Lexium MDrive®

LMD•E57 Ethernet TCP/IP

Product overview

Robust Lexium MDrive® Ethernet TCP/IP products integrate 1.8° 2-phase stepper motors with control electronics including an Ethernet controller that supports user-selectable protocols: Profinet, EtherNet/IP, and ModbusTCP. An optional encoder delivers hMT closed loop performance.

hMT closed loop performance is available in products with either a multi-turn absolute encoder or incremental magnetic encoder. Closed loop performance maintains functional motor control to prevent loss of synchronization, offers variable current control, torque control, and use of the motor's full torque range without derating.

Multi-turn absolute encoders may benefit users by detecting and storing position information, even when powered down. This can eliminate homing routines and reduce setup time at system startup.

Lexium MDrive products are ODVA-compliant adapter class devices capable of explicit or implicit messaging. Compact motion control solutions that interface with many manufacturer's systems.

Application areas

Especially well suited for industrial applications, products include an IP65 rated version with circular M12 connectors. A high torque motor (LMH•M57) is also available, increasing torque up to 50%.

Lexium MDrive products can reduce machine complexity, size and cost in many stepper and servo motor applications. Their high degree of integration can increase system reliability by reducing the number of individual components, eliminating multiple potential failure points.

LMD•E57 Lexium MDrive Ethernet TCP/IP products: integrated NEMA23 motor and controls, IP65 & IP20-rated

Features overview

General	NEMA23 1.8° 2-phase stepper motor integrated with robust control electronics, including programmable motion controller
	Advanced current control for exceptional performance and smoothness
Input power	+12 to +60 VDC single supply
Communication protocols	EtherNet/IP
	Profinet
	ModbusTCP
	MCode/TCP
Encoder options	Multi-turn absolute or incremental magnetic
Motion	20 microstep resolutions up to 51,200 steps per rev including: Degrees, Metric, Arc Minutes
	336 user program labels / 11,120 bytes flash memory
	0 to 2.56 MHz step clock rate selectable in 0.59 Hz increments
I/O, sourcing or sinking	+5 to +24 VDC signal inputs
	12-bit analog input (1)
	100mA power outputs
	5.5mA high-speed signal output
Protection	Temperature warning
	IP20, IP65 ratings
Warranty	4 year, conditional

(1) Not available on products with multi-turn absolute encoder.

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Specifications

Communication	Type		Ethernet TCP/IP
	Protocols		Profinet
			EtherNet/IP (ODVA compliant)
			Modbus TCP
			MCode/TCP on configuration port
	Baud rate		100 Mbps
	Configuration port		503
Input power	Voltage	VDC	+12…+60
	Current maximum (1)	Amp	3.5
Motor	Frame size	NEMA	23
		inches	2.3
		mm	57
	Performance levels		standard torque or premium high torque
	Holding torque	oz-in	103 … 416
		N-cm	73 … 294
	Length	stack sizes	1, 2 & 3
Thermal	Operating temp non-condensing	Heat sink maximum	85°C
		Motor maximum	100°C
Protection	Type	Temp warning	0…84°C, user selectable
		IP rating	IP20, IP65
		Earth grounding	via product chassis ground lug
I/O sourcing or sinking	One analog input (2)	Resolution	12 bit
		Voltage range	0…+5 VDC, 0…+10 VDC, 0…20 mA, 4…20 mA
	Four signal inputs	Voltage range	+5…+24 VDC, TTL level compatible
		Protection	over temp, short circuit, transient, over voltage, inductive clamp
	Two power outputs (3)	Current rating	-100…+100 mA
		Voltage range	-24…+24 VDC
	One high-speed signal output	Current open collector/emitter	5.5 mA
		Voltage open collector	+60 VDC
		Voltage open emitter	+7 VDC
Aux. logic input	Voltage range (4)		+12…+24 VDC
Encoder options	Multi-turn absolute	Position update / retention	30 days on internal power; 5 years with optional battery pack
	Incremental magnetic	Line count	1000 lines / 4000 edges per rev
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)
	Counters	Type	position, encoder / 32 bit
		Edge rate maximum	5 MHz
	Velocity	Range	+/– 2,560,000
		Resolution	0.5961 steps per second
	Accel / Decel	Range	1.1×10^9 steps per second^2
		Resolution	90.9 steps per second^2
		Types	linear, triangle s-curve, sinusoidal s-curve
Software	Program storage	Type/size	flash / 11,120
	User registers	Number/resolution	4 / 32-bit
	Floating point registers	Number/precision	8 / double
	Math functions	Arithmetic	+, -, x, ÷, >, <, =, >=, <=
		Logic	AND, OR, XOR, NOT
		Trigonometric	ABS, COS, ACOS, LOG2, LOG10, PI, SIN, ASIN, SQRT, TAN, ATAN
	Branch functions		Branch & call
	I/O functions	Inputs	Home, limit plus, limit minus, go, stop, pause, jog plus, jog minus, general purpose, capture
		Outputs	Moving, error, velocity change,, moving position, trip, attention. general purpose
	Trip functions		Trip on input, trip on position, trip on time, trip capture, trip on relative position, trip on main power loss
	Party-mode addresses		62
	Encoder functions (5)		stall detection, position maintenance, find index, hMT

(1) Actual power supply current will depend on voltage and load.
(2) Not available on products with multi-turn absolute encoder.
(3) Products with multi-turn absolute encoder have one power output.
(4) When input voltage is removed, maintains power only to control and feedback circuits.
(5) Closed-loop models with encoder only.

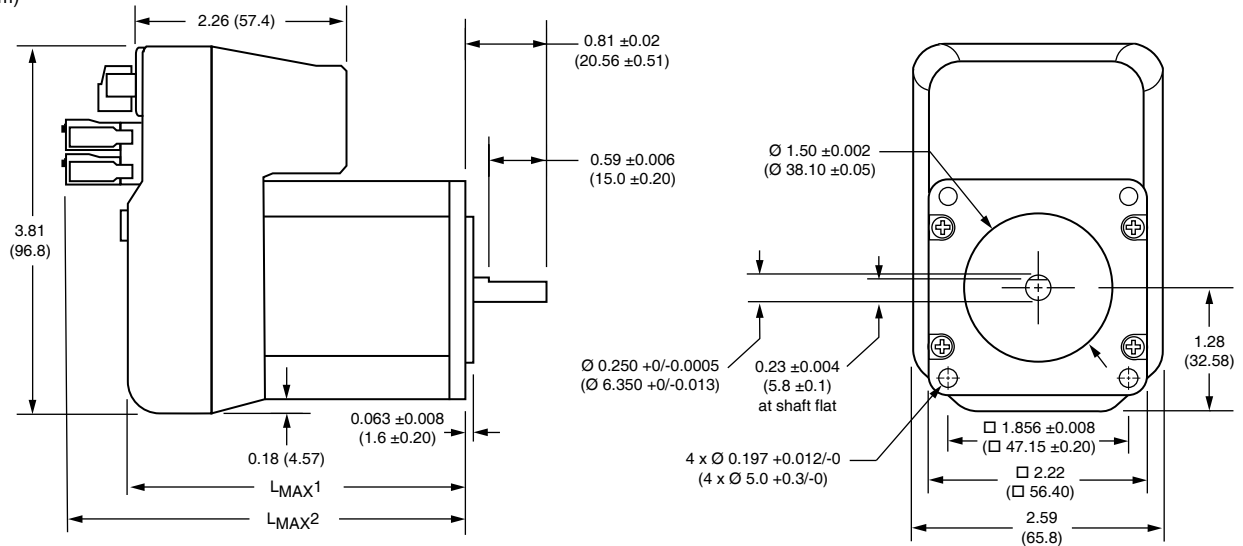An optional Communication Converter is recommended to facilitate prototyping.

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LMD•E57 Ethernet TCP/IP

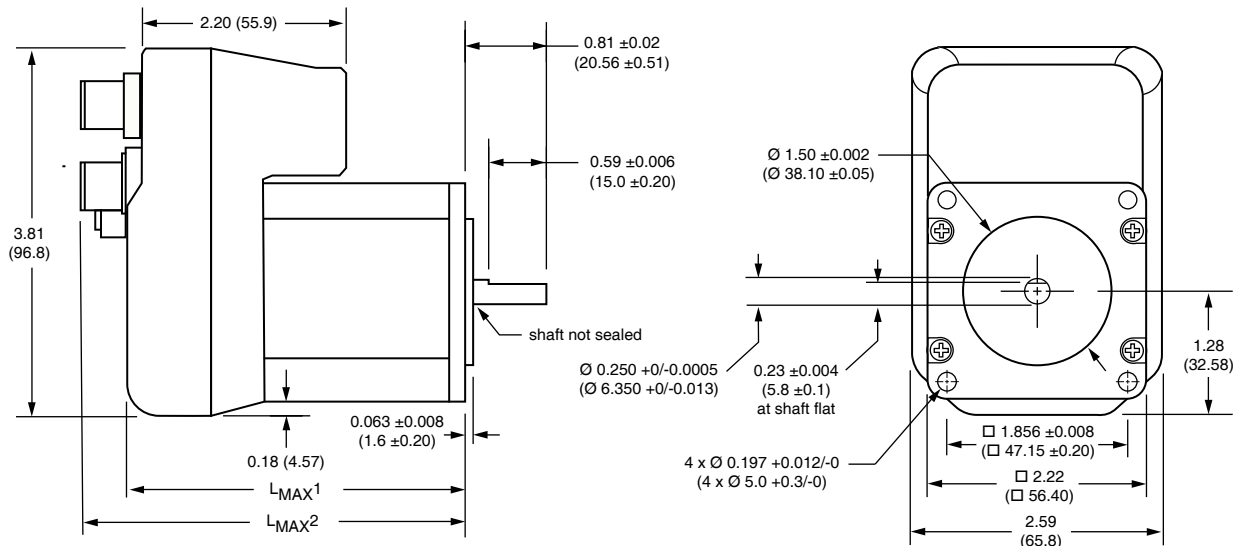## Dimensions

LM•57 NEMA23 motor, IP20-rated

inches (mm)

2.26 (57.4)

3.81 (96.8)

0.81 ±0.02 (20.56 ±0.51)

0.59 ±0.006 (15.0 ±0.20)

0.18 (4.57)

0.063 ±0.008 (1.6 ±0.20)

$L_{MAX}1$

$L_{MAX}2$

Ø 1.50 ±0.002 (Ø 38.10 ±0.05)

Ø 0.250 +0/-0.0005 (Ø 6.350 +0/-0.013)

0.23 ±0.004 (5.8 ±0.1) at shaft flat

4 x Ø 0.197 +0.012/-0 (4 x Ø 5.0 +0.3/-0)

1.28 (32.58)

□ 1.856 ±0.008 (□ 47.15 ±0.20)

□ 2.22 (□ 56.40)

2.59 (65.8)

Motor stack length	Lmax1		Lmax2	
	Standard - LMD	High torque - LMH	Standard - LMD	High torque - LMH
Single	3.17 (80.5)	3.32 (84.3)	3.91 (99.3)	4.01 (101.8)
Double	3.52 (89.4)	3.73 (94.8)	4.26 (108.2)	4.36 (110.7)
Triple	4.38 (111.3)	4.60 (116.8)	5.13 (130.3)	5.23 (133.0)

LM•57•C NEMA23 motor, IP65-rated

inches (mm)

2.20 (55.9)

3.81 (96.8)

0.81 ±0.02 (20.56 ±0.51)

0.59 ±0.006 (15.0 ±0.20)

0.18 (4.57)

0.063 ±0.008 (1.6 ±0.20)

shaft not sealed

$L_{MAX}1$

$L_{MAX}2$

Ø 1.50 ±0.002 (Ø 38.10 ±0.05)

Ø 0.250 +0/-0.0005 (Ø 6.350 +0/-0.013)

0.23 ±0.004 (5.8 ±0.1) at shaft flat

4 x Ø 0.197 +0.012/-0 (4 x Ø 5.0 +0.3/-0)

1.28 (32.58)

□ 1.856 ±0.008 (□ 47.15 ±0.20)

□ 2.22 (□ 56.40)

2.59 (65.8)

Motor stack length	Lmax1		Lmax2	
	Standard - LMD	High torque - LMH	Standard - LMD	High torque - LMH
Single	3.22 (81.8)	3.32 (84.3)	3.91 (99.3)	4.01 (101.8)
Double	3.63 (92.3)	3.73 (94.8)	4.26 (108.2)	4.36 (110.7)
Triple	4.50 (114.3)	4.60 (116.8)	5.13 (130.3)	5.23 (133.0)

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IP20-rated products

LEDs
two signal indicators

**Connector
P1: Power**
2-pin screw lock

Chassis ground
one #6-32 screw

Connectors

P2: I/O & multifunction
2 keyed 7-pin spring lock

P3: Communication
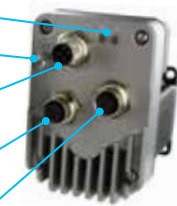RJ45

IP65-rated products

LEDs
two signal indicators

Chassis ground
one #6-32 screw

Connectors

P1: Power
M12 4-pin male

P3: Communication
M12 4-pin female

P2: I/O & multifunction
M12 12-pin male

MD-CS640-000

MD-CS620-000

MD-CS610-000

ICP0531

Part numbers

example part number	L M D C E 5 7 1 C
Product LMD = Lexium MDrive with standard hybrid stepper motor LMH = Lexium MDrive with high torque stepper motor	**L M D** C E 5 7 1 C
Control type C = Closed loop / with hMT and incremental magnetic encoder (1) A = Closed loop / with hMT and multi-turn absolute 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 2.3" / 57mm	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 — omit from part number if unwanted C = M12 circular connectors and IP65 rating	L M D C E 5 7 1 **C**

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

Accessories

description	length feet (m)	part number
IP65 cordsets Shielded cables pre-wired with straight M12 mating connectors		
Communication cordset mates to 4-pin female connector	6.5 (2.0)	MD-CS640-000
Power cordset mates to 4-pin male connector	10.0 (3.0)	MD-CS620-000
I/O cordset mates to 12-pin male connector	10.0 (3.0)	MD-CS610-000
Back-up battery pack for Absolute Encoder models Extend stored position data up to 5-years for 1 to 6 LMDs with absolute encoder		
Battery pack, DIN-rail mount. Uses 3 AA batteries, not provided	—	ICP0531
LMD mating cable(s) with crimp connector to flying lead end	3.3 (1.0)	PD02-0531-FL1
PLC mating cable with crimp connector to flying lead end	3.3 (1.0)	PD04-0531-FL1
Replacement mating connector kit Kits are for IP20 products. They include one 2-pin power mate, and one set (2 pieces) 7-pin multifunction mates	—	CK-15

# Lexium MDrive

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Motor performance

LMD•57 standard torque NEMA 23 motor specifications	Motor	Stack length	Single	Double	Triple
	Holding torque	oz-in	103	159	242
		N-cm	73	112	171
	Detent torque	oz-in	3.9	5.6	9.7
		N-cm	2.7	3.9	6.9
	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 @ 1500rpm (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

LMH•57 high torque NEMA 23 motor specifications	Motor	Stack length	Single	Double	Triple
	Holding torque	oz-in	152	264	416
		N-cm	107	186	294
	Detent torque	oz-in	8.5	14.2	21.2
		N-cm	6.0	10	15
	Rotor inertia	oz-in-sec^2	0.0019	0.0030	0.0065
		kg-cm^2	0.14	0.22	0.46
	Radial load limit, center of shaft	lbs	15	15	15
		kg	6.8	6.8	6.8
	Axial load limit @ 1500rpm (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

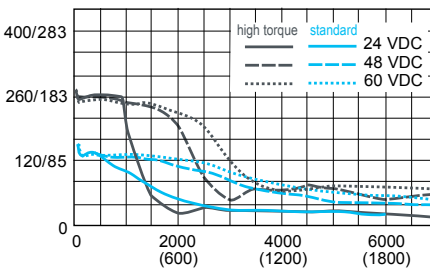### LM•57 NEMA 23 speed torque (1)

Single stack length

Torque in Oz-In / N-cm
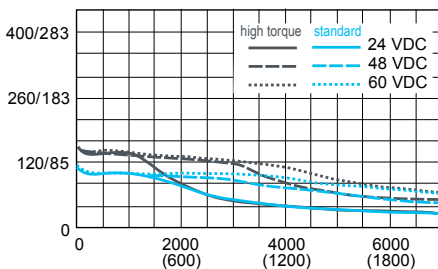
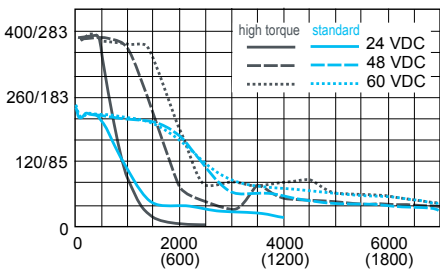Speed of rotation in full steps per second (rpm)

Double stack length

Torque in Oz-In / N-cm

Speed of rotation in full steps per second (rpm)

Triple stack length

Torque in Oz-In / N-cm

Speed of rotation in full steps per second (rpm)

(1) Test conditions: 100% current with damper simulating load.