



## Main

Range of product	Modicon M238 logic controller
Product or component type	Compact base
Product specific application	-
Discrete I/O number	24
Discrete input number	8 fast input conforming to EN/IEC 61131-2 type 1 6 input conforming to EN/IEC 61131-2 type 1
Discrete input voltage	24 V
Discrete input voltage type	DC
Discrete output number	6 relay output 4 solid state output
Discrete output voltage	240 V AC relay output 24 V DC solid state output 24 V DC relay output
Number of I/O expansion module	7
[Us] rated supply voltage	110...240 V AC
Memory description	Internal RAM 1000 kB
Data backed up	Variables of type retain and retain persistent optional battery lithium thionyl chloride (TSXPLP01) 1 year Variables of type retain and retain persistent internal battery 3 days 22 hrs 10 yr
Mounting support	35 mm symmetrical DIN rail Panel

## Complementary

Discrete input logic	Sink or source (positive/negative) input Positive logic (sink) fast input
Number of common point	4 relay output 4 fast input 1 solid state output 1 input
Sensor power supply	19.2...30 V DC
Voltage state1 guaranteed	>= 15 V input/fast input
Current state 1 guaranteed	>= 2 mA input/fast input
Voltage state 0 guaranteed	<= 5 V input/fast input
Current state 0 guaranteed	<= 1.5 mA input/fast input
Discrete input current	8 mA fast input 10.4 mA input
Input impedance	3 kOhm fast input 2.3 kOhm input
Response time	300 ns fast input 3 ms input 0.25 ms solid state output
Configurable filtering time	4 ms fast input 2 ms fast input 1 ms fast input 0.4 ms fast input 0.004 ms fast input
Anti bounce filtering	4 ms configurable input/fast input 12 ms configurable input/fast input 1.5 ms configurable input/fast input 0 ms configurable input/fast input

Input frequency	<= 100 kHz input <= 100 kHz fast input (normal mode) <= 100 kHz fast input (counter mode)
Cable length	<= 30 m solid state output <= 30 m relay output <= 30 m input <= 30 m fast input (normal mode) <= 10 m shielded cable fast input (counter mode)
Isolation between channels and internal logic	500 V DC solid state output 500 V AC relay output
Isolation between channels	None input 500 V solid state output 500 V for group of 2 fast inputs
Discrete output logic	Positive logic (source)
Output voltage limits	30 V relay output 250 V relay output 19.2...30 V solid state output
Discrete output current	5 A relay output Q9 20...500 mA solid state output 2 A relay output Q4...Q8
Output frequency	<= 100 kHz solid state output
Leakage current	< 2 mA solid state output
[Ures] residual voltage	< 2 V solid state output
Tungsten load	< 3 W solid state output
Short-circuit protection	With solid state output
Overvoltage protection	With solid state output
Overload protection	With solid state output
Minimum load	10 mA 5 V DC relay output
Contact resistance	<= 50 $\mu$ Ohm
Load current	5 A 30 V DC inductive <= 1800 cyc/mn relay output Q9 5 A 240 V AC inductive <= 1800 cyc/mn relay output Q9 2 A 30 V DC resistive <= 600 cyc/mn relay output Q4...Q8 2 A 240 V AC resistive <= 600 cyc/mn relay output Q4...Q8
Mechanical durability	>= 20000000 cycles relay output
Electrical durability	>= 500000 cycles relay output Q9 >= 100000 cycles relay output Q4...Q8
Input/Output number	<= 248 HE-10 connector with I/O expansion module <= 192 spring terminal block with I/O expansion module <= 136 removable screw terminal block with I/O expansion module
Supply voltage limits	85...264 V
Inrush current	<= 35 A
Power consumption in W	<= 42 W 264 V <= 25 W 100 V
Insulation resistance	> 10 MOhm at 500 V, between supply and earth terminals > 10 MOhm at 500 V, between I/O and earth terminals
Exact time for 1 Kinstruction	0.3 ms 70 % Boolean + 30 % fixed arithmetic
Execution time per instruction	7.25 $\mu$ s arithmetic REAL floating by operation 5111 $\mu$ s arithmetic REAL floating +, -, x operations 0.971 $\mu$ s Boolean 0.648 $\mu$ s arithmetic REAL floating LD and ST 0.506 $\mu$ s arithmetic DINT double-word +, -, x operations 0.459 $\mu$ s arithmetic DINT double-word LD and ST 0.439 $\mu$ s arithmetic INT word +, -, x operations 0.42 $\mu$ s arithmetic INT word LD and ST
Exct time for event task	0.95 ms arithmetic DINT double-word >= 0.75 ms arithmetic INT word <= 1.75 ms arithmetic REAL floating
System overhead	0.9 ms master task (I/O) 0.35 ms master task (advanced counting) 0.2 ms master task (PTO) 0.15 ms master task (simple counting) 0.15 ms master task (PWM, frequency meter)
Input output assignment	Reading/Writing I/O on extension modules Reading/Writing I/O on CANopen bus Reading/Writing I/O on base

Application structure	1 configurable freewheeling/cyclic master task 2 configurable freewheeling/cyclic/event auxiliary tasks 32 levels of priority between tasks 4 interrupt tasks
Realtime clock	With 10 s/month at 25 °C
Integrated connection type	CANopen removable screw terminal block CANopen 1 isolated serial link female RJ45 Modbus master/slave RTU/ASCII, character mode or SoMachine-Network RS232/RS485 1.2...38.4 kbit/s (19.2 kbit/s by default) 1 isolated serial link female RJ45 Modbus master/slave RTU/ASCII or SoMachine-Network RS485 1.2...115.2 kbit/s (115.2 kbit/s by default)
Supply	Serial link supply 5 V 200 mA
CANopen feature profile	DR 303-1 DS 301 V4.02
Transmission rate	800 kbit/s 50 m CANopen 500 kbit/s 100 m CANopen 50 kbit/s 1000 m CANopen 425 kbit/s 125 m CANopen 250 kbit/s 250 m CANopen 125 kbit/s 500 m CANopen 1000 kbit/s 20 m CANopen
Positioning functions	HSC reflex 4 100 Hz
Counting input number	8 100 kHz 32 bits
Complementary function	Event processing PID
Marking	CE
Local signalling	1 LED SL2 1 LED SL1 1 LED PWR 1 LED per channel I/O state 1 LED module error (ERR) 1 LED CAN RUN 1 LED CAN ERR 1 LED Batt 1 LED RUN
Electrical connection	1 removable screw terminal block for connecting the 100-240 V AC power supply 1 removable screw terminal block (7 terminals) for connecting the sensors (inputs) 1 removable screw terminal block (6 terminals) for connecting the 4 preactuators (output) 1 removable screw terminal block (5 terminals) for connection to the CANopen bus 1 removable screw terminal block (12 terminals) for connecting the sensors (fast inputs) 1 removable screw terminal block (10 terminals) for connecting the 6 preactuators (output) 1 connector mini B USB 2.0 for a programming terminal
Product weight	0.595 kg

## Environment

Immunity to microbreaks	10 ms
Dielectric strength	1500 V for 1 minute, between supply and earth terminals 1500 V for 1 minute, between I/O and earth terminals
Class	Class M20 <= 16 CANopen
Product certifications	CSA CTick GOST UL
Ambient air temperature for operation	-10...55 °C
Ambient air temperature for storage	-40...70 °C
Relative humidity	95 % without condensation
IP degree of protection	IP20
Pollution degree	<= 2
Operating altitude	0...2000 m
Storage altitude	0...3000 m
Vibration resistance	1 gn 3.5 mm (f= 5...150 Hz)
Shock resistance	15 gn for 11 ms
Height	118 mm

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Depth	86 mm
Width	157 mm

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### Offer Sustainability

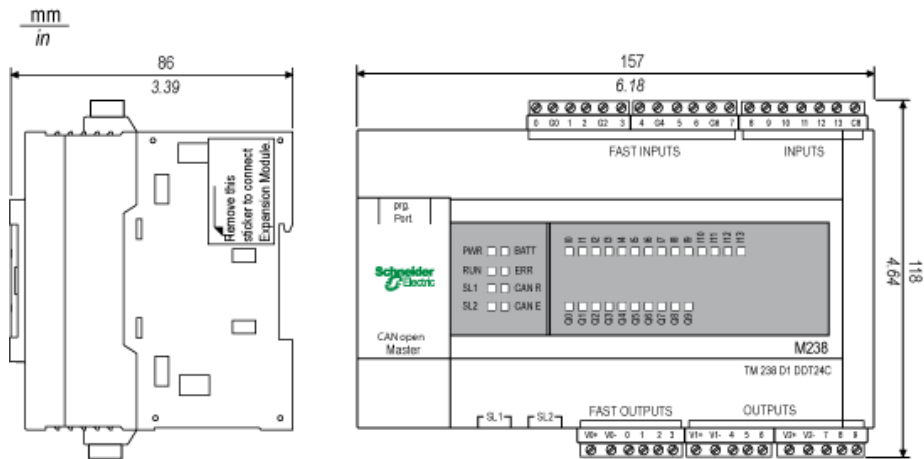
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Sustainable offer status	Not Green Premium product
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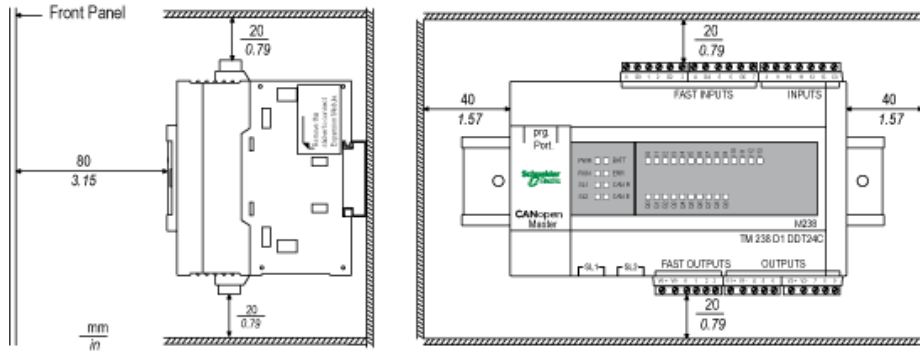
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Modicon M238 Logic Controller

Dimensions

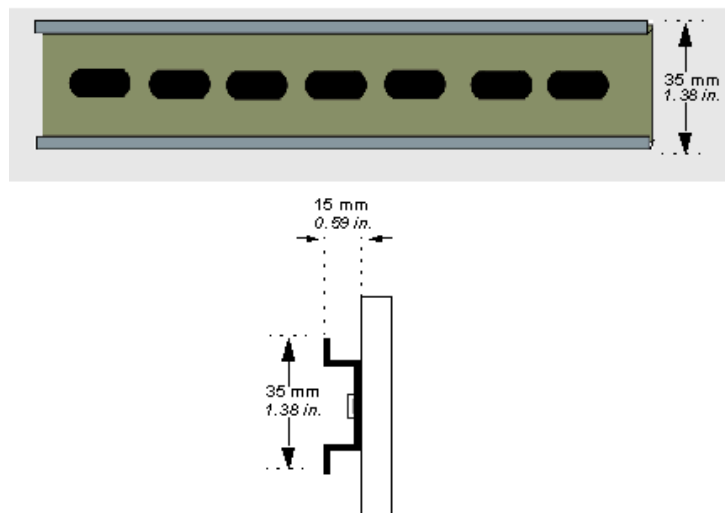


Clearance



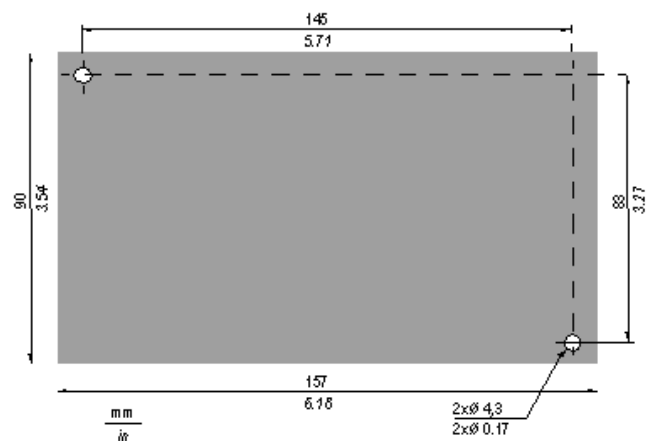
Mounting on a DIN Rail

Dimensions of the DIN Rail

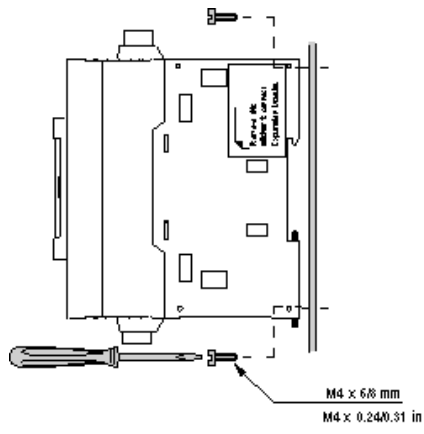


Mounting on a Metallic Panel

Mounting Holes

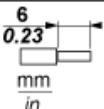

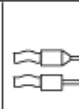






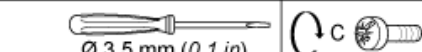

## Mounting the Modicon M238 Logic Controller on a Metallic Panel



## Wiring Requirements

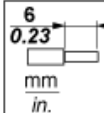

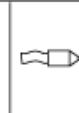

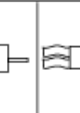
### Rules for Removable Screw Terminal Block

 6 0.23 mm in						
	mm <sup>2</sup>	0,2...1,5	0,25...1,5	0,2...1	0,2...1,5	0,25...1
AWG	24...14	24...14	26...16	24...14	24...16	20...14

 Ø 3,5 mm (0.1 in)	 C	N.m	0,6
		lb-in	5.3

Use copper conductors only.

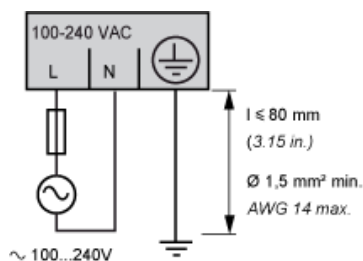
### Rules for Removable Spring Terminal Block

 6 0.23 mm in.				
	mm <sup>2</sup>	0,2...1,5	0,25...1,5	0,25...1
AWG	24...14	24...14	24...16	20...14

Use copper conductors only.

## AC Power Supply

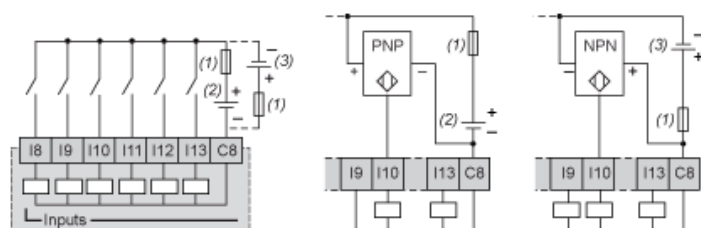
### Wiring Diagram



Use an external fuse 2 A type T (UL recognized and CSA approved).

## Regular Inputs

### Wiring Diagram

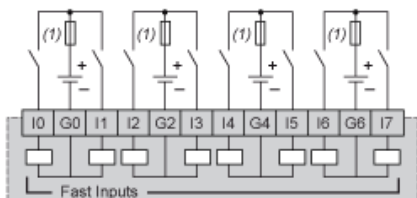


- (1) Fast-blow fuse 0.5 A
- (2) Sink input (positive logic)
- (3) Source input (negative logic)

## Fast Inputs



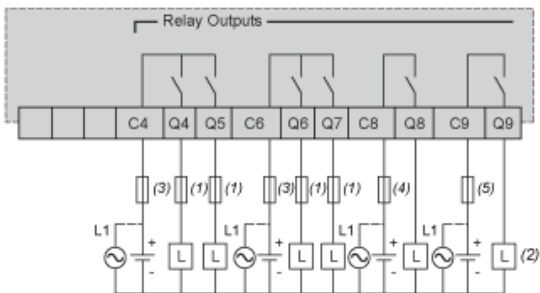
## Wiring Diagram



- (1) Fast-blow fuse 0.5 A

## Relay Outputs

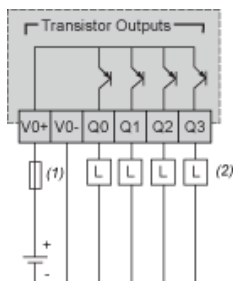
### Wiring Diagram



- (1) 2 A fast-blow fuse
- (2) Load protected against inductive charge
- (3) 4 A slow-blow fuse
- (4) 2 A slow-blow fuse
- (5) 5 A slow-blow fuse
- L1 All relays use the same phase across relay groups for alternate current connections

## Transistor Outputs

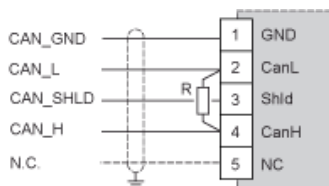
### Wiring Diagram



- (1) 2 A fast-blow fuse
- (2) Protection for inductive load

## CANopen Connection

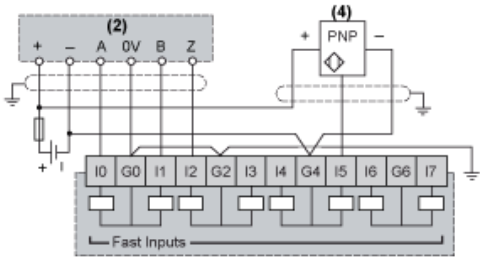
### Wiring Diagram



- R Line termination resistor (120 Ω)

## Wiring Diagram Examples for 1 Encoder on Fast Inputs

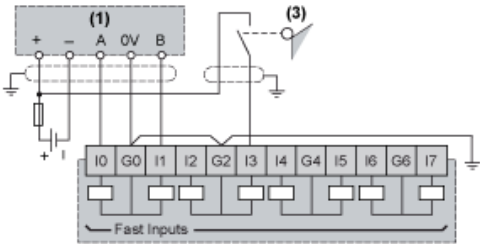
### Incremental Encoder with Phase-Shifted Signals with TDC and 3-Wire PNP Detector



- (2) Dual-phase encoder with index
- (4) PNP sensor

Use a 0.5 A fast-blow fuse.

### Incremental Encoder with Phase-Shifted Signals without TDC and Electromechanical Sensor

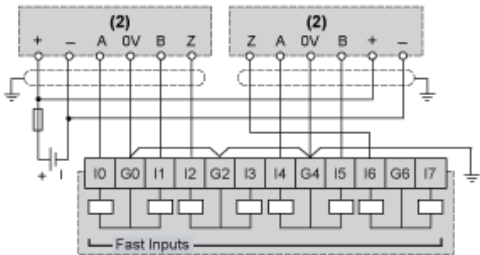


- (1) Dual-phase encoder without index
- (3) Limit switch

Use a 0.5 A fast-blow fuse.

### Wiring Diagram Examples for 2 Encoders on Fast Inputs

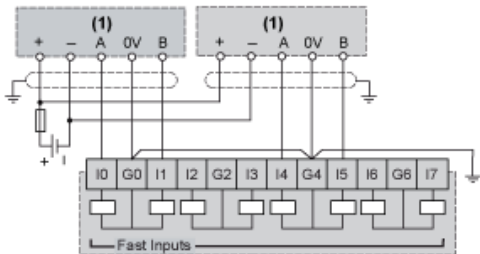
#### Incremental Encoders with Phase-Shifted Signals with TDC



- (2) Dual-phase encoder with index

Use a 0.5 A fast-blow fuse.

#### Incremental Encoders with Phase-Shifted Signals without TDC



- (1) Dual-phase encoder without index

Use a 0.5 A fast-blow fuse.