

M12 Lexium MDrive®

Simplifying machine building with compact integrated motors



Ethernet TCP/IP version: EtherNet/IP, ModbusTCP, Profinet, and MCode/TCP

Integrated stepper motors with Ethernet TCP/IP controller for multi-protocol support, and closed loop performance

CE  REACH IP65 **EtherNet/IP™**
conformance tested

Kinetic-Systems

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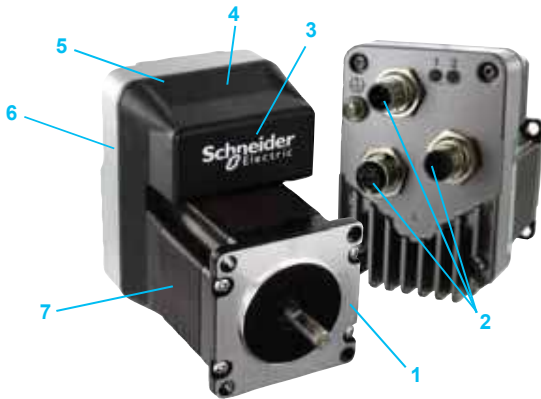
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Description

M12 Lexium MDrive® Ethernet TCP/IP

Profinet; EtherNet/IP & ModbusTCP; MCode/TCP
integrated 2-phase stepper motor



- 1 rotary stepper motor
- 2 M12 sealed circular connectors
- 3 microstepping drive
- 4 Ethernet TCP/IP controller
- 5 up to 8 I/O lines
- 6 internal encoder option
- 7 closed loop performance

Product offer

M12 Lexium MDrive® Ethernet TCP/IP products integrate a high-torque 1.8° 2-phase stepper motor with on-board I/O, drive electronics, Ethernet controller, and closed loop performance with internal encoder option. The Ethernet controller supports multi-protocols selected by the user, including: EtherNet/IP, Profinet, and ModbusTCP.

M12 Lexium MDrive Ethernet TCP/IP products are an adapter class device capable of explicit or implicit messaging. These ODVA™ compliant, compact motion control solutions interface with many manufacturer's systems including Siemens, Rockwell, Omron and Schneider Electric.

Closed loop products (LMDC•C) are equipped with 1000 line (4000 count/rev) encoders internal to the unit, requiring no extra space in an application. Encoders perform stall detection, position maintenance and find index mark, in addition to monitoring motor shaft position for real time closed loop feedback accomplished with hMTechnology.

Unlike traditional motor systems, hMT combines the best of servo and stepper motor technologies, while delivering unique capabilities and enhancements over both, including:

- real time closed loop control
- full use of motor torque
- reduced motor heat (1)
- no loss of synchronization/stalling
- torque mode control
- lower energy consumption (1)

Application areas

Lexium MDrive Ethernet products are ideal for machine builders who want an optimized motor with on-board electronics and support for the widely used Ethernet industrial protocols: EtherNet/IP, Profinet, and ModbusTCP.

Lexium MDrive products are compact motion control solutions that can reduce system cost, design and assembly time for a wide range of motion applications.

Features

- Integrated microstepping drive and high torque 1.8° 2-phase NEMA stepper motor
- Ethernet controller with multi-protocol support
- M12 sealed circular connectors
- Closed loop control with 1000 line internal encoder and hMTechnology (optional)
 - Prevents motor stalling while delivering numerous performance advantages
 - Variable current control reduces motor heat and lowers energy consumption
- Advanced current control for exceptional performance and smoothness
- +12 up to +70 VDC input power range
- Cost effective
- Extremely compact
- Up to 8 I/O
 - Up to four +5 to +24 VDC signal inputs
 - One 12 bit analog input
 - Two 100mA power outputs (only LMD57 & LMD85 products)
 - One 5.5mA high-speed signal output
- Auxiliary logic power supply input
- 20 microstep resolutions to 51,200 steps/rev including: Degrees, Metric, Arc Minutes
- Programmable motor run and hold currents
- Motor stack lengths: single, double and triple
- Graphical user interface provided for quick and easy configuration

(1) Achieved with hMTechnology variable current control.

Specifications

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integrated 2-phase stepper motor

Specifications

		LMD•E57•C (NEMA23)	LMD•E85•C (NEMA34)		
Input power	Voltage	+12...+60 VDC	+12...+70 VDC		
	Current maximum (1)	3.5 A	4.0A		
Thermal	Operating temp non-condensing	Heat sink maximum Motor maximum	85°C 100°C		
	Protection	Type	Temp warning	0...84°C, user selectable	
		Earth grounding	via product chassis ground lug		
		IP rating	IP65	IP20	
Aux. logic input	Voltage range (2)	+12...+24 VDC			
Hardware I/O sourcing or sinking	Analog input	Resolution	12 bit		
		Voltage range	0...+5 VDC, 0...+10 VDC, 0...20 mA, 4...20 mA		
	Signal inputs	Voltage range	+5...+24 VDC, TTL level compatible		
		Protection	over temp, short circuit, transient, over voltage, inductive clamp		
	Power outputs	Current rating	-100...+100mA		
		Voltage range	-24...+24 VDC		
	High-speed signal output	Current open collector/emitter	5.5 mA		
		Voltage open collector	+60 VDC		
Voltage open emitter		+7 VDC			
Communication	Type	Ethernet TCP/IP			
	Protocols	Profinet			
		EtherNet/IP (ODVA compliant)			
		ModbusTCP			
		MCode/TCP on configuration port			
Baud rate	100 Mbps				
Configuration port	503				
Motion	Microstep resolution	Number of settings	20		
		Steps per revolution	200, 400, 800, 1000, 1600, 2000, 3200, 5000, 6400, 10000, 12800, 20000, 25000, 25600, 40000, 50000, 51200, 36000 (0.01 deg/μstep), 21600 (1 arc minute/μstep), 25400 (0.001mm/μstep)		
	Encoder (3)	Line count	1000 lines/4000 edges per rev		
		Style	internal, magnetic		
	Counters	Type	position, encoder/32 bit		
		Edge rate maximum	5 MHz		
	Velocity	Range	+/- 2,560,000 steps per second		
		Resolution	0.5961 steps per second		
	Accel/Decel	Range	1.5 x 10 ⁹ steps per second ²		
		Resolution	90.9 steps per second ²		
	Profinet software (4)	IO data	Output	Slot 1	
			Size	128 bytes	
Registers			38		
Input			Slot 2		
		Size	128 bytes		
		Registers	34		
		Register mapping	Variable, user defined		
		Device class	adapter		
EtherNet/IP software (4)	Message types	explicit or implicit			
	Assembly object 0x04	Output (T→O)	instance 100		
		Output (O→T)	instance 112		
		Mapping to MCode	dynamic		
	Device profile	Identity object	0x01		
		Assembly object	0x04		
		TCP object	0xF5		
		Ethernet link object	0xF6		
	Manufacturer specific objects	0x64: Setup 0x65: Miscellaneous 0x66: Motion	0x67: Hardware inputs/outputs 0x68: Position 0x69: Encoder	0x6A: hMTechnology	
	Modbus TCP software (4)	Device ID	43/14d (0x2B/0x0E)		
Function codes		Public	02d (0x02), 01d (0x01), 05d (0x05), 03d (0x03), 16d (0x10)		
		Manufacturer specific	65d (0x41), 66d (0x42)		
MCode/TCP	Proprietary software	Programming over Ethernet			

(1) Actual power supply current will depend on voltage and load.

(2) When input voltage is removed, maintains power only to control and feedback circuits.

(3) Only with Lexium MDrive closed loop/encoder products.

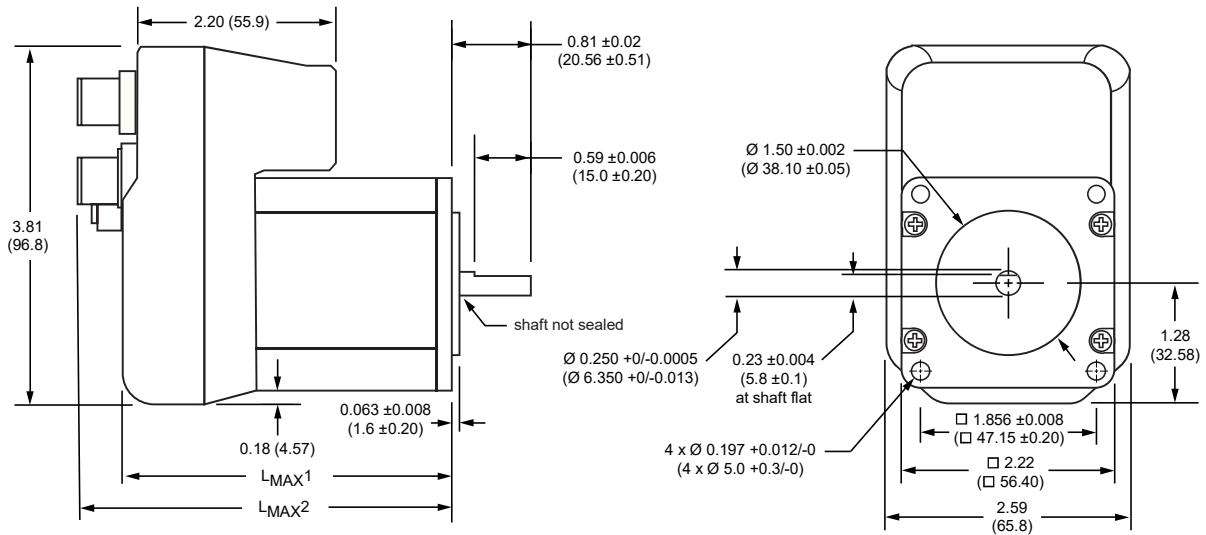
(4) User specifies Profinet, EtherNet/IP and ModbusTCP in software.

Dimensions

M12 Lexium MDrive® Ethernet TCP/IP

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integrated 2-phase stepper motor

LMD•57•C NEMA23 motor – dimensions in inches (mm)



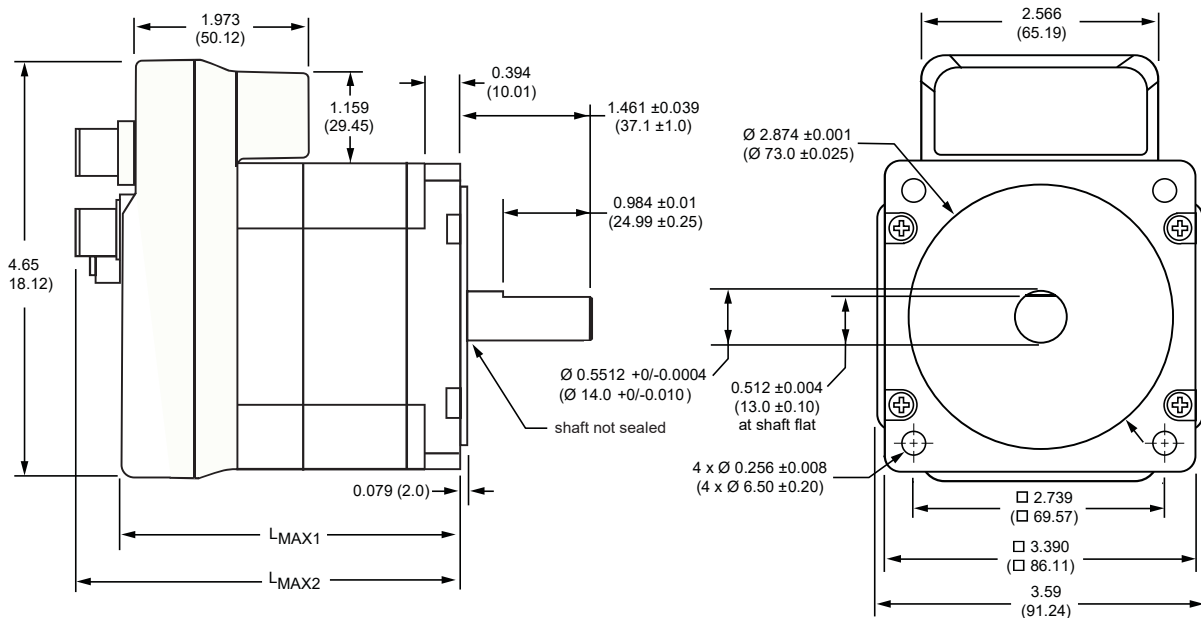
Motor stack length	Lmax1	Lmax2
Single	3.22 (81.8)	3.83 (97.3)
Double	3.56 (90.4)	4.21 (106.9)
Triple	4.44 (112.7)	5.06 (128.5)

Dimensions

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Profinet; EtherNet/IP & ModbusTCP; MCode/TCP
integrated 2-phase stepper motor

LMD•85•C NEMA34 motor – dimensions in inches (mm)

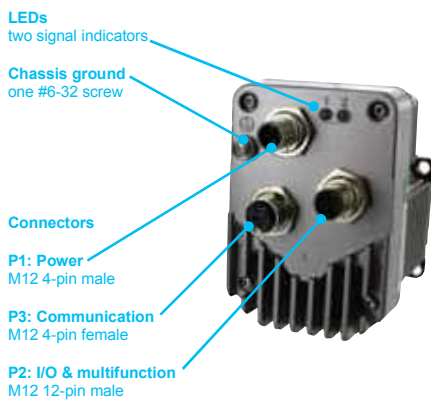


Motor stack length	Lmax1	Lmax2
Single	4.04 (102.7)	4.65 (118.2)
Double	4.57 (116.2)	5.18 (131.7)
Triple	6.14 (156.1)	6.75 (171.5)

Connectivity and signal indicators

M12 Lexium MDrive® Ethernet TCP/IP

Profinet; EtherNet/IP & ModbusTCP; MCode/TCP integrated 2-phase stepper motor



Software interface

The free Lexium MDrive Software Suite includes user interface software for product commissioning and programming. M12 LMD Ethernet products can communicate over EtherNet/IP, ModbusTCP or Profinet, selected through software by the user.

Connectors

All Lexium MDrive connectors are conveniently grouped on the back of each product. Circular M12 connectors are used consistently on all motor sizes, with gender and keying features for correct connecting. Cordsets are available to facilitate rapid prototyping.

A #6-32 screw lug is provided for earth grounding.

Connector	Style	Assignment
P1	M12 4-pin male	Supply voltage
P2	M12 12-pin male	I/O and multifunction interface
P3	M12 4-pin female	Communication
Chassis ground	#6-32 screw lug	Earth grounding

Status indicators

Lexium MDrive products include 2 LED signal indicators. The multi-color LEDs are programmed to indicate a range of pre-defined messages to aid users. See product user manual for details.

Part numbers

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integrated 2-phase stepper motor



LMD-E85-C

LMD-E57-C

Part numbers									
Example	L	M	D	C	E	5	7	1	C
Product LMD = Lexium MDrive	L	M	D	C	E	5	7	1	C
Control type C = Closed loop / with hMT and encoder (1) O = Open loop / no hMT or encoder	L	M	D	C	E	5	7	1	C
Communication type E = EtherNet/IP, ModbusTCP, Profinet, MCode/TCP	L	M	D	C	E	5	7	1	C
Flange size 57 = NEMA 23 / 57mm 85 = NEMA 34 / 85mm	L	M	D	C	E	5	7	1	C
Motor length 1 = single stack 2 = double stack 3 = triple stack	L	M	D	C	E	5	7	1	C
Variation C = M12 circular connectors	L	M	D	C	E	5	7	1	C

(1) Closed loop control delivers encoder feedback and hMT enhanced motor performance.



MD-CS640-000



MD-CS620-000



MD-CS610-000

Installation accessories			
Description	Length m	Length feet	Reference
Communication cordset			
Shielded cable with straight M12 4-pin male connector and RJ45 connector.			
■ Mates to M12 4-pin female communication connector	2.0	6.5	MD-CS640-000
Power cordset			
Pre-wired shielded cable with straight M12 connector.			
■ Mates to M12 4-pin male power connector	3.0	10.0	MD-CS620-000
I/O cordset			
Pre-wired shielded cable with straight M12 connector.			
■ Mates to M12 12-pin male I/O connector	3.0	10.0	MD-CS610-000

Lexium MDrive®

Motor specifications

LMD•57 NEMA23 motor specifications

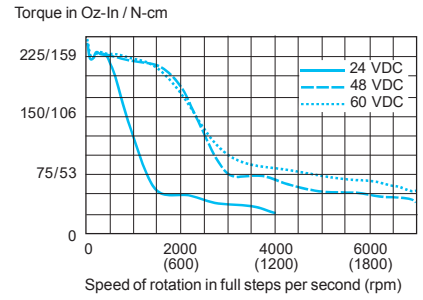
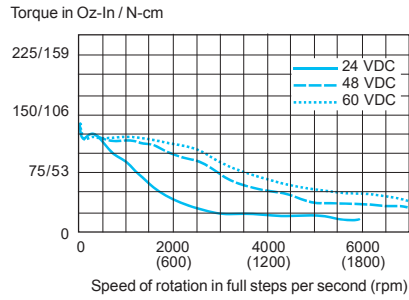
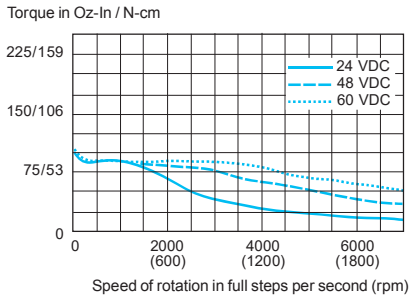
	Motor stack length	Single	Double	Triple
Holding torque	oz-in	103.4	158.6	242.2
	N-cm	73.0	112.0	171.0
Detent torque	oz-in	3.9	5.6	9.72
	N-cm	2.7	3.9	6.86
Rotor inertia	oz-in-sec ²	0.0025	0.0037	0.0065
	kg-cm ²	0.18	0.26	0.46
Radial load limit, center of shaft	lbs	15	15	15
	kg	6.8	6.8	6.8
Axial load limit @ 1500 rpm (5000 full steps/sec)	lbs	20	20	20
	kg	9	9	9
Weight (motor+driver)	oz	26.4	31.2	44.0
	g	748	885	1247

LMD•85 NEMA34 motor specifications

	Motor stack length	Single	Double	Triple
Holding torque	oz-in	336.0	480.0	920.0
	N-cm	237.0	339.0	650.0
Detent torque	oz-in	10.9	14.16	19.83
	N-cm	7.7	10.0	14.0
Rotor inertia	oz-in-sec ²	0.0127	0.0191	0.0382
	kg-cm ²	0.90	1.35	2.70
Radial load limit, center of shaft	lbs	65	65	65
	kg	29.4	29.4	29.4
Axial load limit @ 1500 rpm (5000 full steps/sec)	lbs	20	20	20
	kg	9	9	9
Weight (motor+driver)	lb	4.45	5.65	9.0
	kg	2.02	2.56	4.08

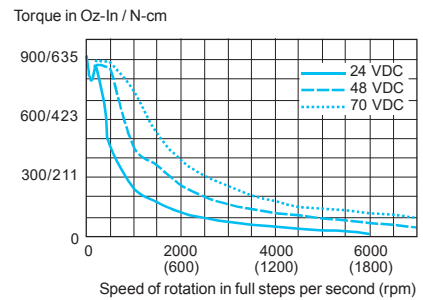
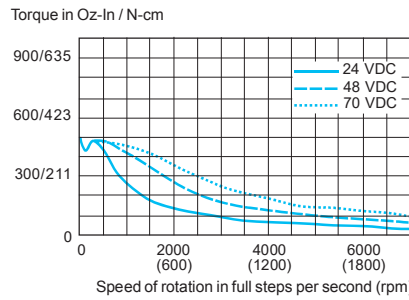
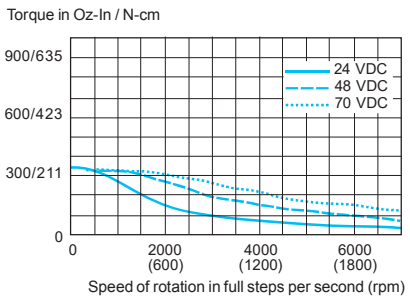
LMD•57 NEMA 23 speed torque (1)

Single stack length Double stack length Triple stack length



LMD•85 NEMA34 speed torque (2)

Single stack length Double stack length Triple stack length



(1) Test conditions: 100% current, 0.84 oz. damper, 0.18589 oz-in² inertia, hMT off
 (2) Test conditions: 100% current, 3.7 oz. damper, 4.75670 oz-in² inertia, hMT off