



Main

Range of product	Modicon M238 logic controller
Product or component type	Compact base
Product specific application	For solutions
Software function	Applicatives functions blocks
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 output 4 fast output
Discrete output voltage	24 V DC
Number of I/O expansion module	7
[Us] rated supply voltage	24 V DC
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 fast input 2 output 1 input 1 fast output
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 fast output < 1 ms 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 shielded cable fast output (normal mode) <= 30 m output <= 30 m input <= 30 m fast input (normal mode) <= 10 m shielded cable fast input (counter mode) <= 10 m fast output (PWM or PTO mode)
Isolation between channels and internal logic	500 V DC
Isolation between channels	None input 500 V for output and fast output 500 V for group of 2 fast inputs
Discrete output logic	Positive logic (source)/negative logic (sink)
Output voltage limits	19.2...30 V
Discrete output current	20...500 mA output <= 500 mA fast output (normal mode) <= 100 mA fast output (PWM mode) <= 100 mA fast output (PTO mode)
Output frequency	<= 20 kHz fast output (PWM mode) <= 100 kHz output <= 100 kHz fast output (PTO mode)
Absolute accuracy error	1 % of full scale fast output (PTO mode) 1 % of full scale cyclic ratio 20...80% fast output (PWM mode)
Leakage current	0.05 mA output <= 2 mA fast output
[Ures] residual voltage	<= 2 V output and fast output
Tungsten load	<= 3 W output and fast output
Short-circuit protection	With output and fast output
Overvoltage protection	With output and fast output
Overload protection	With output and fast output
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	19.2...28.8 V
Inrush current	<= 35 A
Power consumption in W	<= 17.2 W
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 µs arithmetic REAL floating by operation 5111 µs arithmetic REAL floating +, -, x operations 0.971 µs Boolean 0.648 µs arithmetic REAL floating LD and ST 0.506 µs arithmetic DINT double-word +, -, x operations 0.459 µs arithmetic DINT double-word LD and ST 0.439 µs arithmetic INT word +, -, x operations 0.42 µs 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

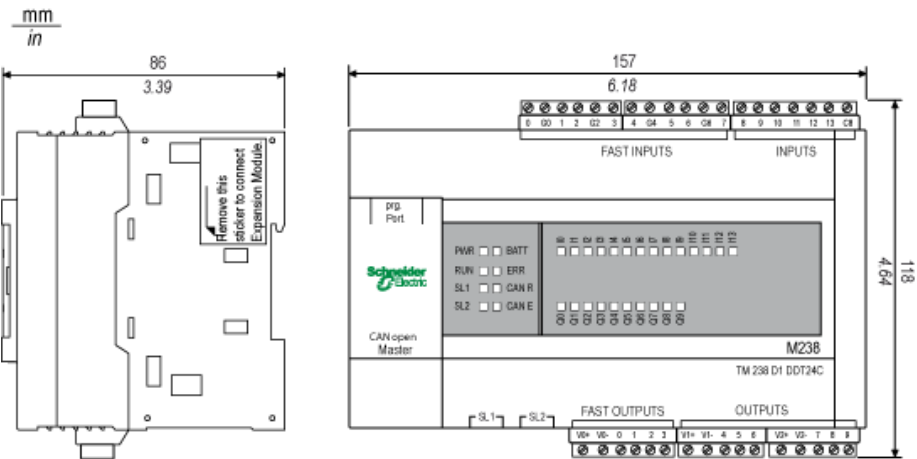
Integrated connection type	CANopen removable screw terminal block CANopen 1 isolated serial link female RJ45 Modbus master/slave RTU/ASCII, character mode or SoMachine-Network RS232/RS485 1.2...38.4 kbit/s (19.2 kbit/s by default) 1 isolated serial link female RJ45 Modbus master/slave RTU/ASCII or SoMachine-Network 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	PWM/PTO 2 100 kHz
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 24 V DC power supply 1 removable screw terminal block (7 terminals) for connecting the sensors (inputs) 1 removable screw terminal block (6 terminals) for connecting the 6 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 4 preactuators (fast output) 1 connector mini B USB 2.0 for a programming terminal
Product weight	0.595 kg

Environment

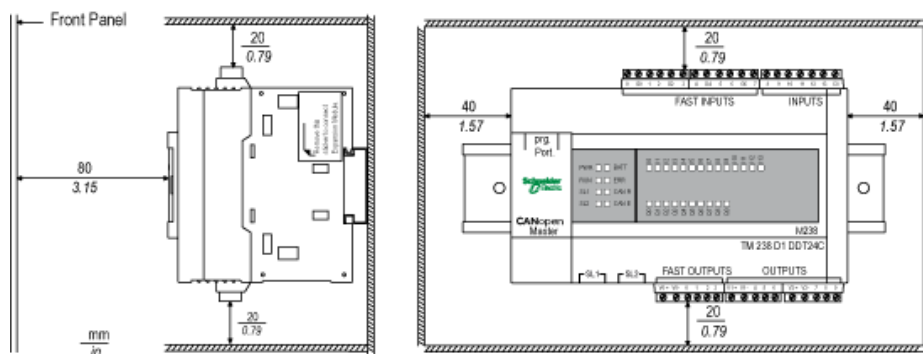
Immunity to microbreaks	10 ms
Dielectric strength	500 V for 1 minute, between supply and earth terminals 500 V for 1 minute, between I/O and earth terminals
Class	Class M20 <= 16 CANopen
Product certifications	CSA CTick GOST UL
Ambient air temperature for operation	-10...55 °C
Ambient air temperature 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
Depth	86 mm
Width	157 mm

Modicon M238 Logic Controller

Dimensions

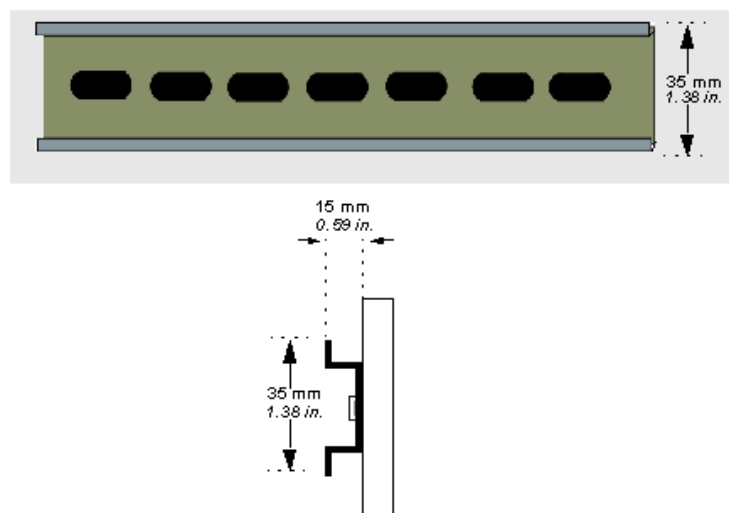


Clearance



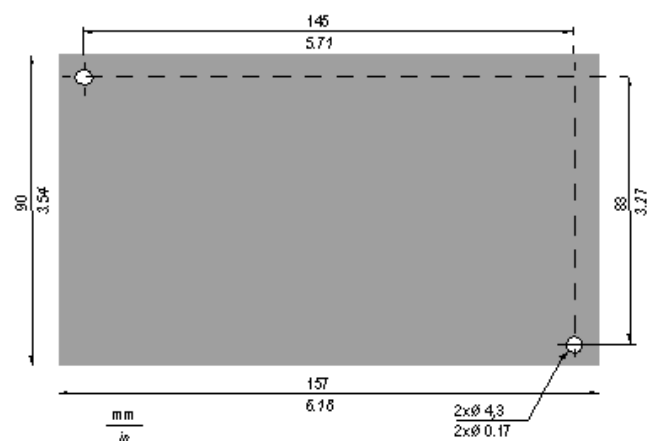
Mounting on a DIN Rail

Dimensions of the DIN Rail

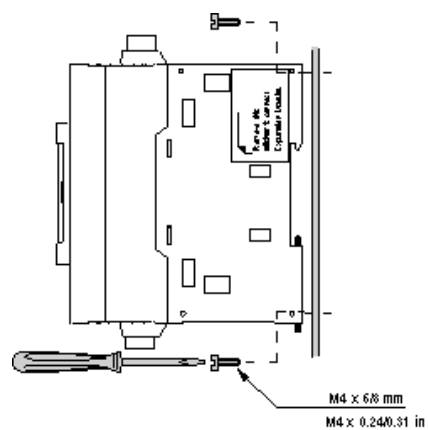


Mounting on a Metallic Panel

Mounting Holes



Mounting the Modicon M238 Logic Controller on a Metallic Panel



Wiring Requirements

Rules for Removable Screw Terminal Block

mm ²	0,2... 1,5	0,25... 1,5	0,2... 1	0,2... 1,5	0,25... 1	0,5... 1,5
AWG	24... 14	24... 14	26... 16	24... 14	24... 16	20... 14

	N.m	0,6
	lb-in	5.3

Use copper conductors only.

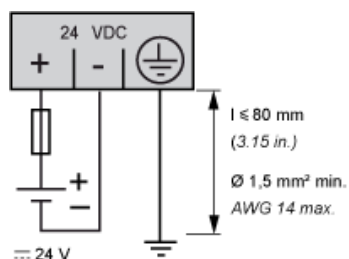
Rules for Removable Spring Terminal Block

mm ²	0,2... 1,5	0,25... 1,5	0,25... 1	0,5... 1,5
AWG	24... 14	24... 14	24... 16	20... 14

Use copper conductors only.

DC Power Supply

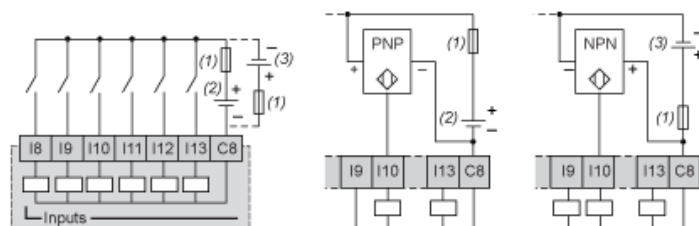
Wiring Diagram



Use an external fast-blow fuse 2 A type F (UL recognized and CSA approved).

Regular Inputs

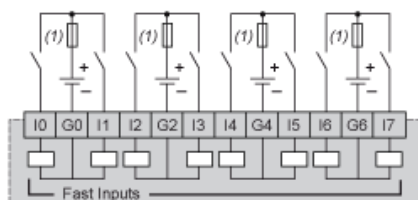
Wiring Diagram



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

Fast Inputs

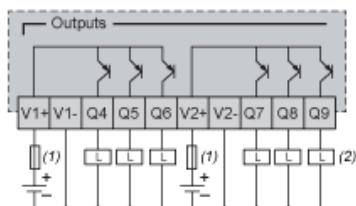
Wiring Diagram



- (1) Fast-blow fuse 0.5 A

Regular Outputs

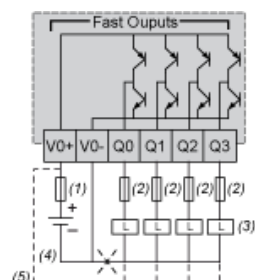
Wiring Diagram



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

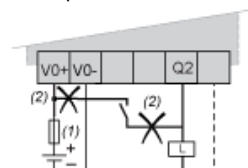
Fast Outputs

Wiring Diagram



- (1) 2 A fast-blow fuse
(2) Fast-blow fuse: 0.5 A in standard use / 0.1 A in PTO use
(3) Protection for inductive load
(4) Positive logic output wiring
(5) Negative logic output wiring

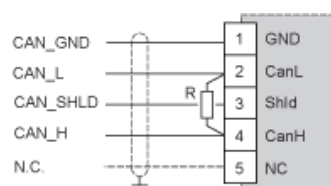
Example of an incorrect wiring on Q2:



- (1) 2 A fast-blow fuse
(2) Incorrect wiring

CANopen Connection

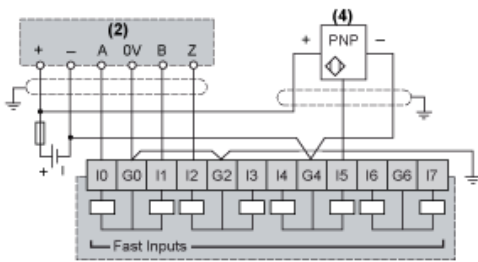
Wiring Diagram



R Line termination resistor (120 Ω)

Wiring Diagram Examples for 1 Encoder on Fast Inputs

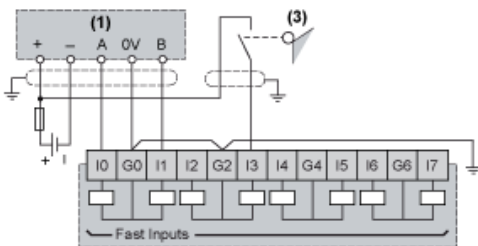
Incremental Encoder with Phase-Shifted Signals with TDC and 3-Wire PNP Detector



- (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

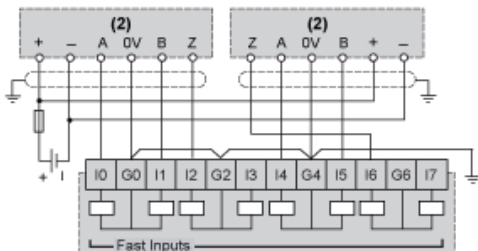


- (1) Dual-phase encoder without index
- (3) Limit switch

Use a 0.5 A fast-blow fuse.

Wiring Diagram Examples for 2 Encoders on Fast Inputs

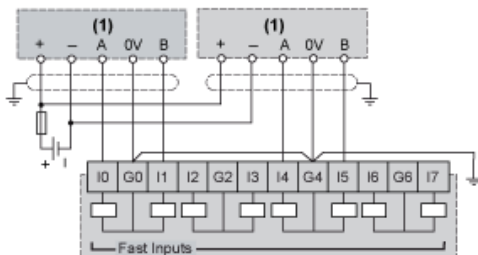
Incremental Encoders with Phase-Shifted Signals with TDC



- (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.