed in a way that is totally transparent to the M238 logic controller application program.

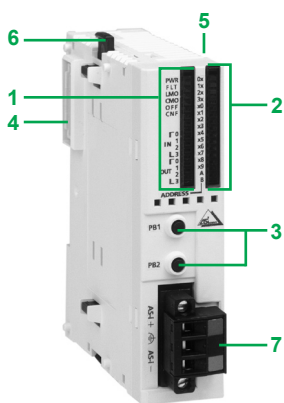
The **TWD NOI 10M3** master module manages the following with the AS-Interface M3 profile:

- discrete slave modules (maximum of 62 slaves arranged in 2 banks, A and B, of 31 addresses each),
- analogue slaves (maximum of 7 slaves in bank A).

The AS-Interface M3 profile supports analogue profile 7.3 (7 slaves), but does not support analogue profile S-7.4.

The maximum number of **TWD NOI 10M3** modules per M238 compact logic controller is 2.

An AS-Interface power supply is essential to supply the various modules on AS-Interface. It should preferably be located close to the stations with high power consumption.



## Description

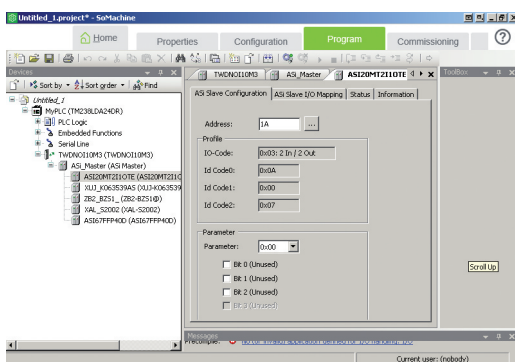
Module **TWD NOI 10M3** takes the form of a standard-size module. It is connected to an M238 compact logic controller in the same way as any I/O module.

It has the following on the front panel:

- 1 A display block comprising:
  - 6 pilot lights indicating the module operating modes:
    - green PWR pilot light: module powered up,
    - red FLT pilot light: error in the configuration loaded,
    - green LMO pilot light: module in local mode,
    - green CMO pilot light: module in connected mode,
    - red CNF pilot light: not used,
    - red OFF pilot light: module in protected, unconnected mode.
  - 6 green pilot lights, 3 for inputs, 3 for outputs.
- 2 A block for displaying the status of the addresses.
- 3 Two pushbuttons PB1 and PB2 for controlling the status of the slaves by selecting their address and changing the mode.
- 4 An extension connector for electrical connection to the previous module.
- 5 A connector (on the RH side) for I/O extension modules **TM2 D●I** ou **TM2 D●O**.
- 6 A latching mechanism for attachment to the previous module.
- 7 An AS-Interface yellow cable removable screw terminal block.

Extension module **TWD NOI 10M3** can be mounted as standard on symmetrical rail. Fixing kit **TWD XMT5** (sold in lots of 5) allows plate or panel mounting.

## Diagnostics



The 30 pilot lights on the front panel of the module are used in conjunction with the two pushbuttons for diagnostics by the Twido controller. The display block on the front panel of master module **TWD NOI 10M3** allows simplified local diagnostics to be performed by displaying the slaves present on the AS-Interface.

### Software set-up

AS-Interface is configured using SoMachine (1) software. The services offered are based on the principle of simplicity:

- Management of profile tables, parameters and data by the master, in a way that is transparent to the user.
- Topological addressing of I/O: each AS-Interface slave defined has a topological address assigned to it, in a way that is transparent to the user.

Each AS-Interface sensor/actuator is seen by the M238 compact logic controller in the same way as any "In-rack" I/O.

## Characteristics

Module type		TWD NOI 10M3	
AS-Interface profile		AS-Interface M3, V 2.11 (profile S-7.4 not supported)	
Type of addressing		Standard and extended	
Product certifications		AS-Interface n° 47801	
Degree of protection		IP 20	
Temperature	Operation	°C	0...+ 55
	Storage	°C	- 25...+ 70
As-Interface external power supply		V	29.5...31.6
Internal current	At --- 5 V	mA	80
	At --- 24 V	mA	0
AS-Interface consumption at --- 24 V		mW	540
<b>Data exchange characteristics</b>			
AS-Interface cycle time	With 1 to 19 slaves	ms	3
	With 20 to 62 slaves	ms	0.156 x (1 + N) where N = number of active slaves
	With 31 standard slaves or slaves in banks A and B	ms	5
	With 62 slaves in banks A and B	ms	10
Max. number of modules	Analogue modules (1)		7
	Discrete modules (1)		62
Max. number of I/O	Standard slaves		248 = 124 inputs + 124 outputs
	Slaves in banks A and B		434 = 248 inputs + 186 outputs
Max. length of AS-Interface cable	Without repeater or line extension	m	100
	With line extension TCS ARR01M	m	200 (Consult our catalogue "Machines & installations with industrial communications")
	With 2 repeaters ASI RPT01	m	300 (Consult our catalogue "Machines & installations with industrial communications")

## References



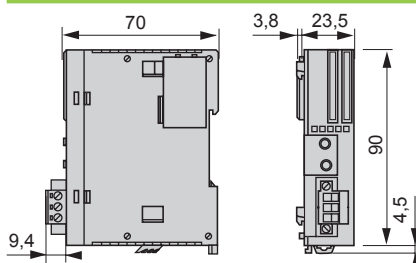
TWD NOI 10M3

Description	No. modules per base controller	AS-Interface profile	Number of I/O (1)	Reference	Weight kg
<b>AS-Interface master module for Modicon M238 compact logic controllers:</b> - TM238 LDD24DT - TM238 LFDC24DT - TM238 LDA24DR - TM238 LFAC24DR	2	M3, V 2.11	62 discrete modules max. 7 analogue modules max.	<b>TWD NOI 10M3</b>	0.085

Description	Application	Reference	Weight kg
<b>Fixing kit</b> Sold in lots of 5	For plate or panel mounting of the module	<b>TWD XMT5</b>	—

(1) When analogue and discrete modules are connected simultaneously to a system, the analogue modules use addresses 1 to 31 in bank A. When an analogue module uses a certain address, the module addresses having the same number in bank B cannot be occupied by slaves in banks A/B.

## Dimensions



# Modicon M238 logic controller

Modicon OTB distributed I/O

Optimum IP 20 I/O system

Interface modules

## Presentation



Example of Modicon OTB islands on CANopen bus

There is an increasing tendency for machine manufacturers to design their automation systems using modular architectures. The use of distributed inputs/outputs (I/Os) is becoming more and more common. The Modicon OTB offer is an ideal solution for “optimised” type distributed input/output requirements. This offer, complementing the Modicon interface family, has been designed to provide the right technical-economical balance: it meets the needs of machine manufacturers and users seeking the best compromise between size, ease of cabling, setting-up and costs. Open and modular, the Modicon OTB solution enables the creation of industrial I/O islands managed by a master controller (PLC, PC or variable speed drive) via a fieldbus or communication network.

With its expandable block type architecture, the Modicon OTB solution adapts to all configurations of automation system islands. The Modicon OTB offer is particularly economical for small and medium size islands. In addition, the optimised sizes of this offer are ideally suited to the size of enclosures for distributed I/Os, that are located as near to the machine as possible. This solution reduces cabling time and costs and at the same time takes into account the modular architecture of the machine.

Furthermore, the Modicon OTB offer proposes fewer references relating to spare parts and accessories that are required for creating an island.

The Modicon OTB offer has also been designed to be as simple as possible. This offer includes 2 communication bases (interface modules) for the various types of fieldbus:

- CANopen bus,
- Modbus RS 485 Serial Line.

Inputs and outputs are directly integrated in the interface modules. Each base incorporates 20 I/O:

- 12  $\pm$  24 V inputs,
- 6 relay outputs,
- 2  $\pm$  24 V solid-state outputs.

All the bases use a  $\pm$  24 V supply. Of monobloc design, each Modicon OTB interface module can be fitted with extension modules of Modicon M238 logic controller.

With its range of I/O extensions, the Modicon OTB offer provides a modularity that allows all requirements to be met, commencing with a base that can be fitted with up to 7 discrete I/O modules **TM2 D●●** or analogue I/O modules **TM2 A●●**. The extension modules, like the interface modules, simply clip-on to 35 mm symmetrical rail and enable configurations of up to 244 discrete I/O and up to 42 analogue I/O channels, or a mixture of both types (within the limit of 7 extension modules), to be obtained.

Sensors and actuators are connected to the interface modules and I/O extension modules using removable screw terminal blocks. All Modicon OTB modules provide an IP 20 degree of protection.

To simplify sensor and actuator connections, as well as linking commons, the Modicon OTB offer also includes a commoning module **OTB 9ZZ 61JP**. This module, as with all the other modules of the Modicon OTB range, allows the through connection of the internal bus or network (passively in this case) and enables connection of the commons in two isolated groups for each commoning module



OTB 1C0 DM9LP  
Interface module for CANopen bus

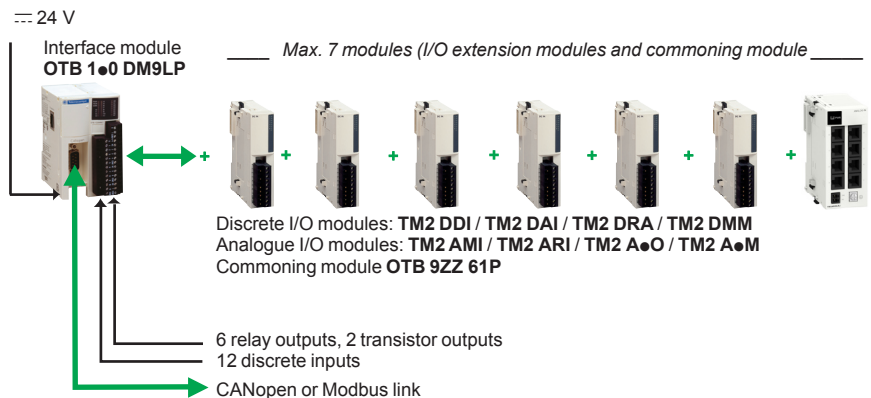


TM2 D●●/TM2 A●●  
Discrete and analogue I/O extension modules



OTB 9ZZ 61JP  
Commoning module

## Configuration of interface modules



## Description

The Modicon **OTB 100 DM9LP** (1) interface modules comprise:

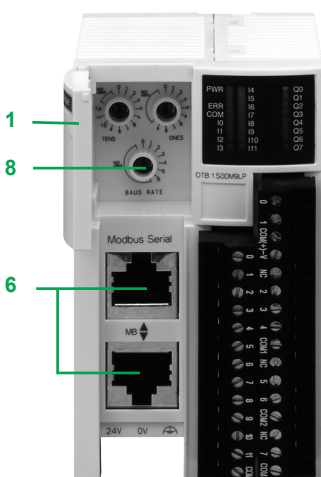
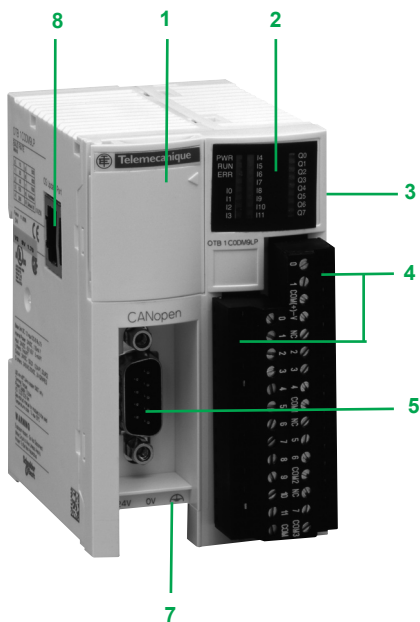
- 1 An access door.
- 2 Indicator lights:
  - module and communication status (PWR, RUN, ERR, COM, STAT)
  - I/O states (IN● and OUT●)
- 3 A connector for expansion modules (right-hand side).
- 4 Two removable screw terminal connectors for connection of inputs/outputs.
- 5 or 6 Depends on model:
  - 5 A SUB-D 15-way connector for connection CANopen bus with **OTB 100 DM9LP** model.
  - 6 Two RJ45 connectors for connection Modbus serial link with **OTB 150 DM9LP** model.
- 7 Terminal for connection of  $\approx$  24 V supply.
- 8 One RJ45 connector for operating system update of interface.

### Via access door 1

- 9 Two or three coding wheels (depending on model) for OTB island address and communication data rate adjustment.

**Mounting:** the interface modules is mounted on 35 mm symmetrical rail. Fixing kit **TWD XMT5** (supplied in lots of 5) allows plate or panel mounting.

(1) Only the communication part 5, 6 and 9 is dedicated to each model and can differ, the general description remains the same.



Environmental characteristics				
Interface module type			OTB 1C0 DM9LP	OTB 1S0 DM9LP
<b>Products certifications</b>			UL, CSA, CE	
<b>Temperature</b>	Operation	°C	0...+ 55	
	Storage	°C	- 25...+ 70	
<b>Relative humidity</b>			30...95%, without condensation	
<b>Degree of protection</b>			IP 20	
<b>Degree of pollution</b>		According to IEC/EN 60664	Type 2	
<b>Altitude</b>	Operation	m	0...2000	
	Storage	m	0...3000	
<b>Vibration resistance</b>	Mounted on 15 mm $\perp$ rail	Hz	10...57, amplitude 0,075 mm, acceleration 57...150 z	
		m/s <sup>2</sup>	9.8 (1 gn)	
	Plate or panel mounted (using TWD XMT5 fixing kit)	Hz	2...25, amplitude 1,6 mm, accélération 25...100 Hz	
		m/s <sup>2</sup>	39.2 (4 gn)	
<b>Shock resistance</b>	According to IEC/EN 61131	m/s <sup>2</sup>	147 (15 gn)	
<b>Immunity</b> According to IEC/EN 61000-6-2	Electrostatic discharge		CEI/EN 61000-4-2 (4 kV en contact, 8 kV dans l'air)	
	Radiated electromagnetic fields		According to IEC/EN 61000-4-3 (10V/m : 80 MHz...2 GHz)	
	Rapid transients		According to IEC 61000-4-4 (1 kV for $\pm$ 24 V discrete I/O and communication, 2 kV for $\pm$ 24 V supply)	
<b>Mounting</b>			On $\perp$ 35 mm symmetrical rail	
Interface modules characteristics (except communication, see page 55)				
Interface module type			OTB 1C0 DM9LP	OTB 1S0 DM9LP
<b>Type of bus</b>			CANopen	Modbus serial link
<b>Power supply</b>	Nominal voltage	$\pm$ V	24, non isolated	
	Limits values	$\pm$ V	20.4...26.2 including ripple	
	Max. input current	mA	700 at 26,2 V	
	Immunity to micro-cuts	ms	Max.10	
	Max inrush current at $\pm$ 24 V	A	50	
	Consumption	W	19 (interface module with 7 I/O extension modules)	
<b>Number of <math>\pm</math> 24 V inputs</b>			12	
<b>Number and type of outputs</b>			6 relay and 2solid-state	
<b>I/O connections</b>			Removable screw terminal block	
<b>I/O extensions</b>	Max. number of modules		7	
	Max. number of I/O (including 20 I/O of interface module)		- 132 with screw terminal discrete I/O extensions - 188 with spring terminal discrete I/O extensions - 244 with HE10 connector discrete I/O extensions - Screw terminal analogue I/O: up to 7 x 8 In, or 7 x 2 Out, or 7 x (4 In/2 Out)	
<b>Dielectric strength</b>	Between power supply terminals and earth terminals	V eff	500 for 1 min	
	Between I/O terminals and earth terminals	V eff	500 for 1 min	
<b>Insulation resistance</b>	Between power supply terminals and earth terminals	M $\Omega$	> 10 ( $\pm$ 500 V)	
	Between I/O terminals and earth terminals	M $\Omega$	> 10 ( $\pm$ 500 V)	
Integrated functions				
<b>Counting</b>	Number of channels		2	
	Frequency		5 kHz x 2 channels or 20 kHz x 2 channels (depending on configuration)	
	Capacity		32 bits	
<b>Movement</b>	Number of channels		2	
	Frequency	kHz	7	
	Functions		PWM (output with pulse width modulation) PLS (pulse generator output)	

Communication																																																																											
<b>CANopen bus</b>																																																																											
<b>Type of interface module</b>																																																																											
<b>OTB 1C0 DM9LP</b>																																																																											
<b>CANopen services</b>	Conformity class	S20																																																																									
	Standard	DS 301 V4.02, DR 303-2																																																																									
	Profile	DS 401 V2.1																																																																									
	Specials	–																																																																									
<b>Structure</b>	Physical interface	9-way male SUB-D																																																																									
	Topology	Link by daisy-chaining																																																																									
	Access method	CSMA-MA, multimaster with priority information																																																																									
<b>Transmission</b>	Data rate	10, 20, 50, 125, 250, 500, 800 and 1000 Kbit/s.																																																																									
	Médium	Double shielded twisted pairs																																																																									
<b>Physical configuration</b>	Number of devices	Max. 63 per segment																																																																									
	Data rate	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 12.5%;">1 Mbit/s</th> <th style="width: 12.5%;">800 Kbit/s</th> <th style="width: 12.5%;">500 Kbit/s</th> <th style="width: 12.5%;">250 Kbit/s</th> <th style="width: 12.5%;">125 Kbit/s</th> <th style="width: 12.5%;">50 Kbit/s</th> <th style="width: 12.5%;">20 Kbit/s</th> <th style="width: 12.5%;">10 Kbit/s</th> </tr> </thead> <tbody> <tr> <td>20 m</td> <td>40 m</td> <td>100 m</td> <td>250 m</td> <td>500 m</td> <td>1000 m</td> <td>2500 m</td> <td>5000 m</td> </tr> <tr> <td>0,6 m</td> <td>6 m</td> <td>10 m</td> <td>10 m</td> <td>10 m</td> <td>120 m</td> <td>300 m</td> <td>600 m</td> </tr> <tr> <td colspan="3">Per segment</td> <td colspan="3">No. of devices</td> <td colspan="2"></td> </tr> <tr> <td colspan="3"></td> <td colspan="3">64</td> <td colspan="2">32</td> </tr> <tr> <td colspan="3"></td> <td colspan="3">Max. 160 m</td> <td colspan="2">Max. 185 m</td> </tr> <tr> <td colspan="3"></td> <td colspan="3"></td> <td colspan="2">16</td> </tr> <tr> <td colspan="3"></td> <td colspan="3"></td> <td colspan="2">Max. 205 m</td> </tr> <tr> <td colspan="3"></td> <td colspan="5">Equivalent length of each repeater</td> <td>15 m</td> </tr> </tbody> </table>	1 Mbit/s	800 Kbit/s	500 Kbit/s	250 Kbit/s	125 Kbit/s	50 Kbit/s	20 Kbit/s	10 Kbit/s	20 m	40 m	100 m	250 m	500 m	1000 m	2500 m	5000 m	0,6 m	6 m	10 m	10 m	10 m	120 m	300 m	600 m	Per segment			No. of devices								64			32					Max. 160 m			Max. 185 m								16								Max. 205 m					Equivalent length of each repeater					15 m
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<b>CANopen interface module</b>	LED indicators	Controller status (PWR, RUN et ERR), I/O (I●/Q●)																																																																									
	Products certification	cULus, CÉ																																																																									
	Conformity to standards	IEC/EN 61131-2, UL 508, CSA 22.2 No. 213 (Class 1, Division 2, Groups A, B, C, D), CÉ																																																																									
<b>Modbus serial link</b>																																																																											
<b>Type of interface module</b>																																																																											
<b>OTB 1S0 DM9LP</b>																																																																											
<b>Structure</b>	Type	Non-isolated serial link (4), RS 485, 3-wire																																																																									
	Access method	Master/slave																																																																									
	Topology	Tap link connection																																																																									
	Physical interface	2 x RJ45 connectors (en parallèle) permettant la topologie chaînage																																																																									
<b>Transmission</b>	Mode	Asynchronous in baseband																																																																									
	Frame	RTU/ASCII, Half duplex																																																																									
	Data rate	1.2...38.4 Kbit/s (19.2 Kbit/s by default)																																																																									
	Format	7 or 8 data bits, 1 or 2 stop bit(s)																																																																									
	Parity	Even, odd or none																																																																									
	Medium	Double shielded twisted pair																																																																									
<b>Physical configuration</b>	Number of devices	Max. 32 maxi per segment																																																																									
	Type of link	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Non-isolated</th> <th style="width: 50%;">Isolated (3)</th> </tr> </thead> <tbody> <tr> <td>Max. length</td> <td>Bus</td> <td>1000 m</td> </tr> <tr> <td>Derivation</td> <td>15 m</td> <td>40 m</td> </tr> </tbody> </table>	Non-isolated	Isolated (3)	Max. length	Bus	1000 m	Derivation	15 m	40 m																																																																	
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(1) For other limitations, consult our catalogue "Machines & installations with industrial communications".

(2) With using the **TSX CAN C●50/100/300** CANopen cables and the **TSX CAN C●DD03/1/3/5** preformed cordsets.

(3) For isolated link, tap isolation **TWD XCA ISO** must be used.



**Inputs/outputs characteristics**

**24 V  $\overline{\text{---}}$  inputs**

Number of input channels			12, type 1 (according IEC/EN 61131)
Nominal input voltage		$\overline{\text{---}}$ V	24 sink/source (positive or negative logic, PNP or NPN)
Common			1
Input voltage limits		$\overline{\text{---}}$ V	20.4...26.4
Nominal input current		mA	4.5 for I0, I1, I6 and I7; 7 for I2...I5 and I8...I11
Input impedance		k $\Omega$	5.3 for I0, I1, I6 and I7; 3,4 for I2...I5 and I8...I11
Electronic filtering time	At state 1	$\mu$ s	35 for I0, I1, I6 and I7; 40 for I2...I5 and I8...I11
	At state 0	$\mu$ s	45 for I0, I1, I6 and I7; 150 for I2...I5 and I8...I11s
Configurable filtering time		ms	- Electronic filtering time - 3 ms ou 12 ms depending on configuration
Isolation	Between channels		None
	Between channels and internal logic	V eff	$\sim$ 500 for 1 min

**Transistor output**

Number of output channels			2 (Q0 and Q1)
Output logic			Source (positive logic, PNP)
Common			1
Nominal output values	Voltage	$\overline{\text{---}}$ V	24
	Current	A	0,3
Output value limits	Voltage	$\overline{\text{---}}$ V	20.4...28,8
	Current per channel	A	0.36
	Current per common	A	0.72
Response time	At state 1	$\mu$ s	5
	At state 0	$\mu$ s	5
Voltage drop	At state 1	$\overline{\text{---}}$ V	Max.1
Maximum inrush current		A	1
Leakage current		mA	0.1
Induction L/R		ms	10 (28.8 V $\overline{\text{---}}$ , 1 Hz)
Overvoltage protection		$\overline{\text{---}}$ V	39 $\pm$ 1
Maximum power (filament lamp)		W	8
Isolation	Between channels		Aucun
	Between channels and internal logic	$\sim$ V	$\sim$ 500 for 1 min

**Relay outputs**

Number of output channels			6 (Q2...Q7)
Commons	Common 1		3 contacts (relay) NO (Q2, Q3 and Q4)
	Common 2		2 contacts (relay) NO (Q5 and Q6)
	Common 3		1 contact (relay) NO (Q7)
Nominal output values (1) (resistive or inductive load)	Voltage	$\overline{\text{---}}$ V	30
		$\sim$ V	240
	Current per channel	A	2
Response time	At state 1	ms	5
	At state 0	ms	2
Bounce time		ms	$\leq$ 1
Min. switchable load		mA	0.1 / $\overline{\text{---}}$ 0,1 V (reference value)
Contact resistance (unused condition)		m $\Omega$	Max. 30
Isolation voltage		V rms	$\sim$ 500 for 1 min
Consumptions for all the outputs	At state 1	$\overline{\text{---}}$ 5 V	mA 30
		$\overline{\text{---}}$ 24 V	mA 40
	At state 0	$\overline{\text{---}}$ 5 V	mA 5
Electrical durability	In AC-1		5 x 10 <sup>5</sup> operating cycles with 500 VA load
	In AC-14		5 x 10 <sup>5</sup> operating cycles with 250 VA load
	In AC-15		5 x 10 <sup>5</sup> operating cycles with 200 VA load
	In DC-1		5 x 10 <sup>5</sup> operating cycles with 60 W load
	In DC-13		5 x 10 <sup>5</sup> operating cycles with 30 W load

**Commoning block characteristics**

Type de module			<b>OTB 9ZZ 61JP</b>
Application			Passive, inter-module
Commons			2 groups of 10 removable terminals
Nominal output values	Voltage	V	$\overline{\text{---}}$ 19...30 / $\sim$ 215...240
	Currents	Per channels	A 2
		Per group of commons	A 8

(1) With 1800 operations max./hour;  
 electric life: min. 100 000 operations, mechanical life: min. 20 x 10<sup>6</sup> operations.

## Modicon M238 logic controller

### Modicon OTB distributed I/O

### Optimum IP 20 I/O system

### Interface modules



OTB 1C0 DM9LP



OTB 1S0 DM9LP



OTB 9ZZ 61JP

#### Interface modules with integrated discrete I/O

Supply voltage	Number and type of integrated I/O			Connection by Link	Reference	Weight kg	
	Inputs	Solid-state outputs	Relay outputs				
24 V	12 I 24 V IEC type 1 (1 common)	2 O 24 V 0.3 A (1 common)	6 O 30 V / ~ 240 V 2 A (3 commons)	Removable screw terminal block	CANopen bus	OTB 1C0 DM9LP	0.195
					Modbus RS 485 serial link	OTB 1S0 DM9LP	0.190

#### Separate parts

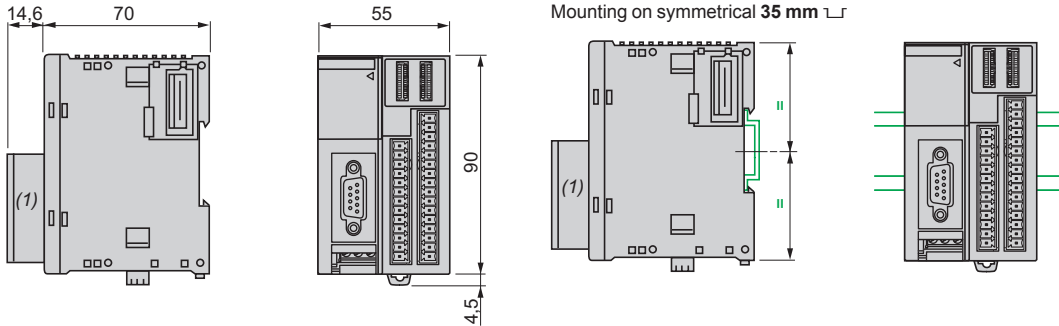
Description	Application	Number of commons	Connection by	Number of wires	Reference	Weight kg
<b>Commoning modules</b>	For grouping input or output commons, 8 A maximum; inter-module	2 isolated groups	Removable screw terminal block	2 x 10	OTB 9ZZ 61JP	0.100
<b>Fixing kit</b> Sold in lot of 5	Plate or panel mounting of modules	–	–	–	TWD XMT5	–
<b>Software and documentation</b>	Configuration software "Modicon Configuration Tool-Lite" and hardware user guide	–	–	–	FTX ES01	0.050

#### Connection accessories

Description	Application	Reference	Weight kg
<b>CANopen bus</b>	Cabling system: junction boxes, cables, cordsets, IP 20 and IP 67 accessories	See pages 66 and 53	
<b>Modbus serial link</b>	Cabling system: ta-off, hub, cables, cordsets, line end adapter	See pages 68 and 69	

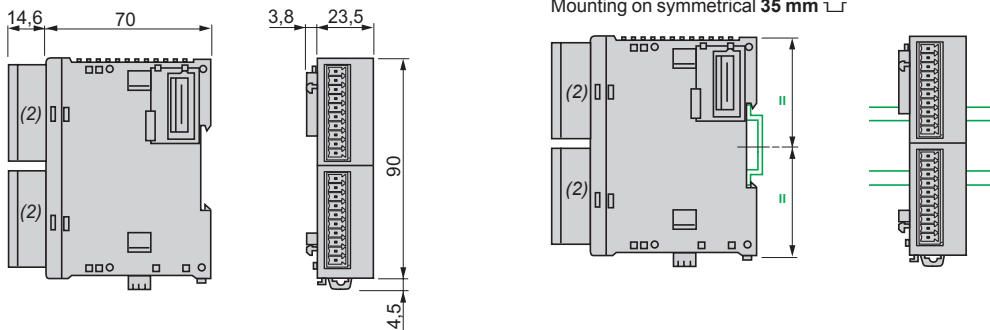
## Dimensions

### OTB 100 DM9LP



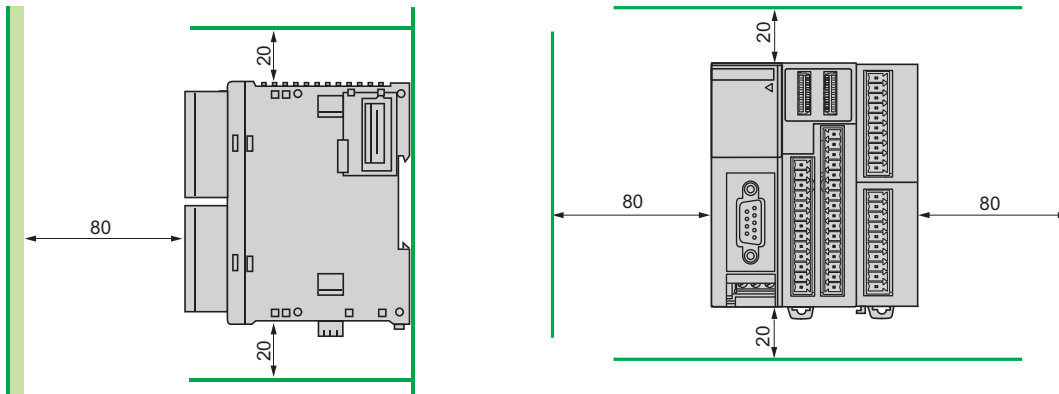
(1) With removable screw terminal block type connector.

### OTB 9ZZ 61JP



(2) With removable screw terminal block type connector.

## Installation rules

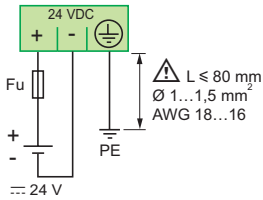


- Must not be horizontally or flat mounted
- Avoid placing the module over a source of heat (transformer, power supply, power contactor, etc.)

## Connections

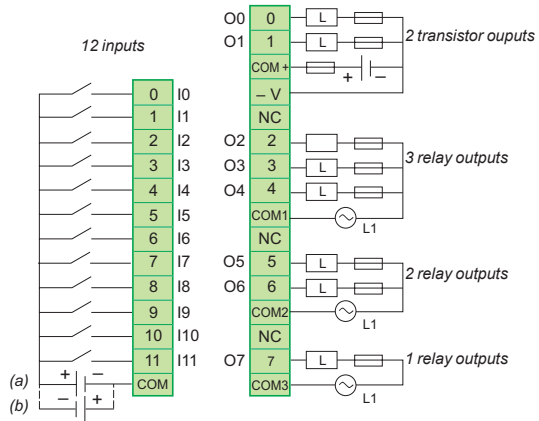
### OTB 1●0 DM9LP

24 V  $\overline{\text{---}}$  power supply



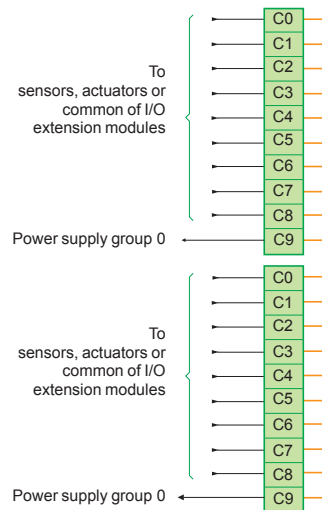
Fu : 2A fast-blow fuse **ABE 7FU200**

$\overline{\text{---}}$  24 V inputs, 24 V  $\overline{\text{---}}$  transistor outputs and relay outputs

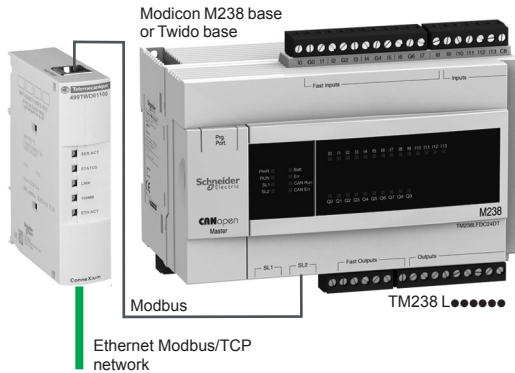


(a) 24 V  $\overline{\text{---}}$  power supply for sink inputs (positive logic).  
(b) 24 V  $\overline{\text{---}}$  power supply for source inputs (negative logic).

### OTB 9ZZ 61JP



Internal links



### Presentation

TwidoPort module **499 TWD 01100** is an Ethernet interface that is easy to use and dedicated to Modicon M238 logic controllers and Twido compact or modular programmable controllers. It allows incorporation of this controllers into an Ethernet network as a passive device (slave). The TwidoPort module is ready for use. When connected to the integrated RS 485 serial port acts as a gateway between the Ethernet network and the controller's Modbus serial link port.

The main characteristics of the TwidoPort module are as follows:

- Connects to the RS 485 of the Modicon M238 controller (marked SL1 or SL2 depending on model) or the RS 485 port of the Twido controller; no external auxiliary supply is necessary.
- Ethernet configuration:
  - takes the Ethernet configuration from the Twido application configuration (normal mode),
  - supports manual configuration using Telnet.
- Provides Ethernet statistics via a Telnet session.

### Description

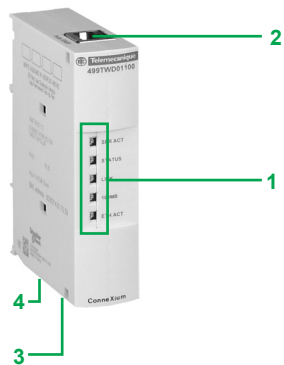
The TwidoPort **499 TWD 01100** interface module comprises:

- 1 Five pilot lights indicating the status of the interface and of the TwidoPort module links.
- 2 An RJ45 type connector for connection of the power supply and of the link to the controller's integrated RS 485 port. This connection is made using connection cable **TWD XCA RJP03P** supplied with the TwidoPort interface module in case of the Twido controller.
- 3 An RJ45 connector (accessed through the bottom of the module) for connection to the Ethernet TCP/IP network.
- 4 An earthing screw (accessed through the bottom of the module).

The TwidoPort interface module can be mounted as standard on a symmetrical  $\sqcup$  rail. Fixing kit **TWD XMT5** (sold in lots of 5) allows plate or panel mounting (2 x  $\varnothing$  4.3 holes).

#### To order separately

For connecting to the Modicon M238 controller, the cordset for connection Modbus **XBT Z9980** (length 2.5 m).



Characteristics		
<b>TwidoPort module</b>		<b>499 TWD 01100</b>
<b>Services</b>	Class	A10
	Web services	No Web server
	Basic Ethernet Modbus/TCP communication services	Modbus messaging (read/write of data words) BOOTP function Auto MDI/MDX function (avoids the use of crossover cable) Supports manual configuration using Telnet.
<b>Structure</b>	Physical interface	10BASE-T/100BASE-TX, standard RJ45 type connector
	Binary rate	10/100 Mbit/s with automatic recognition
	Medium	Twisted pair
<b>TwidoPort interface module</b>	Operating temperature	0...55 °C
	Relative humidity	10...95 % (without condensation)
	Degree of protection	IP 20
	Max. consumption at --- 5 V	180 mA
	Supply	5 ± 0.5 V provided by the Modicon M238 or Twido base controller
	Conforming to standards	UL 508, CSA 1010, FCC Class A, EN 61131-2, CE
	LED indicator	Activity on the Modbus serial link (SER ACT), controller status (STATUS), Ethernet link status (LINK), binary rate 100 Mbit/s (100 MB), Ethernet network activity (ETH ACT)

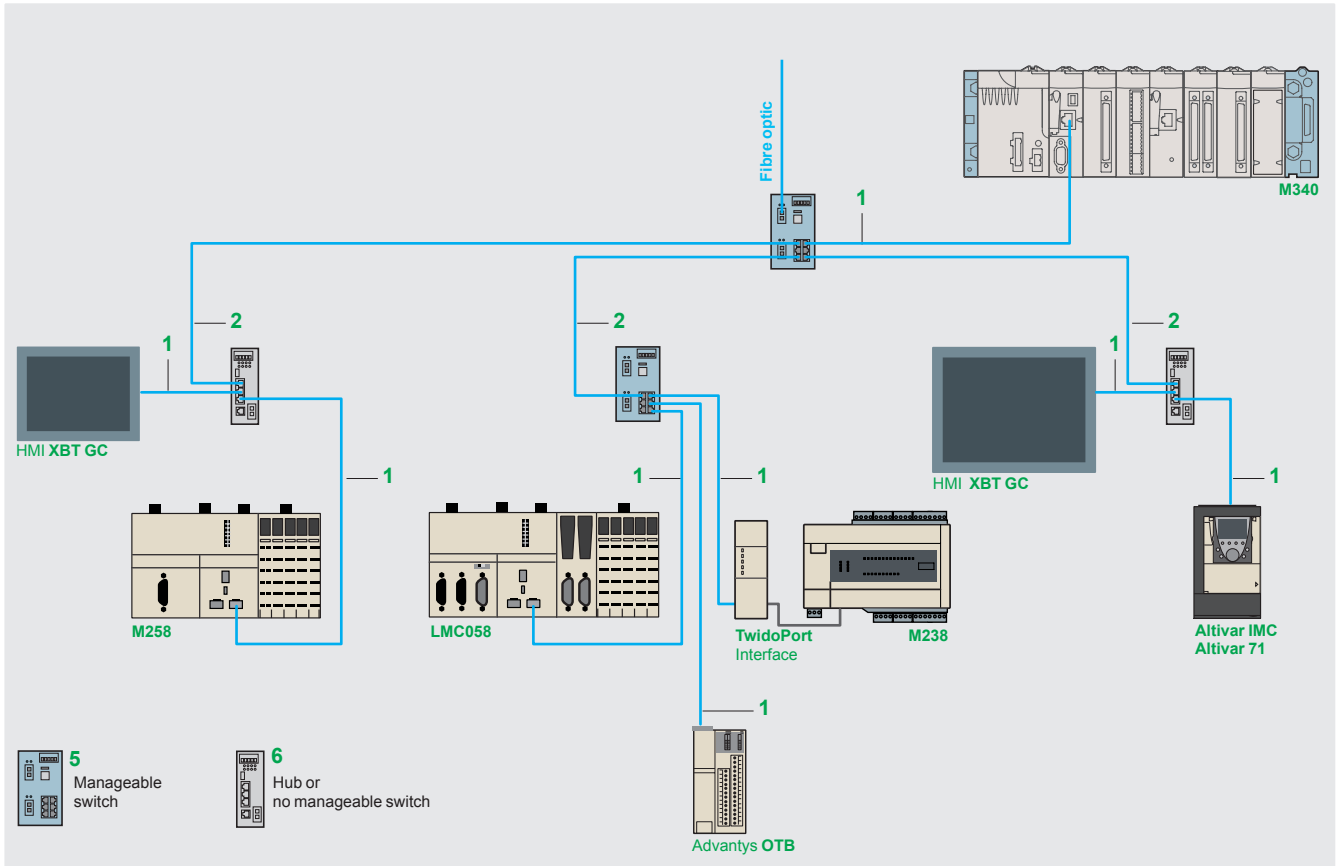
### References



499 TWD 01100

Description	Controller bases	Function	Reference	Weight kg
<b>TwidoPort interface module</b>	Modicon M238 24I/O	10/100 Mbit/s	<b>499 TWD 01100</b>	0.200
	Twido compact	Auto MDIX function		
	10/16/24/40 I/O	Connection cordset to Twido base controller TWD XCA RJP03P included (length 0.3 m)		
<b>Modbus RS 485 cordsets</b>	Twido modular 20/40 I/O			
	Description	Use	Length	Reference
<b>Modbus RS 485 cordsets</b>	Connection to Modicon M238 Equiped with 2 RJ45 connectors	2.5 m	<b>XBT Z9980</b>	0.100

**Ethernet Modbus/TCP or Ethernet IP network architecture**



**References (1)**

**Shielded copper connection cables**

ConneXium shielded copper connection cables are available in two versions to comply with the different standards and approvals in force:

■ **Shielded twisted pair copper cables to standard EIA/TIA 568**

These cables conform to:

- standard EIA/TIA 568, category CAT 5E,
- standard IEC 11801/EN 50173, class D.

Their flame resistance conforms to:

- NFC 32070# classification C2
- standards IEC 322/1,
- Low Smoke Zero Halogen (LSZH).

■ **Shielded twisted pair copper cables, UL and CSA 22.1 approved**

These cables conform to:

- standards UL and CSA 22.1.

Their flame resistance conforms to NFPA 70.

**“Do It Yourself” cable and connectors**

The ConneXium “Do It Yourself” range allows the user to make up Ethernet copper cables on site and to the required length. They are designed for cabling Ethernet 10/100 Mbit/s networks. The maximum length of cables made up in this way is 80 m. They can be assembled quickly using a knife and cutting pliers (no special tools are required).

Description	Characteristics	Length	Reference	Weight kg
<b>Ethernet copper cable</b> 2 shielded twisted pairs 24 AWG	Conforming to the above-mentioned standards and approvals	300 m	<b>TCS ECN 300R2</b>	–
<b>RJ 45 connector</b>	Conforming to EIA/TIA-568-D	–	<b>TCS EK3 MDS</b>	–
<b>M12 connector</b>	Conforming to IEC 60176-2-101	–	<b>TCS EK1 MDRS</b>	–

(1) For other versions (fibre optic, switches, ...): please consult our “Machines and Installations with Industrial Communications” catalogue.



490 NT● 000 ●●



TCS ESU 043F1N0



TCS ESM 043F2C●0



499 NMS/NSS 251 02



TCS ESM 083F2C●0



TCS ESU 051 F0

## References (continued)

## Shielded twisted pair cables to standard EIA/TIA568

Description	Pre-formed at both ends	Item	Length	Reference	Weight kg
Straight cables	2 x RJ45 connectors For connection to terminal equipment (DTE)	1	2 m	490 NTW 000 02	—
			5 m	490 NTW 000 05	—
			12 m	490 NTW 000 12	—
			40 m	490 NTW 000 40	—
			80 m	490 NTW 000 80	—
Crossover cables	2 x RJ45 connectors For connection between hubs, switches and transceivers	2	5 m	490 NTC 000 05	—
			15 m	490 NTC 000 15	—
			40 m	490 NTC 000 40	—
			80 m	490 NTC 000 80	—

## Shielded twisted pair cables, UL and CSA 22.1 approved

Description	Pre-formed at both ends	Item	Length	Reference	Weight kg
Straight cables	2 x RJ45 connectors For connection to terminal equipment (DTE)	1	2 m	490 NTW 000 02U	—
			5 m	490 NTW 000 05U	—
			12 m	490 NTW 000 12U	—
			40 m	490 NTW 000 40U	—
			80 m	490 NTW 000 80U	—
Crossover cables	2 x RJ45 connectors For connection between hubs, switches and transceivers	2	5 m	490 NTC 000 05U	—
			40 m	490 NTC 000 40U	—
			80 m	490 NTC 000 80U	—

## Shielded twisted pair cable for IP 67 switch

Description	Pre-formed at both ends	Item	Length	Reference	Weight kg
Straight cables	1 x IP 67 4-way M12 connector and 1 x RJ45 connector	8	1 m	TCS ECL 1M3M 1S2	—
			3 m	TCS ECL 1M3M 3S2	—
			5 m	TCS ECL 1M3M 5S2	—
			10 m	TCS ECL 1M3M 10S2	—
			25 m	TCS ECL 1M3M 25S2	—
			40 m	TCS ECL 1M3M 40S2	—

## ConneXium hub

Description	Number of ports		Item	Reference	Weight kg
	Copper cable	Fibre optic			
Twisted pair hub 10BASE-T copper ports, RJ45 shielded connectors	4	—	6	499 NEH 104 10	0.530

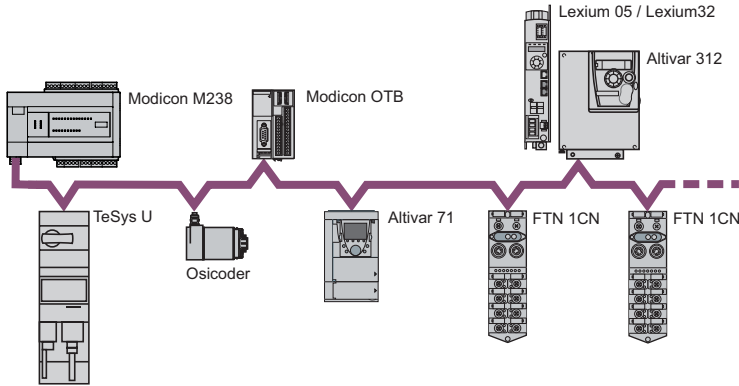
## ConneXium switches

Description	Number of ports		Item	Manag-eable	Reference	Weight kg
	Copper cable	Fibre optic				
Optimised twisted pair switch	3	—	6	No	TCS ESU 033FN0	0.113
10BASE-T/100BASE-TX copper ports, RJ45 shielded connectors	4	1	6	No	TCS ESU 043FN0	0.120
100BASE-FX optic port, SC connectors	5	—	6	No	TCS ESU 053FN0	0.113
Twisted pair switches	8	—	6	No	499 NES 181 00	0.230
0BASE-T/100BASE-TX copper ports, RJ45 shielded connectors	8	—	5	Yes	TCS ESM083F23F0	0.410
Twisted pair and fibre optic switches	3	1, multimode	5	Yes	TCS ESM043F1CU0	0.400
10BASE-T/100BASE-TX copper ports, RJ45 shielded connectors.	2	2, multimode	5	Yes	TCS ESM043F2CU0	0.400
100BASE-FX optic ports, SC connectors	3	1, single-mode	5	Yes	TCS ESM043F1CS0	0.400
	2	2, single-mode	5	Yes	TCS ESM043F2CS0	0.400
	4	1, multimode	6	No	499 NMS 251 01	0.330
	3	2, multimode	6	No	499 NMS 251 02	0.335
	4	1, single-mode	6	No	499 NSS 251 01	0.330
	3	2, single-mode	6	No	499 NSS 251 02	0.335
	7	1, multimode	5	Yes	TCS ESM083F1CU0	0.410
	6	2, multimode	5	Yes	TCS ESM083F2CU0	0.410
	7	1, single-mode	5	Yes	TCS ESM083F1CS0	0.410
	6	2, single-mode	5	Yes	TCS ESM083F2CS0	0.410
IP 67 twisted pair switch (1) 10BASE-T/100BASE-TX copper ports, shielded M12 connectors (type D)	5	—	—	No	TCS ESU 051 F0	0.210

(1) Require special cables with M12 connectors for their --- 24 V supply: XZC P1●64L●.



### Presentation



Schneider Electric has selected CANOpen for its machines and installations because of its wealth of functions and its resulting benefits in the automation world. This decision was based on the general acceptance of CANOpen, and the fact that CANOpen products are increasingly used in control system architectures.

CANOpen is an open network supported by more than 400 companies worldwide, and promoted by CAN in Automation. CANOpen conforms to standards EN 50325-4 and ISO 15745-2.

Schneider Electric is heavily involved in working groups, which are important for machine and installation architectures, systems and products.

### CANOpen brings transparency to Ethernet

The CANOpen bus is a multi-master bus ensuring reliable, deterministic access to real-time data in control system devices. The CSMA/CA protocol is based on broadcast exchanges, sent cyclically or on an event, to ensure optimum use of the passband. A message handling channel can also be used to define slave parameters.

The bus uses a double twisted pair on which, with the Modicon M238 logic controller, 16 slaves devices maximum are connected by daisy-chaining or by tap junctions. The variable data rate between 50 Kbit/s and 1 Mbit/s depends on the length of the bus (between 1,000 m and 20 m). Each end of the bus must be fitted with a line terminator.

The CANOpen bus is a set of profiles on CAN systems, possessing the following characteristics:

- Open bus system
- Data exchanges in real time without overloading the protocol
- Modular design allowing modification of size
- Interconnection and interchangeability of devices
- Standardized configuration of networks
- Access to all device parameters
- Synchronization and circulation of data from cyclic and/or event-controlled processes (short system response time)

The **TM238 LFDC24DT** and **TM238 LFAC24DR** compact bases integrated a CANOpen port (conformity M20 class) perform the role of master on the bus.

### Connectable Schneider Electric devices

The following Schneider Electric devices can be connected to the CANOpen bus:

- Ø 58 mm Osicoder multi-turn absolute encoders **XCC 3510P/3515C S84CB**.
- TeSys U starter-controllers with **LUL C08** communication module.
- TeSys T motor management system with **LTM R●●C●●** controllers.
- Modicon OTB IP 20 Optimum distributed I/O with **OTB 1C0 DM9LP** interface module.
- Modicon FTB/FTM IP 67 I/O splitter boxes **FTB 1CN●●●●●** monobloc.
- Preventa configurable safety controllers **XPS MC16ZC/32ZC**.
- Altivar 312 variable speed drives for asynchronous motors (0.18...15 kW) **ATV 312H ●●●●●**.
- Altivar 61/71 variable speed drives for asynchronous motors (0.75...630 kW) **ATV 61H /71H ●●●●●**.
- Lexium 05/ Lexium 32 servo drives (0,15...7 kW) for BSH/BSM servo motors **LXM 05A●D●●●●/ LXM 32A●D●●●●**.
- Integrated training Lexium **ILA1B, ILE1B** and **ILS1B**.



TeSys U starter-controllers with communication module.



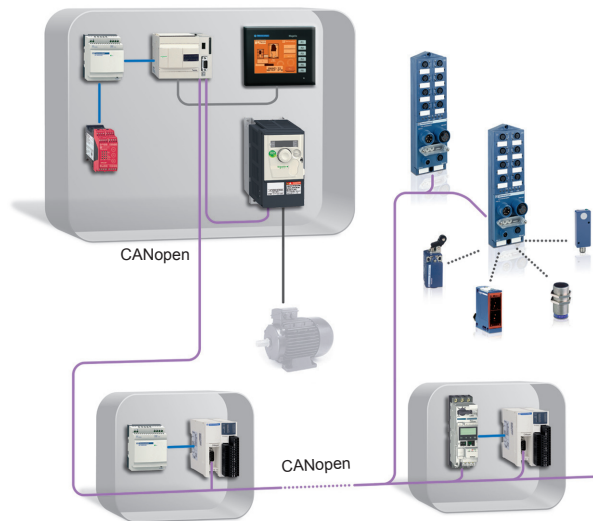
Modicon FTB



Altivar 312



Lexium ILA1B



### Presentation

**TM238 LFDC24DT** and **TM238 LFAC24DR** logic controllers allow to act as CANopen master. The bus consists of a master station, the Modicon M238 controller and slave stations. The master is in charge of configuration, exchanges and diagnostics on the slaves.

The CANopen bus is a communication type bus and allows management of various slaves such as:

- Discrete slaves,
- Analogue slaves,
- Variable speed controllers,
- Motor starters,
- ....

The Modicon M238 CANopen master controls up to 16 slaves, each with an input PDO (*Process Data Object*) and an output PDO. If a slave has more than one PDO, the maximum number of slaves is reduced by an equivalent number.

### CANopen conformity class

Schneider Electric has defined the conformity classes for CANopen master and slave devices. Conformity classes are used to identify the services and levels of service supported by each CANopen device or product. These services are described in section 4 of our "Machines & Installations with industrial communications" catalogue.

The table below shows product combination possibilities according to their conformity class.

Conformity class		Produit esclave		
		S10	S20	S30
Master product	M10			
	M20			
	M30			

  Combination possible: Modicon M238 controller master M20 classe with slave device S10 and S20 classes

  Use restriction: Modicon M238 controller master M20 class with slave device S30 class limits the level of service to that of the lower conformity class, either S20.

### Characteristics

Type of base		TM238 LFDC24DT, TM238 LFAC24DR							
CANopen port		Standards	DS 301 V4.02, DR 303-1						
		Class	Conformity class M20, limit of 16 slaves						
Data rate	Max. length	m	20	50	100	125	250	500	1000
	Data rate	Kbit/s	1000	800	500	425	250	125	50
No. of slaves		16 max, with max. limit of: 64 TDPOs and 64 RPDOs							
Line matching		Line termination resistor supplied with the screw terminal block, to be mounted when necessary							
Connection		Removable screw terminal block							

### Reference

	Number of I/O	Inputs	Outputs	No. of I/O extension modules	Integrated serial links	Reference	Weight kg
<b>Compact bases, embedded CANopen port</b>							
<b>■ 24 V <math>\overline{\text{---}}</math> power supply</b>							
	24 I/O	6 x 24 V $\overline{\text{---}}$ (sink/source) 8 x 24 V $\overline{\text{---}}$ fast (sink)	10 transistor (source) including 4 fast	7 modules max.	1 RS 232/485 1 RS 485	<b>TM238 LFDC24DT</b>	0.595
<b>■ 100-240 V <math>\sim</math> power supply</b>							
	24 I/O	6 x 24 V $\overline{\text{---}}$ inputs (sink/source) 8 x 24 V $\overline{\text{---}}$ fast inputs (sink)	4 transistor outputs (source) and 6 relay outputs	7 modules max.	1 RS 232/485 1 RS 485	<b>TM238 LFAC24DR</b>	0.595

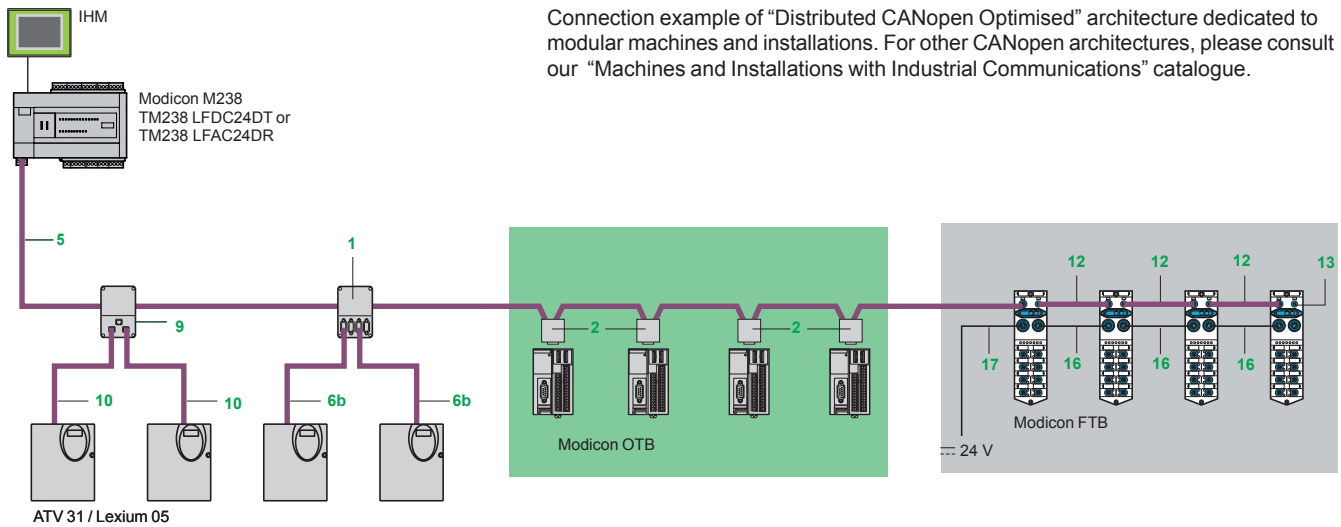


TM238 LFDC24DT



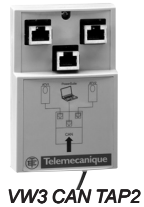
TM238 LFAC24DR

### CANopen architecture



Connection example of “Distributed CANopen Optimised” architecture dedicated to modular machines and installations. For other CANopen architectures, please consult our “Machines and Installations with Industrial Communications” catalogue.

### References



Standard junction boxes and connectors						
Description	Composition	Item	Length	Reference	Weight	kg
<b>CANopen IP 20 tap junction box</b>	4 SUB-D ports. Screw terminal blocks for connection of main cables Line end adapter	1	–	TSX CAN TDM4	0.196	
<b>IP 20 connectors</b> CANopen 9-way SUB-D female. Line end adapter switch	Elbowed (90°)	2	–	TSX CAN KCDF 90T	0.046	
	Straight (2)	–	–	TSX CAN KCDF 180T	0.049	
	Elbowed (90°) with 9-way SUB-D connector for connection to PC or diagnostic tool	–	–	TSX CAN KCDF 90TP	0.051	
<b>M12 connectors</b> IP 67	Male	–	–	FTX CN 12M5	0.050	
	Female	–	–	FTX CN 12F5	0.050	
<b>CANopen IP 20 tap junction box for Altivar and Lexium 05</b>	2 x RJ45 ports	9	–	VW3 CAN TAP2	–	
Standard IP 20 pre-formed cables						
Description	Application	Item	Length	Unit reference	Weight	kg
<b>CANopen cables</b> (2 x AWG 22 2 x AWG 24)	For standard environments (3), CE marking: low fume emission. Halogen-free. Non flame propagating (IEC 60332-1)	5	50 m 100 m 300 m	TSX CAN CA50 TSX CAN CA100 TSX CAN CA300	4.930 8.800 24.560	
	For standard environments (3), UL certified, CE marking: non flame propagating (IEC 60332-2)	5	50 m 100 m 300 m	TSX CAN CB50 TSX CAN CB100 TSX CAN CB300	3.580 7.840 21.870	
	For standard environments (3) or mobile installation, CE marking: low fume emission. Halogen-free. Non flame propagating (IEC 60332-1). Oil resistant	5	50 m 100 m 300 m	TSX CAN CD50 TSX CAN CD100 TSX CAN CD300	3.510 7.770 21.700	
<b>CANopen pre-formed cables</b> 1 x 9-way SUB-D female connector at each end.	For standard environments (3), CE marking: low fume emission. Halogen-free. Non flame propagating (IEC 60332-1)	–	0.3 m 1 m 3 m 5 m	TSX CAN CADD03 TSX CAN CADD1 TSX CAN CADD3 TSX CAN CADD5	0.091 0.143 0.295 0.440	
	For standard environments (3), UL certified, CE marking: non flame propagating (IEC 60332-2)	–	0.3 m 1 m 3 m 5 m	TSX CAN CBDD03 TSX CAN CBDD1 TSX CAN CBDD3 TSX CAN CBDD5	0.086 0.131 0.268 0.400	

(1) Connector VW3 CAN KCDF 180T may also be used for connection to a Controller Inside programmable card.

(2) Standard environment: without any particular environmental restrictions, operating temperature between + 5 °C and + 60 °C, and for fixed installation.

(3) Harsh environments: resistant to hydrocarbons, industrial oils, detergents, solder splashes, hygrometry up to 100%, saline environment, wide temperature variations, operating temperature between - 10 °C and + 70 °C, or mobile installation.

## References (continued)

## Standard IP 20 pre-formed cables (continued)

Description	Composition	Item	Length	Unit reference	Weight kg
CANopen pre-formed cables	Pre-formed cables with 1 x 9-way SUB-D female connector and 1 x RJ45 connector	6b	0.5 m	TCS CCN 4F3 M05T	–
			1 m	TCS CCN 4F3 M1T	–
				VW3 M38 05 R010	–
				(1)	–
			3 m	TCS CCN 4F3 M3T	–
	Pre-formed cables with 2 x 9-way SUB-D connectors, 1 female and 1 male	–	0.5 m	TLA CD CBA 005	–
			1.5 m	TLA CD CBA 015	–
			3 m	TLA CD CBA 030	–
			5 m	TLA CD CBA 050	–

## Standard IP 67 pre-formed cables

CANopen pre-formed cables	Pre-formed cables with 2 x 5-way, elbowed, M12 connectors, A coding (1 male connector and 1 female connector)	12	0.3 m	FTX CN 3203	0.40
			0.6 m	FTX CN 3206	0.70
			1 m	FTX CN 3210	0.100
			2 m	FTX CN 3220	0.160
			3 m	FTX CN 3230	0.220
			5 m	FTX CN 3250	0.430

## IP 20 connection accessories

CANopen connector for Altivar 71 (2)	9-way SUB-D female. Line end adapter switch. 180° cable entry	–	–	VW3 CAN KCDF 180T	–
Adapter for Altivar 71 variable speed controller	CANopen SUB-D to RJ45 adapter	–	–	VW3 CAN A71	–
Pre-formed CANopen cables	1 RJ45 connector at each end.	10	0.3 m	VW3 CAN CARR03	–
			1 m	VW3 CAN CARR1	–
CANopen bus adapter for Lexium 17D	Hardware interface for link conforming to the CANopen standard + 1 connector for connection of PC terminal	–	–	AM0 2CA 001V000	0.110
Y connector	CANopen/Modbus	–	–	TCS CTN011M11F	–

## IP 67 connection accessories for Advantys FTB/FTM monobloc and modular splitter boxes

Description	Composition	Item	Length m	Reference	Weight kg
IP 67 line terminator	Equipped with one M12 connector (for end of bus)	13	–	FTX CNTL12	0.010
24 V supply connection cables	Equipped with two 5-way, 7/8 type connectors	16	0.6	FTX DP2206	0.150
			1	FTX DP2210	0.190
			2	FTX DP2220	0.310
			5	FTX DP2250	0.750
			Equipped with one 5-way, 7/8 type connector at 1 end with free wires at the other end	17	1.5
3	FTX DP2130	0.430			
5	FTX DP2150	0.700			
T-connector for power supply	Equipped with two straight, 5-way, 7/8 type connectors	–	–	FTX CNCT1	0.100

(1) Cable equipped with line end adapter.

(2) For variable speed controllers ATV 71H●●●M3, ATV 71HD11M3X, HD15M3X, ATV 71H075N4... HD18N4, this connector can be replaced by connector TSX CAN KCDF 180T.

(3) Standard environment: without any particular environmental restrictions, operating temperature between + 5 °C and + 60 °C, and for fixed installation.



VW3 CAN A71



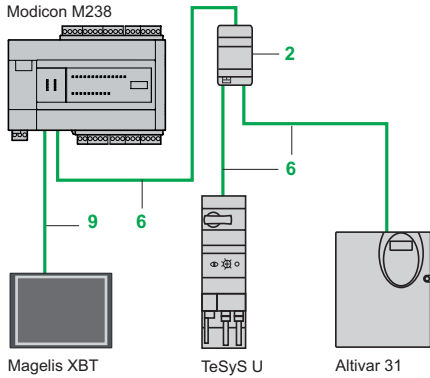
AM0 2CA 001V000



FTX DP21●●

#### Modbus cabling system

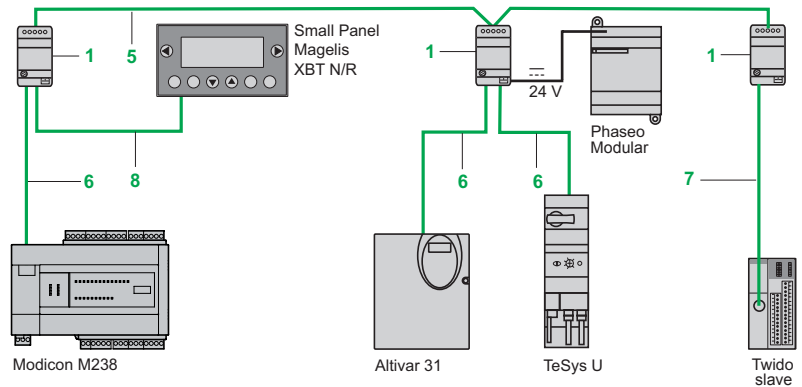
##### Non isolated link (Modicon M238 master)



Cable length between Modicon M238 and Altivar 31:  
≤ 30 m max.

- ★ Line polarisation active
- Line end adapter

##### Isolated link (Modicon M238 master)



- Total length of cables between tap isolation boxes 1: ≤ 1000 m  
- Length of tap link cables 6, 7 or 8: ≤ 10 m

#### References

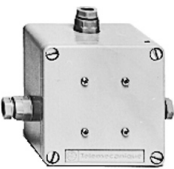


TWD XCA ISO

TWD XCA T3RJ



LU9 GC3



TSX SCA 50



XGS Z24

#### Tap-off and adapter components for RS 485 serial link

Description	Application	Item	Length	Reference	Weight kg
<b>Tap isolation box</b> Screw terminal block for main cable 2 x RJ45 for tap-off	- RS 485 line isolation (1) - Line end adapter (RC 120 Ω, 1nF) - Line pre-polarisation (2 R 620 Ω) - 24 V supply (screw terminal block) or - 5 V (via RJ45) Mounting on 35 mm D-sub	1	-	<b>TWD XCA ISO</b>	0.100
<b>Tap junction box</b> 1 x RJ45 for main cable 2 x RJ45 for tap-off	- Line end adapter (RC 120 Ω, 1nF) - Line pre-polarisation (2 R 620 Ω) Mounting on 35 mm D-sub	2	-	<b>TWD XCA T3RJ</b>	0.080
<b>Modbus hub</b> Screw terminal block for main cable 10 x RJ45 for tap-off	Mounting on 35 mm D-sub, on mounting plate or panel (2 x Ø 4 mm screws)	-	-	<b>LU9 GC3</b>	0.500
<b>T-junction boxes</b> 2 x RJ45 for main cable	1 integrated cable with RJ45 connector for Altivar variable speed controller dedicated tap-off	-	0.3 m 1 m	<b>VW3 A8 306 TF03</b> <b>VW3 A8 306 TF10</b>	-
<b>Passive tap junction box</b>	- Line extension and single-channel tap-off on screw terminal block - Line end adapter	-	-	<b>TSX SCA 50</b>	0.520
<b>RS 232C/RS 485 line converter</b>	- Flow rate 19.2 Kbit/s max. - Without modem signals - 24 V/20 mA supply, Mounting on 35 mm D-sub	-	-	<b>XGS Z24</b>	0.100

(1) Line isolation recommended for distances > 10 m.

# Modicon M238 logic controller

## Modbus and character mode serial link

### Cabling system

## References (continued)

Connection cables for RS 485 serial link											
Description	Application	Item	Length	Unit reference	Weight	kg					
<b>Main cables double shielded twisted pair RS 485</b>	Modbus serial link, supplied without connector	<b>5</b>	100 m	<b>TSX CSA 100</b>	5.680						
			200 m	<b>TSX CSA 200</b>	10.920						
			500 m	<b>TSX CSA 500</b>	30.000						
<b>Modbus cordsets RS 485</b>	2 x RJ45 connectors	<b>6</b>	0.3 m	<b>VW3 A8 306 R03</b>	0.030						
			1 m	<b>VW3 A8 306 R10</b>	0.050						
			3 m	<b>VW3 A8 306 R30</b>	0.150						
	1 x RJ45 connector and 1 end with free wires	-	1 m	<b>TWD XCA FJ010</b>	0.060						
			3 m	<b>VW3 A8 306 D30</b>	0.150						
	1 mini-DIN connector for Twido controller and 1 RJ45 connector	-	0.3 m	<b>TWD XCA RJ003</b>	0.040						
			1 m	<b>TWD XCA RJ010</b>	0.090						
			3 m	<b>TWD XCA RJ030</b>	0.160						
	1 mini-DIN connector for Twido controller and 1 RJ45 connector (1) (2)	<b>7</b>	0.3 m	<b>TWD XCA RJP03</b>	0.027						
	1 mini-DIN connector for Twido controller and 1 RJ45 connector Dedicated programming protocol (2) (3)	-	0.3 m	<b>TWD XCA RJP03P</b>	0.027						
	1 mini-DIN connector for Twido controller and 1 end with free wires	-	1 m	<b>TWD XCA FD010</b>	0.062						
			10 m	<b>TSX CX 100</b>	0.517						
	<b>Modicon M238 cordsets (SL1, SL2) to Magelis HMI terminal</b>	2 x RJ45 connectors	XBT N200/R400 XBT RT500/511 XBT GT11●●/1335	<b>9</b>	2,5 m	<b>XBT Z9980</b>	0,150				
1 x RJ45 connector and 1 x SUB-D 25-way connector							Small Panel XBT N401/410 XBT R410/411	<b>8, 9</b>	2,5 m	<b>XBT Z938</b>	0,210
1 x RJ45 connector and 1 x SUB-D 9-way connector											Advanced panel XBT GT2●●0...7340 XBT GK●●●0
<b>Cordsets for Magelis Small Panel</b>	2 x RJ45 connectors	Small panel XBT N200/R400 XBT RT500/511	<b>8</b>	3 m	<b>VW3 A8 306 R30</b>	0.150					
<b>Twido cordsets (terminal port) to Magelis Small Panel</b>	1 mini-DIN con. and 1 RJ 45 connector	Small panel XBT N200/R400 XBT RT500/511	-	2.5 m	<b>XBT Z9780</b>	0.180					
						1 mini-DIN connector and SUB-D 25-way connector	Small panel XBT N401/410 XBT R410/411	-	2.5 m	<b>XBT Z968</b>	0.210
<b>Line end adapter</b>	For RJ45 connector R = 120 Ω, C = 1 nf	-		Order in multiples of 2	<b>VW3 A8 306 RC</b>	0.200					

Connection cables for RS 232 serial link					
Description	Application	Length	Reference	Weight	kg
<b>Cordset for DTE terminal (printer) (4)</b>	Serial link for terminal device (DTE) 1 x RJ45 connector and 1 x 9-way SUB-D female connector	3 m	<b>TCS MCN 3M4F3C2</b>	0.150	
<b>Cordset for DCE terminal (modem, converter)</b>	Serial link for point to point device (DCE) 1 x RJ45 connector and 1 x 9-way SUB-D male connector	3 m	<b>TCS MCN 3M4M3S2</b>	0.150	

(1) Forcing the configuration of RS 485 integrated port with TwidoSuite programming protocol parameters.

(2) Carries 5 V voltage (supplied by RS 485 integrated port of Twido controller) for **TWD XCA ISO** tap isolation box (not using the 5 V external power supply).

(3) Allows the using of RS 485 integrated port with the parameters defined in configuration.

(4) If the terminal is equipped with a 25-way SUB-D connector, a SUB-D 25-way female/9-way male adapter **TSX CTC 07** must also be ordered.



SoMachine software platform

### Presentation

SoMachine is the OEM solution software for developing, configuring and commissioning the entire machine in a single software environment, including logic, motion control, HMI and related network automation functions.

SoMachine allows you to program and commission all the elements in Schneider Electric's Flexible and Scalable Control platform, the comprehensive solution-oriented offer for OEMs, which helps you achieve the most optimized control solution for each machine's requirements.

Flexible and Scalable Control platforms include:

**Controllers:**

- HMI controllers:
  - XBT GC,
  - XBT GT/GK CANopen,
- Logic controllers:
  - Modicon M238,
  - Modicon M258,
- Motion Controller
  - Modicon LMC 058,
- Integrated Controller Card:
  - Altivar IMC,

**HMI:**

- HMI Magelis graphic panels:
  - XBT GT,
  - XBT GK.

SoMachine is a professional, efficient, and open software solution integrating Vijeo-Designer.

It integrates also the configuring and commissioning tool for motion control devices. It features all IEC 61131-3 languages, integrated field bus configurators, expert diagnostics and debugging, as well as outstanding capabilities for maintenance and visualisation.

SoMachine integrates tested, validated, documented and supported expert application libraries dedicated to applications in Packaging, Hoisting and Conveying.

SoMachine provides you:

- One software package,
- One project file,
- One cable connection,
- One download operation.

### Visual graphic user interface

Navigation within SoMachine is intuitive and highly visual. Presentation is optimized in such a way that selecting the development stage of the desired project makes the appropriate tools available. The user interface ensures nothing is overlooked, and suggests the tasks to be performed throughout the project development cycle. The workspace has been streamlined, so that only that which is necessary and relevant to the current task is featured, without any superfluous information.

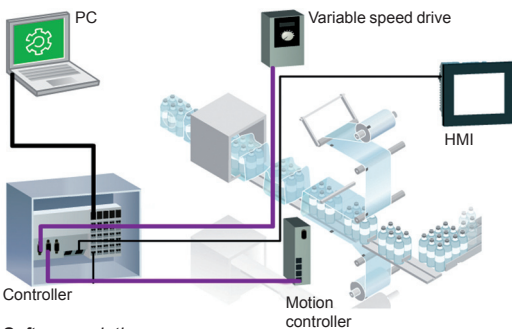
### Learning centre

From the home menu, the learning centre provides several tools to get started with SoMachine. An animated file explains briefly the SoMachine interface and concept. An e-learning allows to run a self-training about SoMachine. A third section gives access to several documented examples of simple coding with SoMachine.

### Projects management

The implemented project management principle allows to browse quickly the existing projects getting the relevant information without the need to open them before selection.

The user can create a new project, starting from several means: using Tested Validated and Documented Architectures, using the provided examples, using an existing project or from scratch. There is quick access to the most recently-used projects.



Software solution



Project management

### Project properties

For each project, the user has the option to define additional information, through friendly forms. It's also possible to attach documents, a customer picture and a configuration picture.

### Configuration

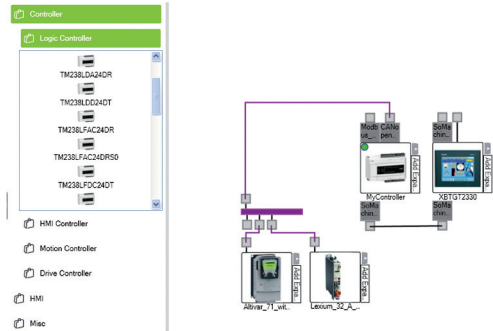
From the graphic user interface, the user can easily build his architecture and configure the devices of this architecture.

### Description of the architecture

A graphic editor can be used to assemble the various elements easily by a simple drag & drop. A devices catalogue is displayed on the left of the screen. It is split into several sections: controllers, HMI, Miscellaneous and search.

### Configuration of the device

Directly from the topologic view of the user interface, a simple click drives the user to the configuration screen of the selected device.



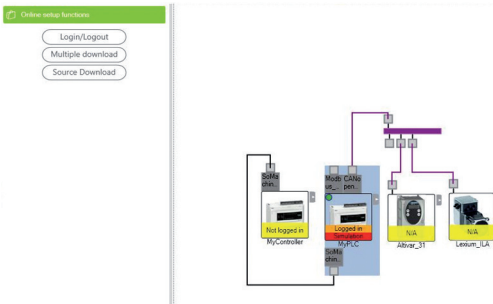
Configuration

### Programming and debug

Programming is an essential step, and the user has to carefully design it to be as efficient as possible. Advanced control and HMI functions cover all the needs of an OEM engineer in terms of creating the control and visualisation system. Powerful tools allow debug and functional tests such as simulation, step by step execution, break points, trace.

### Commissioning

For an easy and fast diagnostic, the menu commissioning allows the user to check the online state of his architecture. Through the topologic view of the configuration, the devices display if you are logged in or not, as well as if they are in run or stop mode.



Commissioning

### Documentation

Because a printed file of the project is an important element, it is possible to build and customize the project report:

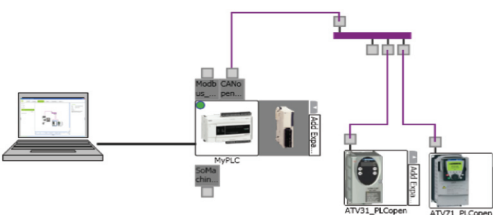
- select the items to be included in the report,
- organize the sections,
- define the page layout
- and then launch the printing.

### Transparency

SoMachine supports Device Type manager (DTM) because it is a field device tool (FDT) container.

With DTM's representing field device in SoMachine, direct communications are possible to every single device via SoMachine, the controller and the field bus CANopen, thus avoiding the lead for individual cable connections.

From the SoMachine unique environment, the remote devices can be set-up off-line and tuned on-line.



Transparency

### Dedicated OEM application libraries (AFB libraries)

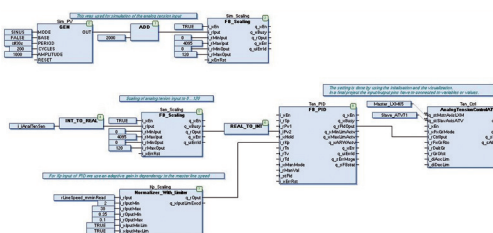
SoMachine can be extended through its solution extension CD. It integrates tested, validated, documented and supported expert application libraries dedicated to many OEM applications. Their simple configuration speeds up design, commissioning, installation and troubleshooting.

These libraries cover the following applications:

- Packaging,
- Hoisting,
- Conveying.

### Tested Validated Documented Architectures (TVDA)

SoMachine provides a variety of preset projects with ready-to-use architectures you can adapt to individual requirements. Some of them are generic TVDA, they are based on controllers configuration. The solution extension CD brings solutions oriented TVDA's to SoMachine.



Application Function Blocks



SoMachine characteristics	
Overview	
IEC 61131-3 programming languages	<ul style="list-style-type: none"> <li>■ IL (Instruction List)</li> <li>■ LD (Ladder Diagram)</li> <li>■ SFC (Sequential Function Chart)</li> <li>■ ST (Structured Text)</li> <li>■ FBD (Function Block Diagram)</li> <li>■ CFC (Continuous Function Chart)</li> </ul>
Controller programming services	<ul style="list-style-type: none"> <li>■ Multi-tasking: Mast, Fast, Event</li> <li>■ Functions (Func) and Function Blocks (FBs)</li> <li>■ Data Unit Type (DUTs)</li> <li>■ On-line changes</li> <li>■ Watch windows</li> <li>■ Graphical monitoring of variables (trace)</li> <li>■ Breakpoints, step-by-step execution</li> <li>■ Simulation</li> <li>■ Visualization for application and machine set-up</li> </ul>
HMI-based services	<ul style="list-style-type: none"> <li>■ Graphics libraries containing more than 4000 2D and 3D objects.</li> <li>■ Simple drawing objects (points, line, rectangles, ellipses, etc ...)</li> <li>■ Preconfigured objects (button, switch, bar graph, etc ...)</li> <li>■ Recipes (32 groups of 256 recipes with max. 1024 ingredients)</li> <li>■ Action tables</li> <li>■ Alarms</li> <li>■ Printing</li> <li>■ Java scripts</li> <li>■ Multimedia file support: wav, png, jpg, emf, bmp</li> <li>■ Variable trending</li> </ul>
Motion services	<ul style="list-style-type: none"> <li>■ Embedded devices configuration and commissioning</li> <li>■ CAM profile editor</li> <li>■ Sample application trace</li> <li>■ Motion and drive function blocks libraries for inverters, servos and steppers</li> <li>■ Visualization screens</li> </ul>
Global services	<ul style="list-style-type: none"> <li>■ User access and profile</li> <li>■ Project documentation printing</li> <li>■ Project comparison (control)</li> <li>■ Variable sharing based on publish/subscribe mechanism</li> <li>■ Library version management</li> </ul>
Integrated fieldbus configurators	<ul style="list-style-type: none"> <li>■ Control network:                             <ul style="list-style-type: none"> <li>□ Modbus Serial Line</li> <li>□ Modbus TCP</li> </ul> </li> <li>■ Field bus:                             <ul style="list-style-type: none"> <li>□ CANopen</li> <li>□ CANmotion</li> <li>□ AS-interface</li> </ul> </li> <li>■ Connectivity:                             <ul style="list-style-type: none"> <li>□ Profibus-DP</li> <li>□ Ethernet IP</li> </ul> </li> </ul>
Expert and solutions libraries	<ul style="list-style-type: none"> <li>■ PLCOpen function blocks for Motion control                             <ul style="list-style-type: none"> <li>□ Exemple: MC_MoveAbsolute, MC_CamIn, ServoDrive, ...</li> </ul> </li> <li>■ Packaging function blocks                             <ul style="list-style-type: none"> <li>□ Exemple: Analog film tension control, rotary knife, lateral film position control, ...</li> </ul> </li> <li>■ Conveying function blocks                             <ul style="list-style-type: none"> <li>□ Exemple: tracking, turntable, conveyor , ...</li> </ul> </li> <li>■ Hoisting function blocks                             <ul style="list-style-type: none"> <li>□ Exemple: anti-sway, anti-crab, hoisting position synchronisation, ...</li> </ul> </li> </ul>

### Product offer

SoMachine software is delivered on a DVD, it is a product oriented version that includes all SoMachine features related to generic hardware (M238, M258, XBT GC), as well as generic TVDA

The solution features are added to SoMachine by installing its solution extension CD. It includes all SoMachine solutions hardware, plus all the dedicated application libraries and TVDA.

### References

- SoMachine is available in 6 languages:
  - English
  - French
  - German
  - Italian
  - Spanish
  - Simplified Chinese.
- System Requirements:
  - Processor: Pentium 3 -1.2 GHz or higher
  - RAM Memory: 2 GByte; recommended: 3 GByte
  - Hard Disk: 3.5 GB, recommended: 4 GB
  - OS: Windows XP Professional, Windows Vista 32 Bit
  - Drive: DVD reader
  - Display: 1024 × 786 pixel resolution or higher
  - Peripherals: a Mouse or compatible pointing device
  - Peripherals: USB interface
  - Web Access: Web registration requires Internet access
- The documentation is supplied in electronic format: complete on-line help plus pdf version.

### SoMachine software

Supported controllers	TVDA	Reference	Weight kg
M238 M258 XBT GC	Optimized HW XBT GC Optimized HW M238 Optimized CANopen M238 Optimized AS-Interface M238 Optimized CANopen XBT GC/GT/GK Performance HW M258 Performance CANopen M258	<b>MSD CHNSFUV20</b>	–

### SoMachine solution extension

Added controllers	Added TVDA	Added libraries	Reference	Weight kg
M238S M258S LMC 058 XBT GCS XBT GT/GK with control Altivar IMC	Optimized CANopen Altivar IMC Performance CANmotion LMC058 Hoisting Optimized CANopen M238 Conveying Performance CANmotion LMC058	Hoisting Conveying Packaging	<b>MSD CHNSFUS0V20</b> (1)	–

(1) For this version, please contact Schneider electric.

# Modicon M238 logic controller

Connection interfaces

Modicon Telefast ABE 7 pre-wired system

Connection sub-bases for discrete I/O extension modules

Applications	Passive connection sub-bases		Output adapter base
	Inputs	Outputs	



Compatibility		I/O extension modules of Modicon M238/Modicon OTB equipped with HE 10 connectors <b>TM2 DDI 16DTK/32DTK and TM2 DDO 16DTK/32DTK</b>			
Relay amplification		-		Electromechanical, fixed	
Control voltage		~ 24 V			
Output voltage		~ 24 V		~ 5...30 V, ~ 250 V (electromechanical)	
Current per channel	Input	5 mA	-	-	
	Output	-	0.1 A	3 A	
Modularity		16 inputs		16 outputs	
Type of inputs/outputs		16 inputs (1 common/16 channels)	16 outputs (1 common/16 channels)	16 outputs with fuse protection LED indication	16 relay outputs (electromechanical) 1 N/O (1 common/4 channels)
Number of terminals per channel		2, 3 (with optional snap-on terminal block)			
Connection to Twido programmable controller		HE 10 connector, 20-way			
Type of terminal		Fixed screw terminal block			
Interface type		<b>ABE 7E16EPN20</b>	<b>ABE 7E16SPN20</b>	<b>ABE 7E16SPN22</b>	<b>ABE 7E16SRM20</b>
Pages		78	78	78	78

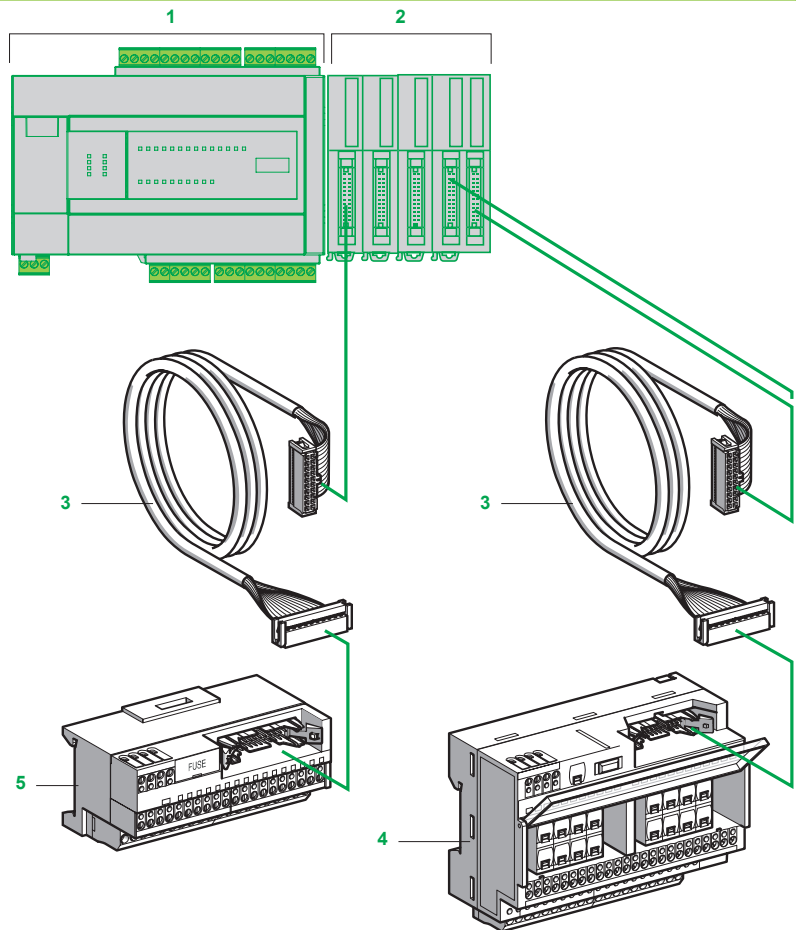
# Modicon M238 logic controller

Connection interfaces

Modicon Telefast ABE 7 pre-wired system

Connection sub-bases for  
discrete I/O extension modules

## Presentation




- 1 Modicon M238 base controller.
- 2 Discrete I/O modules with 20-way HE 10 connectors. The modular sizes available are 16 or 32 I/O.
- 3 Cable (**ABF T20E●●0**) equipped with a 20-way HE 10 connector at each end. This cable is available in 0.5, 1, 2 and 3 m lengths (AWG 28/0.08 mm<sup>2</sup>).
- 4 16 channel sub-base (**ABE 7E16SPN22** or **ABE 7E16SRM20**) for output extension modules.
- 5 16 channel sub-base (**ABE 7E16EPN20** or **ABE 7E16SPN20**) for input or output extension modules.

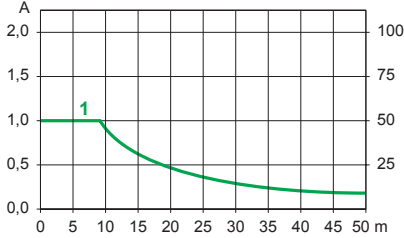
## Compatibility with I/O extension modules

		Discrete I/O extension modules	
		Inputs	Outputs (source)
		<b>TM2 DDI 16DK</b> (16 inputs)	<b>TM2 DDO 16TK</b> (16 outputs)
		<b>TM2 DDI 32DK</b> (32 inputs)	<b>TM2 DDO 32TK</b> (32 outputs)
Terminal block types		HE 10 connectors, 20-ways	
Connection to I/O extension modules		<b>ABF T20E●●0</b> (HE 10, 20-ways)	
<b>Passive connection sub-bases</b>			
16 channels	<b>ABE 7E16EPN20</b>		
	<b>ABE 7E16SPN2●</b>		
<b>Output adapter bases</b>			
16 channels	<b>ABE 7E16SRM20</b>		

Compatible

Environment characteristics				
		ABE 7E16●PN20	ABE 7E16SPN2/SRM20	
<b>Product certifications</b>		UL, CSA		
<b>Degree of protection</b>	Conforming to IEC 60529	IP 2X		
<b>Protective treatment</b>		"TC"		
<b>Resistance to incandescent wire</b>	Conforming to IEC 60695-2-11	°C	750 : extinction < 30 s	
<b>Shock resistance</b>	Conforming to IEC 60068-2-27	ms	11 (half sine wave) 15 gn (acceleration)	
<b>Vibration resistance</b>	Conforming to IEC 60068-2-6	Hz	10...150 2 gn (acceleration)	
<b>Resistance to electrostatic discharge</b>		Conforming to IEC 61000-4-2		
<b>Resistance to radiated fields</b>		Conforming to IEC 61000-4-3		
<b>Immunity to fast transient currents</b>		Conforming to IEC 61000-4-4		
<b>Surge withstand</b>		Conforming to IEC 61000-4-5		
<b>Ambient air temperature</b>		°C	Operation: - 5...+ 60	
		°C	Storage : - 40...+ 80	
<b>Dielectric test voltage (for 1 minute)</b>		kV	2 between terminals and mounting rails	
<b>Overvoltage category</b>	Conforming to IEC 60664-1	Category II		
<b>Degree of pollution</b>	Conforming to IEC 60664-1	2		
<b>Mounting</b>	Conforming to IEC 60715	On standard  rail, height 15 mm, width 35 mm		
<b>Connection</b>		Flexible cable without cable end	mm <sup>2</sup> 1 x 0.14...2.5, AWG 1 x 26...14	–
		Flexible cable with cable end	mm <sup>2</sup> 1 x 0.09...1.5, AWG 1 x 28...16	2 x 0.09...0.75, AWG 2 x 28...20
		Solid cable	mm <sup>2</sup> 1 x 0.14...2.5, AWG 1 x 26...12	2 x 0.12...1.5, AWG 2 x 28...16
<b>Tightening torque</b>		Nm	0.6 (with 3.5 mm flat screwdriver)	
Supply characteristics (controller side)				
<b>Supply voltage</b>	Conforming to IEC 61131-2	~ V	19...30 (Un = 24)	
<b>Maximum supply current per sub-base</b>		~ A	2	
<b>Voltage drop on supply fuse</b>		~ V	0.3	
<b>Supply overload and short-circuit protection</b>		A	2 by quick-blow fuse (included)	
Characteristics of the control circuit for 1 channel (sensor/controller side)				
Sub-base type		Passive connection sub-bases for discrete signals		Connection sub-bases with soldered relays
		ABE 7 E16EPN20	ABE 7 E16SPN2●	ABE 7 E16SRM20
<b>Number of channels</b>		16 inputs	16 outputs	16 relay outputs
<b>Rated voltage Ue</b>		~ V	24	
<b>Min/max voltage</b>	Conforming to IEC 61131-2	~ V	20.4/26.4	
<b>Courant interne par voie à Ue</b>		mA	–	3,2 for ABE 7E16SPN22
<b>Etat 1 garanti</b>	Relay output	V	–	16.8
<b>Etat 0 garanti</b>	Relay output	V	–	2
<b>Conformité</b>		Conforming to IEC 61131-2	Type 1	–
Output circuit characteristics (preactuator side)				
<b>Number of channels</b>		Passive output	–	16
		Relay output	–	–
<b>Contact arrangement</b>		–		
<b>Rated voltage at Ue</b>		Passive output	~ V	24
		Relay output	~ V	–
		~ V	–	5...30
		~ V	–	110...250
<b>Current switched per I/O channel</b>		Entrée/Passive output	mA	15/–
		Relay output	A	–
		–	–	–/100
<b>Maximum current per common</b>		Passive output	A	–
		Relay output	A	–
		–	–	1.6
<b>Rated operational leakage current (60 °C max) (for 500 000 operations)</b>		DC 12	A	–
		DC 13	A	–
		AC 12, relay	A	–
		AC 15, relay	A	–
		–	–	–/3
		–	–	–/0.5
		–	–	2
		–	–	0.4
<b>Minimum current</b>		mA	–	–/100
<b>Rated insulation voltage</b>		V	Not isolated	
<b>Maximum response time</b>		ms	–	
		ms	–	
		ms	–	
<b>Channel fuse protection</b>		mA	–	125 for ABE 7E16SPN22
		–	–	–
Other characteristics (at ambient temperature of 20 °C)				
<b>Permissible leakage current without illuminating the channel LED</b>		mA	–	1.5 for ABE 7E16SPN22
<b>Rated impulse withstand voltage (1.2/50) Relay output</b>		kV	–	6
<b>Switching frequency</b>		Hz	–	20
<b>Mechanical durability</b>		In millions of operating cycles	–	20

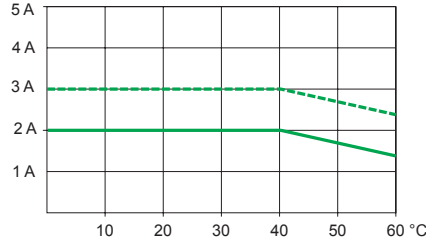
#### Curves for determining the length of cable



1 Cables ABF T2●●●●● c.s.a. 0.08 mm<sup>2</sup> (AWG 28)

#### Temperature derating curves

ABE 7E11SRM20, ABE 7E16SRM20  
6 electromechanical relay outputs



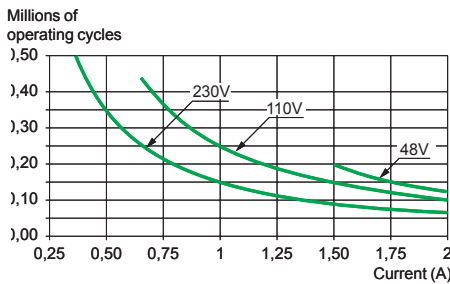
— 100 % of channels used  
- - - 50 % of channels used

#### Electrical durability (in millions of operating cycles, conforming to IEC 60947-5-1)

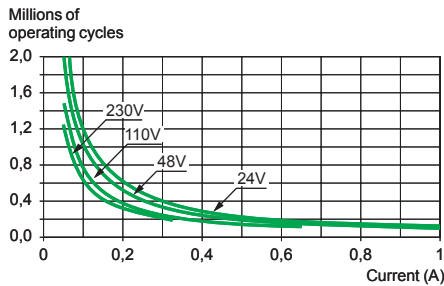
ABE 7E16SRM20

d.c. loads

DC 12 curves (1)

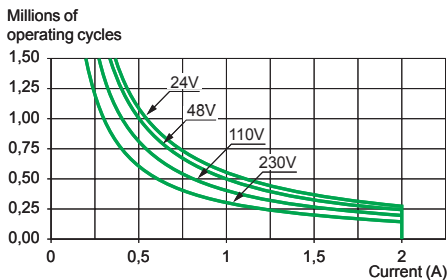


DC 13 curves (2)

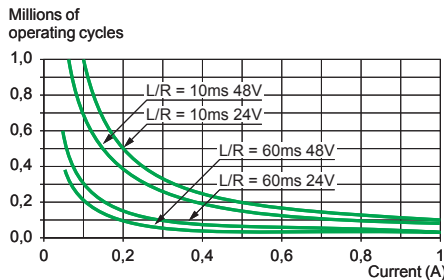


a.c. loads

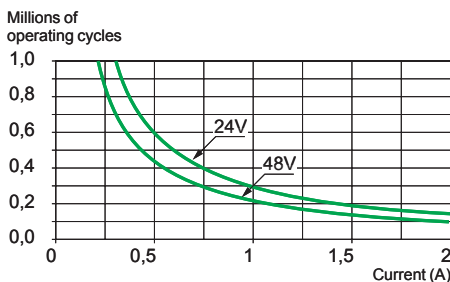
AC 12 curves (3)



AC 14 curves (4)



AC 15 curves (5)



- (1) DC 12: control of resistive loads and of solid state loads isolated by optocoupler,  $L/R \leq 1$  ms.
- (2) DC 13: control of electromagnets,  $L/R \leq 2 \times (U_e \times I_e)$  in ms,  $U_e$ : Rated operational voltage,  $I_e$ : rated operational current (with a protective diode on the load, DC12 curves must be used with a coefficient of 0.9 applied to the number in millions of operating cycles)
- (3) AC 12: control of resistive loads and of solid state loads isolated by optocoupler,  $\cos \varphi \leq 0.9$ .
- (4) AC 14: control of small electromagnetic loads  $\leq 72$  VA, make:  $\cos \varphi = 0.3$ , break:  $\cos \varphi = 0.3$ .
- (5) AC 15: control of electromagnetic loads  $> 72$  VA, make:  $\cos \varphi = 0.7$ , break:  $\cos \varphi = 0.4$ .

# Modicon M238 logic controller

Connection interfaces

Modicon Telefast ABE 7 pre-wired system

Connection sub-bases for discrete I/O extension modules



ABE 7E16EPN20



ABE 7E16SRM20

## References

### For discrete I/O extension modules

Number of inputs	Type of inputs	Compatibility	LED per channel	Fuse	Reference	Weight kg
16	Sink --- 24 V	TM2 DDI16DK/DDI32DK	No	No	<b>ABE 7E16EPN20</b>	0.430

Number of outputs	Type of outputs	Compatibility	LED per channel	Fuse	Reference	Weight kg
16	Source --- 24 V	TM2 DDO16TK/DDO32TK	No	No	<b>ABE 7E16SPN20</b>	0.450
			Yes	Yes	<b>ABE 7E16SPN22</b>	0.450
			No	No	<b>ABE 7E16SRM20</b>	0.430
	Relais --- 24/~ 250 V, DDO16TK/DDO32TK 3 A	TM2				

### Connection cordset for discrete I/O extension modules

Type of signal	Compatibility	Type of connection		Gauge/ C.s.a.	Length (1)	Reference	Weight kg
		TM2 side	Telefast side				
Discrete inputs/ outputs	TM2 DDI16DK/ DDI32DK/ DDO16TK/ DDO32TK	HE 10 20-ways	HE 10 20-ways	AWG 28 0.08 mm <sup>2</sup>	0,5 m	<b>ABF T20E050</b>	0.060
					1 m	<b>ABF T20E100</b>	0.080
					2 m	<b>ABF T20E200</b>	0.140

### Accessories

Description	Number of shunted terminals	Characteristics	Sold in lots of	Unit reference	Weight kg
Optional snap-on terminal blocks	20	–	5	<b>ABE 7BV20</b>	0.060
	12 + 8	–	5	<b>ABE 7BV20TB</b>	0.060
Quick-blow fuses for ABE 7E16SPN22 sub-bases 5 x 20, 250 V, UL	–	0.125 A	10	<b>ABE 7FU012</b>	0.010
	–	0.315 A	10	<b>ABE 7FU030</b>	0.010
	–	1 A	10	<b>ABE 7FU100</b>	0.010
	–	2 A	10	<b>ABE 7FU200</b>	0.010

(1) For lengths > 2 m, please contact us.

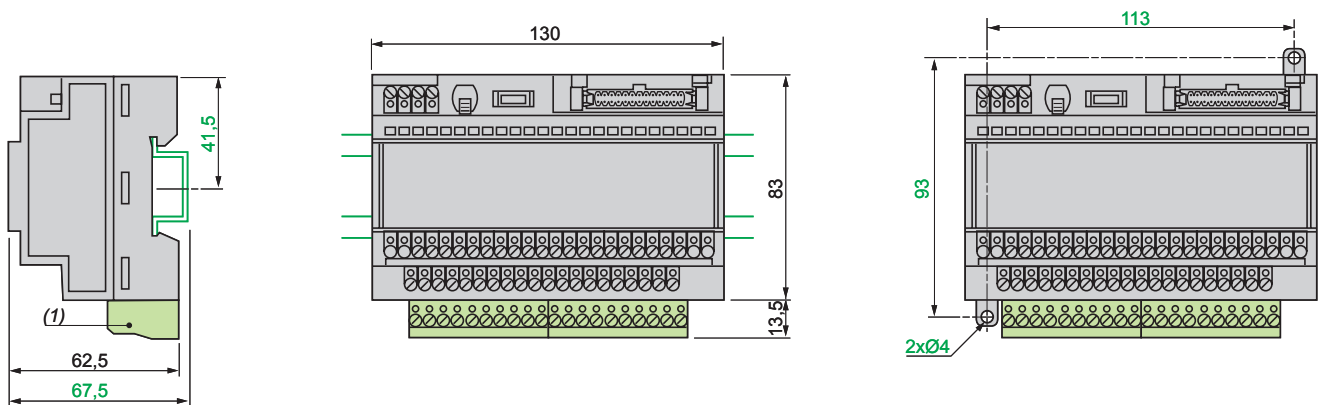
#### References (continued)

Separate for connection components							
Description	Type	Compatibility	Reference	Weight			
Connectors Sold in lots of 5	HE 10 female	TM2	TWD FCN2K20	—			
	20-ways	DDI16DK/32DK/ DDO16TK/32TK					
Screw terminal blocks Sold in lots of 2	10-ways	TM2	TWD FBT2T10	—			
	11-ways	DDI●DT/DAI8DT/ DDO8●T/DRA●RT					
		TM2	TWD FTB2T11	—			
		DMM8DRT/AMI●●T/ARI8HT					
Type of signal	Compatibility	Type of connection		Gauge/ C.s.a.	Length (1)	Reference	Weight
Cables for discrete I/O	TM2	HE 10	Bare wires	AWG 22	3 m	TWD FCW30K	0.405
		20-ways		0.035 mm <sup>2</sup>	5 m	TWD FCW50K	0.670
		DDO16TK/32TK					
Pre-formed cable, rolled	20 conducteurs	—	—	AWG 28	20 m	ABF C20R200	1.310
				0.08 mm <sup>2</sup>			

#### Dimensions

ABE 7E16SPN22, ABE 7E16SRM20

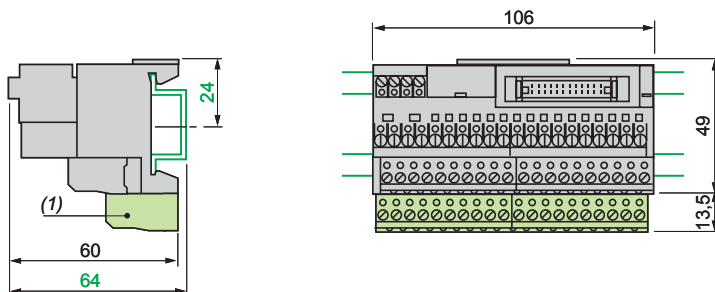
Mounting on 35 mm L rail or screw fixing (retractable lugs)



(1) ABE 7BV20, ABE 7BV20TB.

ABE 7E16EPN20, ABE 7E16SPN20

Mounting on 35 mm L rail



(1) ABE 7BV20, ABE 7BV20TB.



# Modicon M238 logic controller

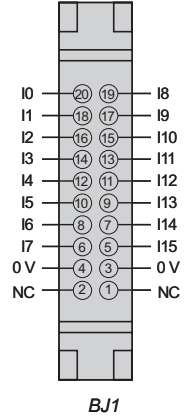
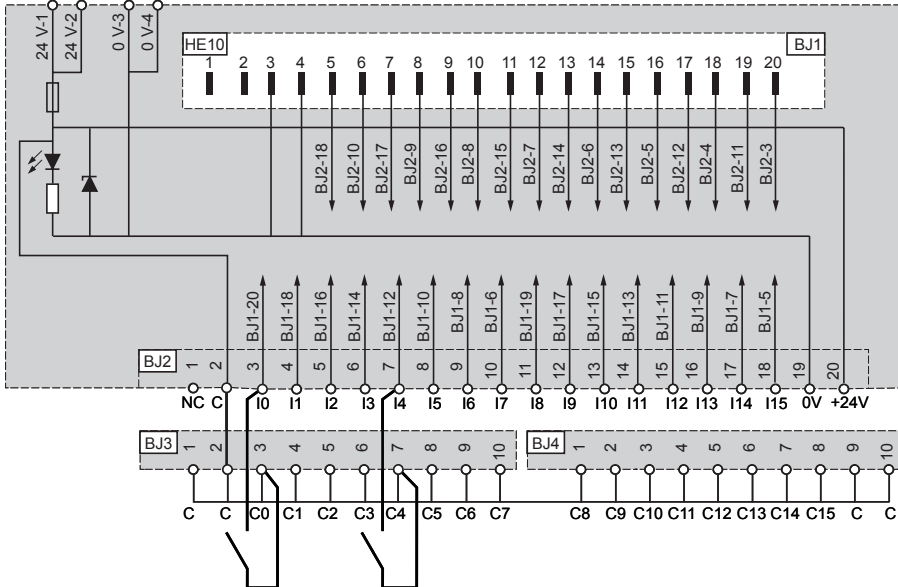
Connection interfaces

Modicon Telefast ABE 7 pre-wired system

Connection sub-bases for discrete I/O extension modules

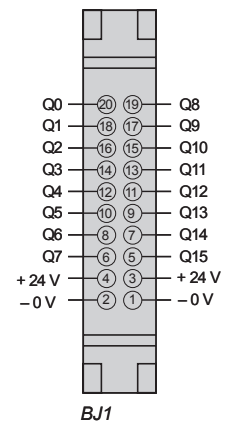
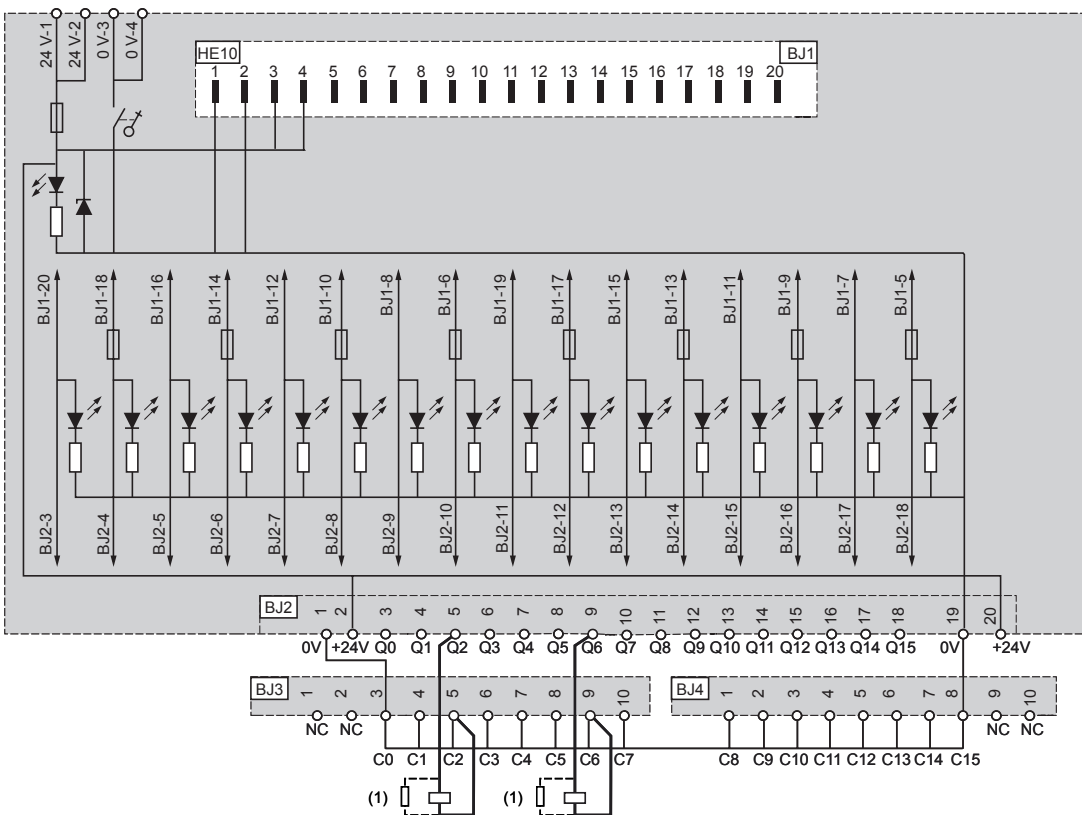
## ABE 7E16EPN20

HE10, 20-way



## ABE 7E16SPN22

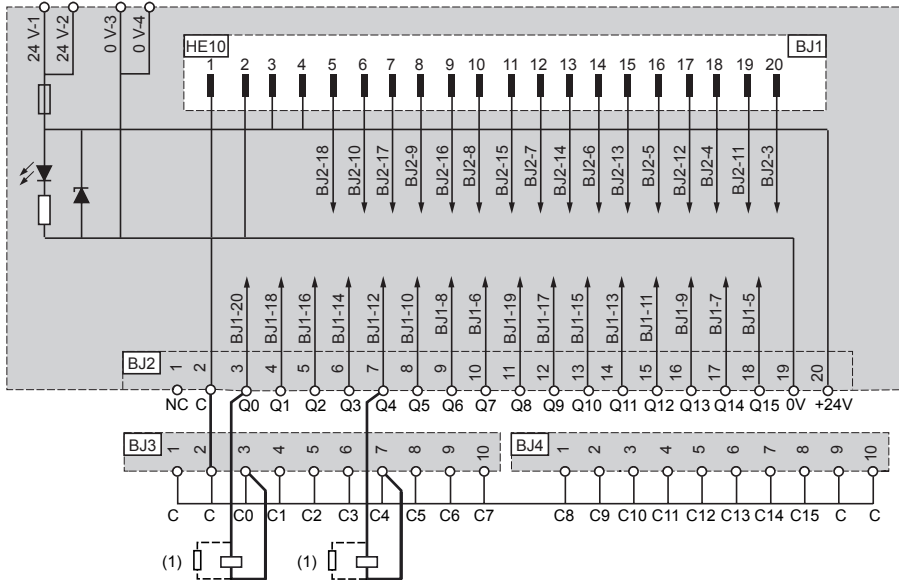
HE10, 20-way



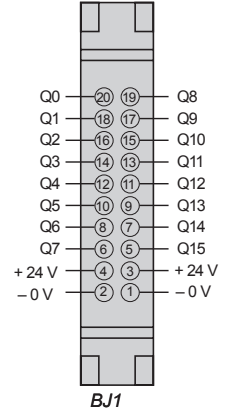
(1) Example of output connections.

When connecting an inductive load, include a diode or a varistor.

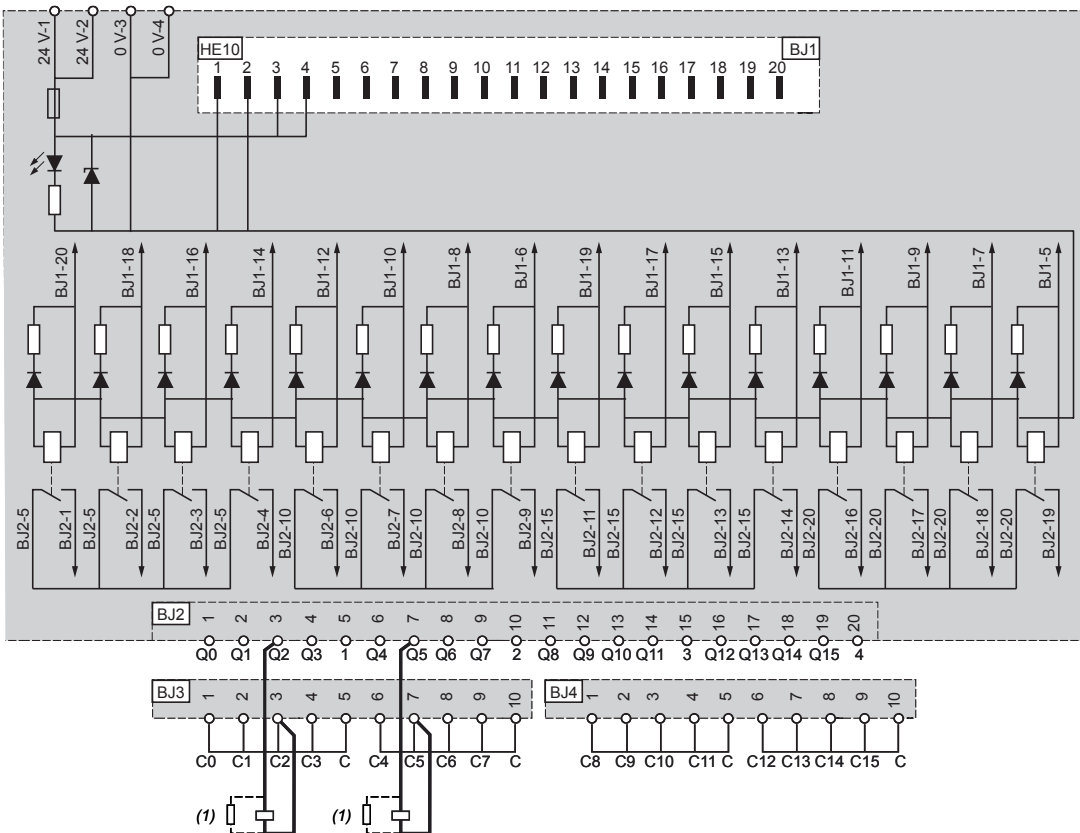
#### ABE 7E16SPN20



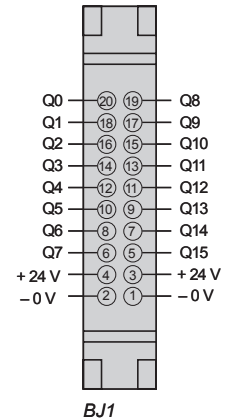
HE10, 20-way



#### ABE 7E16SRM20



HE10, 20-way



(1) Example of output connections.

When connecting an inductive load, include a diode or a varistor.

# Modicon M238 logic controller

## Discrete inputs modules and OsiSense® XS inductive proximity sensors

Temporary version

OsiSense® XS inductive proximity sensors			Logic controller		I/O extension modules	
			TM238 LDD24DT, TM238 LDA24DR, TM238 LFDC24DT, TM238 LFAC24DR		TM2 DDI8DT	
			6 standard inputs	8 HSC inputs	8 inputs	
			24 VCC Sink/Source	24 VCC Sink	24 VCC Sink/Source	
			Type 1	Type 1	Type 1	
2 wires	~	XS1●●BLFA				
		XS7/8 C40FP				
		⋮	XS7 J/F			
			XS7 C/D/E			
	~ / ⋮	XS5 D/C A/B				
		XS7 T4DA				
		XS8 C/D/E				
		XS1/2 M●●M				
		XS6●●B1/B4M				
		XS2●●S/AMA				
	~ / ⋮	XS4 230				
		XSAV●V1●801				
		XS7/8 C40M				
		XS7/8G12MA				
3 wires		PNP	XS8 C/D/E A1P			
			XS7 C/D/E/J/F A1P			
	XS1 P 349					
	XS5 B1P					
	XS4 P 340					
	XS2●●S/AAP●					
	XS1/2 N06 P					
	XS1/2 L/N 04/05 P					
	XS6●●B1/4P					
	XS4 P 370					
	XS6 B2P					
	XS1/2●●A/BLP					
	XS1/208A/BLP					
	XS1 M18PAS4/20					
XSAV1●373						
XS7/8 G12P 140						
4 wires NO + NC	PNP	XS7/8 G12P 440				
		XS7/8 C40P 440/9				
		XS1/2 L/M/N P 410				
3 wires	NPN	XS8 C/D/E A1N				
		XS7 C/D/E/J/F A1N				
		XS1 N 349				
		XS5 B1N				
		XS4 N 340				
		XS2●●S/AAN●				
		XS1/2 N06 N				
		XS1/2 L/N 04/05 N				
		XS6●●B1/4N				
		XS4 N 370				
		XS6 B2N				
		XS1/2●●A/BLN				
		XS1/208A/BLN				
		XS7/8 G12N 140				
4 wires NO + NC	NPN	XS7/8 G12N 440				
		XS7/8 C40N 440/9				
		XS1/2 L/M/N N 410				
4 wires prog. NO/NC	PNP + NPN	XS1/2 M●●KP				
	PNP + NPN Factor 1	XS KP M40				

Compatible

Non compatible



# Modicon M238 logic controller

## Discrete inputs modules and OsiSense® XU photo-electric sensors

Temporary version

OsiSense® XU photo-electric sensors			Logic controller		I/O extension modules
			TM238 LDD24DT, TM238 LDA24DR, TM238 LFDC24DT, TM238 LFAC24DR		TM2 DDI8DT
			6 standard inputs	8 HSC inputs	8 inputs
			24 VCC Sink/Source	24 VCC Sink	24 VCC Sink/Source
			Type 1	Type 1	Type 1
2 wires	~ / ---	XULA			
solid-state output		XU2/5/8/9M			
3 wires	PNP	XUB0/1/2/4/5/9/ P S			
		XUM 1/5/6/9 P			
		XUK 1/2/5/9 P			
		XUX 1/2/5/9 P			
		XUB0/1/2/4/5/9/ P S			
		XUM2 P			
		XUM●A●PCN●●			
		XUM●B●●PN●●			
		XUM0 P			
		XUD A●P			
		XULH			
		XUAH			
		XUBT P			
		XU1/9/5N18P●			
		XU2P●●DL			
		XU2N18P●			
		XUVH			
		XUKC1P			
		XURC3/4P			
		XUKR1P			
		XU5M18U1			
		XUY LCCLAR●●P			
		XUY B/P ●●CO P			
3 wires	NPN	XUB0/1/2/4/5/9/ N S			
		XUM1/5/6/9 N			
		XUK1/2/5/9 N			
		XUX1/2/5/9 N			
		XUM2 N			
		XUM●A●NCN●●			
		XUM●B●●N ●●			
		XUM0 N			
		XUD A●N			
		XULJ			
		XUAJ			
		XUBT N			
		XU1/9/5N18N●			
		XU2N18N●			
		XUVJ			
		XUKC1N			
		XURC3/4N			
		XUKR1N			
		XUY LCCLAR●●N			
		XUY B/P ●●CO N			
3 wires	PNP/NPN	XUC9/8AK			
		XUK8AK			
		XUC2AK			
		XUK0AKS			
		XUX0AKS			
		XUKT1K			
		XURU1			
		XURK0			
		XURK1			
		XUY PS			
		XUY P 952/4 S			
4 wires	PNP + NPN	XUMW1K			
		XUY FAL/P/V			
		XUY F			
		XUVF 30/60			
		XUV/Y F 120/180/250			
		XUVK			

Compatible

Non compatible



# Modicon M238 logic controller

## Discrete inputs modules and OsiSense® XG rotary encoders

Temporary version

OsiSense® XG rotary encoders		Logic controller		I/O extension modules	
		TM238 LDD24DT, TM238 LDA24DR, TM238 LFDC24DT, TM238 LFAC24DR		TM2 DDI8DT	
		6 standard inputs	8 HSC inputs	8 inputs	
		24 VCC Sink/Source	24 VCC Sink	24 VCC Sink/Source	
		Type 1	Type 1	Type 1	
Incremental encoders	5V, RS 422	XCC 14●●●●R		RS 422 (5 V)	
	Push/pull 11...30 V	XCC 14●●●●K			
	5V, RS 422	XCC 19●●●●RN		RS 422 (5 V)	
	Push/pull 11...30 V	XCC 19●●●●KN			
	5V, RS 422	XCC 15●●●●X		RS 422 (5 V)	
	Push/pull 11...30 V	XCC 15●●●●Y			
	5V, RS 422	XCC 15●●●●M●●●X		RS 422 (5 V)	
Push/pull 11...30V	XCC 15●●●●M●●●Y				
Absolute encoders	Push/pull 11...30 V	XCC 25●●●●KB (N) / KG (N)			
	SSI output without parity, clock 13 or 25 bits	XCC 25●●●●SB (N) / SG (N)		SSI	
	Push/pull 11...30 V	XCC 29●●●●KB (N) / KG (N)			
	SSI output without parity, clock 13 or 25 bits	XCC 29●●●●SB (N) / SG (N)		SSI	
	SSI output without parity, clock 13 or 25 bits	XCC 35●●●●SB (N) / SG (N) XCC 39●●●●SB (N) / SG (N)		SSI	
	11...30 V, CanOpen	XCC 35●●●●CB		(CanOpen)	
	11...30 V, Profibus	XCC 35●●●●FB		(Profibus)	

Compatible

Non compatible

Compatible with --- 100 Hz max. frequency

						Counter modules
TM2 DAI8DT	TM2 DDI16DT	TM2 DDI16DK	TM2 DDI32DK	TM2 DMM8DRT	TM2 DMM24DRF	TM200 HSC 206DT/DF
8 inputs	16 inputs	16 HE10 inputs	32 HE10 inputs	4 inputs	16 spring terminal inputs	3 high-speed inputs
120 VAC	24 VCC Sink/Source	24 VCC Sink/Source	24 VCC Sink/Source	24 VCC Sink/Source	24 VCC Sink/Source	24 VCC Sink
Type 1	Type 1	Type 1	Type 1	Type 1	Type 1	Type 1
						RS 422 (5 V)
						RS 422 (5 V)
						RS 422 (5 V)
						RS 422 (5 V)
						SSI
						SSI
						SSI
						SSI
						(CanOpen)
						(Profibus)



**Applications**

**Display of text messages**

**Type of terminal**

**Small Panels with keypad**



<b>Display</b>	Type
	Capacity

Green back-lit LCD, height 5.5 mm or Green, orange or red back-lit LCD, height 4.34...17.36 mm
2 lines of 20 characters or 1 to 4 lines of 5 to 20 characters

**Data entry**

Via keypad with  
8 keys (4 customisable)

<b>Memory capacity</b>	Application
	Expansion by PCMCIA type II

512 KB Flash
–

<b>Functions</b>	Maximum number of pages
	Variables per page
	Representation of variables
	Recipes
	Curves
	Alarm logs
	Real-time clock
	Alarm relay
	Buzzer

128/200 application pages 256 alarm pages
40...50
Alphanumeric
–
–
Depending on model
Access to the PLC real-time clock
–
–

<b>Communication</b>	Asynchronous serial link
	Downloadable protocols
	Printer link

RS 232C/RS 485
Uni-TE, Modbus and for PLC brands : Allen-Bradley, Omron, Mitsubishi, Siemens
RS 232C serial link (2)

<b>Development software</b>	Vijeo Designer Lite (on Windows XP and Vista)
<b>Operating system</b>	Magelis

Vijeo Designer Lite (on Windows XP and Vista)
Magelis

**Terminal type**

**XBT N**

**Pages**

Please, consult our catalogue "Human/Machine interfaces"

- (1) Only XBT RT511.
- (2) Depending on model.

Display of text messages Control and parametering of data	Display of text messages and/or semi-graphics Control and parametering of data
--	---

Small Panels with keypad	Small Panels with touch screen and keypad
--------------------------	---



Green, orange or red back-lit LCD, height 4.34...17.36 mm	Green, orange or red back-lit LCD (198 x 80 pixels), height 4...16 mm
1 to 4 lines of 5 to 20 characters	2 to 10 lines of 5 to 33 characters

Via keypad with 12 function keys or numeric entry (depending on context) + 8 service keys	Via keypad with 4 function keys 8 service keys	Via touch screen and keypad with 10 function keys 2 service keys
---	--	--

512 KB Flash -	512 KB Flash EPROM -
-------------------	-------------------------

128/200 application pages 256 alarm pages 40...50 Alphanumeric - - Yes Access to the PLC real-time clock - -	200 application pages 256 alarm pages 50 Alphanumeric, bargraph, buttons, lights - Yes Yes Yes (1)
---	---

RS 232C/RS 485 Uni-TE, Modbus and for PLC brands : Allen-Bradley, Omron, Mitsubishi, Siemens RS 232C serial link (2)
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Vijeo Designer Lite (on Windows XP and Vista) Magelis
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XBT R	XBT RT
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Please, consult our catalogue "Human/Machine interfaces"

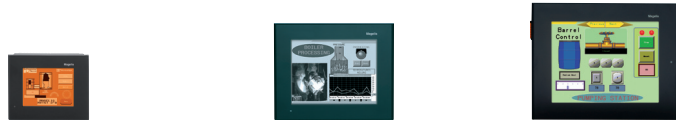
# Modicon M238 logic controller

## Operator dialogue terminals

### Magelis Advanced Panels XBT GT, XBT GK, XBT GH and XBT GTW

<b>Applications</b>	<b>Display of text messages, graphic objects and synoptic views</b> <b>Control and parametering of data</b>
---------------------	--

<b>Type of terminal</b>	<b>Touch screen Advanced Panels</b>
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<b>Display</b>	Type	Back-lit monochrome (amber or red mode) STN LCD (320 x 240 pixels) or TFT LCD	Back-lit monochrome or colour STN LCD or back-lit colour TFT LCD (320 x 240 pixels)	Back-lit colour STN LCD or TFT LCD (640 x 480 pixels)
	Size	3.8" (monochrome or colour)	5.7" (monochrome or colour)	7.5" (colour)

<b>Data entry</b>	Via touch screen
Static function keys	–
Dynamic function keys	–
Service keys	–
Alphanumeric keys	–

<b>Memory capacity</b>	Application	32 MB Flash EPROM	16 MB Flash EPROM	32 MB Flash EPROM
	Expansion	–	By 128, 256, 512 MB, 1, 2 or 4 GB CF card (except XBT GT2110)	

<b>Functions</b>	Maximum number of pages	Limited by internal Flash EPROM memory capacity	Limited by internal Flash EPROM memory capacity or CF card memory capacity	
	Variables per page	Unlimited (8000 variables max.)		
	Representation of variables	Alphanumeric, bitmap, bargraph, gauge, tank, tank level indicator, curves, polygon, button, light		
	Recipes	32 groups of 64 recipes comprising 1024 ingredients max.		
	Curves	Yes, with log		
	Alarm logs	Yes		
	Real-time clock	Built-in		
	Digital inputs/outputs	–	1 input (reset) and 3 outputs (alarm, buzzer, run)	
	Multimedia inputs/outputs	–	1 audio input (microphone), 1 composite video input (digital or analogue camera), 1 audio output (loudspeaker) (1)	

<b>Communication</b>	Downloadable protocols	Uni-TE (2), Modbus, Modbus TCP/IP (1) and for PLC brands: Mitsubishi, Omron, Allen-Bradley and Siemens		
	Asynchronous serial link	RS 232C/RS 485 (COM1)	RS 232C/RS 422/485 (COM1) and RS 485 (COM2)	
	USB ports	1	1	2
	Bus and networks	–	Modbus Plus and Fipway with USB gateway, Profibus DP and Device Net with optional card	
		Ethernet TCP/IP (10BASE-T/100BASE-TX) (1)		
	Printer link	USB port for parallel printer	RS 232C (COM1) serial link, USB port for parallel printer	

<b>Development software</b>	Vijeo Designer (on Windows XP and Vista)		
<b>Operating system</b>	Magelis (200 MHz RISC CPU)	Magelis (133 MHz RISC CPU)	Magelis (266 MHz RISC CPU)

<b>Terminal type</b>	<b>XBT GT11/13</b>	<b>XBT GT21/22/23</b>	<b>XBT GT42/43</b>
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<b>Pages</b>	Please, consult our catalogue "Human/Machine interfaces" (1) Depending on model. (2) Uni-TE version V2 for Twido controller and TSX Micro/Premium platform.
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## Touch screen Advanced Panels



Back-lit colour STN LCD or TFT LCD  
(640 x 480 pixels)

10.4" (colour)



Back-lit colour TFT LCD (800 x 600 pixels)

12.1" (colour)



Back-lit colour TFT LCD (1024 x 768 pixels)

15" (colour)

Via touch screen

–  
–  
–  
–

32 MB Flash EPROM

By 128, 256, 512 MB, 1, 2 or 4 GB Compact Flash card

Limited by internal Flash EPROM memory capacity or CF card memory capacity

Unlimited (8000 variables max.)

Alphanumeric, bitmap, bargraph, gauge, tank, tank level indicator, curves, polygon, button, light

32 groups of 64 recipes comprising 1024 ingredients max.

Yes, with log

Yes

Built-in

1 input (reset) and 3 outputs (alarm, buzzer, run)

1 audio input (microphone), 1 composite video input (digital or analogue camera), 1 audio output (loudspeaker) (1)

Uni-TE (2), Modbus, Modbus TCP/IP (1) and for PLC brands: Mitsubishi, Omron, Allen-Bradley and Siemens

RS 232C/RS 422/485 (COM1) and RS 485 (COM2)

2

Modbus Plus with USB gateway

Ethernet TCP/IP (10BASE-T/100BASE-TX)

RS 232C (COM1) serial link, USB port for parallel printer

Vijeo Designer (on Windows XP and Vista)

Magelis

(266 MHz RISC CPU)

**XBT GT52/53**

**XBT GT63**

**XBT GT73**

Please, consult our catalogue "Human/Machine interfaces"

# Modicon M238 logic controller

## Operator dialogue terminals

Magelis Advanced Panels XBT GT, XBT GK, XBT GH and XBT GTW

**Applications**

Display of text messages, graphic objects and synoptic views  
Control and parametering of data

**Type of terminal**

Advanced Panels with keypad



<b>Display</b>	Type
	Size

Colour TFT LCD (320 x 240 pixels) or monochrome STN LCD	Colour TFT LCD (640 x 480 pixels)
5.7" (monochrome or colour)	10.4" (colour)

<b>Data entry</b>	Static function keys
	Dynamic function keys
	Service keys
	Alphanumeric keys

Via keypad and/or touch screen (configurable) and/or by industrial pointer	
10	12
14	18
8	
12	

<b>Memory capacity</b>	Application
	Expansion

16 MB Flash EPROM	32 MB Flash EPROM
By 128, 256, 512 MB, 1, 2 or 4 GB Compact Flash card	

<b>Functions</b>	Maximum number of pages
	Variables per page
	Representation of variables
	Recipes
	Curves
	Alarm logs
	Real-time clock
	Digital inputs/outputs
	Multimedia inputs/outputs

Limited by internal Flash EPROM memory capacity or CF card memory capacity	
Unlimited (8000 variables max.)	
Alphanumeric, bitmap, bargraph, gauge, tank, tank level indicator, curves, polygon, button, light	
32 groups of 64 recipes comprising 1024 ingredients max.	
Yes, with log	
Yes	
Built-in	
-	1 input - 3 outputs
-	-

<b>Communication</b>	Downloadable protocols
	Asynchronous serial link
	USB ports
	Bus and networks
	Printer link

Uni-TE (2), Modbus, Modbus TCP/IP (1) and for PLC brands: Mitsubishi, Omron, Allen-Bradley and Siemens	
RS 232C/RS 422/485 (COM1) RS 485 (COM2)	
1	2
Modbus Plus, Fipway with USB gateway, Profibus DP and Device Net with optional card	
Ethernet TCP/IP (10BASE-T/100BASE-TX)	
RS 232C (COM1) serial link, USB port for parallel printer	

<b>Development software</b>
<b>Operating system</b>

Vijeo Designer (on Windows XP and Vista)
Magelis (266 MHz RISC CPU)

**Terminal type**

**XBT GK 21/23** | **XBT GK 53**

**Pages**

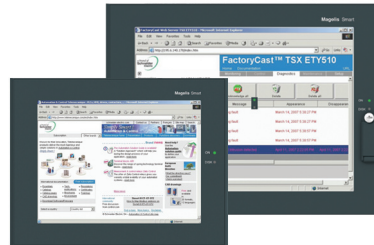
Please, consult our catalogue "Human/Machine interfaces"

(1) Depending on model.  
(2) Uni-TE version V2 for Twido controller and TSX Micro/Premium platform.

**Display of text messages, graphic objects and synoptic views  
Control and parametering of data**

**Portable Advanced Panels**

**Open touch screen Advanced Panels**



Colour TFT LCD (640 x 480 pixels)	Colour TFT LCD (800 x 600 pixels)	Colour TFT LCD (800 x 600 pixels)	Colour TFT LCD (1024 x 768 pixels)
5.7" (colour)	8.4" (colour)	12" (colour)	15" (colour)
Via touch screen	Via touch screen		
11	–		
–	–		
–	–		
–	–		
32 MB Flash EPROM	1 GB CF system card included with terminal, expandable to 4 GB	2 GB CF system card included with terminal, expandable to 4 GB	
By 128, 256, 512 MB, 1, 2 or 4 GB Compact Flash card			
Limited by internal Flash EPROM memory capacity or CF card memory capacity			
Unlimited (8000 variables max.)			
Alphanumeric, bitmap, bargraph, gauge, tank, tank level indicator, curves, polygon, button, light			
32 groups of 64 recipes comprising 1024 ingredients max.			
Yes, with log			
Yes			
Built-in			
–			
1 audio output			
Uni-TE (2), Modbus, Modbus TCP/IP and for PLC brands: Mitsubishi, Omron, Rockwell Automation and Siemens	Uni-TE (2), Modbus, Modbus TCP/IP (1) and for PLC brands: Mitsubishi, Omron, Allen-Bradley and Siemens		
RS 232C/RS 422-485 (COM1)	RS 232C (COM1) RS 232C (COM2)	RS 232C (COM1)	RS 232C (COM1) RS 232C (COM2)
1	4	4 + 1 front mounted	
–	Modbus Plus with USB gateway		
1 Ethernet port (10BASE-T/100BASE-TX)	1 Ethernet TCP/IP port (10BASE-T/100BASE-TX) and 1 Ethernet port (10BASE-T/100BASE-TX/1 GB)		
–	RS 232C (COM1 or COM2) serial link, USB port for parallel printer		
Vijeo Designer (on Windows XP and Vista)			
Magelis (266 MHz RISC CPU)	Windows XP Embedded		

**XBT GH 2460**

**XBT GTW 450**

**XBT GTW 652**

**XBT GTW 750**

Please, consult our catalogue "Human/Machine interfaces"

(1) Depending on model.

(2) Uni-TE version V2 for Twido controller and TSX Micro/Premium platform.

# Modicon M238 logic controller

## Power supplies for DC control circuits

### Phaseo power supplies

**Power supplies**

**Regulated switch mode**  
Phaseo Modular range and Optimum range industrial power supplies



<b>Input voltage</b>	
<b>Connection to world-wide line supplies</b>	United States - 120 V (in phase-to-neutral) - 240 V (in phase-to-phase) Europe - 230 V (in phase-to-neutral) - 400 V (in phase-to-phase) United States - 277 V (in phase-to-neutral) - 480 V (in phase-to-phase)

100...240 V ~ 120...250 V ---
Single-phase (N-L1) or 2-phase (L1-L2) connection
Single-phase (N-L1) connection
–

<b>IEC 61000-3-2 conformity</b>
<b>Protection against undervoltage</b>
<b>Protection against overloads and short-circuits</b>
<b>Diagnostic relay</b>
<b>Compatibility with function modules</b>
<b>Power reserve (Boost)</b>

Yes for ABL 7RP, not for ABL 8REM and not applicable for ABL 8MEM and ABL 7RM	
Yes	
Yes, voltage detection. Automatic restart on elimination on the fault	
–	
–	
1,25 to 1,4 I <sub>n</sub> during 1 minute, depending on model (with ABL 8MEM)	No

<b>Output voltage</b>	
<b>Output current</b>	0.3 A 0.6 A 1.2 A 2 A 2.5 A 3 A 4 A 4.8 A 5 A 6 A 10 A 20 A 40 A

5 V ---	12 V ---	24 V ---	48 V ---
		ABL 8MEM24003 (Modular)	
		ABL 8MEM24006 (Modular)	
		ABL 8MEM24012 (Modular)	
	ABL 8MEM12020 (Modular)		
		ABL 7RM24025 (Modular)	ABL 7RP4803 (Optimum)
		ABL 8REM24030 (Optimum)	
ABL 8MEM05040 (Modular)			
	ABL 7RP1205 (Optimum)	ABL 8REM24050 (Optimum)	

**Pages**

Please, consult our catalogue "Phaseo, Power supplies & transformers"

**Regulated switch mode**  
Phaseo Universal range industrial power supplies

**Regulated switch mode**  
Phaseo range AS-Interface for AS-Interface cabling system



100...120 V ~ and 200...500 V ~ (1)	380...500 V ~	24 V ---	100...240 V
Single-phase (N-L1) or 2-phase (L1-L2) connection	–	–	Single-phase (N-L1) connection
	3-phase (L1-L2-L3) connection	–	Single-phase (N-L1) connection
	3-phase (L1-L2-L3) connection	–	–
Yes		–	No
Yes		–	Yes
Yes, current limitation or undervoltage detection		Yes, current limitation	Yes
Yes, depending on model			–
Yes with buffer module, battery and battery control modules, redundancy module and discriminating downstream protection module			–
1,5 In during 4 secondes		No	No
24 V ---	5 V ---	7...12 V ---	30 V ---
		<b>ABL 8DCC12020 (2)</b>	
			<b>ASI ABLB3002 ASI ABLD3002 (3) ASI ABLM3024 (4)</b>
<b>ABL 8RPS24030</b>			<b>ASI ABLM3024 (4)</b>
			<b>ASI ABLB3004 ASI ABLD3004 (3)</b>
<b>ABL 8RPS24050</b>			
		<b>ABL 8DCC05060 (2)</b>	
<b>ABL 8RPS24100</b>			
<b>ABL 8RPM24200</b>	<b>ABL 8WPS24200</b>		
	<b>ABL 8WPS24400</b>		

Please, consult our catalogue "Phaseo, Power supplies & transformers"

(1) Except **ABL 8RPM24200**. ~ 100...120 V and ~ 200...240 V.

(2) ---/--- converter module, requires to be associated with the Phaseo Universal range power supply.

(3) With earth fault detection.

(4) One output 30 V --- and one output 24 V --- ± 5 %.



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